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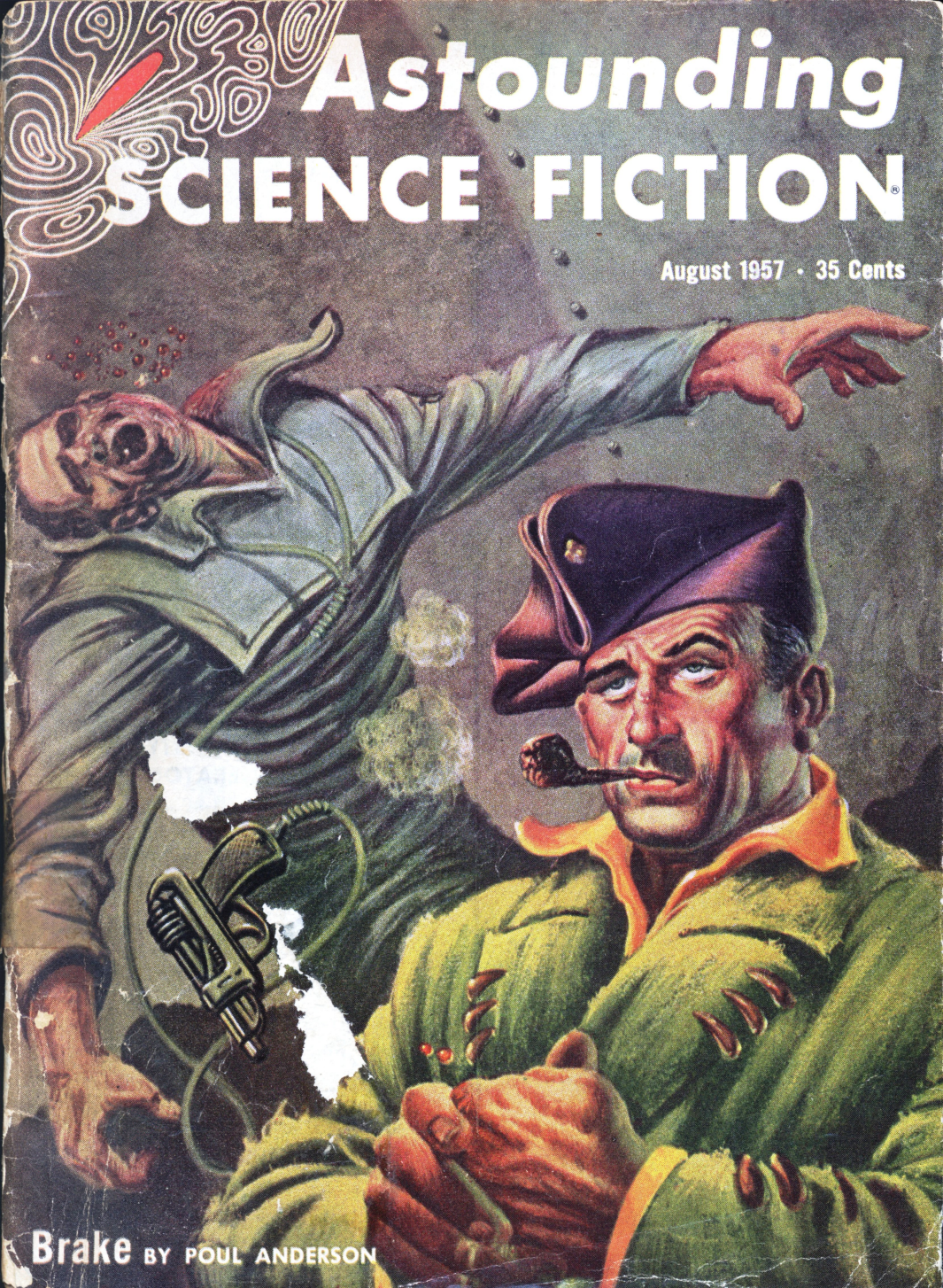

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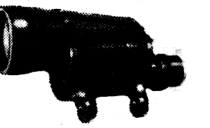

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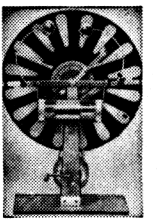

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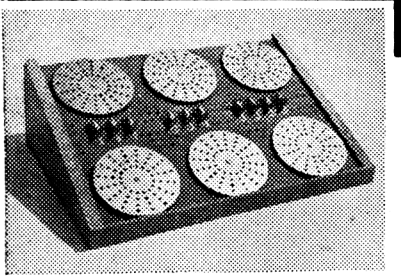

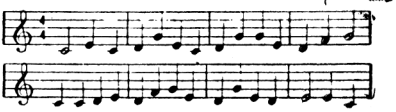

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THAT SHORTAGE OF SCIENTISTS

The Government is very genuinely concerned with the rising shortage of technicians. We need more technicians, and the demand for them is rising.

While technical schools show a decreasing enrollment, and a decreasing number of competent graduates, the Liberal Arts schools are, at the same time, bursting their seams—and the percentage of students going into technology is decreasing. The competent students aren't going into technology, nor are there enough competent applicants for medical training. Interestingly, the greatest rise, percentagewise, is in the humanic sciences—psychology, sociology, anthropology and the like.

I'm in favor of that . . . in one respect only. It's fairly obvious that we're badly in need of some hard-boiled, hard-headed, hard-fact *science* in those fields—and equally obvious that we haven't got it. Psychologists who can't induce human individuals to support their work aren't as good psychologists-in-practical-action as a con man who can induce an individual to back a useless or nonexistent enterprise. Sociologists who complain that the government doesn't pay adequate attention to Sociology can quite properly be told to "Put up or shut up; if you do in practical fact know the forces that motivate societies, then you can get yourselves elected. If your theories work—use 'em. If they don't work for you—why hold they should work for others?"

Psychotherapists complain that the mental hospitals are badly overcrowded; the percentage of the population in mental hospitals is rising. That seems to me a sound indication that the "science" of psychotherapy is falling farther and farther behind on its assigned—and professed—business. It is certainly

true that we badly need more effective research and development in the fields of the humanic sciences. The work *is* needed—but I am about to propose that there are indications of a basic misdirection such that more work *along the present accepted lines* is futile.

One of the deepest urges of a human being is to seek freedom of action, of thought, and of belief. Freedom of Opinion is one of our most precious needs; every human individual has a deep, and overwhelmingly powerful urge in that direction. Men will, at any time, prove that the urge to freedom of opinion, rather than self-preservation, is the first law of human nature. A man will, as all history shows, sacrifice life, family, and everything else in defense of his beliefs—his opinions. The United States was founded by a bunch of the most violently opinionated people in history; the Puritains gave up home, friends, and the values of all their training to risk life and family in the wild new lands of New England. A lot of them died for their opinions; the ones that didn't were just lucky—but equally determined to die rather than yield an iota on their right to their own opinions.

Trouble is . . . there's such a thing as freedom of opinion, and a different thing, *license* of opinion. And who is to judge where "freedom" is really license? Freedom is never unlimited; the essential characteristic of true freedom is that it accepts and works within limits.

What are the limitations on your right to your own opinion? If you cannot name them—then you do not have freedom of opinion, but license. Is your opinion limited only by conflict with another man's opinion? Is the only limit, and the necessary and proper limit, its interference with another man's actions?

Not valid. A homicidal maniac has an opinion which must be interfered with—though he does not acknowledge that. The racketeer, the rapist, the con man—they have opinions that must be denied them. The fact that your opinion interferes with that of another man is no test; it would imply that you should yield your opinion to another man as soon as he generates one that it interferes with.

I don't know the answer—but I suspect that it's been made unnecessarily tough by asking "Who is to judge?" You know the old saying, "Ask a silly question, and you'll get a silly answer." I think "*Who* is to judge" is a silly question, and we'll go on getting silly answers as long as we ask it. The correct question is one that human beings don't like, though: "On what basis shall we judge?"

Lying in that problem, however, lies the cause of the current shortage of technicians, I believe. Science is hard and cold and inhuman; it's utterly dogmatic, and absolutely authoritarian. You haven't the slightest

trace of a right to your own opinion; give up, quit . . . abandon all hope, ye who enter here. You have *no* right to your own opinion. None. It will be stripped from you ruthlessly, and you will be punished with absolutely inexorable rigidity if you seek to maintain that you do have a right to your own opinion. If you think two thousand volts shouldn't hurt you, because you're such a nice, pleasant, friendly fellow . . . you have zero right to that opinion, and will be ruthlessly and instantly punished for manifesting it. The passionate conviction of your argument that this beam is strong enough has not the slightest effect to prevent the structure collapsing and destroying you.

It isn't a matter of *who* is to judge, and any effort to pretend it is simply leads to a new demonstration that it is *not* true. The judgments are absolute, and there is no Court of Appeal. The question is *what* is to judge. "Did it work?" is the absolute, dogmatic, authoritarian, ruthlessly cold ultimate Judge in science. You have *no* right to your own opinion. . . you have only a right to the correct opinion, and that not because it's yours. Then, of course, no man, no authority, emperor, or Bureau can strip it from you, because they'd have to strip it from the Universe.

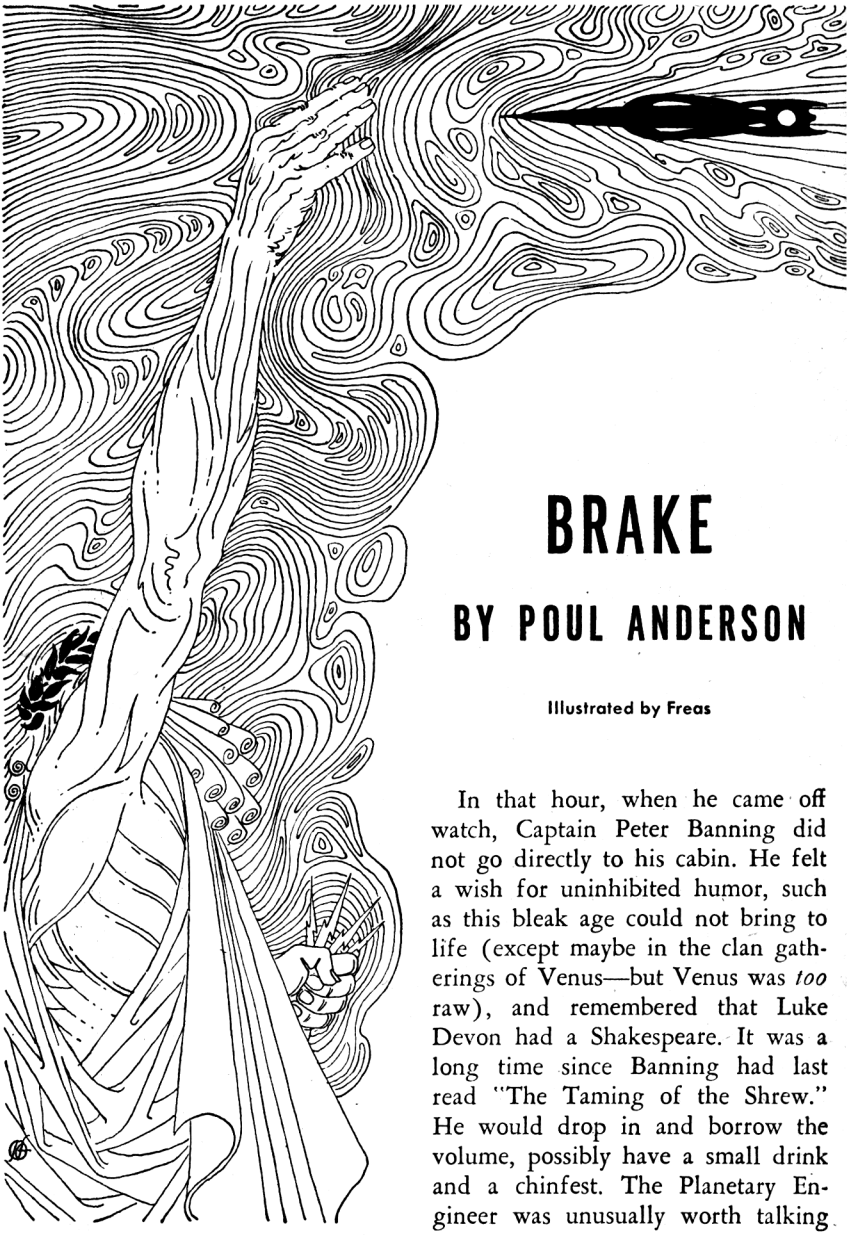
But a man doesn't like having some entity not-himself forcing him to yield his opinions, willy-nilly, without the slightest hope of argument. You can't argue with a *thing;* Science doesn't argue with the intransigent objector to the laws of Nature; it simply proceeds without him. If he shouts a defiant "Over my dead body!" it proceeds with perfect equanimity, and without the slightest hesitancy, over his dead body. If that is the way he wants it —why, he has a perfect right to want it to happen over his dead body, and it will.

Science is cold and inhuman—because it won't yield to the most ardent of human arguments. The most warmly defended beliefs don't have the slightest effect. It's a chilling, ruthless, absolute discipline. It will break you without the slightest hesitancy—or, if you are right, defend you with the ultimate and unlimited might of the Universe itself.

Ignorance of the law of gravity is no excuse; it crushes the careless baby, or the careless airplane pilot with equal finality. "I didn't mean to!" is no excuse; the accidentally touched two thousand volt power lead kills you precisely as dead as it would someone who was deliberately defying it.

The technical education offers the student the opportunity to submit to a discipline guaranteed to prove to him he has no right to his own opinions. It guarantees to strip away many of his dearest beliefs, to frustrate him with the knowledge that his frustration is absolute and beyond appeal—that he must simply abandon, flatly and completely, any

(*Continued on page* 160)

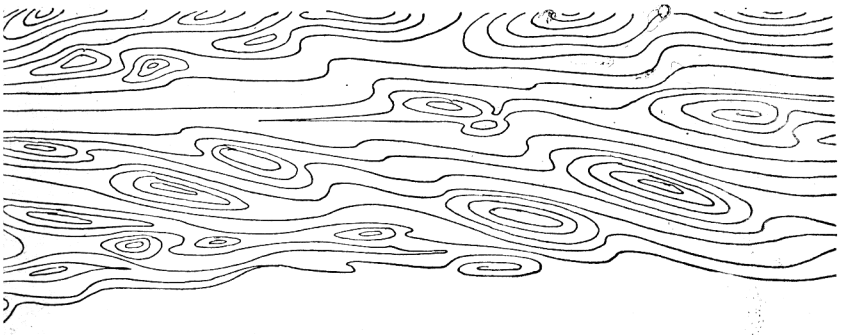


BRAKE

BY POUL ANDERSON

Illustrated by Freas

In that hour, when he came off watch, Captain Peter Banning did not go directly to his cabin. He felt a wish for uninhibited humor, such as this bleak age could not bring to life (except maybe in the clan gatherings of Venus—but Venus was *too* raw), and remembered that Luke Devon had a Shakespeare. It was a long time since Banning had last read "The Taming of the Shrew." He would drop in and borrow the volume, possibly have a small drink and a chinfest. The Planetary Engineer was unusually worth talking to.



The Solar System was in political ferment—there was a restless urge to go somewhere—but no decision as to where. And the problem of the ship was that it was going . . . and there were no brakes to stop it. . . .

So it was that he stepped out of the companionway into A-deck corridor, and saw Devon backed up against the wall at gun point.

Banning had not stayed alive as long as this—a good deal longer than he admitted—through unnecessary heroics. He slid back, flattened himself against the aluminum side of the stairwell, and stretched his ears. Very gently, one hand removed the stubby pipe from his teeth and slipped it into a pocket of his tunic, to smolder itself out. The fumes might give him away to a sensitive nose, and he was unarmed.

Devon spoke softly, with rage chained in his throat: "The devil damn thee, thou cream-faced loon!"

"Not so hasty," advised the other person. It was the Minerals Authority representative, Serge Andreyev, a large hairy man who dressed and talked too loudly. "I do not wish to kill you. This is just a needler in my hand. But I have also a gun for blowing out brains—if required."

His English bore its usual accent, but the tone had changed utterly. It was not the timbre of an irritating extrovert; there was no particular melodrama intended; Andreyev was

making a cool statement of fact.

"It is unfortunate for me that you recognized me through all the surgical changes," he went on. "It is still more unfortunate for you that I was armed. Now we shall bargain."

"Perhaps." Devon had grown calmer. Banning could visualize him, backed up against the wall, hands in the air: a tall man, cat-lithe under the austere stiffness of his Order, close-cropped yellow hair and ice-blue eyes and a prow of nose jutting from the bony face. *I wouldn't much like to have that hombre on my tail,* reflected Banning.

"Perhaps," repeated Devon. "Has it occurred to you, though, that a steward, a deckhand . . . anyone . . . may be along at any moment?"

"Just so. Into my cabin. There we shall talk some more."

"But it *is* infernally awkward for you," said Devon. " 'Is it a world to hide virtues in?'—or prisoners, for that matter? Here we are, beyond Mars, with another two weeks before we reach Jupiter. There are a good fifteen people aboard, passengers and crew—not much, perhaps, for a ship as big as the *Thunderbolt,* but enough to search her pretty thoroughly if anyone disappears. You can't just cram me out any convenient air lock, you know, not without getting the keys from an officer. Neither can you keep me locked away without inquiries as to why I don't show up for meals . . . I assure you, if you haven't noticed, my appetite is notorious. Therefore, dear old chap—"

"We will settle this later," snapped Andreyev. "Quickly, now, go to my cabin. I shall be behind. If necessary, I will needle you and drag you there."

Devon was playing for time, thought Banning. If the tableau of gunman and captive remained much longer in the passageway, someone was bound to come by and—*As a matter of fact, son, someone already has.*

The captain slipped a hand into his pouch. He had a number of coins: not that they'd be any use on Ganymede, but he didn't want to reenter Union territory without beer cash. He selected several of nearly uniform size and tucked them as a stack into his fist. It was a very old stunt.

Then, with the quick precision of a hunter—which he had been now and then, among other things—he glided from the companionway. Andreyev had just turned his back, marching Devon up the hall toward Cabin 5. Peter Banning's weighted fist smote him at the base of the skull.

Devon whirled, a tiger in gray. Banning eased Andreyev to the floor with one hand; the other took the stun pistol, not especially aimed at the engineer nor especially aimed away from him. "Take it easy, friend," he murmured.

"You . . . oh!" Devon eased, muscle by muscle. A slow grin crossed his face. " 'For this relief much thanks.' "

"What's going on here?" asked the captain.

There was a moment of stillness. Only the ship spoke, with a whisper of ventilators. The sound might almost have belonged to that night of cold stars through which she hurtled.

"Well?" said Banning impatiently.

Devon stood for an instant longer, as if taking his measure. The captain was a stocky man of medium height, with faintly grizzled black hair clipped short on a long head. His face was broad, it bore high cheekbones, and its dark-white skin had a somehow ageless look: deep trenches from wide nose to big mouth, crow's-feet around the bony-ridged gray eyes, otherwise smooth as a child's. He did not wear the trim blue jacket and white trousers of the Fireball Line, but favored a Venusian-style beret and kilt, Arabian carpet slippers, a disreputable old green tunic of possibly Martian origin.

"I don't know," said the Planetary Engineer at last. "He just pulled that gun on me."

"Sorry, I heard a bit of the talk between you. Now come clean. I'm responsible for this ship, and I want to know what's going on."

"So do I," said Devon grimly. "I'm not really trying to stall you, skipper—not much, anyway." He stooped over Andreyev and searched the huddled body. "Ah, yes, here's that other gun he spoke of, the lethal one."

"Give me that!" Banning snatched it. The metal was cold and heavy in his grasp. It came to him with a faint shock that he himself, and his entire crew, had nothing more dangerous between them than some knives and monkey wrenches. A spaceship was not a Spanish caravel, her crew had no reason to arm against pirates or mutiny or—

Or did they?

"Go find a steward," snapped Banning. "Come back here with him. Mr. Andreyev goes in irons for the rest of the trip."

"Irons?" Under the cowl of his gray tunic, Devon's brows went up.

"Chains . . . restraint . . . hell, we'll lock him away. I've got a bad habit of using archaisms. Now, jump!"

The engineer went quickly down the hall. Banning lounged back, twirling the gun by its trigger guard, and watched him go.

Where had he seen the fellow before?

He searched a cluttered memory for a tall blond man who was athlete, technician, Shakespearean enthusiast, and amateur painter in oils. Perhaps it was only someone he had read about, with a portrait; there was so much history— Wait. The Rostomily brotherhood. Of course. But that was three centuries ago!

Presumably someone, somewhere, had kept a few cells in storage, after that corps of exogenetic twins had finally made their secret open, disbanded, and mingled their superior genes in the common human lifestream. And then, perhaps thirty years ago, the Engineers had quietly grown such a child in a tank. Maybe

a lot of them. Almost anything could happen in that secret castle on the rim of Archimedes Crater, and the Solar System none the wiser till the project exploded in man's collective face.

The brotherhood had been a trump card of the early Un-men, in the days when world government was frail and embattled. A revived brotherhood must be of comparable importance to the Order. But for what purpose? The Engineers, quasi-military, almost religious, were supposed to be above politics; they were supposed to serve all men, an independent force whose only war was against the inanimate cosmos.

Banning felt a chill. With the civilization-splitting tension that existed on Earth, and was daily wrung one notch higher, he could imagine what hidden struggles there were between the many factions. It wasn't all psychodynamics, telecampaigning, or parliamentary maneuver: the Humanist episode had scarred Earth's soul, and now there were sometimes knives in the night.

Somehow an aspect of those battles had focused on his ship.

He took out his pipe, rekindled it, and puffed hard. Andreyev stirred, with a retch and a rattle in his throat.

There was a light footfall in the corridor. Banning looked up. He would have cursed the interruption had anyone but Cleonie Rogers appeared. As it was, he made the forgotten gesture of raising his cap.

"Oh!" Her hand went to her mouth. For an instant she looked frightened, then came forward in a way he liked: the more so as she had been consistently annoyed by Andreyev's loud attempts to flirt. "Oh, is he hurt? Can I help?"

"Better stand back, m'lady," advised Banning. She saw the stunner in his hand and the automatic in his waistband. Her lips parted in the large-eyed, snub-nosed face. With the yellow hair that fell softly down to bare shoulders, with a wholly feminine topless shimmergown and a whisper of cosmetics, she was a small walking anachronism.

"What happened?" A shaken courage rallied in her. It was well done, thought the man, considering that she was a child of wealth, never done a day's work in her life, bound for the Jovian Republic as an actual live tourist.

"That's what I'd kind of like to know," he told her. "This character here pulled an equalizer—a gun, I mean—on Engineer Devon. Then I came along and sapped him."

He saw her stiffen. Even aboard the *Thunderbolt,* which was not one of the inner-planet luxury liners but a freighter whose few passengers—except her—were bound for Ganymede on business . . . even here, there were dimly lit corners and piped music and the majesty of the stars. Banning had noticed how much she and Devon had been together. Therefore he said kindly: "Oh, Luke wasn't hurt. I sent him for help. Must say it's taking him one hell of a time, too. Did the stewards crawl into the fire chamber for a nap?"

She smiled uncertainly. "What do you think the trouble is, captain? Did Mr. Andreyev, ah—"

"Slip a cog?" Banning scowled. In his preoccupation he forgot that the rising incidence of nonsanity on Earth made the subject unfit for general conversation. "I doubt it. He came aboard with these toys, remember. I wonder, though. Now that the topic has come up, we do have a rum lot of passengers."

Devon was legitimate enough, his mind continued: a genuine Engineer, nursemaiding the terraforming equipment which was the *Thunderbolt*'s prime cargo, the great machines which the Order would use to make Europa habitable.

And Cleonie must be an authentic tourist. (Since he regarded her as a woman, which he did not the crop-headed, tight-lipped, sad-clad creature that was today's typical Western Terrestrial female, Banning thought of her by her first name.) On the other hand—

Andreyev was not a simple Union bureaucrat, sent to negotiate a trade agreement; or, if he was, he was also much more. And how about the big fellow, Robert Falken, allegedly a nucleonic technie offered a job on Callisto? He didn't say much at table, kept to himself, but Banning knew a hard, tough man when he saw one. And Morgan Gentry, astronaut, who said the Republic had hired him to pilot intersatellite shuttles—undoubtedly a trained spaceman, but what was he besides that? And the exchange professor of advanced symbolics, dome-healed little Gomez, was he really bound for a position at the new University of X?

The girl's voice interrupted his reverie: "Captain Banning . . . what *could* be the matter with the passengers? They're all Westerners, aren't they?"

He could still be shocked, just a little bit every now and then. He hesitated a second before realizing that she had spoken not in ill will but from blank náiveté. "What has that got to do with it?" he said. "You don't really think, do you, Miss, that the conflict on Earth is a simple question of Oriental Kali worshipers versus a puritanical pro-technological Occident?" He paused for breath, then plowed on: "Why, the Kali people are only one branch of the Ramakrishian Eclectics, and there are plenty of Asians who stand by population control and Technic civilization—I have a couple in my own crew—and there are Americans who worship the Destroyer as fervently as any Ganges River farmer—and the Husseinite Moslems are closer to you, Miss Rogers, than you are to the New Christendom—"

He broke off, shaking his head. It was too big to be neatly summarized, the schism which threatened to rip Earth apart. He might have said it boiled down to the fact that technology had failed to solve problems which *must* be solved; but he didn't want to phrase it thus, because it would sound anti-scientific, and he wasn't.

Thank all kindly gods that there were men on other planets now! The harvest of all the patient centuries since Galileo would not be entirely lost, whatever happened to Earth.

Andreyev pulled himself up till he rested on his hands, head dangling between his shoulders. He groaned.

"I wonder how much of that is put on," mused Banning. "I did a well-calibrated job of slugging him. He shouldn't be too badly concussed." He gave Cleonie a beady look. "Maybe we ought to haul him into a cabin at that. Don't want to rattle any other cash customers, do we? Where are they all, anyway?"

"I'm not sure. I just left my cabin—" She stopped.

Someone came running from aft. The curvature of the hall, which was wrapped around the inner skin of the ship, made it impossible to see more than about forty meters. Banning shifted his gun, warily.

It was the large square-faced man, Falken, who burst into view. "Captain!" he shouted. The metal that enclosed all of them gave his tone a faint, unhuman resonance. "Captain, what happened?"

"How do *you* know about it, son?"

"A . . . eh . . . Engineer Devon—" Falken jogged to a halt, a meter away. "He told me—"

"Told you? Well, did he now?" Banning's gray gaze narrowed. Suddenly the needler in his hand leaped up and found an aim. "Hold it. Hold it there, pardner, and reach."

Falken flushed red. "What the ruination do you mean?"

"I mean that if you even look like you're going after a gun, I'll put you to sleep," said Banning. "Then if it turns out you only intended to offer me a peanut butter sandwich, I'll beg your humble pardon. But something sure smells here."

Falken backed away. "All right, all right, I'll go," he snarled. "I just wanted to help."

Cleonie screamed.

As Andreyev's burly form tackled him by the ankles, and he went down, Banning knew a moment of rage at himself. He had been civilized too long . . . inexcusably careless of him— 'Sbones and teeth!

He hit the deck with the other man on top. The red face glared murder. Andreyev yanked at the gun in Banning's kilt with one hand, his other grabbed the arm holding the stun pistol.

Banning brought his hard forehead up, into Andreyev's mouth. The fellow screamed. His fingers released the stunner. At that moment Falken joined the fight, snatching the sleepy weapon before Banning could get it into action.

The skipper reached up with an efficiently unsportsmanlike thumb. He had not quite gouged out Andreyev's eye when the man bellowed and tried to scramble free. Banning rolled away. Falken fired at him. An anaesthetic dart broke near Banning's nose and he caught a whiff of vapor.

For a moment, while the universe

waltzed around him, Banning accomplished nothing more than to reel to his feet. Falken sidestepped the weeping Andreyev, shoved the captain back against the wall, and yanked the automatic from his waistband.

Cleonie came from behind and threw her arms around Falken's neck.

He shouted, bent his back and tossed her from him. But it had been enough of a distraction. Banning aimed a kick for the solar plexus. Both guns went on a spin from Falken's hands.

Banning's sole had encountered hard muscle. Falken recovered fast enough to make a jump for the nearest weapon. Banning put a large foot on it. "Oh, no, you don't," he growled.

Falken sprang at him. It was not the first time Banning had been in a party which got rough, and he did not waste energy on fisticuffs. His hand snapped forward, open, the edge of a horny palm driving into Falken's larynx. There was a snapping noise.

Falken fell backward, over Andreyev, who still whimpered and dabbed at his injured eye. Banning stooped for the gun.

A bullet smashed down the corridor, ricocheted, and whined around his ears. Gentry came into view, with the drop on him.

"Oh, oh," said Banning. "School's out." He scooped up Cleonie and scampered back into the companionway.

Up the stairwell! His weight lessened with every jump, as he got closer to the ship's axis of spin.

Passing C-deck, he collided with Charles Wayne. The young second mate had obviously been yanked from sleep by the racket. He was pulling on his gold-collared blue uniform jacket as he entered the companionway. "Follow me!" puffed Banning.

Gentry appeared at the foot of the stairs. The automatic in his grasp found an aim on the captain's stomach. "Stay there!" he rapped. "Raise your hands!"

Banning threw himself and Cleonie backward, into C-deck corridor. The bullet snapped viciously past Wayne's head. "Come on, I told you!" gasped Banning. "Get her to the bridge!"

Wayne looked altogether bewildered, but any spaceman learns to react fast. He slung the girl over his shoulder and dashed down the hall toward an alternate stairwell.

Banning followed. He heard Gentry's shoes clang on metal, up the steps after him. As he ran, he groped after his pipe lighter, got it out and thumbed the switch.

There were rails and stanchions along the wall, for use in null-gravity. Aided by his lessened weight, Banning swarmed ape fashion up the nearest and waved his flame beneath a small circle in the ceiling.

Then down again, toward the stair! Gentry burst into the hall and fired. Coriolis force deflected the bullet, it fanned the captain's cheek.

The next one would be more carefully aimed.

The ceiling thermocouple reacted to heat, flashed a signal, and put the C-deck fire extinguisher system into action with a lather of plastifoam. Gentry's second shot flew off to nowhere. Thereafter he struggled with the stuff while Banning scampered up the stairs.

The bridge was a bubble in the ship's nose, precisely centered on the axis of rotation. There was virtually no weight, only a wilderness of gleaming consoles and the great viewscreen ablaze with its simulacrum of the sky.

Cleonie hung onto a stanchion, torn and shaken by the wretchedness of sudden, unaccustomed free fall. Tetsuo Tokugawa, the first mate, whose watch this was, floated next to her, offering an antidizzy pill. Wayne crouched by the door, wild-eyed. "What's going on, sir?" he croaked.

"I'm curious to know myself," panted Banning. "But it's all hell let out for noon."

Tokugawa gave him a despairing look. "Can you stuff this pill down her throat, skipper?" he begged. "I've seen people toss their dinner in nullgee."

"Uh, yeah, it is rather urgent." Banning hooked a knee around a stanchion, took the girl's head in one hand, and administered the medicine veterinary fashion. Meanwhile he clipped forth his story.

Tokugawa whistled. "What the destruction is this?" he said. "Mutiny?"

"If passengers can mutiny . . . neat point of law, that. Be quiet." Banning cocked his head and listened. There was no sound from the passages beyond the open door. He closed and bolted it.

Wayne looked sick. He wasn't a bad young fellow, thought the captain, but he was brought up in the puritan reaction of today's Western peoples. He was less afraid of danger, now, than stunned by a kick to his sense of propriety. Tokugawa was more reliable, being Lunar City bred, with all the Lunar colonist's cat-footed cosmopolitanism.

"What are we going to *do?*" rasped the second mate.

"Find out things," grunted Banning. He soared across to the intercom cabinet, entered it, and flicked switches. The first thing he wanted was information about the ship. If that failed them, it would be a long walk home.

The *Thunderbolt* was a steelloy spheroid, flattened along the axis of the drive-tubes whose skeletal structure jutted like an ancient oil derrick from the stern. She was a big ship: her major diameter more than three hundred meters; she was a powerful ship: not required to drift along a Hohmann ellipse, but moving at a speed which took her on a hyperbolic orbit—from Earth Station Prime to the Jovian System in less than a month! But she had her limitations.

She was not intended to enter an atmosphere, but orbited and let shuttleboats bring or remove her

cargo. This was less because of the great mass of her double hull—that wasn't too important, when you put atomic nuclei to work for you—than because of the design itself. To build up her fantastic velocities, she must spurt out ions at nearly the speed of light: which required immensely long accelerating tubes, open to the vacuum of space. They would arc over and burn out if air surrounded the charged rings.

She carried no lifeboat. If you abandon ship at hyperbolic speeds, a small craft doesn't have engine enough to decelerate you before running out of reaction mass. Here, in the big cold darkness beyond Mars, there was no escaping this vessel.

Banning tuned in the screen before him. It gave two-way visual contact between a few key points, in case of emergency. "And if this ain't

an emergency," he muttered, "it'll do till one comes along."

First, the biotic plant, armored at the heart of the ship. He breathed a gusty sigh. No one had tampered with that—air and water were still being renewed.

Next, the control gyros. The screen showed him their housing, like the pillars of some heathen temple. In the free fall at the ship's axis, a dead man drifted past them. The slow air currents turned him over and over. When his gaping face nudged the screen pickup, Banning recognized Tietjens, one of the two stewards. He had been shot through the head, and there was a grisly little cloud of red and gray floating around him.

Banning's lips grew thin. "I was supposed to look after you," he mumbled. "I'm sorry, Joppe."

He switched to the engine room. His view was directed toward the main control board, also in the axial null-gee state. The face that looked back at him, framed by the tall machines, belonged to Professor Gomez.

Banning sucked in a breath. "What are you doing there?" he said.

"Oh . . . it's you, captain. I rather expected you to peer in." The little man shoved himself forward with a groundlubber's awkwardness, but he was calm, not spacesick at all. "Quite a job you did on Falken. He's dead."

"Too bad you weren't in on that party," said Banning. "How are the other boys? Mine, I mean."

"The red-haired man—he was on watch here when I came—I am afraid I found it necessary to terminate him."

"Tietjens and O'Farrell," said Banning, very slowly. "Just shot down, huh? Who else?"

"No one, yet. It's your fault, captain. You precipitated this affair before we were ready; we had to act in haste. Our original plan did not involve harming any person." The shriveled face grew thoughtful. "We have them all prisoners, except for you there on the bridge. I advise you to surrender peacefully."

"What's the big idea?" growled Banning. "What do you want?"

"We are taking over this ship."

"Are you crazy? Do you know what sort of job it is to handle her—do you know how much kinetic energy she's got, right now?"

"It is unfortunate that Falken died," said Gomez tonelessly. "He was to have been our engineer. But I daresay Andreyev can take his place, with some help from me—I know a bit about nucleonic controls. Gentry, of course, is a trained astrogator."

"But who are you?" shouted Banning. He had the eerie feeling that the whole world had gone gibbering insane around him. "What are you doing this for?"

"It is not essential for you to know that," said Gomez. "If you surrender now, you will receive good treatment and be released as soon as possible. Otherwise we shall probably have to shoot you. Remember, we have all the guns."

Banning told him what he could do with his guns, and cut the circuit. Switching on the public-address mike, he barked a summary of the situation, for the benefit of any crewmen who might be at liberty. Then, spinning out of the booth, he told the others in a few harsh words how it stood.

Cleonie's face had gotten back a little color. Now, between the floating gold locks of hair, it was again drained of blood. But he admired the game way she asked him: "What can we do?"

"Depends on the situation, m'lady," he replied. "We don't know for sure . . . let's see, another steward, two engineers, and a deckhand . . . we don't know if all four of the crewmen still alive are prisoners or not. I'm afraid, though, that they really are."

"Luke," she whispered. "You sent him off—"

Banning nodded. Even in this moment, he read an anguish in her eyes and knew pity for her. "I'm afraid Luke has been clobbered," he said. "Not permanently, though, I hope."

Wayne's gaze was blank and lost. "But what are they *doing?*" he stammered. "Are they . . . ps-ps-psychotic?"

"No such luck," said Banning. "This was a pretty well-laid plan. At the proper time, they'd have pulled guns on us and locked us away—or maybe shot us. Luke happened to . . . I don't know what, but it alarmed Andreyev, who stuck him up. Then I horned in. I sent Luke after help. Not suspecting the other passengers, he must have told Tietjens in the presence of another member of this gang. So poor old Joppe got shot, but apparently Luke was just herded off. Then the whole gang was alerted, and Gomez went to take over the engine room while Falken and Gentry came after me." He nodded heavily. "A fast, smooth operation, in spite of our having thrown 'em off balance. No, they're sane for all practical purposes."

He waited a moment, gathering his thoughts, then:

"The remaining four crewmen would all have been in their quarters, off duty. The situation as she now stands depends on whether Gentry broke off from chasing me in time to surprise them in that one place. I wish I'd gotten on the mike faster."

Suddenly he grinned. "Tetsuo," he rapped, "stop the ship's rotation. Pronto!"

The mate blinked, then laughed —a short rough bark in his gullet— and leaped for the controls. "Hang on!" said Banning.

"What . . . what do you plan to do, sir?" asked Wayne.

"Put this whole tub into null-gee. It'll equalize matters a bit."

"I don't understand."

"No, you've never seen a weightless free-for-all, have you? Too bad. There's an art to it. A trained man with his hands can make a monkey of a groundlubber with a gun."

It was hard to tell whether Wayne

was more deeply shocked at the mutiny or at learning that his captain had actually been in vulgar brawls. "Cheer up, son," said Banning. "You, too, Cleonie. You both look like vulcanized oatmeal."

There was a brief thrumming. The tangential jets blew a puff of chemical vapor and brought the spin of the ship to a halt. For a moment, the astro screen went crazy, still compensating for a rotation which had ceased, then the cold image of the constellations steadied.

"O.K.," said Banning. "We've got to move fast. Tetsuo, come with me. Charlie, Cleonie, guard the bridge. Lock the door behind us and don't open it for anyone whose voice you find unmusical. If our boys do show up, tell 'em to wait here."

"Where are you going?" breathed the girl shakenly.

"Out to kill a few people," said Banning with undiminished good cheer.

He led the way, in a long soaring glide through the door. "Up" and "down" had become meaningless, there was only this maze of halls, rooms, and tairwells. His skin prickled with the thought that an armed man might be waiting in any cross-corridor. The silence of the ship drew his nerves taut as wires. He pulled himself along by the rails, hand over hand, accelerating till the doorways blurred past him.

The galley was on B-deck, just "above" passenger country. When Banning opened the door, an unfastened kettle drifted out and gonged on his head. A rack held the usual kitchen assortment of knives. He stuck a few in his waistband, giving the two longest to himself and Tokugawa. "Now I don't feel so nude," he remarked.

"What's next?" whispered the mate.

"If our lads are being kept prisoner, it's probably in crew territory. Let's try—"

The spacemen's own cabins were on this level; they did not require the full Earth-value of spin-gravity given the passengers on A-deck. Banning slipped with a caution that rose exponentially, toward the area he always thought of as the forecastle.

He need not have been quite so careful. Andreyev waited with a pistol outside a cabin door, but Andreyev had been unprepared for a sudden change to no-weight. His misery was not active, but it showed.

Banning launched himself.

Andreyev's abused senses reacted slowly. He looked around, saw the hurtling form, and yelled. Almost instinctively, he whipped his gun about and fired. It was nearly point-blank, but he missed. He could not help missing, when the recoil sent him flying backward with plenty of English.

He struck the farther wall, scrabbled wildly, bounced off it and pinwheeled to the ceiling. Banning grinned, changed course with a thrust of leg against floor, and closed in. Andreyev fired again. It was a

bomb-burst roar in that narrow space. The bullet tore Banning's sleeve. Recoil jammed Andreyev against the ceiling. As he rebounded, it was onto his enemy's knife.

The captain smiled sleepily, grabbed Andreyev's tunic with his free hand, and completed the job.

Tokugawa dodged a rush of blood. He looked sick. "What did you do that for?" he choked.

"Tietjens and O'Farrell," said Banning. The archaic greenish light faded from his eyes, and he added in a flat tone: "Let's get that door open."

Fists were hammering on it. The thin metal dented beneath the blows, but held firm. "Stand aside!" yelled Tokugawa. "I'm going to shoot the lock off—can't find the key, no time—" He picked Andreyev's gun from the air, put the muzzle to the barrier, and fired. He was also thrown back by reaction, but knew how to control such forces.

Luke Devon flung the door open. The Engineer looked as bleak as Banning had ever known a man to be. Behind him crowded the others, Nielsen, Bahadur, Castro, Vladimirovitch. Packing five men into a cubbyhole meant for one had in itself been a pretty good way to immobilize them.

Their voices surfed around the captain. "Shut up!" he bawled. "We got work to do!"

"Who else is involved in this?" demanded Devon. "Gentry killed Tietjens and took me prisoner . . . herded all of us in here, with Andreyev to help . . . but who else is there to fight?"

"Gentry and Gomez," said Banning. "Falken is dog's meat. We still hold the bridge, and we outnumber 'em now—but they've got the engine room, *and* all the guns but one." He passed out knives. "Let's get out of here. We've made enough racket to wake the Old Martians. I don't want Gentry to come pot-hunting."

The men streamed behind him as he dove along another stairwell, toward the bowels of the ship. He wanted to post a guard over the gyros and biotics. But he had not gotten to them when the spiteful crack of an automatic toned between metal walls.

His hands closed on the rail, slamming him to a halt that skinned his palms. "Hold it," he said, very softly. "That could only have come from the bridge."

If we can shoot a door open, I reckon Gentry can, too.

There was only one approach to the bridge, a short passageway on which several companionways converged. To either side of this corridor were the captain's and mate's cabins; at the far end was the bridge entrance.

Banning came whizzing out of a stairwell. He didn't stop, but glided on into the one opposite. A bullet smashed where he had been.

His brain held the glimpsed image: the door open, Gentry braced in it with his feet on one jamb and his back against the other. That way, he could cover Wayne and

Cleonie—if they were still alive—and the approach as well. The recoil of his fire wouldn't bother him at all.

Banning's followers milled about like the debris of a ship burst open. He waited till Gentry's voice reached out:

"So you have all your men back, captain . . . and therefore a gun, I presume? Nice work. But stay where you are. I'll shoot the first head that pokes around a corner. I know how to use a gun in null-gee, and I've got Wayne and Rogers for hostages. Want to parley?"

Banning stole a glimpse at Devon. The Engineer's nostrils were pinched and bloodless. It was he who answered:

"What are you after?"

"I think you know, Luke," said Gentry.

"Yes," said Devon. "I believe I do."

"Then you're also aware that anything goes. I won't hesitate to shoot Rogers—or dive the ship into the sun before the Guard gets its claws on us! It would be better if you gave up."

There was another stillness. The breathing of his men, of himself, sounded hoarse in Banning's ears. Little drops of sweat pearled off their skin, glistened in the fluorotube light, and danced away on air currents.

He cocked a brow at Devon. The Engineer nodded. "It's correct enough, skipper," he said. "We're up against fanatics."

"We could rush him," hissed Banning. "Lose a man or two, maybe, but—"

"No," said Devon. "There's Cleonie to think about." A curious mask of peace dropped over his bony face. "Let me talk to him. Maybe we can arrange something. You be ready to act as . . . as indicated."

He said, aloud, that he would parley. "Good," grunted Gentry. "Come out slow, and hang on to the rail with both your hands where I can see them." Devon's long legs moved out of Banning's view. "That's close enough. Stop." *He must still be three or four meters from the door,* thought the captain, and moved up to the corner of the stairwell.

It came to him, with a sudden chill, what Devon must be planning. The Rostomily clan had always been that sort. His scalp prickled, but he dared not speak. All he could do was take a few knives from the nearest men.

"Luke." That was Cleonie's voice, a whisper from the bridge. "Luke, be careful."

"Oh, yes." The Engineer laughed. It had an oddly tender note.

"Just what happened to kick off this landslide, anyway?" asked Gentry.

" 'Thou hast the most unsavory similes,' " said Devon.

"What?"

The roar which followed must have jerked all of Gentry's remaining attention to him, as Devon launched himself into space.

The gun crashed. Banning heard

the bullet smack home. Devon's body turned end over end, tumbling backward down the hall.

Banning was already around the corner. He did not fire at Gentry; it would have taken a whole fatal second to brace himself properly against a wall.

He threw knives.

The recoil was almost negligible; his body twisted back and forth as his arms moved, but he was used to that. It took only a wink to stick four blades in Gentry.

The spaceman screamed, hawked blood, and scrabbled after the gun that had slipped from his fingers. Tokugawa came flying, hit him with one shoulder. They thudded to the floor. The mate wrapped his legs about Gentry's and administered an expert foul blow to the neck.

Cleonie struggled from the bridge, toward Devon. Banning was already there, holding the gray form between his knees while he examined the wound. The girl bumped into them. *"How is he?"* Banning had heard that raw tone, half shriek, often and often before this day—when women saw the blood of their men.

He nodded. "Could be worse, I reckon. The slug seems to've hit a rib and stopped. Shock knocked him out, but . . . well, a bullet never does as much harm in free fall, the target bounces away from it easier." He swatted at the little red globules in the air. "Damn!"

Wayne emerged, green-faced. "This man . . . shot the door open when we wouldn't let him in," he rattled. "We hadn't any weapon . . . he threatened Miss Rogers—"

"O.K., never mind the breast-beating. Next time remember to stand beside the door and grab when the enemy comes through. Now, I assume you have the medical skills required for your certificate. Get Luke to sickbay and patch him up. Nielsen, help Mr. Wayne. Gentry still alive?"

"He won't be if he doesn't get some first aid quick," said Tokugawa. "You gashed him good." He whistled in awe. "Don't you ever simply *stun* your enemies, boss?"

"Take him along too, Mr. Wayne, but Devon gets priority. Bahadur, break out the vacuum sweeper and get this blood sucked up before it fouls everything. Tetsuo . . . uh, Mr. Tokugawa, go watch the after bulkhead in case Gomez tries to break out. Vladimirovitch, tag along with him. Castro, stick around here."

"Can I help?" asked Cleonie. Her lips struggled for firmness.

"Go to sickbay," nodded Banning. "Maybe they can use you."

He darted into the bridge and checked controls. Everything was still off—good. Gomez couldn't start the engines without rigging a by-pass circuit. However, he had plenty of ancillary machines, generators and pumps and whatnot, at his disposal down there. The captain entered the intercom cabinet and switched on the engine-room screen.

Gomez's pinched face had taken on a stiffened wildness. "For your

information, friend," said Banning, "we just mopped up Andreyev and Gentry. That leaves you alone. Come on out of there, the show's over."

"No," said Gomez. His voice was dull, abnormally calm. It gave Banning a creepy sensation.

"Don't you believe me? I can haul the bodies here if you want."

"Oh, yes, I will take your word." Gomez's mouth twisted. "Then perhaps you will do me the same honor. It is still you who must surrender to me."

Banning waited for a long few seconds.

"I am here in the engine room," said Gomez. "I am alone. I have locked the outer doors: emergency seal, you'll have to burn your way through and that takes hours. There will be plenty of time for me to disable the propulsion system."

Banning was not a timid man, but his palms were suddenly wet and he fumbled a thick dry tongue before he could shape words:

"You'd die, too."

"I am quite prepared for that."

"But you wouldn't have accomplished anything! You'd just have wrecked the ship and killed several people."

"I would have kept this affair from being reported to the Union," said Gomez. "The very fact of our attempt is more of a hint than we can afford to let the Guard have."

"What are you doing all this *for?*" howled the captain.

The face in the screen grew altogether unhuman. It was a face Banning knew—millennia of slaughterhouse history knew it—the face of embodied Purpose.

"It is not necessary for you to be told the details," clipped Gomez. "However, perhaps you will understand that the present government's spineless toleration of the Kali menace in the East and the moral decay in the West, has to be ended if civilization is to survive."

"I see," said Banning, as gently as if he spoke in the presence of a ticking bomb. "And since toleration is built into Union law—"

"Exactly. I do not say anything against the Uniters. But times have changed. If Fourre were alive today, he would agree that action is necessary."

"It's always convenient to use a dead man for a character witness, isn't it?"

"What?"

"Never mind." Banning nodded to himself. "Don't do anything radical yet, Gomez. I'll have to think about this."

"I shall give you exactly one hour," said the desiccated voice. "Thereafter I shall begin work. I am not an Engineer myself, but I think I can disable something—I have studied a trifle about nucleonics. You may call me when you are ready to surrender. At the first suspicion of misbehavior, I will, of course, wreck the propulsion system immediately."

Gomez turned away.

Banning sat for a while, his mind curiously empty. Then he shoved across to the control board, alerted

the crew, and started the rotation again. You might as well have some weight.

"Keep an eye on the screen," he said as he left the main pilot chair. "Call me on the intercom if anything develops. I'll be in sickbay."

"Sir?" Castro gaped at him.

"Appropriate spot," said Banning. "Velocity is equivalent to temperature, isn't it? If so, then we all have a fever which is quite likely to kill us."

Devon lay stretched and stripped on the operating table. Wayne had just removed the bullet with surgical pincers. Now he clamped the wound and began stitching. Nielsen was controlling the sterilizers, both UV and sonic, while Cleonie stood by with bowl and sponges. They all looked up, as if from a dream, when Banning entered. The tools of surgery might be developed today to a point where this was an operation simple enough for a spaceman's meditechnic training; but there was a man on the table who might have died, and only slowly did their minds break away from his heartbeat.

"How is he?" asked the captain.

"Not too bad, sir, considering." Given this job, urgent and specific, Wayne was competent enough; he spoke steadily. "I daresay he presented his chest on purpose when he attacked, knowing the bones had a good chance of acting as armor. There's a broken rib, and some torn muscle, of course, but nothing that won't heal."

"Gentry?"

"Conked out five minutes ago, sir," said Nielsen. "I stuck him in the icebox. Maybe they've got revivification equipment on Ganymede."

"Wouldn't make much difference," said Banning. "The forebrain would be too far gone by the time we arrived—no personality survival to speak of." He shuddered a little. Clean death was one thing; this was another matter, one which he had never quite gotten used to. "Luke, though," he went on quickly, "can he stand being brought to consciousness? Right away?"

"No!" Almost, Cleonie lifted her basin to brain him.

"Shut up." He turned his back on her. "It'd be a poor kindness to let him sleep comfy now and starve to death later, maybe, out beyond Pluto. Well, Mr. Wayne?"

"Hm-m-m . . . I don't like it, sir. But if you say so, I guess I can manage it. Local anaesthesia for the wound and a shot of mild stimulant; oxygen and neoplasma, just in case—Yes, I don't imagine a few minutes' conversation would hurt him permanently."

"Good. Carry on." Banning fumbled after his pipe, remembered that he had dropped it somewhere in all the hullabaloo, and swore.

"What did you say?" asked Nielsen.

"Never mind," said Banning. True, women were supposed to be treated like men these days, but he had old-fashioned ideas. It was useful to know a few earthy languages unfamiliar to anyone else.

Cleonie laid a hand on his arm. "Captain," she said. Her eyes were shadowed, with weariness and with —compassion? "Captain, is it necessary to wake him? He's been hurt so much—for our sakes."

"He may have the only information to save our lives," answered Banning patiently.

The intercom cleared its throat: "Sir . . . Castro on bridge—he's unbolting the main mass-tank access port."

Wayne turned white as he labored. He understood.

Banning nodded. "I thought so. Did you ask him what he was up to? He promised us an hour."

"Yes, sir. He said we'd get it, too, but . . . but he wanted to be ready, in case—"

"Smart boy. It'll take him a while

to get to the flush valves; they're quite well locked away and shielded. Then the pump has to have time. We might have burned our way in to him by then."

"Maybe we should do it, sir. Now!"

"Maybe. It'd be a race between his wrenches and our torches. I'll let you know. Stand by."

Banning turned back to Devon, gnawing his lip. The Engineer was stirring to wakefulness. As he watched, the captain saw the eyes blink palely open, saw color creep into the face and the mouth tighten behind the transparent oxygen mask.

Cleonie moved toward the table. "Luke—"

Devon smiled at her, a sudden human warmth in this cold room of machines. Gently, Banning shoved her aside. "You'll get your innings later, girl," he said. Bending over the Engineer: "Hello, buster. You're going to be O.K. Can you tell me some things in a hell of a hurry?"

"I can try—" It was the merest flutter of air. "Tell me—"

Banning began to talk. Devon lay back, breathing deeply and making some curious gestures with his hands. He'd had Tighe System training, then—total integration—good! He *would* be able to hang on to his consciousness, even call up new strength from hidden cellular reserves.

"We clobbered all the gang except Gomez, who seems to be the kingpin. He's holed up in the engine room, threatens to wreck us all unless we surrender to him inside an hour. Does he mean it?"

"Yes. Oh, yes." Devon nodded faintly.

"Who is this outfit? What do they want?"

"Fanatic group . . . quasi-religious . . . powerful, large membership furnishes plenty of money . . . but the real operations are secret, a few men—"

"I think I know who you mean. The Western Reformists, huh?"

Devon nodded again. The pulse that flickered in his throat seemed to strengthen.

Banning spent a bleak moment of review. In recent years, he had stayed off Earth as much as possible; when there, he had not troubled himself with political details, for he recognized all the signs of a civilization going under. It had seemed more worthwhile to give his attention to the Venusian ranch he had bought, against the day of genocide and the night of ignorance and tyranny to follow. However, he did understand that the anti-technic Oriental cult of Kali had created its own opposite pole in the West. And the prim grim Reformists might well try to forestall their enemies by a coup.

"Sort of like the Nazis versus the Communists, back in Germany in the 1920s," he muttered.

"The who?" said Nielsen.

"No matter. It's six of one and half a dozen of the other. Let me see, Luke." Banning took a turn around the room. "In order to overthrow

constitutional government and impose their will on Earth, the Reformists would have to kill quite a few hundred millions of people, especially in Asia. That means nuclear bombardment, preferably from space. Am I right?"

"Yes—" said Devon. His voice gained resonance as he went on. "They have a base, somewhere in the asteroid belt. They hope to build it up to a fortress, with a fleet of ships, arsenal, military corps . . . the works. It's a very long-range thing, of course, but the public aspect of their party is going to need lots of time anyway, to condition enough citizens toward the idea of— Well. At present their base doesn't amount to much. They can't just buy ships, the registry would give them away . . . they have to build . . . they need at least one big supply ship, secretly owned and operated, before they can start serious work at all."

"And we're elected," said Devon. "Yeah. I can even see why. Not only is this a fast ship with a large capacity, but our present cargo, the terrraforming stuff, would be valuable to them in itself . . . Uh-huh. Their idea was to take over this clunk, bring her in to their base—and the *Thunderbolt* becomes another ship which just plain vanished mysteriously."

Devon nodded.

"I scarcely imagine they'd have kept us alive, under the circumstances," went on Banning.

"No."

"How do you know all this?"

"The Order . . . We stay out of politics . . . officially . . . but we have our Intelligence arm and use it quietly." So that was why he'd been reluctant to explain Andreyev's actions! "We knew, in a general way, what the situation was. Of course, we didn't know *this* ship, on this particular voyage, was slated for capture."

"That's fairly obvious. You recognized Andreyev?"

"Yes. Former Engineer, under another name—expelled for . . . good reasons. Surgical changes made, but the overall gestalt bothered me. All of a sudden, I thought I knew who he was. Like a meddling fool, I tried a key word on him. Yes, he reacted, by pulling a gun on me! Later on—again, like an idiot—I didn't think Gentry might be his partner, so I told Tietjens what had happened while Gentry was there." Devon sighed. "Old Rostomily would disown me."

"You weren't trained for secret-service work, yourself," said Banning. "All right, Luke. One more question. Gomez wants us to surrender to him. I presume this means we'll let ourselves be locked away except for one or two who slow down the ship while he holds a gun on 'em. After we've decelerated to a point where a boat from the Reformist asteroid can match velocities, he'll radio and— Hell! What I'm getting at is, would our lives be spared afterward?"

"I doubt it," said the Engineer.

"O my darling—" As he closed

his eyes, Cleonie came to his side. Their hands groped together.

Banning swung away. "Thanks, Luke," he said. "I didn't know if I had the right to risk lives for the sake of this ship, but now I see there's no risk at all. We haven't got a thing to lose. Cleonie, can you take care of our boy here?"

"Yes," she whispered, enormous-eyed. "If there's no emergency."

"There shouldn't be. They fabricated him out of teflon and rattlesnake leather. O.K., then, you be his nurse. You might also whomp up some coffee and sandwiches. The rest of the crew meet me at the repair equipment lockers, aft section . . . no, you stay put, Castro. We're going to burn our way in to friend Gomez."

"But he . . . he'll dump the reaction mass!" gasped Wayne.

"Maybe we can get at him before he gets at the tanks," said Banning. "A man might try."

"No—look, sir. I know how long it takes to operate the main flush system. Even allowing for Gomez being alone and untrained, he can do it before we can get through the after bulkhead. We haven't a chance that way!"

"What do you recommend, Mr. Wayne?" asked Banning slowly.

"That we give in to him, sir."

"And be shot down out of hand when his pals board the ship?"

"No, sir. There'll be seven of us to one of Gomez before that happens. We have a faint hope of being able to jump him—"

"A very faint hope indeed," said Banning. "He's no amateur. And if we don't succeed, not only will we die, but that gang of hellhounds will have gotten the start it wants. Whereas, if we burn through to Gomez, but fail to stop him disabling the ship . . . well, it'll only be us who die, now. Not a hundred million people twenty or thirty years from now."

Is this the truth? Do you really believe one man can delay the Norns? What is your choice, captain? By legal definition, you are omnipotent and omniscient while the ship is under weigh. What shall be done, O god of the ship?

Banning groaned. *Per Jovem,* it was too much to ask of a man!

And then he stiffened.

"What is it, sir?" Nielsen looked alarmed.

"By Jupiter," said Banning. "Well, by Jupiter!"

"What?"

"Never mind. Come on. We're going to smoke Gomez out of there!"

The last, stubborn metal glared white, ran molten down the gouge already carved, and froze in gobbets. Bahadur shut off the electric torch, shoved the mask away from his dark turbanned face, and said: "All right, sir."

Banning stepped carefully over the heavy torch cables. His gang had attacked the bulkhead from a point near the skin of the ship, for the sake of both surprise and weight. "How's

the situation inside?" he asked the air.

The intercom replied from the bridge, where Castro huddled over the telescreen that showed him Gomez at work. "Pump still going, sir. I guess he really means business."

"We've got this much luck," said Banning, "that he isn't an Engineer himself. You'd have had those tanks flushed out half an hour ago."

He stood for another instant, gathering strength and will. His mind pawed over the facts again.

The outer plates of the ship would stop a fair-sized meteor, even at hyperbolic relative velocity: it would explode into vapor, leaving a miniature Moon-crater. Anything which might happen to break through that would lose energy to the self-sealer between the hulls; at last it would encounter the inner skin, which could stand well over a hundred atmospheres of pressure by itself. It was not a common accident for a modern spaceship to be punctured.

But the after bulkhead was meant to contain stray radiation, or even a minor explosion, if the nuclear energies which drove the ship should get out of hand. It was scarcely weaker than the double hull. The torches had required hours to carve a hole in it. There would have been little or no saving of time by cutting through the great double door at the axis of the ship, which Gomez had locked; nor did Banning want to injure massive pieces of precision machinery. The mere bulkhead would be a lot easier to repair afterward—if there was an afterward.

Darkness yawned before him. He hefted the gun in his hand. "All right, Vladimirovitch, let's go," he said. "If we're not back in ten minutes, remember, let Wayne and Bahadur follow."

He had overruled Tokugawa's anguished protests and ordered the first mate to stay behind under all circumstances. The Lunarite alone had the piloting skill to pull off the crazy stunt which was their final hope. He and Nielsen were making a racket at the other end of the bulkhead, a diversion for Gomez's benefit.

Banning slipped through the hole. It was pitchy beyond, a small outer room where no one had turned on the lights. He wondered if Gomez waited just beyond the door with a bullet for the first belly to come through.

He'd find out pretty quick.

The door, which led into the main control chamber, was a thin piece of metal. Rotation made it lie above Banning's head. He scampered up the ladder. His hand closed on the catch, he turned it with an enormous caution—flung the door open and jumped through.

The fluoros made a relentless blaze of light. Near the middle of that steel cave, floating before an opened panel, he saw Gomez. So the hell-bound Roundhead hadn't heard them breaking in!

He did now. He whirled, clumsily, and scrabbled for the gun in his belt.

Banning fired. His bullet missed, wailed and gonged around the great chamber. Gomez shot back. Recoil tore him from the stanchion he held, sent him drifting toward the wall.

Banning scrambled in pursuit, over the spidery network of ladders and handholds. His weight dropped with each leap, closer to the axis; he fought down the characteristic Coriolis vertigo. Gomez spiraled away from him, struck a control chair, clawed himself to a stop and crouched in it.

Banning grew aware of the emergency pump. It throbbed and sang in the metal stillness around him, and every surge meant lost mass . . . like the red spurting from a slashed artery. The flush system was rarely used—only if the reaction mass got contaminated, or for some such reason. Gomez had found a new reason, thought Banning grimly. To lose a ship and murder a crew.

"Turn that thing off, Vlad," he said between his teeth.

"Stay where you are!" screamed Gomez. "I'll shoot! I will!"

"Get going!" roared the captain.

Vladimirovitch hauled himself toward the cut-off switch. Gomez flipped his pistol to full automatic and began firing.

He didn't hit anything of value, in the few seconds granted him. In a ship rotating in free fall, the pattern of forces operating on a bullet is so complicated that practical ballistics must be learned all over again. But that hose of lead was bound to kill someone, by sheer chance and ricochet, unless—

Banning clutched himself to a rod, aimed, and fired.

On the second shot, Gomez jerked. The pistol jarred from his hand, he slumped back into the chair and lay still.

Banning hurried toward him. It would be worthwhile taking Gomez alive, to interrogate and— No. As he reached the man, he saw the life draining out of him. A shot through the heart is not invariably fatal, but this time it was.

The pump clashed to silence.

Banning whirled about. "Well?" His shout was raw. "How much did we lose?"

"Quite a bit, sir." Vladimirovitch squinted at the gauges. His words came out jerkily. "Too much, I'm afraid."

Banning went to join him, leaving Gomez to die alone.

They met in the dining saloon: seven hale men, an invalid, and a woman. For a moment they could only stare at the death in each other's eyes.

"Break out the Scotch, Nielsen," said Banning at last. He took forth his pipe and began loading it. A grin creased his mouth. "If your faces get any longer, people, you'll be tripping over your own jawbones."

Cleonie, seated at the head of the couch on which Devon lay, ruffled the Engineer's hair. Her gaze was blind with sorrow. "Do you expect

us to be happy, after all that killing?" she asked.

"We were lucky," shrugged Banning. "We lost two good men, yes. But all the ungodly are dead."

"That's not so good a thing," said Devon. "I'd like to have them narcoed, find out where their asteroid is and—" He paused. "Wait. Gentry's still in the freeze, isn't he? If he was revived at Ganymede, maybe his brain wouldn't be too deteriorated for a deep-memory probe, at least."

"Nix," said Banning. "The stiffs are all to be jettisoned. We've got to lighten ship. If your Order's Intelligence men—or the Guard's, for that matter—are any good, they'll be able to trace back people like our late playfellows and rope in their buddies."

Cleonie shivered. "Please!"

"Sorry." Banning lit his pipe and took a long drag. "It is kind of morbid, isn't it? O.K., then, let's concentrate on the problem of survival. The question is how to use the inadequate amount of reaction mass left in the tanks."

"I'm afraid I don't quite understand," said the girl.

She looked more puzzled than frightened. Banning liked her all the more for that. Devon was a lucky thus-and-so, if they lived . . . though she deserved better than an Engineer, always skiting through space and pledged to contract no formal marriage till he retired from field service.

"It's simple enough," he told her. "We're on a hyperbolic orbit. That means we're moving with a speed greater than escape velocity for the Solar System. If we don't slow down quite a bit, we'll just keep on going; and no matter how we ration it, there's only a few weeks' worth of food aboard and no suspended-animation stuff."

"Can't we radio for help?"

"We're out of our own radio range to anywhere."

"But won't they miss us—send high-acceleration ships after us? They can compute our orbit, can't they?"

"Not that closely. Too much error creeps in when the path gets as monstrous long as ours would be before we could possibly be overhauled. It'd be remarkable if the Guard ship came as close to us as five million kilometers, which is no use at all." Banning wagged his pipestem at her. "It's up to us alone. We have a velocity of some hundreds of kilometers per second to kill. We don't have reaction mass enough to do it."

Nielsen came in with bottles and glasses. He went around doing the honors while Devon said: "Excuse me, captain. I assume this has occurred to you, but after all, it's momentum which is the significant quantity, not speed *per se*. If we jettison everything which isn't absolutely essential, cargo, furnishings, even the inner walls and floors—"

"Tet and I figured on that," answered Banning. "You remember just now, I said we had to lighten ship. We even assumed stripping off the outer hull and taking a chance on meteors. It's quite feasible, you

know. Spaceships are designed to come apart fairly easily under the right tools, for replacement work, so if we all sweat at it I think we can finish peeling her down by the time we have to start decelerating."

Wayne looked at the whiskey bottle. He didn't drink; it wasn't considered quite the thing in today's West. But his face grew tighter and tighter, till suddenly he reached out and grabbed the bottle and tilted it to his mouth.

When he was through choking, he said hoarsely: "All right, sir. Why don't you tell them? We still can't lose enough speed."

"I was coming to that," said Banning.

Devon's hand closed on the girl's. "What are the figures?" he asked in a level tone.

"Well," said Banning, "we can enter the Jovian System if we like, but then we'll find ourselves fuelless with a velocity of about fifty kilometers per second relative to the planet."

The Engineer whistled.

"Must we do that, though?" inquired Bahadur. "I mean, sir, well, if we can decelerate that much, can't we get into an elliptic orbit about the sun?"

"'Fraid not. Fifty k.p.s. is still a lot more than solar escape velocity for that region of space."

"But look, sir. If I remember rightly, Jupiter's own escape velocity is well *over* fifty k.p.s. That means the planet itself will be giving us all that speed. If we didn't come near it, we should have mass enough left to throw ourselves into a cometary—"

"Smart boy," said Banning. He blew smoke in the air and hoisted his glass. "We computed that one, too. You're quite right, we can get into a cometary. The very best cometary we can manage will take a few years to bring us back into radio range of anyone—and of course space is so big we'd never be found on such an unpredictable orbit unless we hollered for help and were heard."

"Years," whispered Cleonie.

The terror which rose in her, then, was not the simple fear of death. It was the sudden understanding of just how big and old this universe which she had so blithely inhabited really was. Banning, who had seen it before, waited sympathetically.

After a minute she straightened herself and met his eyes. "All right, captain," she said. "Continue the arithmetic lesson. Why can't we simply ask the Jovians to pick us up as we approach their system?"

"You knew there was a catch, eh?" murmured Banning. "It's elementary. The Republic is poor and backward. Their only spacecraft are obsolete intersatellite shuttles, which can't come anywhere near a fifty k.p.s. velocity."

"And we've no means of losing speed, down to something they can match." Wayne dropped his face into his hands.

"I didn't call you here for a weeping contest," said Banning. "We do have one means. It might or might not work—it's never been tried—but

Tetsuo here is one hell of a good pilot. He's done some of the cutest braking ellipses you ever saw in your life."

That made them sit up. But Devon shook his head, wryly. "It won't work," he said. "Even after the alleged terraforming, Ganymede hasn't enough atmosphere to—"

"Jupiter has all kinds of atmosphere," said Banning.

The silence that fell was thunderous.

"No," said Wayne at last. He spoke quickly, out of bloodless lips. "It could only work by a fluke. We would lose speed, yes, if friction didn't burn us up . . . finally, on one of those passes, we'd emerge with a sensible linear velocity. But a broken shell like this ship will be after we lighten her—an atmosphere as thick and turbulent as Jupiter's—there wouldn't be enough control. We'd never know precisely what orbit we were going to have on emergence. By the time we'd computed what path it really was and let the Jovians know, and their antiquated boats had reached it . . . we'd be back in Jupiter's air on the next spiral!"

"And the upshot would be to crash," said Devon. "Hydrogen and helium at one hundred and forty degrees Absolute. Not very breathable."

"Oh, we'd have spattered on the surface before we had to try breathing that stuff," said Vladimirovitch sarcastically.

"No, we wouldn't either," said Bahadur. "Our inner hull can stand perhaps two hundred atmospheres' pressure. But Jupiter goes up to the tens of thousands. We would be squashed flat long before we reached the surface."

Banning lifted his brows. "You know a better 'ole?" he challenged.

"What?" Wayne blinked at him.

"Know anything which gives us a better chance?"

"Yes, I do." The young face stiffened. "Let's get into that cometary about the sun. When we don't report in, there'll be Guard ships hunting for us. We have a very small chance of being found. But the chance of being picked up by the Jovians, while doing those crazy dives, is infinitesimal!"

"It doesn't look good either way, does it?" said Cleonie. A sad little smile crossed her lips. "But I'd rather be killed at once, crushed in a single blow, than . . . watch all of us shrivel and die, one by one—or draw lots for who's to be eaten next. I'd rather go out like a human being."

"Same here," nodded Devon.

"Not I!" Wayne stood up. "Captain, I won't have it. You've no right to . . . to take the smaller chance, the greater hazard, deliberately, just because it offers a quicker death. No!"

Banning slapped the table with a cannon-crack noise. "Congratulations on getting your master's certificate, Mr. Wayne," he growled. "Now sit down."

"No, by the Eternal! I demand—"

"Sit down!"

Wayne sat.

"As a matter of fact," continued Banning mildly, "I agree that the

chance of the Jovians rescuing us is negligible. But I think we have a chance to help ourselves.

"I think maybe we can do what nobody has ever tried before—enter Jovian sky and live to brag about it."

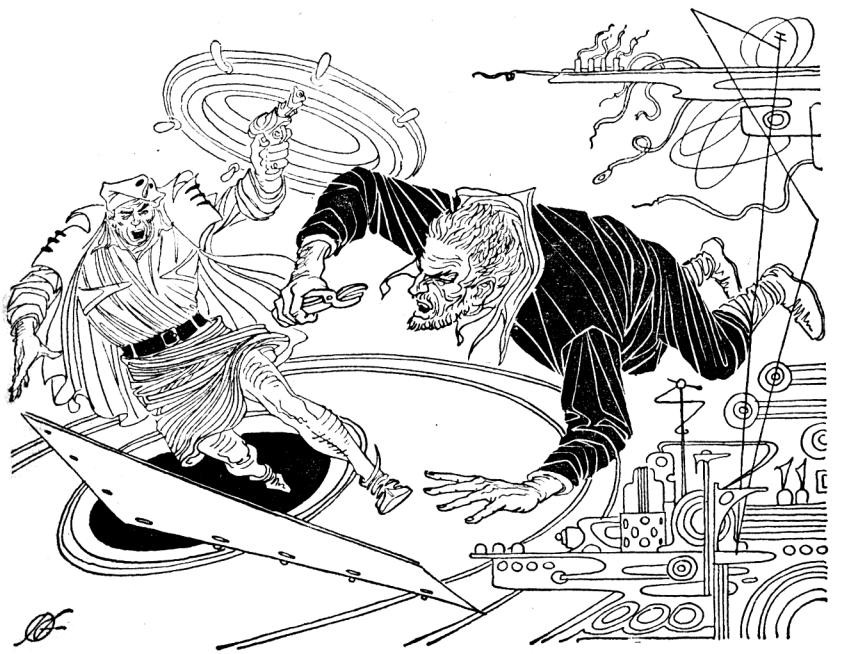
From afar, as they rushed to their destiny, Jupiter had a splendor which no other planet, perhaps not the sun itself, could match. From a cold great star to an amber disk to a swollen shield banded with storm—the sight caught your heart.

But then you fought it. You got so close that the shield became a cauldron and ate you down.

The figures spoke a bleak word: the escape velocity of Jupiter is about fifty-nine kilometers per second. The *Thunderbolt* had about fifty-two, relative. If she had simply whizzed by the planet, its gravitation would have slowed her again, and eventually she would have fallen back into it with a speed that would vaporize her. There was no possibility of the creaking old boats of the satellite colonists getting close to her at any point of such an orbit; they would have needed far more advance warning than a short-range radio could give them.

Instead, Tokugawa used the last reaction mass to aim at the outer fringes of atmosphere.

The first pass was almost soundless. Only a thin screaming noise, a



sense of heat radiated in human faces, a weak tug of deceleration, told how the ship clove air. Then she was out into vacuum again, curving on a long narrow ellipse.

Banning worked his radio, swearing at the Doppler effect. He got the band of Ganymede at last. Beside him, Tokugawa and Wayne peered into the viewscreen, reading stars and moons, while the computer jabbered out an orbit.

"Hello. Hello. Are you there?"

The voice hissed weakly from X Spaceport: "Heh, *Thun'erbolt.* Central Astro Control, Ganymede. Harris speakin'. Got y'r path?"

"To a rough approximation," said Banning. "We'd need several more readings to get it exactly, of course. Stand by to record." He took the tape from the computer and read off the figures.

"We've three boats in y' area," said Harris. "They'll try t' find y'. G' luck."

"Thanks," said Banning. "We could use some."

Tokugawa's small deft fingers completed another calculation. "We'll strike atmosphere again in about fifty hours, skipper," he reported. "That gives the demolition gang plenty of time to work."

Banning twisted his head around. There was no rear wall now to stop his eyes. Except for the central section, with its vital equipment, little enough remained between the bridge and the after bulkhead. Torches had slashed, wrenches had turned, air locks had spewed out jagged temporary moons, for days. The ship had become a hollow shell and a web of bracing.

He felt like a murderer.

Across the diameter of the great spheroid, he saw Devon floating free, ordering the crew into spacesuits. As long as they were in null-gee, the Engineer made an excellent foreman, broken rib and all.

His party was going out to cut loose reactor, fire chamber, ion tubes, everything aft. Now that the last mass was expended and nothing remained to drive the ship but the impersonal forces of celestial mechanics, the engines were so much junk whose weight could kill them. Never mind the generators—there was enough energy stored in the capacitor bank to keep the shell lighted and warmed for weeks. If the Jovians didn't catch them in space, they might need those weeks, too.

Banning sighed. Since men first steered a scraped-out log or a wicker basket to sea, it has been an agony for a captain to lose his ship.

He remembered a submarine once, long ago—it still hurt him to recall, though it hadn't been his fault. Of course, he'd gotten the idea which might save all their lives now because he knew a trifle about submarines . . . or should the Montgolfiers get the credit, or Archimedes?

Cleonie floated toward him. She had gotten quite deft in free fall, during the time before deceleration in which they orbited toward Jupiter, when spin had been canceled to speed

the work of jettisoning. "May I bother you?" she asked.

"Of course." Banning took out his pipe. She cheered him up. "Though the presence of a beautiful girl is not a bother. By definition."

She smiled, wearily, and brushed a strand of loose hair from her eyes. It made a halo about her worn face. "I feel so useless," she said.

"Nonsense. Keep the meals coming, and you're plenty of use. Tietjens and Nielsen were awful belly robbers."

"I wondered—" A flush crossed her cheeks. "I do so want to understand Luke's work."

"Sure." Banning opened his tobacco pouch and began stuffing the pipe, not an easy thing to do in free fall. "What's the question?"

"Only . . . we hit the air going so fast—faster than meteors usually hit Earth, wasn't it? Why didn't we burn up?"

"Meteors don't exactly burn. They volatilize. All we did was skim some very thin air. We didn't convert enough velocity into heat to worry about. A lot of what we did convert was carried away by the air itself."

"But still—I've never heard of braking ellipses being used when the speed is as high as ours."

Banning clicked his lighter, held it "above" the bowl, and drew hard. "In actual fact," he said, "I don't think it could be done in Earth or Venus atmosphere. But Jupiter has about ten times the gravitational potential, therefore the air thins out with height correspondingly more slowly. In other words, we've got a deeper layer of thin air to brake us. It's all right. We'll have to make quite a few passes—we'll be at this for days, if we aren't rescued—but it can be done."

He got his pipe started. There was a trick to smoking in free fall. The air-circulating blowers, which kept you from smothering in your own breath, didn't much help as small an object as a pipe. But he needed this comfort. Badly.

Many hours later, using orbital figures modified by further observation, a shuttleboat from Ganymede came near enough to locate the *Thunderbolt* on radar. After maneuvering around so much, it didn't have reaction mass enough to match velocities. For about a second, it passed so close that Devon's crew, working out on the hull, could see it —as if they were the damned in hell watching one of the elect fly past.

The shuttleboat radioed for a vessel with fuller tanks. One came. It zeroed in—and decelerated like a startled mustang. The *Thunderbolt* had already fallen deeper into the enormous Jovian gravity field than the boat's engines could rise.

The drifting ship vanished from sight, into the great face of the planet. High clouds veiled it from telescopes—clouds of free radicals, such as could not have existed for a moment under humanly endurable conditions. Jupiter is more alien than men can really imagine.

Her orbit on re-emergence was not so very much different. But the boats which had almost reached her had been forced to move elsewhere; they could not simply hang there, in that intense a field. So the *Thunderbolt* made another long, lonesome pass. By the time it was over, Ganymede was in an unfavorable position, and Callisto had never been in a good one. Therefore the ship entered Jupiter's atmosphere for a third time, unattended.

On the next emergence into vacuum, her orbit had shortened and skewed considerably. The rate at which air drag operated was increasing; each plunge went deeper beneath the poison clouds, each swing through clear space took less time. However, there was hope. The Ganymedeans were finally organizing themselves. They computed an excellent estimate of what the fourth free orbit would be, and planted well-fueled boats strategically close at the right times.

Only—the *Thunderbolt* did not come anywhere near the predicted path.

It was pure bad luck. Devon's crew, working whenever the ship was in vacuum, had almost cut away the after section. This last plunge into stiffening air resistance finished the job. Forces of drag and reaction, a shape suddenly altered, whipped the *Thunderbolt* wildly through the stratosphere. She broke free at last, on a drastically different orbit.

But then, it had been unusual good luck which brought the Jovians so close to her in the first place. Probabilities were merely re-asserting themselves.

The radio said in a weak, fading voice: "Missed y' 'gain. Do' know 'f we c'n come near, nex' time. Y'r period's gettin' very short."

"Maybe you shouldn't risk it." Banning sighed. He had hoped for more, but if the gods had decided his ship was to plunge irretrievably into Jupiter, he had to accept the fact. "We'll be all right, I reckon."

Outside, the air roared hollowly. Pressures incomparably greater than those in Earth's deepest oceans waited below.

On his final pass into any approximation of clear space—the stars were already hazed—Banning radioed: "This will be the last message, except for a ten-minute signal on the same band when we come to rest. Assuming we're alive! We've got to save capacitors. It'll be some time before help arrives. When it does, call me. I'll respond if we've survived, and thereafter emit a steady tone by which we can be located. Is that clear?"

"Clear. I read y'. Luck, spaceman . . . over an' out."

Watching the mists thicken in the viewscreen, Banning added figures in his head for the hundredth time.

His schedule called for him to report at Phobos in fifteen days. When he didn't, the Guard would send a high-acceleration ship to find out what had gone wrong. Allow a few days for that. Another week for it to

return to Mars with a report of the facts. Mars would call Lunar on the radio beam—that, at least, would be quick—and the Guard, or possibly the Engineers, would go to work at once.

The Engineers had ships meant to enter atmosphere: powerful, but slow. Such a vessel could be carried piggy-back by a fast ion-drive craft of the Guard. Modifications could be made en route. But the trip would still require a couple of weeks, pessimistically reckoned.

Say, then, six weeks maximum until help arrived. Certainly no less than four, no matter what speeds could be developed by these latest models.

Well, the *Thunderbolt* had supplies and energy for more than six weeks. That long a time under two-plus gees was not going to be fun, though gravanol injections would prevent physiological damage. And the winds were going to buffet them around. That should be endurable, though; they'd be above the region of vertical currents, in what you might call the Jovian stratosphere—

A red fog passed before the screen.

Luke Devon, strapped into a chair like everyone else, called across the empty ship: "If I'd only known this was going to happen—what a chance for research! I do have a few instruments, but it'll be crude as hell."

"Personally," said Banning, "I saved out a deck of cards and some poker chips. But I hardly think you'll have much time for research—in Jovian atmospherics, anyway."

He could imagine Cleonie blushing. He was sorry to embarrass her, he really did like that girl, but the ragged laugh he got from the others was worth it. While men could laugh, especially at jokes as bad as his, they could endure.

Down and down the ship went. Once, caught in a savage gust, she turned over. If everything hadn't been fastened down, there could have been an awful mess. The distribution of mass was such that the hulk would always right itself, but . . . yes, reflected Banning, they'd all have to wear some kind of harness attached to the interior braces. It could be improvised.

The wind that boomed beyond the hull faded its organ note, just a trifle.

"We're slowing down," said Tokugawa.

And later, looking up from the radaltimeter: "We've stopped."

"End of the line." Banning stretched. He felt bone-crushingly tired. "Nothing much we can do now. Let's all strap into our bunks and sleep for a week."

His Jovian weight dragged at him. But they were all alive. And the ship might be hollowed out, but she still held food and drink, tools and materials, games and books—what was needed to keep them sane as well as breathing in the time they must wait.

His calculations were verified. A hollow steelloy shell, three hundred odd meters in diameter, could carry more than a hundred thousand tons,

besides its own mass, and still have a net specific gravity of less than 0.03. Now the Jovian air has an average molecular weight of about 3.3, so after due allowance for temperature and a few other items, the result was derived that at such a thickness its pressure is an endurable one hundred atmospheres.

Like an oil drop in a densitometer, like a free balloon over eighteenth-century France, like a small defiant bubble in the sky, the *Thunderbolt* floated.

THE END

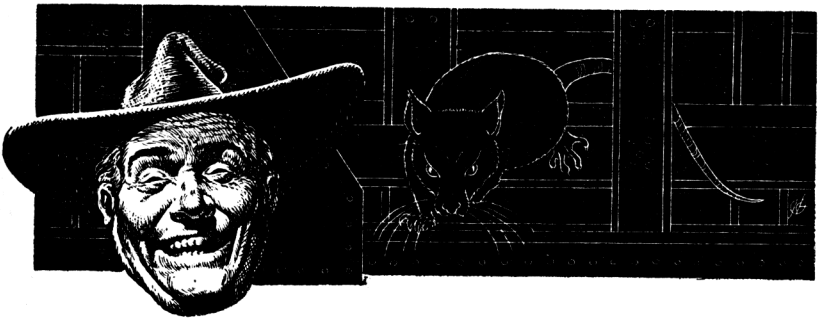
IN TIMES TO COME

Next issue starts Bob Heinlein's new novel, "Citizen of the Galaxy." I'm not just sure at the moment which I find most enjoyable—the first part of that serial or the cover painting van Dongen has done for it. Baslim, the one-eyed, one-legged old beggar of Jubbulpore, and Thorby, the sick, sullen, small-boy slave who was so little wanted the old beggar bought him as a joke at the slave-auction. Baslim, the scarred and scabrous old man . . . who spoke more languages than any man had a right to, and was an expert hypno-therapist. Baslim, who lived in the rotting ruins of an abandoned section of a tawdry city on an outlying planet . . . and for whom every Free Trader skipper in all space would play messenger boy, and jump when he did it!

Bob's got quite a yarn—and Van managed to match it with a cover!

There is, also, a novelette by David Gordon; Bob's yarn's on the serious side, but this one, "Look Out! Duck!" is on the uproarious side. What's more fun than a barrel of monkeys? Hah! Gordon's answer is a spaceship full—and that's a full five thousand!—of ducks. Fun, that is, for the guy who doesn't have to take care of the situation. You, for instance.

THE EDITOR.



THE STAINLESS STEEL RAT

BY HARRY HARRISON

All human history shows that not all humans are men; some are mules, and some are wolves—and there are always a few rats.

Illustrated by Freas

When the office door opened suddenly I knew the game was up. It had been a money-maker—but it was all over. As the cop walked in I sat back in the chair and put on a happy grin. He had the same somber expression and heavy foot that they all have—and the same lack of humor. I almost knew to the word what he was going to say before he uttered a syllable.

"James Bolivar diGriz I arrest you on the charge—"

I was waiting for the word *charge*, I thought it made a nice touch that way. As he said it I pressed the button that set off the charge of black powder in the ceiling, the crossbeam buckled and the three-ton safe dropped through right on the top of the cop's head. He squashed very nicely, thank you. The cloud of plaster dust settled and all I could see of him was one hand, slightly crumpled. It twitched a bit and the index finger pointed at me accusingly. His voice was a little muffled by the safe and sounded a

bit annoyed. In fact he repeated himself a bit.

". . . On the charge of illegal entry, theft, forgery—"

He ran on like that for quite a while, it was an impressive list but I had heard it all before. I didn't let it interfere with my stuffing all the money from the desk drawers into my suitcase. The list ended with a new charge and I would swear on a stack of thousand credit notes *that* high that there was a hurt tone in his voice.

"In addition the charge of assaulting a police robot will be added to your record. This was foolish since my brain and larynx are armored and in my midsection—"

"That I know well, George, but your little two-way radio is in the top of your pointed head and I don't want you reporting to your friends just yet."

One good kick knocked the escape panel out of the wall and gave access to the steps to the basement. As I skirted the rubble on the floor the robot's fingers snapped out at my leg, but I had been waiting for that and they closed about two inches short. I have been followed by enough police robots to know by now how indestructible they are. You can blow them up or knock them down and they keep coming after you; dragging themselves by one good finger and spouting saccharine morality all the while. That's what this one was doing. Give up my life of crime and pay my debt to society and such. I could still hear his voice echoing down the stairwell as I reached the basement.

Every second was timed now. I had about three minutes before they would be on my tail, and it would take me exactly one minute and eight seconds to get clear of the building. That wasn't much of a lead and I would need all of it. Another kick panel opened out into the label-removing room. None of the robots looked up as I moved down the aisle—I would have been surprised if they had. They were all low-grade M types, short on brains and good only for simple, repetitive work. That was why I hired them. They had no curiosity as to why they were taking the labels off the filled cans of azote fruits, or what was at the other end of the moving belt that brought the cans through the wall. They didn't even look up when I unlocked the Door That Was Never Unlocked that led through the wall. I left it open behind me as I had no more secrets now.

Keeping next to the rumbling belt, I stepped through the jagged hole I had chopped in the wall of the government warehouse. I had installed the belt too, this and the hole were the illegal acts that I had to do myself. Another locked door opened into the warehouse itself. The automatic fork-lift truck was busily piling cans onto the belt and digging fresh ones out of the ceiling-high piles. This fork-lift had hardly enough brains to be called a robot,

it just followed taped directions to load the cans. I stepped around it and dog-trotted down the aisle. Behind me the sounds of my illegal activity died away. It gave me a warm feeling to still hear it going full blast like that.

It *had* been one of the nicest little rackets I had ever managed. For a small capital outlay I had rented the warehouse that backed on the government warehouse. A simple hole in the wall and I had access to the entire stock of stored goods, long-term supplies that I knew would be untouched for months or years in a warehouse this size. Untouched, that is, until I came along.

After the hole had been made and the belt installed it was just a matter of business. I hired the robots to remove the old labels and substitute the colorful ones I had printed. Then I marketed my goods in a strictly legal fashion. My stock was the best and due to my imaginative operation my costs were very low, I could afford to undersell my competitors and still make a handsome profit. The local wholesalers had been quick to sense a bargain and I had orders for months ahead. It *had* been a good operation—and could have gone on for quite a while.

I stifled that train of thought before it started. One lesson that has to be remembered in my line of business is that when an operation is over it is OVER! The temptation to stay just one more day or to cash just one more check can be almost overwhelming, ah, how well I know. I also know that it is also the best way to get better acquainted with the police.

Turn your back and walk away—
And live to graft another day.

That's my motto and it's a good one. I got where I am because I stuck to it.

And daydreams aren't part of getting away from the police.

I pushed all thoughts from my mind as I reached the end of the aisle. The entire area outside must have been swarming with cops by this time and I had to move fast and make no mistakes. A fast look right and left. Nobody in sight. Two steps ahead and press the elevator button. I had put a meter on this back elevator and it showed that the thing was used once a month on the average.

It arrived in about three seconds, empty, and I jumped in, thumbing the roof button at the same time. The ride seemed to go on forever, but that was just subjective. By the record it was exactly fourteen seconds. This was the most dangerous part of the trip. I tightened up as the elevator slowed. My .75 caliber recoilless was in my hand, that would take care of one cop, but no more.

The door shuffled open and I relaxed. Nothing. They must have the entire area covered on the ground so they hadn't bothered to put cops on the roof.

In the open air now I could hear the sirens for the first time—a wonderful sound. They must have had half of the entire police force out from the amount of noise they were making. I accepted it as any artist accepts tribute.

The board was behind the elevator shaft where I had left it. A little weather-stained but still strong. A few seconds to carry it to the edge of the parapet and reach it across to the next building.

Gently, this was the one dangerous spot where speed didn't count. Carefully onto the end of the board, the suitcase held against my chest to keep my center of gravity over the board. One step at a time. A thousand-foot drop to the ground. If you don't look down you can't fall . . .

Over. Time for speed. The board behind the parapet, if they didn't see it at first my trail would be covered for a while at least. Ten fast steps and there was the door to the stairwell. It opened easily—and it better have—I had put enough oil on the hinges. Once inside I threw the bolt and took a long, deep breath. I wasn't out of it yet, but the worst part where I ran the most risk, was past. Two uninterrupted minutes here and they would never find James Bolivar, alias "Slippery Jim" diGriz.

The stairwell at the roof was a musty, badly lit cubicle that was never visited. I had checked it carefully a week before for phono and optic bugs and it had been clear. The dust looked undisturbed, except for my own footprints. I had to take a chance that it hadn't been bugged since then. The calculated risk must be accepted in this business.

Good-by James diGriz, weight ninety-eight kilos, age about forty-five, thick in the middle and heavy in the jowls, a typical business man whose picture graces the police files of a thousand planets—also his fingerprints. They went first. When you wear them they feel like a second skin, a touch of solvent though and they peel off like a pair of transparent gloves.

All my clothes next—and then the girdle in reverse—that lovely paunch that straps around my belly and holds twenty kilos of lead mixed with thermite. A quick wipe from the bottle of bleach and my hair was its natural shade of brown, the eyebrows, too. The nose plugs and cheek pads hurt coming out, but that only lasts a second. Then the blue-eyed contact lenses. This process leaves me mother-naked and I always feel as if I have been born again. In a sense it is true, I had become a new man, twenty kilos lighter, ten years younger and with a completely different description. The large suitcase held a complete change of clothes and a pair of dark-rimmed glasses that replaced the contact lenses. All the loose money fitted neatly into a brief case.

When I straightened up I really felt as if ten years had been stripped

from me. I was so used to wearing that weight that I never noticed it —until it was gone. Put a real spring in my step.

The thermite would take care of all the evidence, I kicked it all into a heap and triggered the fuse. It caught with a roar and bottles, clothes, bag, shoes, weights, et al, burned with a cheerful glare. The police would find a charred spot on the cement and micro-analysis might get them a few molecules off the walls, but that was all they would get. The glare of the burning thermite threw jumping shadows around me as I walked down three flights to the one hundred twelfth floor.

Luck was still with me, there was no one on the floor when I opened the door. One minute later the express elevator let me and a handful of other business types out into the lobby.

Only one door was open to the street and a portable TV camera was trained on it. No attempt was being made to stop people from going in and out of the building, most of them didn't even notice the camera and the little group of cops around it. I walked towards it at an even pace. Strong nerves count for a lot in this business.

For one instant I was square in the field of that cold, glass eye, then I was past. Nothing happened so I knew I was clear. That camera must have fed direct to the main computer at police headquarters, if my description had been close enough to the one they had on file those robots would have been notified and I would have been pinned before I had taken a step. You can't outmove a computer-robot combination, not when they move and think in microseconds—but you can outthink them. I had done it again.

A cab took me about ten blocks away. I waited until it was out of sight then took another one. It wasn't until I was in the third cab that I felt safe enough to go to the space terminal. The sounds of sirens were growing fainter and fainter behind me and only an occasional police car tore by in the opposite direction.

They were sure making a big fuss over a little larceny, but that's the way it goes on these overcivilized worlds. Crime is such a rarity now that the police really get carried away when they run across some. In a way I can't blame them, giving out traffic tickets must be an awful dull job. I really believe they ought to thank me for putting a little excitement in their otherwise dull lives.

It was a nice ride to the spaceport being located, of course, far out of town. I had time to lean back and watch the scenery and gather my thoughts. Even time to be a little philosophical. For one thing I could enjoy a good cigar again, I smoked only cigarettes in my other personality and never violated that personality, even in strictest privacy. The cigars were still fresh in the pocket humidor where I had put them six

months ago. I sucked a long mouthful and blew the smoke out at the flashing scenery. It was good to be off the job, just about as good as being on it. I could never make my mind up which period I enjoyed more—I guess they are both right at the time.

My life is so different from that of the overwhelming majority of people in our society that I doubt if I could even explain it to them. They exist in a fat, rich union of worlds that have almost forgotten the meaning of the word crime. There are few malcontents and even fewer that are socially maladjusted. The few that are still born in spite of centuries of genetic control are caught early and the aberration quickly adjusted. Some don't show their weakness until they are adults, they are the ones who try their hand at petty crime—burglary, shop-lifting or such. They get away with it for a week or two or a month or two, depending on the degree of their native intelligence. But sure as atomic decay—and just as predestined—the police reach out and pull them in.

That is almost the full extent of crime in our organized, dandified society. Ninety-nine per cent of it, let's say. It is that last and vital one per cent that keeps the police departments in business. That one per cent is me, and a few others like me, a handful of men scattered around the galaxy. Theoretically we can't exist, and if we do exist we can't operate—but we do. We are the rats in the wainscoting of society—we operate outside of their barriers and outside of their rules. Society had more rats when the rules were looser, just as the old wooden buildings had more rats than the concrete buildings that came later. But they still had rats. Now that society is all ferroconcrete and stainless steel there are fewer gaps between the joints, and it takes a smart rat to find them. A stainless steel rat is right at home in this environment.

It is a proud and lonely thing to be a stainless steel rat—and it is the greatest experience in the galaxy if you can get away with it. The sociological experts can't seem to agree why we exist, some even doubt that we do. The most widely accepted theory says that we are victims of delayed psychological disturbance that shows no evidence in childhood when it can be detected and corrected and only appears later in life. I have naturally given a lot of thought to the topic and I don't hold with that idea at all.

A few years back I wrote a small book on the subject—under a nom de plume of course—that was rather well received. My theory is that the aberration is a philosophical one, not a psychological one. At a certain stage the realization striked through that one must either live outside of society's bonds or die of absolute boredom. There is no future or freedom in the circumscribed life and the only other life is complete rejection of the rules. There is no

longer room for the soldier of fortune or the gentleman adventurer who can live both within and outside of society. Today it is all or nothing. To save my own sanity I chose the nothing.

The cab just reached the spaceport as I hit on this negative line of thought and I was glad to abandon it. Loneliness is the thing to fear in this business, that and self-pity can destroy you if they get the upper hand. Action has always helped me, the elation of danger and escape always clears my mind. When I paid the cab I shortchanged the driver right under his nose, palming one of the credit notes in the act of handing it to him. He was blind as a riveted bulkhead, his gullibility had me humming with delight. The tip I gave him more than made up the loss since I only do this sort of petty business to break the monotony.

There was a robot clerk behind the ticket window, he had that extra third eye in the center of this forehead that meant a camera. It clicked slightly as I purchased a ticket recording my face and destination. A

normal precaution on the part of the police, I would have been surprised if it hadn't happened. My destination was intersystem so I doubted if the picture would appear any place except in the files. I wasn't making an interstellar hop this time, as I usually did after a big job, it wasn't necessary. After a job a single world or a small system is too small for more work, but Beta Cygnus has a system of almost twenty planets all with terrafied weather. This planet, III, was too hot now, but the rest of the system was wide open. There was a lot of commercial rivalry within the system and I knew their police departments didn't co-operate too well. They would pay the price for that. My ticket was for Moriy, number XVIII, a large and mostly agricultural planet.

There were a number of little stores at the spaceport, I shopped them carefully and outfitted a new suitcase with a complete wardrobe and traveling essentials. The tailor was saved for last. He ran up a couple of traveling suits and a formal kilt for me and I took them into the fitting booth. Strictly by accident I managed to hang one of the suits over the optic bug in the wall and made undressing sounds with my feet while I doctored the ticket I had just bought. The other end of my cigar cutter was a punch, with it I altered the keyed holes that indicated my destination. I was now going to planet X, not XVIII, and I had lost almost two hundred credits with the alteration. That's the secret of ticket and order changing, don't raise the face value—there is too good a chance that this will be noticed. If you lower the value and lose money on the deal, even if it is caught, people will be sure it is a mistake on the machine's part. There is never the shadow of a doubt, since why should anyone change a ticket to lose money?

Before the police could be suspicious I had the suit off the bug and tried it on, taking my time. Almost everything was ready now, I had about an hour to kill before the ship left. I spent the time wisely by going to an automatic cleaner and having all my new clothes cleaned and pressed. Nothing interests a customs man more than a suitcase full of unworn clothes.

Customs was a snap and when the ship was about half full I boarded her and took a seat near the hostess. I flirted with her until she walked away, having classified me in the category of MALE, BRASH, ANNOYING. An old girl who had the seat next to mine also had me filed in the same drawer and was looking out of the window with obvious ice on her shoulder. I dozed off happily since there is one thing better than not being noticed and that is being noticed and filed into a category. Your description gets mixed up with every other guy in the file and that is the end of it.

When I woke up we were almost

to planet X, I half dozed in the chair until we touched down, then smoked a cigar while my bag cleared customs. My locked brief case of money raised no suspicions since I had foresightedly forged papers six months ago with my occupation listed as *bank messenger.* Interplanet credit was almost nonexistent in this system, so the customs men were used to seeing a lot of cash go back and forth.

Almost by habit I confused the trail a little more and ended up in the large manufacturing city of Brouggh over one thousand kilometers from the point where I had landed. Using an entirely new set of identification papers I registered at a quiet hotel in the suburbs.

Usually after a big job like this I rest up for a month or two; this was one time though I didn't feel like a rest. While I was making small purchases around town to rebuild the personality of James diGriz, I was also keeping my eyes open for new business opportunities. The very first day I was out I saw what looked like a natural—and each day it looked better and better.

One of the main reasons I have stayed out of the arms of the law for as long as I have, is that I have never repeated myself. I have dreamed up some of the sweetest little rackets, run them off once, then stayed away from them forever after. About the only thing they had in common was the fact that they all made money. About the only thing I hadn't hit to date was out and out armed robbery. It was time for a change and it looked like that was it.

While I was rebuilding the paunchy personality of Slippery Jim I was making plans for the operation. Just about the time the fingerprint gloves were ready the entire business was planned. It was simple like all good operations should be, the less details there are, the less things there are that can go wrong.

I was going to hold up Moraio's, the largest retail store in the city. Every evening, at exactly the same time, an armored car took the day's receipts to the bank. It was a tempting prize—a gigantic sum in intraceable small bills. The only real problem as far as I was concerned was how one man could handle the sheer bulk and weight of all that money. When I had an answer to that the entire operation was ready.

All the preparations were of course, made only in my mind until the personality of James diGriz was again ready. The day I slipped that weighted belly back on, I felt I was back in uniform. I lit my first cigarette almost with satisfaction, then went to work. A day or two for some purchases and a few simple thefts and I was ready. I scheduled the following afternoon for the job.

A large tractor-truck that I had bought was the key to the operation —along with some necessary alterations I had made to the interior. I parked the truck in an "L" shaped alley about a half mile from

Moraio's. The truck almost completely blocked the alley but that wasn't important since it was used only in the early morning. It was a leisurely stroll back to the department store, I reached it at almost the same moment that the armored truck pulled up. I leaned against the wall of the gigantic building while the guards carried out the money. My money.

To someone of little imagination I suppose it would have been an awe-inspiring sight. At least five armed guards standing around the entrance, two more inside the truck as well as the driver and his assistant. As an added precaution there were three monocycles purring next to the curb, they would go with the truck as protection on the road. Oh, very impressive. I had to stifle a grin behind my cigarette when I thought about what was going to happen to those elaborate precautions.

I had been counting the handtrucks of money as they rolled out of the door. There were always fifteen, no more, no less; this practice made it easy for me to know the exact time to begin. Just as fourteen was being loaded into the armored truck, load number fifteen appeared in the store entrance. The truck driver had been counting the way I had, he stepped down from the cab and moved to the door in the rear in order to lock it when loading was finished.

We synchronized perfectly as we strolled by each other. At the moment he reached the rear door I reached the cab, quietly and smoothly I climbed up into it and slammed the door behind me. The assistant had just enough time to open his mouth and pop his eyes when I placed an anesthetic bomb on his lap; he slumped in an instant. I was, of course, wearing the correct filter plugs in my nostrils. As I started the motor with my left hand I threw a larger bomb through the connecting window to the rear with my right. There were some reassuring thumps as the guards there dropped over the bags of change.

This entire process hadn't taken six seconds. The guards on the steps were just waking up to the fact that something was wrong. I gave them a cheerful wave through the window and gunned the armored truck away from the curb. One of them tried to run and throw himself through the open rear door but he was a little too late. It all had happened so fast that not one of them had thought to shoot, I had been sure there would be a *few* bullets. The sedentary life on these planets does slow the reflexes.

The monocycle drivers caught on a lot faster, they were after me before the truck had gone a hundred feet. I slowed down until they had caught up, then stamped on the accelerator, keeping just enough speed so they couldn't pass me.

Their sirens were screaming of course and they had their guns working; it was just as I had plan-

ned. We tore down the street like jet racers and the traffic melted away before us. They didn't have time to think and realize that *they* were making sure the road was clear for my escape. The situation was very humorous and I'm afraid I chuckled out loud as I tooled the truck around the tight corners.

Of course the alarm had been turned in and the road blocks must have been forming up ahead—but that half mile went by fast at the speed we were doing. It was a matter of seconds before I saw the alley mouth ahead. I turned the truck into it, at the same time pressing the button on my pocket short wave.

Along the entire length of the alley my smoke bombs ignited. They were, of course, home made, as was all my equipment, nevertheless they produced an adequately dense cloud in that narrow alley. I pulled the truck a bit to the right until the fenders scraped the wall and only slightly reduced my speed, this way I could steer by touch. The monocycle drivers of course couldn't do this and had the choice of stopping or rushing headlong into the darkness. I hope they made the right decision and none of them were hurt.

The same radio impulse that triggered the bombs was supposed to have opened the rear door of the trailer truck up ahead and dropped the ramp. It had worked fine when I had tested it, I could only hope now that it did the same in practice. I tried to estimate the distance I had gone in the alley by timing my speed, but I was a little off. The front wheels of the truck hit the ramp with a destructive crash and the armored truck bounced rather than rolled into the interior of the larger van. I was jarred around a bit and had just enough sense left to jam on the brakes before I plowed right through into the cab.

Smoke from the bombs made a black midnight of everything, that and my shaken-up brains almost ruined the entire operation. Valuable seconds went by while I leaned against the truck wall trying to get oriented. I don't know how long it took, when I finally did stumble back to the rear door I could hear the guards' voices calling back and forth through the smoke. They heard the bent ramp creak as I lifted it so I threw two gas bombs out to quiet them down.

The smoke was starting to thin as I climbed up to the cab of the tractor and gunned it into life. A few feet down the alley and I broke through into sunlight. The alley mouth opened out into a main street a few feet ahead and I saw two police cars tear by. When the truck reached the street I stopped and took careful note of all witnesses. None of them showed any interest in the truck or the alley. Apparently all the commotion was still at the other end of the alley. I poured power into the engine and rolled out into the street, away from the store I had just robbed.

Of course I only went a few blocks in that direction then turned down a side street. At the next corner I turned again and headed back towards Moraio's, the scene of my recent crime. The cool air coming in the window soon had me feeling better, I actually whistled a bit as I threaded the big truck through the service roads.

It would have been fine to go up the highway in front of Moraio's and see all the excitement, but that would have been only asking for trouble. Time was still important. I had carefully laid out a route that avoided all congested traffic and this was what I followed. It was only a matter of minutes before I was pulling into the loading area in the back of the big store. There was a certain amount of excitement here but it was lost in the normal bustle of commerce. Here and there a knot of truck drivers or shipping foremen were exchanging views on the robbery, since robots don't gossip the normal work was going on. The men were, of course, so excited that no attention was paid to my truck when I pulled into the parking line next to the other vans. I killed the engine and settled back with a satisfied sigh.

The first part was complete. The second part of the operation was just as important though. I dug into my paunch for the kit that I always take on the job—for just such an emergency as this. Normally, I don't believe in stimulants, but I was still groggy from the banging around. Two cc's of Linoten in my ante cubital cleared that up quickly enough. The spring was back in my step when I went into the back of the van.

The driver's assistant and the guards were still out and would stay that way for at least ten hours. I arranged them in a neat row in the front of the truck where they wouldn't be in my way and went to work.

The armored car almost filled the body of the trailer as I knew it would; therefore I had fastened the boxes to the walls. They were fine, strong shipping boxes with Moraio's printed all over them. It was a minor theft from their warehouse that should go unnoticed. I pulled the boxes down and folded them for packing, I was soon sweating and had to take my shirt off as I packed the money bundles into the boxes.

It took almost two hours to stuff and seal the boxes with tape. Every ten minutes or so I would check through the peephole in the door; only the normal activities were going on. The police undoubtedly had the entire town sealed and were tearing it apart building by building looking for the truck. I was fairly sure that the last place they would think of looking was the rear of the robbed store.

The warehouse that had provided the boxes had also provided a supply of shipping forms. I fixed one of these on each box, addressed to different pick-up addresses and

marked paid of course, and was ready to finish the operation.

It was almost dark by this time, however I knew that the shipping department would be busy most of the night. The engine caught on the first revolution and I pulled out of the parking rank and backed slowly up to the platform. There was a relatively quiet area where the shipping dock met the receiving dock, I stopped the trailer as close to the dividing line as I could. I didn't open the rear door until all the workmen were faced in a different direction. Even the stupidest of them would have been interested in why a truck was unloading the firm's own boxes. As I piled them up on the platform I threw a tarp over them, it only took a few minutes. Only when the truck gates were closed and locked did I pull off the tarp and sit down on the boxes for a smoke.

It wasn't a long wait. Before the cigarette was finished a robot from the shipping department passed close enough for me to call him.

"Over there. The M-19 that was loading these burned out a brake-band, you better see that they're taken care of."

His eyes glowed with the light of duty. Some of these higher M types take their job very seriously. I had to step back quickly as the fork lifts and M-trucks appeared out of the doors behind me. There was a scurry of loading and sorting and my haul vanished down the platform. I lighted another cigarette and watched for a while as the boxes were coded and stamped and loaded on the outgoing trucks and local belts.

All that was left for me now was the disposing of the truck on some side street and changing personalities.

As I was getting into the truck I realized for the first time that something was wrong. I, of course, had been keeping an eye on the gate —but not watching it closely enough. Trucks had been going in and out. Now the realization hit me like a hammer blow over the solar plexus. They were the same trucks going both ways. A large, red cross-country job was just pulling out. I heard the echo of its exhaust roar down the street—then die away to an idling grumble. When it roared up again it didn't go away, instead the truck came in through the second gate. There were police cars waiting outside that wall. Waiting for me.

For the first time in my career I felt sharp fear of the hunted man. This was the first time I had ever had the police on my trail when I wasn't expecting them. The money was lost, that much was certain, but I was no longer concerned with that. It was me they were after now.

Think first, then act. I was safe enough for the moment. They were, of course, moving in on me, going slowly as they had no idea of where I was in the giant loading yard.

How had they found me? *That* was the important point. The local police were used to an almost crimeless world, they couldn't have found my trail this quick. In fact, I hadn't left a trail, whoever had set the trap here had done it with logic and reason.

Unbidden the words jumped into my mind.

The Special Corps.

Nothing was ever printed about it, only a thousand whispered words heard on a thousand worlds around the galaxy. The Special Corps, the branch of the League that took care of the troubles that individual planets couldn't solve. The Corps was supposed to have finished off the remnants of Haskell's Raiders after the peace, of putting the illegal T & Z Traders out of business, of finally catching Inskipp. And now they were after me.

They were out there waiting for me to make a break. They were thinking of all the ways out just as I was—and they were blocking them. I had to think fast and I had to think right.

Only two ways out. Through the gates or through the store. The gates were too well covered to make a break, in the store there would be other ways out. It had to be that way. Even as I made the conclusion I knew that other minds had made it too, that men were moving in to cover those exits. That thought brought fear—and made me angry as well. The very idea that someone could outthink me was odious. They could try all right—but I would give them a run for their money. I still had a few tricks left.

First, a little misdirection. I started the truck, left it in low gear and aimed it at the gate. When it was going straight I locked the steering wheel with the friction clamp and dropped out the far side of the cab and strolled back to the warehouse. Once inside I moved faster. Behind me I heard some shots, a heavy crump, and a lot of shouting. That was more like it.

The night locks were connected on the doors that led to the store proper. An old-fashioned alarm that I could disconnect in a few moments. My pick-locks opened the door and I gave it a quick kick with my foot and turned away. There were no alarm bells, but I knew that somewhere in the building an indicator showed that the door was opened. As fast as I could run I went to the last door on the opposite side of the building. This time I made sure the alarm was disconnected before I went through the door. I locked it behind me.

It is the hardest job in the world to run and be quiet at the same time. My lungs were burning before I reached the employees' entrance. A few times I saw flashlights ahead and had to double down different aisles, it was mostly luck that I made it without being spotted. There were two men in uniform standing in front of the door I wanted to go out. Keeping as close to the wall as I could I made it to within twenty

feet of them before I threw the gas grenade. For one second I was sure that they had gas masks on and I had reached the end of the road—then they slumped down. One of them was blocking the door, I rolled him aside and slid it open a few inches.

The searchlight couldn't have been more than thirty feet from the door; when it flashed on the light was more pain than glare. I dropped the instant it came on and the slugs from the machine pistol ate a line of glaring holes across the door. My ears were numb from the roar of the exploding slugs and I could just make out the thud of running footsteps. My own .75 was in my hand and I put an entire clip of slugs through the door, aiming high so I wouldn't hurt anyone. It would not stop them, but it should slow them down.

They returned the fire, must have been a whole squad out there. Pieces of plastic flew out of the back wall and slugs screamed down the corridor. It was good cover, I knew there was nobody coming up behind me. Keeping as flat as I could I crawled in the opposite direction, out of the line of fire. I turned two corners before I was far enough from the guns to risk standing up. My knees were shaky and great blobs of color kept fogging my vision. The searchlight had done a good job, I could barely see at all in the dim light.

I kept moving slowly, trying to

get as far away from the gunfire as possible. The squad outside had fired as soon as I had opened the door, that meant standing orders to shoot at anyone who tried to leave the building. A nice trap. The cops inside would keep looking until they found me. If I tried to leave I would be blasted. I was beginning to feel very much like a trapped rat.

Every light in the store came on and I stopped, frozen. I was near the wall of a large farm-goods showroom. Across the room from me were three soldiers. We spotted each other at the same time, I dived for the door with bullets slapping all around me. The military was in it too, they sure must have wanted me bad. A bank of elevators was on the other side of the door—and stairs leading up. I hit the elevator in one bounce and punched the sub-basement button, and just got out ahead of the closing doors. The stairs were back towards the approaching soldiers, I felt like I was running right into their guns. I must have made the turn into the stairs a split second ahead of their arrival. Up the stairs and around the first landing before they were even with the bottom. Luck was still on my side. They hadn't seen me and were sure I had gone down. I sagged against the wall, listening to the shouts and whistle blowing as they turned the hunt towards the basement.

There was one smart one in the bunch. While the others were all following the phony trail I heard him start slowly up the stairs. I didn't have any gas grenades left, all I could do was climb up ahead of him, trying to do it without making a sound.

He came on slowly and steadily and I stayed ahead of him. We went up four flights that way, me in my stockinged feet with my shoes around my neck, his heavy boots behind me making a dull rasping on the metal stairs.

As I started up the fifth flight I stopped, my foot halfway up a step.

Someone else was coming down, someone wearing the same kind of military boots. I found the door to the hall, opened it behind me and slipped through. There was a long hall in front of me lined with offices of some kind. I began to run the length of it, trying to reach a turning before the door behind me could open and those exploding slugs tear me in half. The hall seemed endless and I suddenly realized I would never make it to the end in time.

I was a rat looking for a hole—and there was none. The doors were locked, all of them, I tried each as I came to it, knowing I would never make it. That stairwell door was opening behind me and the gun was coming up, I didn't dare turn and look but I could feel it. When the door opened under my hand I fell through before I realized what had happened. I locked it behind me and leaned against it in the darkness, panting like a spent animal.

Then the light came on and I saw the man sitting behind the desk, smiling at me.

There is a limit to the amount of shock the human body can absorb. I'd had mine. I didn't care if he shot me or offered a cigarette—I had reached the end of my line. He did neither. He offered me a cigar instead.

"Have one of these, diGriz, I believe they're your brand."

The body is a slave of habit, even with death a few inches away it will respond to established custom. My fingers moved of their own volition and took the cigar, my lips clenched it and my lungs sucked it into life. And all the time my eyes watched the man behind the desk waiting for death to reach out.

It must have shown. He waved towards a chair and carefully kept both hands in sight on top of the desk. I still had my gun, it was trained on him.

"Sit down diGriz and put that cannon away. If I wanted to kill you, I could have done it a lot easier than herding you into this room." His eyebrows moved up in surprise when he saw the expression on my face. "Don't tell me you thought it was an accident that you ended up here?"

I had, up until that moment, and the lack of intelligent reasoning on my part brought on a wave of shame that snapped me back to reality. I had been outwitted and outfought, the least I could do was surrender graciously. I threw the gun on the deck and dropped into the offered chair. He swept the pistol neatly into a drawer and relaxed a bit himself.

"Had me worried there for a minute, the way you stood there rolling your eyes and waving this piece of field artillery around."

"Who are you?"

He smiled at the abruptness of my tone. "Well, it doesn't matter who I am. What does matter is the organization that I represent."

"The Corps?"

"Exactly. The Special Corps. You didn't think I was the local police, did you? They have orders to shoot you on sight. It was only after I told them how to find you that they let the Corps come along on the job. I have some of my men in the building, they're the ones who herded you up here. The rest are all locals with itchy trigger fingers."

It wasn't very flattering but it was true. I had been pushed around like a class M robot, with every move charted in advance. The old boy behind the desk—for the first time I realized he was about sixty-five—really had my number. The game was over.

"All right Mr. Detective, you have me so there is no sense in gloating. What's next on the program? Psychological reorientation, lobotomy—or just plain firing squad?"

"None of those I'm afraid. I am here to offer you a job on the Corps."

The whole thing was so ludicrous

that I almost fell out of the chair laughing. Me. James diGriz, the interplanet thief working as a policeman. It was just too funny. The other one sat patiently, waiting until I was through.

"I will admit it has its ludicrous side—but only at first glance. If you stop to think, you will have to admit that who is better qualified to catch a thief than another thief?"

There was more than a little truth in that, but I wasn't buying my freedom by turning stool pigeon.

"An interesting offer, but I'm not getting out of this by playing the rat. There is even a code among thieves, you know."

That made him angry. He was bigger than he looked sitting down and the fist he shook in my face was as large as a shoe.

"What kind of stupidity do you call that? It sounds like a line out of a TV thriller. You've never met another crook in your whole life and you know it! And if you did you would cheerfully turn him in if you could make a profit on the deal. The entire essence of your life is individualism—that and the excitement of doing what others can't do. Well that's over now, and you better start admitting it to yourself. You can no longer be the interplanet playboy you used to be—but you *can* do a job that will require every bit of your special talents and abilities. Have you ever killed a man?"

His change of pace caught me off guard, I stumbled out an answer.

"No . . . not that I know of."

"Well you haven't, if that will make you sleep any better at night. You're not a homicidal, I checked that on your record before I came out after you. That is why I know you will join the Corps and get a great deal of pleasure out of going after the *other* kind of criminal who is sick, not just socially protesting. The man who can kill and enjoy it."

He was too convincing, he had all the answers. I had only one more argument and I threw it in with the air of a last ditch defense.

"What about the Corps, if they ever find out you are hiring half-reformed criminals to do your dirty work we will both be shot at dawn."

This time it was his turn to laugh. I could see nothing funny so I ignored him until he was finished.

"In the first place my boy, *I* am the Corps—at least the man at the top—and what do you think *my* name is? Harold Peters Inskipp, that's what it is!"

"Not the Inskipp that—"

"The same. Inskipp the Uncatchable. The man who looted the Pharsydion II in mid-flight and pulled all those others deals I'm sure you read about in your misspent youth. I was recruited just the way you were."

He had me on the ropes. He must have seen my rolling eyes, so he moved in for the kill.

"And who do you think the rest

of our agents are? I don't mean the bright-eyed grads of our technical schools, like the ones on my squad downstairs, I mean the full agents. The men who plan the operations, do the preliminary fieldwork and see that everything comes off smoothly. They're crooks. All crooks. The better they were on their own, the better a job they do for the Corps. It's a great, big, brawling universe and you would be surprised at some of the problems that come up. The only men we can recruit to do the job are the ones who have already succeeded at it.

"Are you on?"

It had happened too fast and I hadn't had time to think, I would probably go on arguing for an hour. But way down in the back of my mind the decision had been made. I was going to do it, I couldn't say no.

There was the beginning of a warm glow, too. The human race is gregarious, I knew that even though I had been denying it for years.

I was going to keep on doing the loneliest job in the universe—only I wasn't going to be doing it alone.

THE END

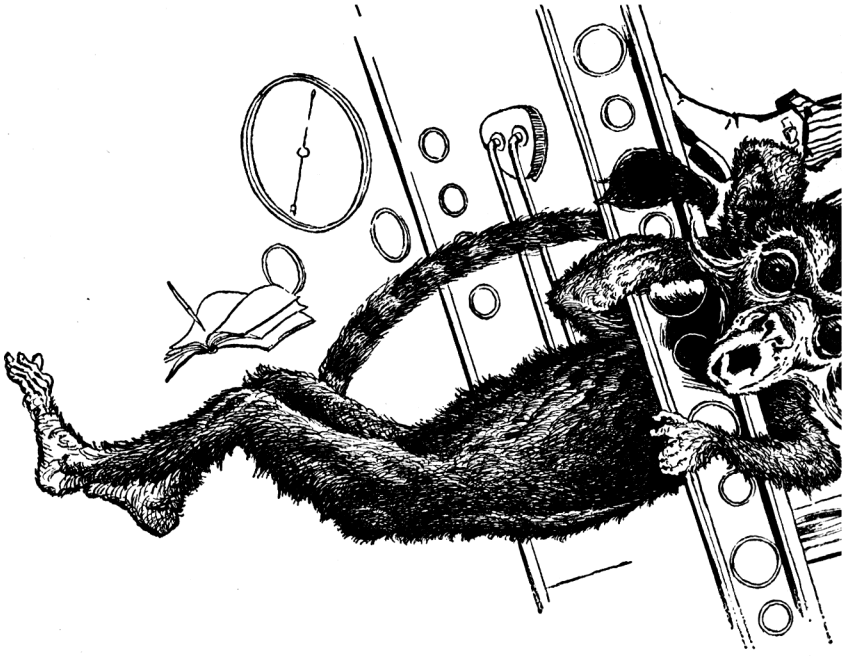
THE ANALYTICAL LABORATORY

One of Robert Randall's two heads seems to have been holding a back-biting contest with himself in the May issue. In one instance, he's half of first place, and in the other, all of second place. Meanwhile, Isaac Asimov's article, "The Trapping of the Sun" was getting considerable endorsement—but since articles aren't rated in the Lab here, it doesn't show in the score-box.

The score came out, for the May, 1957 issue, thus:

PLACE	STORY	AUTHOR	POINTS
1.	The Dawning Light (Pt. 3)	Robert Randall	1.54
2.	What's Eating You?	Randall Garrett	2.21
3.	Something In The Sky	Lee Correy	3.12
4.	The Queen's Messenger	John J. McGuire	3.16

THE EDITOR.

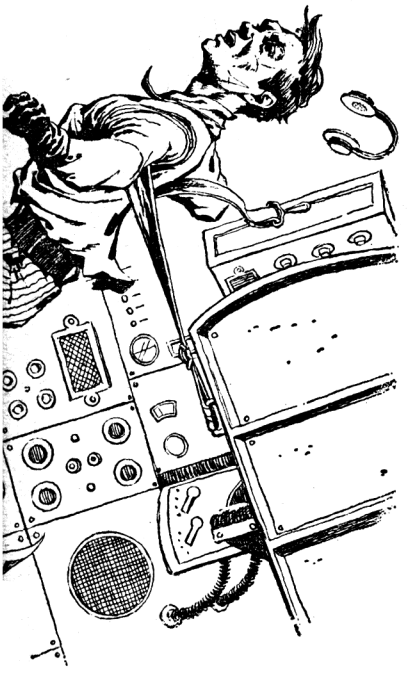


MED SERVICE

BY MURRAY LEINSTER

When is an expert doctor unwelcome on a plague-ridden planet? Easy! When somebody wants that plague to go on...!

Illustrated by van Dongen



I

"The probability of unfavorable consequences cannot be zero in any action of common life, but the probability increases by a very high power as a series of actions is lengthened. The effect of moral considerations, in conduct, may be stated to be a mathematically verifiable reduction in the number of unfavorable possible chance happenings. Of course, whether this process is termed the intelligent use of probability, or ethics, or piety, makes no difference in the fact. It is the method by which unfavorable chance happenings are made least probable. Arbitrary actions such as we call criminal cannot ever be justified by mathematics. For example . . ."

Probability and Human Conduct
Fitzgerald

Calhoun lay in his bunk and read Fitzgerald on "Probability and Human Conduct" as the little Med Ship floated in overdrive. In overdrive travel there is nothing to do but pass the time away. Murgatroyd, the *tormal,* slept curled up in a ball in one corner of the small ship's cabin. His tail was meticulously curled about his nose. The ship's lights burned steadily. There were those small random noises which have to be provided to keep a man sane in the dead stillness of a ship traveling at thirty times the speed of light. Calhoun turned a page and yawned.

Something stirred somewhere. There was a click, and a taped voice said:

"When the tone sounds, breakout will be five seconds off."

A metronomic ticking, grave and deliberate, resounded in the stillness. Calhoun heaved himself up from the bunk and marked his place in the book. He moved to and seated himself in the control chair and fastened the safety belt. He said:

"Murgatroyd! Hark, hark the lark in Heaven's something-or-other doth sing. Wake up and comb your whiskers. We're getting there."

Murgatroyd opened one eye and saw Calhoun in the pilot's chair. He uncurled himself and padded to a place where there was something to grab hold of. He regarded Calhoun with bright eyes.

"BONG!" said the tape. It counted down. "Five—four—three—two—one—"

It stopped. The ship popped out of overdrive. The sensation was unmistakable. Calhoun's stomach seemed to turn over twice, and he had a sickish feeling of spiraling dizzily in what was somehow a cone. He swallowed. Murgatroyd made gulping noises. Outside, everything changed.

The sun Maris blazed silently in emptiness off to port. The Cetis star-cluster was astern, and the light by which it could be seen had traveled for many years to reach here, though Calhoun had left Med Headquarters only three weeks before. The third planet of Maris swung splendidly in its orbit. Calhoun checked, and nodded in satisfaction. He spoke over his shoulder to Murgatroyd.

"We're here, all right."

"*Chee!*" shrilled Murgatroyd.

He uncoiled his tail from about a cabinet-handle and hopped up to look at the vision-screen. What he saw, of course, meant nothing to him. But all *tormals* imitate the actions of human beings, as parrots imitate their speech. He blinked wisely at the screen and turned his eyes to Calhoun.

"It's Maris III," Calhoun told him, "and pretty close. It's a colony of Dettra Two. One city was reported started two Earth-years ago. It should just about be colonized now."

"*Chee-chee!*" shrilled Murgatroyd.

"So get out of the way," commanded Calhoun. 'We'll make our approach and I'll tell 'em we're here."

He made a standard approach on interplanetary drive. Naturally, it was a long process. But after some hours he flipped over the call-switch and made the usual identification and landing request.

"Med Ship *Aesclipus Twenty* to ground," he said into the transmitter. "Requesting co-ordinates for landing. Our mass is fifty tons. Repeat, five-oh tons. Purpose of landing, planetary health inspection."

He relaxed. This job ought to be purest routine. There was a landing grid in the spaceport city on Maris III. From its control room instructions should be sent, indicating a position some five planetary diameters or farther out from the surface of that world. Calhoun's little ship should repair to that spot. The giant landing grid should then reach out its specialized force-field and lock onto the ship, and then bring it gently but irresistibly down to ground. Then Calhoun, representing Med Service, should confer gravely with planetary authorities about public health conditions on Maris III.

It was not to be expected that anything important would turn up. Calhoun would deliver full details of recent advances in the progress of medicine. These might already have reached Maris III in the ordinary course of commerce, but he would make sure. He might—but it was unlikely—learn of some novelty worked out here. In any case, within three days he should return to the small Med Ship, the

landing grid should heave it firmly heavenward to not less than five planetary diameters distance, and there release it. And Calhoun and Murgatroyd and the Med Ship should flick into overdrive and speed back toward Headquarters, from whence they had come.

Right now, Calhoun waited for an answer to his landing call. But he regarded the vast disk of the nearby planet.

"By the map," he observed to Murgatroyd, "the city ought to be on the shore of that bay somewhere near the terminus. Close to the sunset line."

His call was answered. A voice said incredulously on the space-phone speaker:

"What? What's that? What's that you say?"

"Med Ship *Aesclipus Twenty,*" Calhoun repeated patiently. "Requesting co-ordinates for landing. Our mass is fifty tons. Repeat, five-oh tons. Purpose of landing, planetary health inspection."

The voice said more incredulously still:

"A Med Ship? Holy—" By the change of sound, the man down on the planet had turned away from the microphone. *"Hey! Listen to this—"*

There was abrupt silence. Calhoun raised his eyebrows. He drummed on the control desk before him.

There was a long pause. A very long pause. Then a new voice came on the space phone, up from the ground:

"You up aloft there! Identify yourself!"

Calhoun said very politely:

"This is Med Ship *Aesclipus Twenty.* I would like to come to ground. Purpose of landing, health inspection."

"Wait," said the voice from the planet. It sounded strained.

A murmuring sounded, transmitted from fifty thousand miles away. Then there was a click. The transmitter down below had cut off. Calhoun raised his eyebrows again. This was not according to routine. Not at all! The Med Service was badly overworked and understaffed. The resources of interplanetary services were always apt to be stretched to their utmost, because there could be no galactic government as such. Some thousands of occupied planets, the closest of them light-years apart —or weeks of traveling—couldn't hold elections or have political parties for the simple reason that travel even in overdrive was too slow. They could only have service organizations whose authority depended on the consent of the people served, and whose support had to be gathered when and as it was possible.

But the Med Service was admittedly important. The local Sector Headquarters was in the Cetis cluster. It was a sort of interstellar clinic, with additions. It gathered and disseminated the results of experience in health and medicine among some

thousands of colony-worlds, and from time to time it made contact with other Headquarters carrying on the same work elsewhere. It admittedly took fifty years for a new technique in gene-selection to cross the so-far-occupied part of the galaxy, but it was a three-year voyage in overdrive to cover the same distance direct. And the Med Service was worth while. There was no problem of human ecological adjustment it had so far been unable to solve, and there were some dozens of planets whose human colonies owed their existence to it. There was nowhere—nowhere at all—that a Med Ship was not welcomed on its errand from Headquarters.

"Aground there!" said Calhoun sharply. "What's the matter? Are you landing me or not?"

There was no answer. Then, suddenly, every sound-producing device in the ship abruptly emitted a hoarse and monstrous noise. The lights flashed up and circuit-breakers cut them off. The nearby-object horn squawked. The hull-temperature warning squealed. The ship's internal gravity-field tugged horribly for an instant and went off. Every device within the ship designed to notify emergency clanged or shrieked or roared or screamed. There was a momentary bedlam.

It lasted for part of a second only. Then everything stopped. There was no weight within the ship, and there were no lights, and there was dead silence, and Murgatroyd made whimpering sounds in the darkness.

Calhoun thought absurdly to himself, *"According to the book, this is an unfavorable chance consequence of something or other."* But it was more than an unfavorable chance occurrence. It was an intentional and drastic and possibly a deadly one.

"Somebody's acting up," said Calhoun measuredly, in the blackness. "What's the matter with them?"

He flipped the screen switch to bring back vision of what was outside. The vision screens of a ship are very carefully fused against overload burnouts, because there is nothing in all the cosmos quite as helpless and foredoomed as a ship which is blind in the emptiness of space. But the screens did not light again. They couldn't. The cutouts hadn't worked in time.

Calhoun's scalp crawled. But as his eyes adjusted, he saw the palely fluorescent handles of switches and doors. They hadn't been made fluorescent in expectation of an emergency like this, of course, but they would help a great deal. He knew what had happened. It couldn't be but one thing—a landing-grid field clamped on the fifty-ton Med Ship with the power needed to grasp and land a twenty-thousand-ton liner. At that strength it would paralyze every instrument and blow every cut-off. It could not be accident. The reception of the news of his identity, the repeated request that he identify himself, and then the demand that he wait— This murderous performance was deliberate.

"Maybe," said Calhoun in the inky-black cabin, "as a Med Ship our arrival is an unfavorable chance consequence of something—or the unfavorableness is—and somebody means to keep us from happening. It looks like it."

Murgatroyd whimpered.

"And I think," added Calhoun coldly, "that somebody may need a swift kick in the negative feedback!"

He released himself from the safety-belt and dived across the cabin in which there was now no weight at all. In the blackness he opened a cabinet door. What he did inside was customarily done by a man wearing thick insulating gloves, in the landing grid back at Headquarters. He threw certain switches which would allow the discharge of the power-storage cells which worked the Med Ship's overdrive. Monstrous quantities of energy were required to put even a fifty-ton ship into overdrive, and monstrous amounts were returned when it came out. The power amounted to ounces of pure, raw energy, and as a safety-precaution such amounts were normally put into the Duhanne cells only just before a Med Ship's launching, and drained out again on its return. But now, Calhoun threw switches which made a rather incredible amount of power available for dumping into the landing-grid field about him—if necessary.

He floated back to the control chair.

The ship lurched—violently. It was being moved by the grid field without any gentleness at all. Calhoun's hands barely grasped the back of his pilot's chair before the jerk came, and it almost tore them free. He just missed being flung against the back wall of the cabin by the applied acceleration. But he was a long way out from the planet. He was at the end of a lever fifty thousand miles long. For that lever to be used to shake him too brutally would require special adjustments. But somebody was making them. The jerk reversed directions. He was flung savagely against the chair to which he'd been clinging. He struggled. Another yank, in another direction. Another one still. It flung him violently into the chair.

Behind him, Murgatroyd squealed angrily as he went hurtling across the cabin. He grabbed for holding-places with all four paws and his tail.

Another shake. Calhoun had barely clipped the safety belt fast before a furious jolt nearly flung him out of it again to crash against the cabin ceiling. Yet another vicious surge of acceleration. He scrabbled for the controls. The yanks and plungings of the ship increased intolerably. He was nauseated. Once he was thrust so furiously into the control chair that he was on the verge of blacking out, and then the direction of thrust was changed to the exact opposite so that the blood rushing to his head seemed about to explode it. His arms flailed out of control. He became dazed. But when

his hands were flung against the control board, despite their bruising he tried to cling to the control knobs, and each time he threw them over. Practically all his circuits were blown, but there was one—

His numbing fingers threw it. There was a roar, so fierce that it seemed an explosion. He'd reached the switch which made effective the discharge-circuit of his Duhanne cells. He'd thrown it. It was designed to let the little ship's overdrive power-reserve flow into storage at Headquarters on return from duty. Now, though, it poured into the landing-grid field outside. It amounted to hundreds of millions of kilowatt hours, delivered in the fraction of a second. There was the smell of ozone. The sound was like a thunder clap.

But abruptly there was a strange and incredible peace. The lights came on waveringly as his shaking fingers restored the circuit breakers. Murgatroyd shrilled indignantly, clinging desperately to an instrument rack. But the vision screens did not light again. Calhoun swore. Swiftly, he threw more circuit-restorers. The nearest-object indicator told of the presence of Maris III at forty-odd thousand miles. The hull-temperature indicator was up some fifty-six degrees. The internal-gravity field came on, faintly, and then built up to normal. But the screens would not light. They were permanently dead. Calhoun raged for seconds. Then he got hold of himself.

"Chee-chee-chee!" chattered Murgatroyd desperately. *"Chee-chee!"*

"Shut up!" growled Calhoun. "Some bright lad aground thought up a new way to commit murder. Damned near got away with it, too! He figured he'd shake us to death like a dog does a rat, only he was using a landing-grid field to do it with! Right now, I hope I fried him!"

But it was not likely. Such quantities of power as are used to handle twenty-thousand-ton space liners are not controlled direct, but by relays. The power Calhoun had flung into the grid field should have blown out the grid's transformers with a spectacular display of fireworks, but it was hardly probable it had gotten back to the individual at the controls.

"But I suspect," observed Calhoun vengefully, "that he'll consider this business an unfavorable occurrence! Somebody'll twist his tail, too, either for trying what he did or for not getting away with it! Only, as a matter of pure precaution—"

His expression changed suddenly. He'd been trying not to think of the consequences of having no sight of the cosmos outside the ship. Now he remembered the electron telescope. It had not been in circuit, so it could not have been burned out like his vision screens. He switched it on. A star field appeared over his head.

"Chee-chee!" cried Murgatroyd hysterically.

Calhoun glanced at him. The jerking of the ship had shifted the

instruments in the rack to which Murgatroyd clung. Clipped into place though they were, they'd caught Murgatroyd's tail and pinched it tightly.

"You'll have to wait," snapped Calhoun. "Right now I've got to make us look like a successful accident. Otherwise whoever tried to spread us all over the cabin walls will try something else!"

The Med Ship flung through space in whatever direction and at whatever velocity it had possessed when the grid field blew. Calhoun shifted the electron-telescope field and simultaneously threw on the emergency-rocket controls. There was a growling of the pencil-thin, high-velocity blasts. There was a surging of the ship.

"No straight-line stuff," Calhoun reminded himself.

He swung the ship into a dizzy spiral, as if innumerable things had been torn or battered loose in the ship and its rockets had come on of themselves. Painstakingly, he jettisoned in one explosive burst all the stored waste of his journey which could not be disposed of while in overdrive. To any space-scanning instrument on the ground, it would look like something detonating violently inside the ship.

"Now—"

The planet Maris III swung across the electron telescope's field. It looked hideously near—but that was the telescope's magnification. Yet Calhoun sweated. He looked at the nearest-object dial for reassurance. The planet was nearer by a thousand miles.

"Hah!" said Calhoun.

He changed the ship's spiral course. He changed it again. He abruptly reversed the direction of its turn. Adequate training in space-combat might have helped plot an evasion-course, but it might have been recognizable. Nobody could anticipate his maneuvers now, though. He adjusted the telescope next time the planet swept across its field, and flipped on the photo-recorder. Then he pulled out of the spiral, whirled the ship until the city was covered by the telescope, and ran the recorder as long as he dared keep a straight course. Then he swooped toward the planet in a crazy, twisting fall with erratic intermissions, and made a final lunatic dash almost parallel to the planet's surface.

At five hundred miles, he unshielded the ports which of necessity had to be kept covered in clear space. There was a sky which was vividly bright with stars. There was a vast blackness off to starboard which was the night side of the planet.

He went down. At four hundred miles the outside pressure indicator wavered away from its pin. He used it like a pitot-tube recording, doing sums in his head to figure the static pressure that should exist at this height, to compare with the dynamic pressure produced by his velocity through the near hard vacuum. The pressure should have been substan-

tially zero. He swung the ship end-for-end and killed velocity to bring the pressure-indication down. The ship descended. Two hundred miles. He saw the thin bright line of sunshine at the limb of the planet. Down to one hundred. He cut the rockets and let the ship fall silently, swinging it nose up.

At ten miles he listened for man-made radiation. There was nothing in the electromagnetic spectrum but the crackling of static in an electric storm which might be a thousand miles away. At five miles height the nearest-object indicator, near the bottom of its scale, wavered in a fashion to prove that he was still moving laterally across mountainous country. He swung the ship and killed that velocity, too.

At two miles he used the rockets for decelleration. The pencil-thin flame reached down for an incredible distance. By naked-eye observation out a port he tilted the fiercely-roaring, swiftly-falling ship until hillsides and forests underneath him ceased to move. By that time he was very low indeed.

He reached ground on a mountainside which was lighted by the blue-white flame of the rocket-blast. He chose an area in which the tree tops were almost flat, indicating something like a plateau underneath. Murgatroyd was practically frantic by this time because of his capture and the pinching of his tail, but Calhoun could not spare time to release him. He let the ship down gently, gently, trying to descend in an asbolutely vertical line.

If he didn't do it perfectly, he came very close. The ship settled into what was practically a burned-away tunnel among monstrous trees. The high-velocity slender flame did not splash when it reached ground. It penetrated. It burned a hole for itself through humus and clay and bedrock. When the ship touched and settled, there was boiling molten stone some sixty feet underground, but there was a small scratching sound as it came to rest. A flame-amputated tree-limb rubbed tentatively against the hull.

Calhoun turned off the rockets. The ship swayed slightly and there were crunching noises. Then it was still on its landing fins.

"Now," said Calhoun, "I can take care of you, Murgatroyd."

He flicked on the switches of the exterior microphones—much more sensitive than human ears. The radiation-detectors were still in action. They reported only the cracklings of the distant storm.

But the microphones brought in the moaning of wind over nearby mountaintops, and the almost deafening susurrus of rustling leaves. Underneath these noises there was a bedlam of other natural sounds. There were chirpings and hootings and squeaks, and the gruntings made by native animal life. These sounds had a singularly peaceful quality. When Calhoun toned them down to be no more than background-noises, they suggested the sort of concert of

night-creatures which to men has always seemed an indication of purest tranquility.

Presently Calhoun looked at the pictures the photorecorder had taken while the telescope's field swept over the city. It was the colony-city reported to have been begun two years before, to receive colonists from Dettra Two. It was the city of the landing grid which had tried to destroy the Med Ship as a dog kills a rat—by shaking it to fragments, some fifty thousand miles in space. It was the city which had made Calhoun land with his vision-plates blinded, that had made him pretend his ship was internally a wreck: which had drained his power-reserves of some hundreds of millions of kilowatt hours of energy. It was the city which had made his return to Med Headquarters impossible.

He inspected the telescopic pictures. They were very clear. They showed the city with astonishing detail. There was a lacy pattern of highways, with their medallions of multiple-dwelling units. There were the lavish park areas between the buildings of this planetary capital. There was the landing grid itself—a half-mile-high structure of steel girders, a full mile in diameter.

But there were no vehicles on the highways. There were no specks on the crossing bridges to indicate people on foot. There were no copters on the building roofs, nor were there objects in mid-air to tell of air traffic.

The city was either deserted or it had never been occupied. But it was absolutely intact. The structures were perfect. There was no indication of past panic or disaster, and even the highways had not been overgrown by vegetation. But it was empty—or else it was dead.

But somebody in it had tried very ferociously and with singular effectiveness to try to destroy the Med Ship.

Because it was a Med Ship.

Calhoun raised his eyebrows and looked at Murgatroyd.

"Why is all this?" he asked. "Have you any ideas?"

"Chee!" shrilled Murgatroyd.

II

"The purpose of a contemplated human action is always the attainment of a desired subjective experience. But a subjective experience is desired both in terms of intensity, and in terms of duration. For an individual the temptingness of different degrees of intensity-of-experience is readily computed. However, the temptingness of different durations is equally necessary for the computation of the probability of a given individual performing a given action. This modification of desirability by expectable duration depends on the individual's time-sense: its acuity and its accuracy. Measurements of time-sense—"

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Two days later Calhoun found a cultivated field and a dead man, but before that he found only bewilderment. Before leaving the Med Ship, he very carefully monitored all over again the entire radiation spectrum for man-made signals. There were no communications in the air of Maris III—which on the face of it was proof that the planet was uninhabited. But the ship's external microphones picked up a rocket roar in mid-morning of the day after Calhoun's landing. By the time the sound reached the ground, of course, the rocket itself was far below the horizon; but Calhoun saw the faint white trail of its passage against the blue of the sky. The fact that he saw it, in daytime, was proof that it was within the atmosphere. Which, in turn, said that the rocket was taking photographs from high altitude for signs of the crater the Med Ship should have made in an uncontrolled landing.

The fact of search proved that the planet was inhabited, and the silence of the radio spectrum said that it wasn't. The absence of traffic in the city said that it was dead or empty, but there were people there because they'd answered Calhoun's hail, and tried to kill him when he identified himself. But nobody would want to destroy a Med Ship except to prevent a health inspection, and nobody would want to prevent an inspection unless there was a situation aground that the Med Service ought to know about. But there should not possibly be such a situation.

There was no logical explanation for such a series of contradictions. Civilized men acted this way or that. There could only be civilized men here. They acted neither this way

nor that. Therefore—the confusion began all over again.

Calhoun dictated an account of events to date into the emergency responder in the ship. If a search-call came from space, the responder would broadcast this data and Calhoun's intended action. He carefully shut off all other operating circuits so the ship couldn't be found by their radiation. He equipped himself for travel, and he and Murgatroyd left the ship. Obviously, he headed toward the city where whatever was wrong was centered.

Travel on foot was unaccustomed, but not difficult. The vegetation was semi-familiar. Maris III was an Earth-type planet and circled a Sol-type sun, and given similar conditions of gravity, air, sunlight, and temperature-range, similar organisms should develop. There would be room, for example, for low-growing ground-cover plants and there would also be advantages to height. There would be some equivalent of grasses, and there would be the equivalent of trees, with intermediate forms having in-between habits of growth. Similar reasoning would apply to animal life. There would be parallel ecological niches for animals to fill, and animals would adapt to fill them.

Maris III was not, then, an "unearthly" environment. It was much more like an unfamiliar part of a known planet than a new world altogether. But there were some oddities. An herbivorous creature without legs which squirmed like a snake. It lived in holes. A pigeon-sized creature whose wings were modified, gossamer-thin scales with irridescent colorings. There were creatures which seemed to live in lunatic association, and Calhoun was irritably curious to know if they were really symbiotes or only unrecognizable forms of the same organism, like the terrestrial male and female firefly-glowworm.

But he was heading for the city. He couldn't spare time to biologize. On his first day's journey he looked for food to save the rations he carried. Murgatroyd was handy, here. The little *tormal* had his place in human society. He was friendly, and he was passionately imitative of human beings, and he had a definite psychology of his own. But he was useful, too. When Calhoun strode through the forests which had such curiously un-leaflike foliage, Murgatroyd strode grandly with him, imitating his walk. From time to time he dropped to all four paws to investigate something. He invariably caught up with Calhoun within seconds.

Once Calhoun saw him interestedly bite a tiny bit out of a most unpromising looking shrub-stalk. He savored its flavor, and then swallowed it. Calhoun took note of the plant and cut off a section. He bound it to the skin of his arm up near the elbow. Hours later there was no allergic reaction, so he tasted it. It was almost familiar. It had the flavor of a bracken-shoot, mingled with a fruity taste. It

would be a green bulk-food like spinach or asparagus, filling but without much substance.

Later, Murgatroyd carefully examined a luscious-seeming fruit which grew low enough for him to pluck. He sniffed it closely and drew back. Calhoun noted that plant, too. Murgatroyd's tribe was bred at Headquarters for some highly valuable qualities. One was a very sensitive stomach—but it was only one. Murgatroyd's metabolism was very close to man's. If he ate something and it didn't disagree with him, it was very likely safe for a man to eat it, too. If he rejected something, it probably wasn't. But his real value was much more important than the tasting of questionable foods.

When Calhoun camped the first night, he made a fire of a plant shaped like a cactus-barrel and permeated with oil. By heaping dirt around it, he confined its burning to a round space very much like the direct-heat element of an electronic stove. It was an odd illustration of the fact that human progress does not involve anything really new in kind, but only increased convenience and availability of highly primitive comforts. By the light of that circular bonfire, Calhoun actually read a little. But the light was inadequate. Presently he yawned. One did not get very far in the Med Service without knowing probability in human conduct. It enabled one to check on the accuracy of statements made, whether by patients or officials, to a Med Ship man. Today, though, he'd traveled a long way on foot. He glanced at Murgatroyd, who was gravely pretending to read from a singularly straight-edged leaf.

"Murgatroyd," said Calhoun, "it is likely that you will interpret any strange sound as a possible undesirable subjective experience. Which is to say, as dangerous. So if you hear anything sizable coming close during the night, I hope you'll squeal. Thank you."

Murgatroyd said *"Chee,"* and Calhoun rolled over and went to sleep.

It was mid-morning of the next day when he came upon a cultivated field. It had been cleared and planted, of course, in preparation for the colonists who'd been expected to occupy the city. Familiar Earth-plants grew in it, ten feet high and more. And Calhoun examined it carefully, in the hope of finding how long since it had received attention. In his examination, he found the dead man.

As a corpse, the man was brand-new, and Calhoun very carefully put himself into a strictly medical frame of mind before he bent over for a technical estimate of what had happened, and when. The dead man seemed to have died of hunger. He was terribly emaciated, and he didn't belong in a cultivated field far from the city. By his garments he was a city-dweller and a prosperous one. He wore the jewels which nowadays indicated a man's profes-

sion and status in it much more than the value of his possessions. There was money in his pockets, and writing materials, a wallet with pictures and identification, and the normal oddments a man would carry. He'd been a civil servant. And he shouldn't have died of starvation.

He especially shouldn't have gone hungry here! The sweet-maize plants were tall and green. Their ears were ripe. He hadn't gone hungry! There were the inedible remains of at least two dozen sweet-maize ears. They had been eaten some time—some days—ago, and one had been left unfinished. If the dead man had eaten them but was unable to digest them, his belly should have been swollen with undigested food. It wasn't. He'd eaten and digested and still had died, at least largely of inanition.

Calhoun scowled.

"How about this corn, Murgatroyd?" he demanded.

He reached up and broke off a half-yard-long ear. He stripped away the protecting, stringy leaves. The soft grains underneath looked appetizing. They smelled like good fresh food. Calhoun offered the ear to Murgatroyd.

The little *tormal* took it in his paws and on the instant was eating it with gusto.

"If you keep it down, he didn't die of eating it," said Calhoun, frowning, "and if he ate it—which he did—he didn't die of starvation. Which he did."

He waited. Murgatroyd consumed every grain upon the oversized cob. His furry belly distended a little. Calhoun offered him a second ear. He set to work on that, too, with self-evident enjoyment.

"In all history," said Calhoun, "nobody's ever been able to poison one of you *tormals* because your digestive system has a qualitative-analysis unit in it that yells bloody murder if anything's likely to disagree with you. As a probability of *tormal* reaction, you'd have been nauseated before now if that stuff wasn't good to eat."

But Murgatroyd ate until he was distinctly pot-bellied. He left a few grains on the second ear with obvious regret. He put it down carefully on the ground. He shifted his left-hand whiskers with his paw and elaborately licked them clean. He did the same to the whiskers on the right-hand side of his mouth. He said comfortably:

"Chee!"

"Then that's that," Calhoun told him. "This man didn't die of starvation. I'm getting queasy!"

He had his lab kit in his shoulder pack, of course. It was an absurdly small outfit, with almost microscopic instruments. But in Med Ship field work the techniques of microanalysis were standard. Distastefully, Calhoun took the tiny tissue-sample from which he could gather necessary information. Standing, he ran through the analytic process that seemed called for. When he finished, he buried the dead man as well as he could and started off in the di-

rection of the city again. He scowled as he walked.

He journeyed for nearly half an hour before he spoke. Murgatroyd accompanied him on all fours, now, because of his heavy meal. After a mile and a half, Calhoun stopped and said grimly:

"Let's check you over, Murgatroyd."

He verified the *tormal's* pulse and respiration and temperature. He put a tiny breath-sample through the part of the lab-kit which read off a basic metabolism rate. The small animal was quite accustomed to the process. He submitted blandly. The result of the checkover was that Murgatroyd the *tormal* was perfectly normal.

"But," said Calhoun angrily, "that man died of starvation! There was practically no fat in that tissue-sample at all! He arrived where we found him while he was strong enough to eat, and he stayed where there was good food, and he ate it, and he digested it, and he died of starvation! Why?"

Murgatroyd wriggled unhappily, because Calhoun's tone was accusing. He said, *"Chee!"* in a subdued tone of voice. He looked pleadingly up at Calhoun.

"I'm not angry with you," Calhoun told him, "but dammit—"

He packed the lab-kit back into his pack, which contained food for the two of them for about a week.

"Come along!" he said bitterly. He started off. Ten minutes later he stopped. "What I said was impossible. But it happened, so it mustn't have been what I said. I must have stated it wrongly. He could eat, because he did. He did eat, because of the cobs left. He did digest it. So why did he die of starvation? Did he stop eating?"

"Chee!" said Murgatroyd, with conviction.

Calhoun grunted and marched on once more. The man had not died of a disease—not directly. The tissue analysis gave a picture of death which denied that it came of any organ ceasing to function. Was it the failure of the organism—the man—to take the action required for living? Had he stopped eating?

Calhoun's mind skirted the notion warily. It was not plausible. The man had been able to feed himself and had done so. Anything which came upon him and made him unable to feed himself—

"He was a city man," growled Calhoun. "And this is a long way from the city. What was he doing away out here, anyhow?"

He hesitated and tramped on again. A city man found starved in a remote place might have become lost, somehow. But if this man was lost, he was assuredly not without food.

"If there was a ground-car," Calhoun considered, "it wouldn't mean anything. If he dared go back to the city he might have used it, but he wouldn't have been where I found him if he hadn't wanted or needed to leave the city. Hm-m-m— He

walked out into the middle of the field. He was hungry—why didn't he have food?—and he ate. He stayed there for days, judging by the amount of food he ate *and* digested. Why did he do that? Then he stopped eating and died. Again why?"

He crossed over the top of a rounded hillock some three miles from the shallow grave he'd made. He began to accept the idea that the dead man had stopped eating, for some reason, as the only possible explanation. But that didn't make it plausible. He saw another ridge of higher hills ahead.

In another hour he came to the crest of that farther range. It was the worn-down remnant of a very ancient mountain-range, now eroded to a mere fifteen hundred or two thousand feet. He stopped at the very top. Here was a time and place to look and take note of what he saw. The ground stretched away in gently rolling fashion for very many miles, and there was the blue blink of sea at the horizon. A little to the left he saw shining white. He grunted.

That was the city of Maris III, which had been built to receive colonists from Dettra and relieve the population-pressure there. It had been planned as the nucleus of a splendid, spacious, civilized world-nation to be added to the number of human-occupied worlds. From its beginning it should hold a population in the hundreds of thousands. It was surrounded by cultivated fields, and the air above it should be a-shimmer with flying things belonging to its inhabitants.

Calhoun stared at it through his binoculars. They could not make an image, even so near, to compare to that the electron telescope had made from space, but he could see much. The city was perfect. It was intact. It was new. But there was no sign of occupancy anywhere in it. It did not look dead, so much as frozen. There were no fliers above it. There was no motion on the highways. He saw one straight road which ran directly away along his line of sight. Had there been vehicles on it, he would have seen at least shifting patches of color as clots of traffic moved together. There were none.

He pressed his lips together. He began to inspect the nearer terrain. He saw foreshortened areas where square miles of ground had been cleared and planted to Earth vegetation. The ground would have been bulldozed clean, and then great sterilizers would have lumbered back and forth, killing every native seed and root and even the native soil-bacteria. Then there would have been spraying with cultures of the nitrogen-fixing and phosphorous-releasing microscopic organisms which normally lived in symbiosis with Earth plants. They would have been tested beforehand for their ability to compete with indigenous bacterial life. And then Earth-plants would have been seeded.

They had been. Calhoun saw that inimitable green which a man some-

how always recognizes. It is the green of plants whose ancestors throve on Earth and have followed that old planet's children halfway across the galaxy.

"The population must be practically nothing," growled Calhoun, "because it doesn't show. But the part of it in the city wants to keep whatever's happened from the Med Service. Hm-m-m. They're not dying, or they'd want help. But at least one dead man wasn't in the city where he belonged, and he could have used some help! Maybe there are more like him."

Murgatroyd said,

"Chee!"

"If there are two kinds of people here," added Calhoun darkly, "they might be—antagonistic to each other."

He stared with knitted brows over the vast expanse toward the horizon. Murgatroyd had halted a little behind him. He stood up on his hind legs and stared intently off to one side. He shaded his eyes with a forepaw in a singularly humanlike fashion and looked inquisitively at something he saw. But Calhoun did not notice.

"Make a guess, Murgatroyd," said Calhoun. "There are at least a few people in the city who don't want something known to the Med Service. So whatever's the matter, it's not fatal to them. There may be people wandering about like that poor devil we found. Something was fatal to him! Where'd we find more of his type? Since they haven't tried to kill me, we might make friends."

Murgatroyd did not answer. He stared absorbedly at a patch of underbrush some fifty yards to the left.

Calhoun shrugged and started down the hillside. Murgatroyd remained fixed in a pose of intensely curious attention to the patch of brush. Calhoun went on down the farther hillside. His back was toward the brush-thicket.

There was a deep-toned, musical twanging sound from the thicket. Calhoun's body jerked violently as an impact sounded. He stumbled and went down, with the shaft of a wooden projectile sticking out of his pack. He lay still.

Murgatroyd whimpered. He rushed to where Calhoun lay upon the ground. He danced in agitation, chattering shrilly. He wrung his paws in humanlike distress. He whimpered and chattered together. He tugged at Calhoun. Calhoun made no response.

A figure came out of the thicket. It was gaunt and thin, yet its garments had once been of admirable quality. It carried a strange and utterly primitive weapon. It moved toward Calhoun without lightness, but with a dreary resolution.

It bent over him and laid a hand to the wooden projectile it had fired into his back.

Calhoun moved suddenly. He grappled. The gaunt figure toppled, and he swarmed upon it savagely as it struggled. But it was taken by surprise. Pantings sounded, and

Murgatroyd danced in a fever of anxiety.

Then Calhoun stood up quickly. He stared down at the emaciated figure which had tried to murder him from ambush. That figure panted horribly, now.

"Really," said Calhoun in a professional tone, "as a doctor I'd say that you should be in bed instead of wandering around trying to murder total strangers. When did this trouble begin? I'm going to take your temperature and your pulse. Murgatroyd and I have been hoping to find someone like you. The only other human being I've seen on this planet wasn't able to talk."

He swung his shoulder-pack around and impatiently jerked a sharp-pointed stick out of it. It was the missile, which had been stopped by the pack. He brought out his lab kit. With absolute absorption in the task, he prepared to make a swift check of his would-be murderer's state of health.

It was not good. There was already marked emaciation. The desperately panting young woman's eyes were deep-sunk: hollow. She gasped and gasped. Still gasping, she lapsed into unconsciousness.

"Here," said Calhoun curtly, "you enter the picture, Murgatroyd! This is the sort of thing you're designed to handle!"

He set to work briskly. But presently he said over his shoulder:

"Besides a delicate digestion and a hair-trigger antibody system, Murgatroyd, you ought to have the instincts of a watchdog. I don't like coming that close to being speared by my patients. See if there's anybody else around, won't you?"

"Chee!" said Murgatroyd shrilly. But he didn't understand. He watched as Calhoun deftly drew a small sample of blood from the unconscious young woman and painstakingly put half the tiny quantity into an almost microscopic ampule in the lab kit. Then he moved toward Murgatroyd.

The *tormal* wriggled as Calhoun made the injection. But it did not hurt. There was an insensitive spot on his flank where the pain-nerves had been blocked off before he was a week old.

"As one medical man to another," said Calhoun, "what's a good treatment for anoxia when you haven't got any oxygen? You don't know? Neither do I. But we've found out why those chaps in the city tried to shake us to bits, out in space."

He swore in a sudden, bitter anger. Then he looked quickly at the girl, concerned lest she'd heard.

She hadn't. She was still unconscious.

III

"That pattern of human conduct which is loosely called "self-respecting" has the curious property of restricting to the individual—through his withdrawal of acts to communicate misfortune—the unfavorable chance occurrences which probability insists must take place. On the other hand, the same pattern of human conduct tends to disseminate and to share chance favorable occurrences among

the group. The members of a group of persons practicing "self-respect," then, increase the mathematical probability of good fortune to all their number. This explains the instability of cultures in which principles leading to this type of behavior become obsolete. A decadent society brings bad luck upon itself by the operation of the laws of probability . . ."

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She came very slowly back to consciousness. It was almost as if she waked from utterly exhausted sleep. When she first opened her eyes, they wandered vaguely until they fell upon Calhoun. Then a bitter and contemptuous hatred filled them. Her hand fumbled weakly to the knife at her waist. It was not a good weapon. It had been table-cutlery and the handle was much too slender to permit a grip by which somebody could be killed. Calhoun bent over and took the knife away from her. It had been ground unskillfully to a point.

"In my capacity as your doctor," he told her, "I must forbid you to stab me. It wouldn't be good for you." Then he said, "Look! My name's Calhoun. I came from Sector Med Headquarters to make a planetary health inspection, and some lads in the city apparently didn't want a Med Ship aground. So they tried to kill me by buttering me all over the walls of my ship, with the landing-grid field. I made what was practically a crash landing, and now I need to know what's up."

The burning hatred remained in her eyes, but there was a trace of doubt.

"Here," said Calhoun, "is my identification."

He showed her the highly official documents which gave him vast authority—where a planetary government was willing to concede it.

"Of course," he added, "papers can be stolen. But I have a witness that I'm what and who I say I am. You've heard of *tormals*? Murgatroyd will vouch for me."

He called his small and furry companion. Murgatroyd advanced and politely offered a small, prehensile paw. He said *"Chee"* in his shrill voice, and then solemnly took hold of the girl's wrist in imitation of Calhoun's previous action of feeling her pulse.

Calhoun watched. The girl stared at Murgatroyd. But all the galaxy had heard of *tormals*. They'd been found on a planet in the Deneb region, and they were engaging pets and displayed an extraordinary immunity to the diseases men were apt to scatter in their interstellar journeyings. A forgotten Med Service researcher made an investigation on the ability of *tormals* to live in contact with men. He came up with a discovery which made them very much too valuable to have their lives wasted in mere sociability. There were still not enough of Murgatroyd's kind to meet the need that men had of them, and laymen had to forego their distinctly charming society. So Murgatroyd was an identification.

The girl said faintly:

"If you'd only come earlier. . . . But it's too late now! I . . . thought you came from the city."

"I was headed there," said Calhoun.

"They'll kill you—"

"Yes," agreed Calhoun, "they probably will. But right now you're ill and I'm Med Service. I suspect there's been an epidemic of some disease here, and that for some reason the people in the city don't want the Med Service to know about it. You seem to have . . . whatever it is. Also you had a very curious weapon to shoot me with."

The girl said drearily:

"One of our group had made a hobby of such things. Ancient weapons. He had bows and arrows and —what I shot you with was a crossbow. It doesn't need power. Not even chemical explosives. So, when we ran away from the city, he ventured back in and armed us as well as he could."

Calhoun nodded. A little irrelevant talk is always useful at the beginning of a patient-interview. But what she said was not irrelevant. A group of people had fled the city. They'd needed arms, and one of their number had "ventured" back into the city for them. He'd known where to find only reconstructions of ancient lethal devices—a hobby collection. It sounded like people of the civil-service type. Of course there were no longer social classes separated by income. Not on most worlds, anyhow. But there were social groupings based on similar

tastes, which had led to similar occupations and went on to natural congeniality. Calhoun placed her, now. He remembered a long-outmoded term, "upper middle class" which no longer meant anything in economics but did in medicine.

"I'd like a case-history," he said conversationally. "Name?"

"Helen Jons," she said wearily.

He held the mike of his pocket recorder to pick up her answers. Occupation, statistician. She'd been a member of the office force which was needed during the building of the city. When the construction work was finished, most of the workmen returned to the mother-world Dettra, but the office staff stayed on to organize things when colonists should arrive.

The plague appeared among the last shipload of workmen waiting to be returned to the mother world. There were about a thousand persons in the city altogether. The disease produced, at first, no obvious physical symptoms, but those afflicted with it tended to be listless and lackadaisical and without energy. The first-noticed symptom was a cessation of gripes and quarrelings among the workmen. Shortness of breath appeared two days later. It was progressive. Deaths began in two weeks. Men sank into unconsciousness and died. By the time the transport-ship arrived from Dettra with colonists to be landed . . . it was to take back the workmen . . . the physicians on the planet were grim. They described the situation by space phone. The transport returned to Dettra without removing the workmen or landing the colonists. The people left in the city on Maris III were self-quarantined, but they expected help.

It was two months before another ship arrived. By then fewer than two hundred of the original thousand remained. More than half those survivors were already listless and short-breathed. A good ten per cent were in the beginning of that marked lethargy which deepened into coma and ended fatally. A desperate, gaunt, plague-stricken few still manned the landing grid.

The ship came down. Men disembarked. There was no crowd to greet them. The survivors still in the city had scattered themselves widely, hoping to escape the contagion by isolating themselves in new and uncontaminated dwelling-units. But there was no lack of communication facilities. Nearly all the survivors watched on vision screens in contact with the landing grid.

The newcomers did not look like doctors, nor act like them. Visiphone contact with the landing grid was immediately broken. It could not be restored. So the isolated groups spoke agitatedly to each other by other visiphone contacts, exchanging messages of desperate hope. Then, new-landed men appeared at an apartment whose occupant was in the act of such a conversation with a group in a distant building. He left the visiphone on as he went to

admit and greet the men he hoped were researchers, at least, come to find the cause of the plague and end it.

The viewer at the other visiphone plate gazed eagerly into his friend's apartment. He saw a group of the newcomers admitted. He saw them deliberately murder his friend and the survivors of his family.

Plague-stricken or merely terrified people—in pairs or trios widely separated through the city—communicated in swift desperation. It was possible that there had been a mistake—a blunder; an unauthorized crime had been committed. But it was not a mistake. Unthinkable as such an idea was, there developed evidence that the plague on Maris III was to be ended as if it were an epizootic among animals. Those who had it and those who had been exposed to it were to be killed to prevent its spread among the newcomers.

A conviction of such horror could not be accepted without absolute proof. But when night fell, the public power-supply of the city was cut off—communications ended. The singular sunset hush of Maris III left utter stillness everywhere—and there were screams which echoed among the city's innumerable empty-eyed, unoccupied buildings.

The scant remainder of the plague-survivors fled in the night. They fled singly, carrying the plague with them. Some carried members of their families already stricken. Some helped already-doomed wives or friends or husbands to the open country. Flight would not save their lives. It would only prevent their murder. But somehow that seemed a thing to be attempted.

"This," said Calhoun, "is not a history of your own case. When did you develop the disease . . . whatever it may be?"

"Don't you know what it is?" asked Helen hopelessly.

"Not yet," admitted Calhoun. "I've very little information. I'm trying to get more now."

What other information he had he'd gathered from a newly dead man in a field some miles away. He did not mention that at this moment.

The girl went on, exhaustedly. The first symptom was listlessness, of which the victim was unconscious. One could pull out of it with an effort, but one wasn't aware that anything was wrong. The listlessness progressed. One could realize it only by recognizing the more urgent, more violent effort needed to pay attention, and the discovery of weakness when one tried to act. One did not feel discomfort—not even hunger or thirst. One had to summon increasing resolution even to become aware of the need to do anything at all.

The symptoms were singularly like those of a man too long at too high an altitude without oxygen. They were even more like those of a man in a non-pressurized flier whose oxygen supply has been cut

off. But such a man would pass out without realizing that he was slipping into unconsciousness. On Maris III the process was infinitely gradual. It was a matter of two weeks or more.

"I'd been infected before we ran away," she said drearily. "I didn't know it then. Now I know I've a few more days of being able to think and act . . . if I try hard enough. But it'll be less and less each day. Then I'll stop being able to try."

Calhoun watched the tiny recorder roll its multiple-channel tape from one spool to the other as she talked.

"You had energy enough to try to kill me," he observed.

He looked at the weapon. There was an arched steel spring placed crosswise at the end of a barrel like a sporting blast-rifle. Now he saw a handle and a ratchet by which the spring was brought tc tension, storing up power to throw the missile. He asked:

"Who wound up this crossbow?"

Helen hesitated.

"Kim . . . Kim Walpole."

"You're not a solitary refugee now? There are others of your group still alive?"

She hesitated again, and then said:

"Some of us came to realize that staying apart didn't matter. We . . . couldn't hope to live, anyhow. We . . . already had the plague. Kim is . . . one of us. He's the strongest. He . . . wound up the crossbow for me. He . . . had the weapons to begin with."

Calhoun asked seemingly casual questions. She told him of a group of fugitives remaining together because all were already doomed. There had been eleven of them. Two were dead, now. Three others were in the last lethargy. It was impossible to feed them. They were dying. The strongest was Kim Walpole, who'd ventured back into the city to bring out weapons for the rest. He'd led them, and now was still the strongest and—so the girl considered—the wisest of them all.

They were waiting to die. But the newcomers to the planet—the invaders, they believed—were not content to let them wait. Groups and single hunters came out of the city and searched for them.

"Probably," said the girl dispassionately, "to burn our bodies against contagion. They . . . kill us so they won't have to wait. And it's just . . . seemed so horrible that we . . . felt we ought to defend our right to die naturally by . . . dying fighting. That's why I . . . shot at you. I shouldn't have, but—"

She stopped, helplessly. Calhoun nodded.

The fugitives now aided each other simply to avoid murder. They gathered together exhaustedly at nightfall, and those who were strongest did what they could for the others. By day, those who could walk scattered to separate hiding places, so that if one were discovered, the others might still escape the indignity of being butchered. They had no stronger motive than

that. They were merely trying to die with dignity, instead of being killed as sick beasts. Which bespoke a tradition and an attitude which Calhoun approved. People like these would know something of the science of probability in human conduct. Only they would call it ethics. But the strangers—the invaders—the occupiers of the city were of another type. They probably came from another world.

"I don't like this," said Calhoun coldly. "Just a moment."

He went over to Murgatroyd. Murgatroyd seemed to droop a little. Calhoun checked his breathing and listened to his heart. Murgatroyd submitted, saying only *"Chee"* when Calhoun put him down.

"I'm going to help you to your rendezvous," said Calhoun abruptly. "Murgatroyd's got the plague now. I . . . exposed him to it, and he's reacting fast. And I want to see the others of your group before nightfall."

The girl just managed to get to her feet. Even speaking had tired her, but she gamely though wearily moved off at a slant to the hillside's slope. Calhoun picked up the odd weapon and examined it thoughtfully. He wound it up as it was obviously meant to be. He picked up the missile it had fired, and put it in place. He went after the girl, carrying it. Murgatroyd brought up the rear.

Within a quarter of a mile the girl stopped and clung swaying to the trunk of a slender tree. It was plain that she had to rest, and dreaded getting off her feet because of the desperate effort needed to arise.

"I'm going to carry you," said Calhoun firmly. "You tell me the way."

He picked her up bodily and marched on. She was light. She was not a large girl, but she should have weighed more. Calhoun still carried the quaint ancient-type weapon without difficulty.

Murgatroyd followed as Calhoun went up a small inclination on the greater hillside and down a very narrow ravine. Through brushwood he pushed until he came to a small open space where shelters had been made for a dozen or so human beings. They were utterly primitive —merely roofs of leafy branches over frameworks of sticks. But of course they were not intended for permanent use. They were meant only to protect plague-stricken folk while they waited to die.

But there was disaster here. Calhoun saw it before the girl could. There were beds of leaves underneath the shelters. There were three bodies lying upon them. They would be those refugees in the terminal coma which—since the girl had described it—accounted for the dead man Calhoun had found, dead of starvation with food-plants all around him. But now Calhoun saw something more. He swung the girl swiftly in his arms so that she would not see. He put her gently down and said:

"Stay still. Don't move. Don't turn."

He went to make sure. A moment later he raged. Because it was Calhoun's profession to combat death and illness in all its forms. He took his profession seriously. And there are defeats, of course, which a medical man has to accept, though unwillingly. But nobody in the profession, and least of all a Med Ship man, could fail to be roused to fury by the sight of people who should have been his patients, lying utterly still with their throats cut.

He covered them with branches. He went back to Helen.

"This place has been found by somebody from the city," he told her harshly. "The men in coma have been murdered. I advise you not to look. At a guess, whoever did it is now trying to track down the rest of you."

He went grimly to the small open glade, searching the ground for footprints. There was ground-cover at most places, but at the edge of the clearing he found one set of heavy footprints going away. He put his own foot beside a print and rested his weight on it. His foot made a lesser depression. The other print had been made by a man weighing more than Calhoun. Therefore it was not one of the party of plague-victims.

He found another set of such footprints, entering the glade from another spot.

"One man only," he said icily. "He won't think he has to be on guard, because a city's administrative personnel—such as were left behind for the plague to hit—doesn't usually have weapons among their possessions. And he's confident that all of you are weak enough not to be dangerous to him."

Helen did not turn pale. She was pale before. She stared numbly at Calhoun. He looked grimly at the sky.

"It'll be sunset within the hour," he said savagely. "If it's the intention of the newcomers . . . the invaders to burn the bodies of all plague victims, he'll come back here to dispose of these three. He didn't do it before lest the smoke warn the rest of you. But he knows the shelters held more than three people. He'll be back!"

Murgatroyd said *"Chee!"* in a bewildered fashion. He was on all fours, and he regarded his paws as if they did not belong to him. He panted.

Calhoun checked him over. Respiration away up. Heart-action like that of the girl Helen. His temperature was not up, but down. Calhoun said remorsefully:

"You and I, Murgatroyd, have a bad time of it in our profession. But mine is the worse. You don't have to play dirty tricks on me, and I've had to, on you!"

Murgatroyd said *"Chee!"* and whimpered. Calhoun laid him gently on a bed of leaves which was not occupied by a murdered man.

"Lie still!" he commanded. "Exercise is bad for you!"

He walked away. Murgatroyd whined faintly, but lay still as if exhausted.

"I'm going to move you," Calhoun told the girl, "so you won't be sighted if that man from the city comes back. And I've got to keep out of sight for a while or your friends will mistake me for him. I count on you to vouch for me later. Basically, I'm making an ambush." Then he explained irritably, "I daren't try to trail him because he might not backtrack to return here!"

He lifted the girl and placed her where she could see the glade in its entirety, but would not be visible. He settled down himself a little distance away. He was acutely dissatisfied with the measures he was forced to take. He could not follow the murderer and leave Helen and Murgatroyd unprotected, even though the murderer might find another victim because he was not trailed. In any case Murgatroyd's life, just now, was more important than the life of any human being on Maris III. On him depended everything.

But Calhoun was not pleased with himself.

There was silence except for the normal noises of living wild things. There were fluting sounds, which later Calhoun would be told, from crawling creatures not too much unlike the land-turtles of Earth. There were deep-bass hummings, which came from the throats of miniature creatures which might roughly be described as birds. There were chirpings which were the cries of what might be approximately described as wild pigs—except that they weren't. But the sun Maris sank low toward the nearer hill-crests, and behind them, and there came a strange, expectant hush over all the landscape. At sundown on Maris III there is a singular period when the creatures of the day are silent and those of the night are not yet active. Nothing moved. Nothing stirred. Even the improbable foliage was still.

It was into this stillness and this half-light that small and intermittent rustling sounds entered. Presently there was a faint murmur of speech. A tall, gaunt young man came out of the brushwood, supporting a pathetically feeble old man, barely able to walk. Calhoun made a gesture of warning as the girl Helen opened her lips to speak. The slowly moving pair—the young man moving exhaustedly, the older man staggering with weakness despite his help—came into the glade. The younger helped the older to sit down. He stood panting.

A woman and a man came together, assisting each other. There was barely light enough from the sun's afterglow to show their faces, emaciated and white.

A fifth feeble figure came tottering out of another opening in the brush. He was dark-bearded and

broad, and he had been a powerful man. But now the plague lay heavily upon him.

They greeted each other listlessly. They had not yet discovered those of their number who had been murdered.

The gaunt young man summoned his strength and moved toward the shelter where Calhoun had covered an unseemly sight with branches.

Murgatroyd whimpered.

There came another rustling sound. But this had nothing of feebleness in it. Someone pushed branches forthrightly out of his way. He came striding confidently into the small open space. He was well-fleshed, and his color was excellent. Calhoun automatically judged him to be in superlative good health, slightly over-fleshed, and of that physical type which suffers very few psychosomatic troubles because it lives strictly and enjoyably in the present.

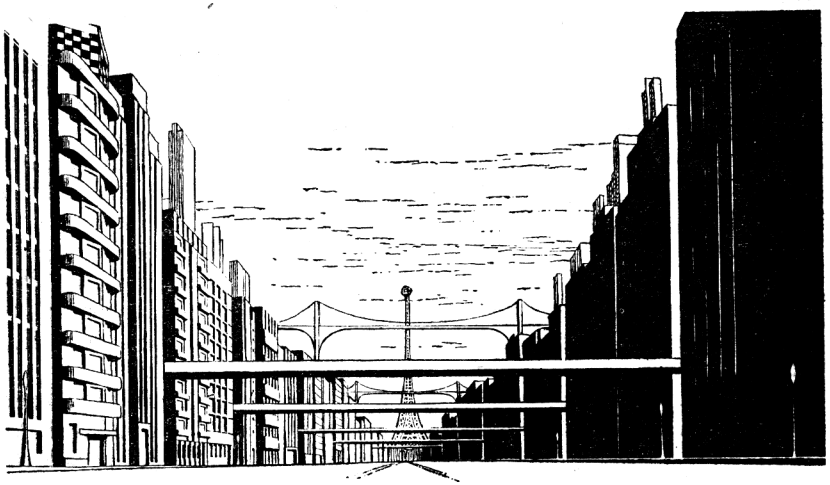
Calhoun stood up. He stepped out into the fading light just as the sturdy last-comer grinned at the group of plague-stricken semi-skeletons.

"Back, eh?" he said amiably. "Saved me a lot of trouble. I'll make one job of it."

With leisurely confidence he reached to the blaster at his hip.

"Drop it!" snapped Calhoun, from quartering behind him. "Drop it!"

The sturdy man whirled. He saw Calhoun with a crossbow raised to cover him. There was light enough to show that it was not a blast-rifle—in fact, that it was no weapon of any kind modern men would ordinarily know. But much more significant to the sturdy man was the fact



that Calhoun wore a uniform and was in good health.

He snatched out his blast-pistol with professional alertness.

And Calhoun shot him with the crossbow. It happened that he shot him dead.

IV

"Statistically, it must be recognized that no human action is without consequences to the man who acts. Again statistically, it must be recognized that the consequences of an action tend with strong probability to follow the general pattern of the action. A violent action, for example, has a strong probability of violent consequences, and since some at least of the consequences of an act must affect the person acting, a man who acts violently exposes himself to the probability that chance consequences which affect him, if unfavorable, will be violently so."

Probability and Human Conduct
Fitzgerald

Murgatroyd had been inoculated with a blood-sample from the girl Helen some three hours or less before sunset. But it was one of the more valuable genetic qualities of the *tormal* race that they reacted to bacterial infection as a human being reacts to medication. Medicine on the skin of a human being rarely has any systemic effect. Medication on mucus membrane penetrates better. Ingested medication—medicine that is swallowed—has greater effectiveness still. But substances injected into tissues or the bloodstream have most effect of all. A centigram of almost any drug administered by injection will have an effect close to that of a gram taken orally. It acts at once and there is no modification by gastric juices.

Murgatroyd had had half a cubic centimeter of the girl's blood injected into the spot on his flank where he could feel no pain. It contained the unknown cause of the plague on Maris III. Its effect as injected was incomparably greater than the same infective material smeared on his skin or swallowed. In either such case, of course, it would have had no effect at all, because *tormals* were to all intents and purposes immune to ordinary contagions. Just as they had a built-in unit in their digestive tract to cause the instant rejection of unwholesome food, their body-cells had a built-in ability to produce antibodies immediately the toxin of a pathogenic organism came into contact with them. So *tormals* were effectively safe against any disease transmitted by ordinary methods of infection. Yet if a culture of pathogenic bacteria—say—were injected into their blood stream, their whole body set to work to turn out antibodies because all their body was attacked. And all at once. There was practically no incubation-period.

Murgatroyd, who had been given the plague in mid-afternoon, was reacting violently to its toxins by sunset. But two hours after darkness fell he arose and said shrilly, *"Chee-chee-chee!"* He'd been sunk in heavy slumber. When he woke, there was

a small fire in the glade, about which the exhausted, emaciated fugitives consulted with Calhoun. Calhoun was saying bitterly:

"Those characters in the city are immune! They have to be! And they know they're immune, or they wouldn't risk contagion by murdering you or handling the bodies of plague-victims to burn them! So they have to know all about the plague—and they knew it before they arrived! They came because they knew! That's why I shot that man with the crossbow, instead of taking a blaster to him. I meant to wound him so I could make him answer questions, but it's not an accurate weapon and I killed him instead. I got very little from the stuff in his pockets. The only significant thing was a ground-car key, and even that means only there's a car waiting somewhere for him."

The gaunt young man said drearily:

"He didn't come from Dettra, our home planet. Fashions are different on different worlds. His footwear was like a style we had on Dettra four years back, and his body-clothing has fasteners we don't use."

Murgatroyd saw Calhoun and rushed to him, embracing his legs with enthusiasm and chattering shrilly of his relief at finding the man he knew. The skeletonlike plague-victims stared at him.

"This," said Calhoun with infinite relief, "is Murgatroyd. He's had the plague and is over it. So now we'll get you people cured. I wish I had better light!"

He counted Murgatroyd's breathing and listened to his heart. Murgatroyd was in that state of boisterous good health which is normal in any lower animal, but amounts to genius in a *tormal.* Calhoun regarded him with satisfaction.

"All right!" he said. "Come along!"

He plucked a brand of burning resinous stuff from the campfire. He handed it to the gaunt young man and led the way. Murgatroyd ambled complacently after him. Calhoun stopped under one of the unoccupied shelters and got out his lab kit. He bent over Murgatroyd. What he did, did not hurt. When he stood up, he squinted at the red fluid in the instrument he'd used.

"About fifteen CCs," he observed. "This is strictly emergency stuff I'm doing now. But I'd say that there's an emergency."

The gaunt young man said:

"I'd say you've doomed yourself. The incubation period seems to be about six days. It took that long to develop among the doctors we had in the office staff."

Calhoun opened a compartment of the kit, whose minuscule test tubes and pipettes gleamed in the torchlight. He absorbedly transferred the reddish fluid to a miniature filter-barrel, piercing a self-healing plastic cover to do so. He said:

"You're pre-med? The way you talk—"

"I was an interne," said Kim. "Now I'm pre-corpse."

"I doubt that last," said Calhoun. "But I wish I had some distilled water— This is anticoagulant." He added the trace of a drop to the sealed, ruddy fluid. He shook the whole filter to agitate it. The instrument was hardly larger than his thumb. "Now a clumper—" He added a minute quantity of a second substance from an almost microscopic ampule. He shook the filter again. "You can guess what I'm doing. With a decent lab I'd get the structure and formula of the antibody Murgatroyd has so obligingly turned out for us. We'd set to work to synthesize it. In twenty hours, lab time, we ought to have it coming out of the reaction-flasks in quantity. But there is no lab."

"There's one in the city," said the gaunt young man hopelessly. "It was for the colonists who were to come. And we were staffed to give them proper medical care. When the plague came, our doctors did everything imaginable. They not only tried the usual culture tricks, but they cultured samples of every separate tissue in the fatal cases. They never found a single organism—even in the electron microscopes—that would produce the plague." He said with a sort of weary pride, "Those who'd been exposed worked until they had it, then others took over. Every man worked as long as he could make his brain work, though."

Calhoun squinted through the glass tube of the filter at the sputtering torch.

"Almost clumped," he observed. Then he said, "Did you ever hear of a man named Pasteur? One of his first discoveries was that one could get an effectively pure culture of a pathogenic organism by giving the disease to an experimental animal. Better ways were found later, but one still expects a pure culture in a patient who has a disease really badly. What did the lab turn up?"

Kim shook his head.

"Nothing. The bacteriological survey of the planet had been thorough. Oral and intestinal flora were normal. Naturally, the local bacteria couldn't compete with the strains we humans have learned to live with. They couldn't symbiotize. So there wasn't anything unknown. There wasn't any cause of the plague."

Calhoun began to work the filter plunger, by the wavering light of the torch. The piston was itself the filter, and on one side a clear, mobile liquid began very slowly to appear.

"'Mutated standard bug? Still, if your doctors did cultures and couldn't reproduce the disease—"

"They could pass it," said Kim bitterly, "but they could never find what carried it! No pure culture would!"

Calhoun watched the clear fluid develop on the delivery side of the filtering piston. The job got done. There was better than twelve cubic centimeters of clear serum on the delivery side, and an almost solid

block of clumped blood cells on the other. He drew off the transparent fluid with a fine precision.

"We're doing biochemistry under far from asceptic conditions," he said wryly, "but the work has to be done and we have to take the risk. Anyhow, I'm getting a feeling that this isn't any ordinary plague. A normal pathogenic organism should have been turned up by your doctors."

"It wasn't," said Kim.

"So," said Calhoun, "maybe it isn't on isolatable organism. Maybe the disease-producing mechanism simply isn't there when you make pure cultures of the separate strains of virus and microbe. Murgatroyd was a pretty sick animal. I've only known of one previous case in which a *tormal* reacted as violently as Murgatroyd did. That one had us sweating."

"If I were going to live," said Kim grimly, "I might ask what it was."

"Since you're going to," Calhoun told him, "I'll tell you though you don't. It was a pair of organisms. Their toxins acted synergically together. Separately they were innocuous. Together they were practically explosive. That one was the devil to track down!"

He went back across the glade. Murgatroyd came skipping after him, scratching at the anaesthetic patch on his hide, which he sometimes seemed to notice not because it felt oddly, but because it did not feel at all.

"You," said Calhoun briefly to Helen Jons, "you go first. This is an antibody serum. You may itch afterward, but I doubt it. Your arm, please."

She bared her rather pitifully thin arm. He gave her practically a cc. of fluid which—plus blood-corpuscles and some forty-odd other essential substances—had been circulating in Murgatroyd's blood stream not long since. The blood-corpuscles had been clumped and removed by one compound plus the filter, and the anticoagulant had neatly modified most of the others. In a matter of minutes, the lab kit had prepared as usable a serum as any animal-using technique would produce. Logically, the antibodies it contained should be isolated and their chemical structure determined. They should be synthesized, and the synthetic antibody-complex administered to plague victims. But Calhoun faced a small group of people doomed to die. He could only use his field kit to produce a small-scale miracle for them. He could not do a mass production job.

"Next!" said Calhoun. "Tell them what it's all about, Kim!"

The gaunt young man bared his own arm.

"If what he says is so, this will cure us. If it isn't so, nothing can do us any harm!"

And Calhoun briskly gave them, one after another, the shots of what ought to be a curative serum for an unidentified disease which he suspected was not caused by any single

germ, but by a partnership. Synergy is an acting-together. Charcoal will burn quietly. Liquid air will not burn at all. But the two together constitute a violent explosive. This is analogous to synergy. The ancient simple drug sulfa is not intoxicating. A glass of wine is not intoxicating. But the two together have the kick of dynamite. Synergy, in medicine, is a process in which when one substance with one effect is given in combination with another substance with another effect, the two together have the consequences of a third substance intensified to fourth or fifth or tenth power.

"I think," said Calhoun when he'd finished, "that by morning you'll feel better—perhaps cured of the plague and only weak from failure to force yourselves to take nourishment. If it turns out that way, I advise you all to get as far away from the city as possible for a considerable while. I think this planet is going to be repopulated. I suspect that shiploads of colonists are on the way here now—but not from Dettra, which built the city. And I definitely guess that, sick or well, you're going to be in trouble if or when you contact the new colonists."

They looked tiredly at him. They were a singular lot of people. Each one seemed half-starved, yet their eyes had not the brightness of suffering. They looked weary beyond belief, and yet there was not self-neglect. They were of that singular human type which maintains human civilization against the inertia of the race—because it drives itself to get needed things done. It is not glamorous, this dogged part of mankind which keeps things going. It is sometimes absurd. For dying folk to wash themselves, when even such exertion calls for enormous resolution, is not exactly rational. To help each other try to die with dignity was much more a matter of self-respect than of intellectual decision. But as a Med Ship man, Calhoun viewed them with some warmth. They were the type that has to be called on when an emergency occurs and the wealth-gathering type tends to flee and the low-time-sense part of a population inclines to riot or loot or worse.

Now they waited listlessly for their own deaths.

"There's no exact precedent for what's happened here," explained Calhoun. "A thousand years or so ago there was a king of France—a country back on old Earth—who tried to wipe out a disease called leprosy by executing all the people who had it. Lepers were a nuisance. They couldn't work. They had to be fed by charity. They died in inconvenient places and only other lepers dared handle their bodies. They tended to throw normal human life out of kilter. That wasn't the case here. The man I killed wanted you dead for another reason. He wanted you dead right away."

The gaunt Kim Walpole said tiredly:

"He wanted to dispose of our bodies in a sanitary fashion."

"Nonsense!" snapped Calhoun. "The city's infected. You lived, ate, breathed, walked in it. Nobody can dare use that city unless they know how the contagion's transmitted, and how to counteract it. Your own colonists turned back. These men wouldn't have landed if they hadn't known they were safe!"

There was silence.

"If the plague is an intended crime," added Calhoun, "you are the witnesses to it. You've got to be gotten rid of before colonists from somewhere other than Dettra arrive here."

The dark-bearded man growled: "Monstrous! Monstrous!"

"Agreed," said Calhoun. "But there's no interstellar government, now, any more than there was a planetary government in the old days back on Earth. So if somebody pirates a colony ready to be occupied, there's no authority able to throw them out. The only recourse would be war. And nobody is going to start an interplanetary war! Not with the bombs that can be landed! If the invaders can land a population here, they can keep it here. It's piracy, with nobody able to do anything to the pirates." He paused, and said with irony: "Of course they could

be persuaded that they were wrong."

But that was not even worth thinking about. In the computation of probabilities in human conduct, self-interest is a high-value factor. Children and barbarians have clear ideas of justice due to them, but no idea at all of justice due from them. And though human colonies spread toward the galaxy's rim, there was still a large part of every population which was civilized only in that it could use tools. Most people still remained comfortably barbaric or childish in their emotional lives. It was a fact that had to be considered in Calhoun's profession. It bore remarkably on matters of health.

"So you'll have to hide. I think permanently," Calhoun told them. "But in the morning, after I've checked on you people again, I think I'll go into the city and see what I can do about it. Try to rest now. You should all feel much better in the morning."

Kim Walpole said abruptly:

"You've been exposed to the plague. Have you protected yourself?"

"Not yet," acknowledged Calhoun. "Give me a quarter of a CC."

He handed the injector to the gaunt young man. He noted the precision with which Kim handled it. Then he helped get the survivors of the original group—there were six of them—to the leafy beds under the shelters. They were very quiet—even more quiet than their illness demanded. They were very polite. The old man and woman who had struggled back to the glade together made an especial attempt to bid Calhoun good night with the courtesy appropriate to city folk of tradition.

Calhoun settled down to keep watch through the night. Murgatroyd snuggled confidingly close to him. There was silence.

But not complete silence. The night of Maris III was filled with tiny noises, and some not so tiny. There were little squeaks which seemed to come from all directions, including overhead. There were chirpings which were definitely at ground-level. There was a sound like effortful grunting somewhere in the direction of the rampart of hills. In the lowlands there was a rumbling which moved very slowly from one place to another. By its rate of motion, Calhoun guessed that a pack or herd of small animals was making a night-journey and uttering deep-bass noises as it traveled.

He debated certain grim possibilities. The man he'd killed had had a ground-car key in his pocket. He'd probably come out in a powered vehicle. He might have had a companion, and the method of hunting down fugitives—successful, in his case—was probably well established. That companion might come looking for him, so watchfulness was necessary.

Meanwhile—the plague. The idea of synergy was still most plausible. Suppose the toxins—the poisonous

metabolic products—or two separate kinds of bacteria combined to lessen the ability of the blood to carry oxygen and scavenge away carbon dioxide? It would be extremely difficult to identify the pair, and the symptoms would be accounted for. No pure culture of any organism to be found would give the plague. Each, by itself, would be harmless. Only a combination of two would be injurious. And if so much was assumed—why—if the blood lost its capacity to carry oxygen, mental listlessness would be the first symptom of all. The brain requires a high oxygen-level in its blood-supply if it is to work properly. Let a man's brain be gradually, slowly, starved of oxygen and all the noted effects would follow. His other organs would slow down, but at a lesser rate. He would not remember to eat. His blood would still digest food and burn away its own fat—though more and more sluggishly—while his brain worked only foggily. He would become only semiconscious, and then there would come a time of coma when unconsciousness claimed him and his body lived on only as an idling machine—until it ran out of fuel and died.

Calhoun tried urgently to figure out a synergic combination which might make a man's blood case to do its work. Perhaps only minute quantities of the dual poison might be needed—like an antivitamin or an antienzyme, or—

The invaders of the city were immune. Quite possibly the same antibodies Murgatroyd had produced were responsible for their safety. Somewhere, somebody had very horribly used the science of medicine to commit a monstrous crime. But the science of medicine—

A savage idea came to Calhoun. Its practicality might depend on the number of men in the city. But his eyes burned.

He heard a movement across the glade. He reached for his blaster. Then he saw where the motion was. It was Kim Walpole, intolerably weary, trudging with infinite effort to where Helen Jons lay. Calhoun heard him ask heavily:

"You're all right?"

"Yes, Kim," said the girl softly. "I couldn't sleep. I'm . . . wondering if we can hope."

Kim did not answer.

"If we live—" said the girl yearningly, and stopped.

Calhoun felt that he ought to put his fingers in his ears. The conversation was strictly private. But he needed to be on guard. So he coughed, to give notice that he heard. Kim called to him across the starlit glade.

"Calhoun."

"Yes," said Calhoun. "If you two talk, I suggest that you do it in whispers. I want to listen, in case the man I killed had friends who'll come looking for him. Did you get his blaster, by the way?"

"Yes," said Kim from the darkness across the way.

"Good!" said Calhoun. "Keep it. And against all medical ethics, I advise you to use it freely if you

find suitable targets. But now, just talk quietly if you can."

He settled back. Murgatroyd stirred and cuddled closer against him without wakening. There was the faintest possible murmuring of voices where Kim Walpole and the girl Helen talked wistfully of the possibility of hope.

Calhoun felt very lonely, despite the violent activities he foresaw for the morrow. He almost envied Kim Walpole. But he could not have traded places with him. It wouldn't have been a fair trade. Calhoun was quite confident that—via Murgatroyd—the folk in the glade had a very fair chance of living for some time yet.

His own chances, considering what he had to do, were more nearly zero. Just about zero, when considered dispassionately.

V

"Very much of physical science is merely the comprehension of long-observed facts. In human conduct, there is a long tradition of observation, but a very brief record of comprehension. For example, human life in contact with other human lives follows the rules of other ecological systems. All too often, however, a man may imagine that an ecological system is composed only of things, whereas such a system operates through the actions of things. It is not possible for any part of an ecological complex to act upon the other parts without being acted upon, in its turn. So that it is singularly stupid—and singularly common—for an individual to consider human society as passive and unreactive, so that he may do what he pleases without a reaction as energetic as his action, and as well-directed. Moreover, probability—."

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An hour after sunrise Calhoun's shoulder-pack was empty of food. The refugees arose, and they were weak and ravenous. Their respiration had slowed to normal. Their pulses no longer pounded. Their eyes were no longer dull, but very bright. But they were in advanced states of malnutrition, and only now were aware of it. Their brains were again receiving adequate oxygen and their metabolism was at a normal level—and they knew that they were starving.

Calhoun served as cook. He trudged to the spring that Helen described and brought back water. While they sucked on sweet tablets from his rations and watched with hungry eyes, he made soup from the dehydrated rations he'd carried for Murgatroyd and himself. He gave it to them as the first thing their stomachs were likely to digest.

He watched as they fed themselves. The elderly man and woman consumed it delicately, looking at each other. The man with the broad dark beard ate with enormous self-restraint. Helen fed the weakest oldest man, between spoonfuls for herself, and Kim Walpole ate slowly, brooding.

Calhoun drew him aside.

"During the night," he said, "I got another lot of serum ready. I'm leaving it with you, with an injector.

You'll find other refugees. I gave you massive doses. You'd better be stingy. Try half-CC shots."

"What about you?" demanded Kim.

Calhoun shrugged.

"You'd be surprised how much authority I have—when I can make it stick," he said dryly. "As a Med Ship man I've authority to take complete charge of any health emergency. You people have a hitherto unknown plague here. That's one emergency. The present inhabitants of the city haven't got it. That's another. So since I have authority and reason to exercise it if I can, I'm going to the city to take a little action."

"You'll be killed," said Kim.

"Possibly," admitted Calhoun. "But the number of chance happenings that could favor me is very much greater than the number of breaks that could favor the invaders. And there's the matter of colonists. Prospective colonists. You're being hunted so hard that they must be about due. They've probably been immunized against this plague, but technically I shouldn't let them land on a plague-stricken planet."

Kim Walpole stared.

"You mean you'll try to stop them?"

"I shall try," said Calhoun, "to implement the authority vested in me by the Med Service for such cases as this. The rules about quarantine are rather strict."

"You'll be killed," said Kim, again.

Calhoun ignored the repeated prediction.

"That hunter found you," he observed, "because he knew that you'd have to drink. So he found a brook and followed it up, looking for signs of humans drinking from it. He found footprints about the spring. I found his footprints there, too. That's the trick you'll use to find other fugitives. But pass on the word not to leave tracks hereafter. For other advice, I advise you to get all the weapons you can. Modern ones, of course. You've got the blaster from the man I killed."

"I think," said Kim between his teeth, "that I'll get some more. If hunters from the city do track us to our drinking places, I'll know how to get more weapons!"

"Yes," agreed Calhoun, and added, "Murgatroyd made the antibodies that cured you. As a general rule, you can expect antibody production in your own bodies once an infection begins to be licked. In case of extreme emergency, each of you can probably supply antibodies for a fair number of other plague-victims. You might try serum from blisters you produce on your skin. Quite often antibodies turn up there. I don't guarantee it, but sometimes it works."

He paused. Kim Walpole said harshly:

"But you! Isn't there anything we can do for you?"

"I was going to ask you something," said Calhoun. He produced the telephoto films of the city as

photographed from space. "There's a laboratory in the city—a biochemistry lab. Show me where to look for it."

Walpole gave explicit directions, pointing out the spot on the photo. Calhoun nodded. Then Kim said fiercely:

"But tell us something we can do! We'll be strong, presently! We'll have weapons! We'll track downstream to where hunters leave their ground-cars and be equipped with them! We can help you!"

Calhoun nodded approvingly.

"Right. If you see the smoke of a good-sized fire in the city, and if you've got a fair number of fairly strong men with you, and if you've got ground-cars, you might investigate. But be cagey about it! Very cagey!"

"If you signal we'll come," said Kim Walpole grimly, "no matter how few we are!"

"Fine!" said Calhoun. He had no intention of calling on these weakened, starveling people for help.

He swung his depleted pack on his back again and slipped away from the glade. He made his way to the spring, which flowed clear and cool from unseen depths. He headed down the little brook which flowed away from it. Murgatroyd raced along its banks. He hated to get his paws wet. Presently, where the underbrush grew thickly close to the water's edge, Murgatroyd wailed. *"Chee! Chee!"* And Calhoun plucked him from the ground and set him on his shoulder. Murgatroyd clung blissfully there as Calhoun followed down the stream bed. He adored being carried.

Two miles down, there was another cultivated field. This one was set out to a gigantized root-crop, and Calhoun walked past shoulder-high bushes with four-inch blue-and-white flowers. He recognized the plants as of the family *solanaceae*—belladona was still used in medicine—but he couldn't identify it until he dug up a root and found a potato. But the six-pound specimen he uncovered was still too young and green to be eaten. Murgatroyd refused to touch it.

Calhoun was ruefully considering the limitations of specialized training when he came to the end of the cultivated field. There was a highway. It was new, of course. City, fields, highways and all the appurtenances of civilized life had been built on this planet before the arrival of the colonists who were to inhabit it. It was extraordinary to see such preparations for a population not yet on hand. But Calhoun was much more interested in the ground-car he found waiting on the highway, hard by a tiny bridge under which the brook he followed flowed.

The key he'd taken from the hunter fitted. He got in and put Murgatroyd on the seat beside him.

"These invaders, Murgatroyd," he observed, "must be in a bad way. A newly-built city which was never occupied will be like an empty house. There's no amusement or

loot to be found in prowling it. They were sent to take over the planet, and they've done it. But they've nothing to do now, except hunt refugees—until their colonists arrive. I suspect they're bored. We'll try to fix that!"

He set the ground-car in motion. Toward the city.

It was a full twenty miles, but he did not encounter a single other vehicle. Presently the city lay spread out before him. He stopped and surveyed the vast pile. It was a very beautiful city. Fifty generations of architects on many worlds had played with stone and steel, groping for the perfect combination of materials with design. This city was a product of their tradition. There were towers which glittered whitely, and low buildings which seemed to nestle on the vegetation-covered ground. There were soaring bridges, and gracefully curving highways, and park areas laid out and ready. There was no monotony anywhere.

The only exception to gracefulness was the sturdy landing grid itself, half a mile high and a mile across, which was a lace-work of massive steel girders with spider-thin lines of copper woven about in the complex curves the creation of its force-field required. Inside it, Calhoun could see the ship of the invaders. It had been brought down inside the circular structure and was dwarfed by it. It gleamed there.

"And we," said Calhoun, "are going to look for a prosaic, probably messy laboratory which people who make a sport of hunting fellow-humans won't find amusing. Characters like these, Murgatroyd, aren't interested in medical science. They consider themselves conquerors. People have strange ideas!"

"Chee!" said Murgatroyd.

Calhoun spread out his photographs. Kim Walpole had marked where he should go and a route to it. Having been in the city while it was building, he knew even the service-lanes which, being sunken, were not a part of the city's good looks.

"But our enemies," explained Calhoun, "will not deign to use such grubby routes. They consider themselves aristocrats because they were sent as conquerors, whose job it was to clean up the dead bodies of their victims. I wonder what kind of swine are in power in the planetary government which sent them?"

He put away the photos and headed for the city again. He branched off from the rural highway where a turn-off descended into a cut. This low-level road was intended for loads of agricultural produce entering the city. It was strictly utilitarian. It ran below the surface of the park-areas and entered the city without pride. It wound between rows of service-gates, behind which waste matter was some day to be assembled to be carted away for fertilizer on the fields. The city was very well designed.

Rolling along the echoing sunken road, Calhoun saw, just

once, a ground-car in motion on a far-flung, cobwebby bridge between two tall towers. It was high overhead. Nobody in it would be watching grubby commerce-roads.

The whole affair was very simple indeed. Calhoun brought the car to a stop beneath the overhang of a balconied building many stories high. He got out and opened the gate. He drove the car into the cavernous, so-far-unused lower part of the building. He closed the gate behind him. He was in the center of the city, and his presence was unknown.

He climbed a new-clean flight of steps and came to the sections the public would use. There were glassy walls which changed their look as one moved between them. There were the lifts. Calhoun did not try to use them. He led Murgatroyd up the circular ramps which led upward in case of unthinkable emergency. He and Murgatroyd plodded up and up. Calhoun kept count.

On the fifth level there were signs of use, while all the others had that dusty cleanness of a structure which has been completed but not yet occupied.

"Here we are," said Calhoun cheerfully.

But he had his blaster in his hand when he opened the door of the laboratory. It was empty. He looked approvingly about as he hunted for the storeroom. It was a perfectly equipped biological laboratory, and it had been in use. Here the few doomed physicians awaiting the city's population had worked desperately against the plague. Calhoun saw the trays of cultures they'd made—dried up and dead, now. Somebody had turned over a chair. Probably when the laboratory was searched by the invaders, lest someone not of their kind remained alive in it.

He found the storeroom. Murgatroyd watched with bright eyes as he rummaged.

"Here we have the things men use to cure each other," said Calhoun oracularly. "Practically every one a poison save for its special use! Here's an assortment of spores—pathogenic organisms, Murgatroyd. One could start a plague with them. And here are drugs which are synthesized nowadays, but are descended from the compounds found on the spears of savages. Great helps in medicine. And here are the anaesthetics—poisons, too. These are what I am counting on!"

He chose, very painstakingly. Dextrethyl. Polysulfate. The one marked inflammable and dangerous. The other with the maximum permissible dose on its label, and the name of counteracting substances which would neutralize it. He burdened himself. Murgatroyd reached up a paw. Since Calhoun was carrying something, he wanted to carry something, too.

They went down the circular ramp again. Calhoun searched once more in the below-surface levels of the building. He found what he wanted —a painter's vortex gun which

would throw "smoke-rings" of tiny paint-droplets at a wall or object to be painted. One could vary the size of the ring at impact from a bare inch to a three-foot spread.

Calhoun cleaned the paint gun. He was meticulous about it. He filled its tank with dextrethyl brought down from the laboratory. He piled the empty containers out of sight.

"This trick," he observed, as he picked up the paint gun again, "was devised to be used on a poor devil of a lunatic who carried a bomb in his pocket for protection against imaginary assassins. It would have devastated a quarter-mile circle, so he had to be handled gently."

He patted his pockets. He nodded.

"Now we go hunting—with an oversized atomizer loaded with dextrethyl. I've polysulfate and an injector to secure each specimen I knock over. Not too good, eh? But if I have to use a blaster I'll have failed."

He looked out a window at the sky. It was now late afternoon. He went back to the gate to the service road. He went out and piously closed it behind him. On foot, with many references to the photomaps, he began to find his way toward the landing grid. It ought to be something like the center of the invaders' location.

It was dark when he climbed other service stairs from the cellar of another building. This was the communications center of the city. It had been the key to the mopping-up process the invaders began on landing. Its call board would show which apartments had communicators in use. When such a call showed, a murder-party could be sent to take care of the caller. Even after the first night, some individual isolated folk might remain —perhaps unaware of what went on. So there would be somebody on watch, just in case a dying man called for the solace of a human voice while still he lived.

There was a man on watch. Calhoun saw a lighted room. Paint gun at the ready, he moved very silently toward it. Murgatroyd padded faithfully behind him.

Outside the door, Calhoun adjusted his curious weapon. He entered. There was a man nodding in a chair before the lifeless board. When Calhoun entered he raised his head and yawned. He turned.

Calhoun sprayed him with smoke rings—vortex rings. But the rings were spinning fissiles of vaporized dextrethyl—that anaesthetic developed from ethyl chloride some two hundred years before, and not yet bettered for its special uses. One of its properties was that the faintest whiff of its odor produced a reflex impulse to gasp. A second property was that—like the ancient ethyl chloride—it was the quickest-acting anaesthetic known.

The man by the call board saw Calhoun. His nostrils caught the odor of dextrethyl. He gasped.

He fell unconscious.

Calhoun waited patiently until the dextrethyl was out of the way. It was almost unique among vapors in that at room temperature it was lighter than air. It rose toward the ceiling. Calhoun moved forward, brought out the polysulfate injector, and bent over the unconscious man. He did not touch him otherwise.

He turned and walked out of the room with Murgatroyd piously marching behind him.

Outside, Calhoun said:

"As one medical man to another, maybe I shouldn't have done that! I doubt these invaders have a competent physician among them. But even he would be apt to think that that man had collapsed suddenly and directly into the coma of the plague. That polysulfate's an assisting anaesthetic. It's not used alone, because when you knock a man out with it he stays out for days. It's used just below the quantity that would affect a man, and then the least whiff of another anaesthetic puts him under, and he can be brought out fast and he's better off all around. But I've got this man knocked out! He'll stay unconscious for a week."

Murgatroyd piped, *"Chee!"*

"He won't die," said Calhoun grimly, "but he won't come out fighting—unless somebody wakes him earlier. And of course, he is a murderer!"

"Chee!" agreed Murgatroyd.

He reached up a furry paw and took hold of Calhoun's hand. They walked out into the street together.

It is notorious that the streets of a city at night are ghostly and strange. That is true of a city whose inhabitants are only asleep. There is more and worse of eeriness in a deserted city, whose inhabitants are dead. But a city which has never lived, which lies lifeless under the stars because its people never came to live in it—that has the most ghastly feel of all.

Calhoun and Murgatroyd walked hand in paw through such a place. That the invaders felt the same eeriness was presently proved. Calhoun found a place where a light shone and voices came out into the tiny, remote night sounds of Maris III. Men were drinking in an unnecessarily small room, as if crowding together to make up for the loneliness outside. In the still night they made a pigmy tumult with their voices. They banged drunkenly on a table and on the floor.

Calhoun stood in the doorway and held the paint-gun trigger down. He traversed the room twice. Whirling rings of invisible vapor filled the place. Men gasped.

Calhoun waited a long time, because he had put a great deal of dextrethyl into a small space. But presently he went in and bent over each man in turn, while Murgatroyd watched with bright, inquisitive eyes. He arranged one figure so that it seemed to have been stricken while bending over another, fallen companion. The others he carried out, one at a time, and placed at different distances as if they had fallen while fleeing from a plague.

One he carried quite a long distance, and left him with dusty knees and hands as if he had tried to crawl when strength failed him.

"They'd have been immunized at pretty well the same time, before they were shipped on this job," Calhoun told Murgatroyd. "It'll seem very plaguelike for them to fall into comas nearly together. If I found men like this, and didn't know what to do, I'd suspect that it was a delayed-action effect of some common experience—like an immunization shot. We'd better try the ship, Murgatroyd."

On the way he passed close to the control-building of the landing grid. There was a light inside it, too. There were four men on watch. Two remained inside, very, very still, when Calhoun went on. The others seemed to have fled and collapsed in the act. They breathed, to be sure. Their hearts beat solidly. But it would not be possible to rouse them to consciousness.

Calhoun didn't get into the ship, though. A chance happening intervened, which seemed an unfavorable one. Its port was locked and his cautious attempt to open it brought a challenge and a blaze of lights.

He fled for the side of the landing grid with blaster-bolts searing the ground all about him. Murgatroyd leaped and pranced with him as he ran.

VI

"The probable complete success of a human enterprise which affects non-cooperating other human beings may be said to vary inversely as the fourth power of the number of favorable happenings necessary for complete success. This formula is admittedly empirical, but its accordance with observation is remarkably close. In practice, the probability of absolute, total success in any undertaking is negligible. For this reason, mathematics and sanity alike counsel the avoidance of complex plannings, and most especially of plans which must succeed totally to succeed at all."

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When morning came, Calhoun very wryly considered the situation. He couldn't know the actual state of things, to be sure. He'd been shot at. But even so—though that fact did not allow his hopes to be realized in every detail—the probability of a considerable success remained. It was not likely that the invaders would ascribe the finding of unconscious, stertoriously breathing members of their number to Calhoun. Making men unconscious was not the kind of warfare a plague-refugee would use. Still more certainly, it was not what the invaders themselves would practice. To devise and spread a plague, of course, was not beyond them. That had been done. But they would not disable an enemy and leave him alive. They would murder him or nothing. So when men of their group were found in something singularly close to the terminal coma of the plague, they'd think them victims. They'd guess that their supposed immunity was only to the early symptoms, not to the final ones and death.

It should not be an encouraging opinion.

But this morning Calhoun found himself hungry. He looked remorsefully at Murgatroyd.

"I gave our rations to those refugees," he said regretfully. "I took no thought for the morrow—which has turned out to be today. I'm sorry, Murgatroyd!"

Murgatroyd said nothing.

"Maybe," suggested Calhoun, "we can find some of these invaders at a meal."

It was reckless, but recklessness was necessary in the sort of thing Calhoun had started. He and Murgatroyd ventured out into the streets. The emptiness of the city was appalling. If it had been dilapidated, if it had been partly ruined—the emptiness might have seemed somehow romantic. But every building was perfect. Each was complete but desolately unused.

Calhoun spotted a ground-car at a distance, stopped before a long, low, ground-hugging structure near the landing grid. It was perfectly suited to be the headquarters of the strangers in the city. Calhoun considered it for a long time, peering at it from a doorway.

"We shouldn't try it," he said at

last. "But we probably will. If we can make these characters so panic-stricken that they run out of the city like the earlier refugees—it would be a highly favorable happening. They might do it if their bosses were knocked out by what they thought was the plague. And besides, we should get a meal out of it. There'll be food in there."

He backtracked a long way. He darted across a road with Murgatroyd scampering beside him. He stalked the building, approaching it behind bushes, carrying the paint gun. He reached its wall. He began to crawl around the outside to reach the doorway. He heard voices as he passed the first windows.

"But I tell you we're immune!" cried a voice furiously. *"It can't be the same thing those Dettrans died from! It can't! And there was that man who ran from the ship last night—"*

Calhoun crawled on. Murgatroyd skipped. Calhoun heard an exclamation behind him. He turned his head, and Murgatroyd was fifteen feet away from the building-wall, and plainly visible to those inside. And he'd been seen fleeing with Calhoun from the ship.

Calhoun swore softly. He ran. He reached the door before which a ground-car stood. He wrenched it open and set the paint gun at work firing a steady stream of vortex rings into the interior. He drew his blaster and faced the outside world.

There was a crashing of glass. Somebody had plunged out a window. There were rushing feet inside. They'd be racing toward this doorway from within. But the hallway—anteroom—foyer—whatever was immediately inside the door would be filled with dextrethyl vapor. Men would gasp and fall.

A man did fall. Calhoun heard the crash of his body to the floor. But also a man came plunging around the building's corner, blaster out, searching for Calhoun. But he had to sight his target and then aim for it. Calhoun had only to pull trigger. He did.

Shoutings inside the building. More rushing feet. More falls. Then there was the beginning of the rasping snarl of a blaster, and then a cushioned, booming, roaring detonation which was the explosive dextrethyl vapor, ignited by it. The blast lifted the building's roof. It shattered partitions. It blew every window out.

Calhoun sprinted for the ground-car. A blaster-bolt flashed past him. He halted and deliberately traversed the building with the trigger held down. Smoke and flame leaped up. At least one more invader crumpled. Calhoun heard a voice yelling inside somewhere.

"We're attacked! Those refugees are throwing bombs! Rally! Rally! We need help!"

It would be a broadcast call for assistance. Wherever men lolled or loafed or tried desultorily to find something to loot, they would hear it. Even the standby crew in the spaceship would hear it. Those who

repaired the grid-transformers Calhoun had burned out would hear it. Men would come running. Hunters would come. Men in cars—

Calhoun snatched Murgatroyd to the seat beside him. He turned the key and the tires screamed and he shot away.

The highways were of course, superb. He raced forward, and the car's communicator began to mutter as somebody in the undamaged part of the building chattered that he'd gotten in a car and away. It described his course. It commanded that he be headed off. It hysterically demanded that he be killed, killed, killed—

Another voice took its place. This voice was curt and coldly furious. It snapped precise instructions.

Calhoun found himself on a gracefully curving, rising road. He was midway between towers when another car flashed toward him. He took his blaster in his left hand. In the split second during which the cars passed each other, he blasted it. There was a monster surge of smoke and flame as the stricken car's Duhanne cell shorted and vaporized half the metal of the car itself.

There came other voices. Somebody had sighted the explosion. The voice in the communicator roared for silence.

"You," he rasped. *"If you got him, report yourself!"*

"Chee-chee-chee!" chattered Murgatroyd excitedly.

But Calhoun did not report.

"He got one of us," raged the icy voice. *"Get ahead of him! And blast him!"*

Calhoun's car went streaking down the far side of the traffic-bridge. It rounded a curve on two wheels. It flashed between two gigantic empty buildings and came to a sideway, and plunged into that, and came again to a division and took the left-hand turn, and next time took the right. But the muttering voices continued in the communicator. A voice, by name, was ordered to the highest possible bridge from which it could watch all lower-level roadways. Others were to post themselves here, and there—and to stay still! A group of four cars was coming out of the storage-building. Blast any single car in motion. Blast it! And report, report, report—

"I suspect," said Calhoun to the agitated Murgatroyd beside him, "that this is what is known as military tactics. If they ring us in—There aren't but so many of them, though. The trick for us is to get out of the city. We need more choices for action. So—"

The communicator panted a report of his sighting, from a cobweblike bridge at the highest point of the city. He was heading—

He changed his heading. He had so far seen but one car of his pursuers. Now he went racing along empty, curving highways, among untenanted towers and between balconied walls with blank-eyed windows gazing at him everywhere.

It was nightmarish because of the

magnificence and the emptiness of the city all about him. He plunged along graceful highways, across delicately arched bridges, through crazy ramifications of its lesser traffic arteries—and he saw no motion anywhere. The wind whistled past the car windows, and the tires sang a high-pitched whine, and the sun shone down and small clouds floated tranquilly in the sky. There was no sign of life or danger anywhere on the splendid highways or in the heart-wrenchingly beautiful buildings. Only voices muttered in the communicator of the car. He'd been seen here, flashing around a steeply banked curve. He'd swerved from a waiting ambush by pure chance. He'd—

He saw green to the left. He dived down a sloping ramp toward one of the smaller park areas of the city.

And as he came from between the stone guard rails of the road, the top of the car exploded over his head. He swerved and roared into dense shrubbery, jerked Murgatroyd free despite the *tormal's* clinging fast with all four paws and his tail, and dived into the underbrush.

He ran, swearing and plucking solidified droplets of still-hot metal from his garments and his flesh. They hurt abominably. But the man who'd fired wouldn't believe he'd missed, followed as his blasting was by the instant wrecking of the car. The man who'd fired would report his success before he moved to view the corpse of his supposed victim. But there'd be other cars coming. At the moment it was necessary for Calhoun to get elsewhere, fast.

He heard the rushing sound of arriving cars while he panted and sweated through the foliage of the park. He reached the far side and a road, and on beyond there was a low stone wall. He knew instantly what it was. Service highways ran in cuts, now and again roofed over to hide them from sight, but now and again open to the sky for ventilation. He'd entered the city by one of them. Here was another. He swung himself over the wall and dropped. Murgatroyd recklessly and excitedly followed.

It was a long drop, and he was staggered when he landed. He heard a soft rushing noise above. A car raced past. Instants later, another.

Limping, Calhoun ran to the nearest service-gate. He entered and closed it. Scorched and aching, he climbed to the echoing upper stories of this building. Presently he looked out. His car had been wrecked in one of the smaller park areas of the city. Now there were other cars at two-hundred-yard intervals all about it. It was believed that he was in the brushwood somewhere. Besides the cars of the cordon, there were now twenty men on foot receiving orders from an authoritative figure in their midst.

They scattered. Twenty yards apart, they began to move across the park. Other men arrived and strengthened the cordon toward

which he was supposed to be driven. A fly could not have escaped.

Those who marched across the park began methodically to burn it to ashes before them with their blasters.

Calhoun watched. Then he remembered something and was appalled. Among the fugitives in the glade, Kim Walpole had asked hungrily if they whose lives he had saved could not do something to help him. And he'd said that if they saw the smoke of a good-sized fire in the city they might investigate. He'd had no faintest intention of calling on them. But they might see this cloud of smoke and believed he wanted them to come and help!

"Damn!" he said wryly to Murgatroyd. "After all, there's a limit to any one series of actions with probable favorable chance consequences. I'd better start a new one. We might have whittled them down and made the unwhittled ones run away, but I had to start using a car! And then they'd try to blame me for everything. So—we start all over with a new policy."

He explored the building quickly. He prepared his measures. He went back to the window from which he'd looked. He cracked its window.

He opened fire with his blaster. The range was long, but with the beam cut down to minimum spread he'd knocked over a satisfying number of the men below before they swarmed toward the building, sending before them a barrage of blaster-fire that shattered the windows and had the stone façade smoking furiously.

"This," said Calhoun, "is an occasion where we have to change their advantage in numbers and weapons into an unfavorable circumstance for them. They'll be brave because they're many. Let's go!"

He met the two ground-car loads of refugees with his arms in the air. He did not want to be shot down by mistake. He said hurriedly, when Kim and the other lean survivors gathered about him:

"Everything's all right. We've a pack of prisoners but we won't bother to feed them intravenously for the moment. How'd you get the ground-cars?"

"Hunters," said Kim savagely. "We found them and killed them and took their cars. We found some other refugees, too, and I cured them—at least they will be cured. When we saw the smoke we started for the city. Some of us still have the plague, but we've all had our serum shots." His face worked. "When we started for the city, another car overtook us. Naturally he wasn't suspicious of a car! We blasted him. Half of us have arms, now."

"I don't think we need them," said Calhoun. "Our prisoners are quite peacefully sleeping. They stormed a building where I'd fired on them, and I'd dumped some dextrethyl in the air-conditioning system. They keeled over. Later, Murgatroyd and I went in and made

their slumber more . . . ah . . . lasting with polysulfate. The few who weren't caught were . . . ah . . . demoralized. I think the city's clean, now. But we've got to get to the landing-grid control room. There are some calls coming in from space. I think the first shipload of colonists is arriving. I didn't answer, so they went in orbit around the planet. I want you people to talk to them."

"We'll bring their ship down," said the bearded man hungrily, "and blast them as they come out the exit port!"

Calhoun shook his head.

"To the contrary," he said regretfully. "You'll put on the clothes of some of our prisoners. You'll tell the arriving colonists that the plague hit you, too. You'll pretend to be one of the characters we really have safely sleeping, and you'll say all the rest have been bowled over by the plague that was sowed here to win the planet for the characters you're talking to. If they land, they'll die—or so you'll tell them. And so they will all go home, very unhappy, and they'll tell the public about it. And there will be no more shiploads of colonists arriving. We don't want them. If we persuade them to go home and not come back, there are fewer chances of unfavorable consequences to us."

The bearded man growled. But later he was one of the most convincing of the scarecrow figures whose images appeared in the vision plates of the ship overhead. He was especially pathetic and alarming. When he'd finished, there'd have been a mass mutiny of the passengers had the spaceship skipper tried to land them.

Later, all the fugitives were very conscientious about bringing the captive invaders out of the lethargy that had been begun by dextrethyl and reinforced by polysulfate. They enjoyed their labor, after Calhoun explained.

"They came in their own ship," he said mildly, "and it's still in the landing grid—which they repaired for us, by the way. And I've been aboard the ship with Kim, here, and we've smashed their drive and communicators, and wrecked their Duhanne circuits. We took out the breech-plugs of their rockets and dumped their rocket fuel. Of course we removed their landing boats. So we're going to put them in their ship and hoist them up to space with the landing grid, and we're going to set them in a lovely orbit, to wait until we've time to spare for them. Up there they can't run or land or even signal if another shipload of colonists turns up. They'll feed themselves and they won't need guarding, and they'll be quite safe until we get help from Dettra. And that will come as soon as the Med Service has told Dettra that it wasn't a plague but an invasion that seemed to take their colony away from them."

"But—" That was Kim Walpole, frowning.

"I'm bringing my ship to the

grid," said Calhoun, "and we'll recharge my Duhanne cells and replace my vision screens. I can make it here on rocket power, but it's a long way back to Headquarters. So I'll report, and a field team will come here from Med Service to get the exact data on the plague, and just how the synergy factor worked, and to make everything safe for the people the city was built for. Incidentally, I've a tiny blood-sample from Helen that they can get to work on for the bacteriology."

Kim said, frowning:

"I wish we could do something for you!"

"Put up a statue," said Calhoun dryly, "and in twenty years nobody will know what it was for. You and Helen are going to be married, aren't you?" When Kim nodded, Calhoun said, "In course of time, if you remember and think it worth while, you may inflict a child with my name. That child will wonder why, and ask, and so my memory will be kept green for a full generation!"

"Longer than that!" insisted Kim. "You'll never be forgotten here!"

Calhoun grinned at him.

Three days later, which was six days longer than he'd expected to be aground on Maris III, the landing grid heaved the little Med Ship out to space. The beautiful, nearly-empty city dwindled as the grid-field took the tiny spacecraft out to five planetary diameters and there released it. And Calhoun spun the Med Ship

about and oriented it carefully for that place in the Cephis cluster where Med Service Headquarters was, and threw the overdrive switch.

The universe reeled. Calhoun's stomach seemed to turn over twice, and he had a sickish feeling of spiraling dizzily in what was somehow a cone. He swallowed. Murgatroyd made gulping noises. There was no longer a universe preceptible about the ship. There was dead silence. Then those small random noises began which have to be provided if a man is not to crack up in the dead stillness of a ship traveling at thirty times the speed of light.

Then there was nothing more to do. In overdrive travel there is never anything to do but pass the time away.

Murgatroyd took his right-hand whiskers in his right paw and licked them elaborately. He did the same to his left-hand whiskers. He contemplated the cabin, deciding upon a soft place in which to go to sleep.

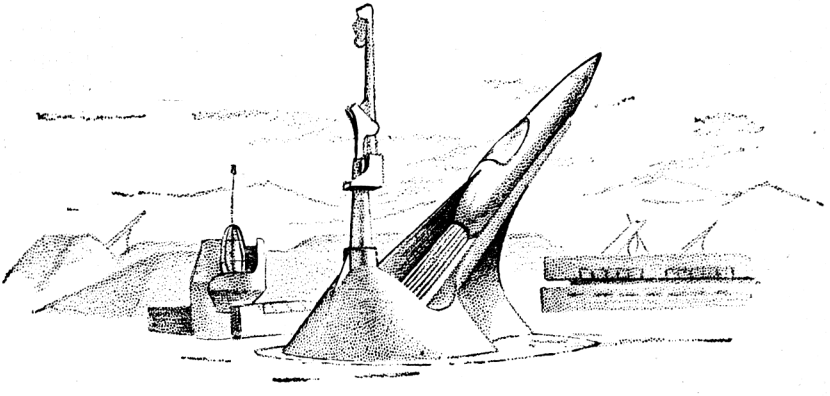
"Murgatroyd," said Calhoun severely, "I have to have an argument with you! You imitate us humans too much! Kim Walpole caught you prowling around with an injector, starting to give our prisoners another shot of polysulfate! It might have killed them! Personally, I think it would have been a good idea, but in a medical man it would have been most unethical. We professional men have to curb our impulses! Understand?"

"Chee!" said Murgatroyd. He curled up and wrapped his tail meticulously about his nose, preparing to doze.

Calhoun settled himself comfortably in his bunk. He picked up a book. It was Fitzgerald on "Probability and Human Conduct."

He began to read as the ship went on through emptiness.

THE END



BRING BACK THOSE MUSTARD PLANTS!

BY PAUL M. LEAVY, JR.

It says in most chemistry books that carbon monoxide is poisonous, but that carbon dioxide isn't. But it says in submarine experience — which is practically, from the atmosphere problem viewpoint, spaceship experience — that CO_2 is mighty poisonous; that it produces strange and deadly effects, even in relatively small doses!

Back in the good old days of space travel, around the 1920s, they had mustard plants on their spaceships; or at least the equivalent in some kind of living, broad leaf plant. They were used to remove the carbon dioxide from the air and to replenish the oxygen supply. Since, at that time, no contracts were being let for the production of rocket motors or space frames, no one took those designs too seriously.

After the recent revelations that submarines can stay submerged while going from here to there and back—not even surfacing to reenlist the crew—no one seems to take the need to revitalize the air too seriously. After all, a submarine is much like a spaceship. It is a sealed container with the inhabitants depending upon mechanical marvels for their every need.

The true complexity of submarines, with their myriad complex systems and miles of piping and thousands of valves and intricate precision equipment, makes it readily apparent that the minor problem of removing carbon dioxide from the air has long since been vanquished—or at least, so it is assumed.

Submariners in the United States proudly wear the title "The Silent Service" and since there are exceed-

ingly few other successful submarine fleets about the place, real factual information on the subject is actually quite scarce.

If you should happen to be a submariner living in a sealed steel tube for exceedingly long times, as I have done, and if the effects of carbon dioxide begin to bother the vessel—as they may have done—you may find that the sparsity of information is exceeded only by its original inaccuracy.

In the process of pointing up a few inaccuracies in the then existing "Bible" for submarine carbon dioxide removal, I looked briefly into the problem. Since my own brief look was taken a few years ago, and I am now somewhat separated from submarine and the Navy by my civil endeavors, I can now present a picture which undoubtedly has been improved recently, but is one that, in the words of a learned, highly technical report, is ". . . until recently a neglected scientific field." The field under discussion is the toxicity of low concentrations of carbon dioxide.

A look at almost any handy reference work will quickly tell you that exposure to carbon dioxide gas in concentrations of four to five per cent, or greater, results in narcotic poisoning and ultimate death for long exposure. Normally the carbon dioxide content of the air is less than oh point one per cent so that no undue fear need be felt. It takes a little doing to increase the supply in the air fifty fold.

There is, however, a more subtle aspect of carbon dioxide's effect upon the human body which is not too generally understood. This subtle effect is seriously considered to be a contributory factor which ultimately helped the allies to sink hundreds of German submarines.

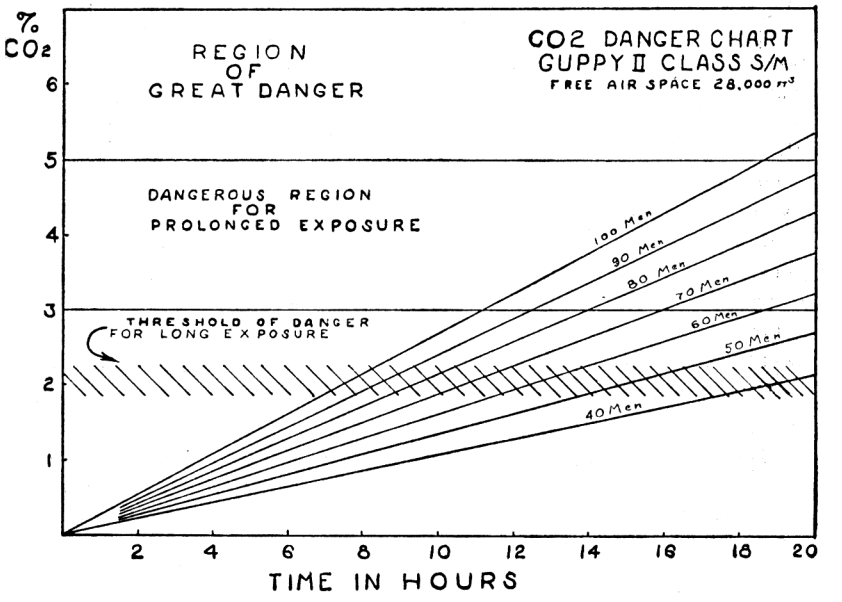
Fortunately for the United States, our submarines fought a different war in the Pacific than the Germans did in the Atlantic. The United States submarines never had to face the problem of this invisible enemy. The Germans recognized the problem correctly enough and spent notable effort to overcome this additional foe, but they were too late in their efforts to accomplish any real good.

This same invisible enemy will create the same problems aboard a spaceship that it did to the German submarine fleet. This invisible enemy is the toxic effect of low concentrations of carbon dioxide when breathed for prolonged periods of time.

To begin with, a brief discussion of submarine carbon dioxide removal systems in use a few years ago, may be in order. In general, they may be especially noted by their conspicuous absence on United States submarines and their relative crudeness in the submarines of other navies. In essence, the air is passed over an alkali material and the carbon dioxide is pulled from the air by the hungry alkali, which then relaxes in the carbonate state.

In United States submarines, rather than inflict one more mechanical marvel upon the overburdened crew, the carbon dioxide removal "system" consists of pulling the top off a sealed container of alkali material such as lithium hydroxide and spreading the dusty powder out on a piece of cloth laid flat on a bunk —taking due care all the while to keep the dust out of the eyes. Very long arms help to do this. Normal air circulation will soon cause a drop in the overall carbon dioxide content, especially if the bunk selected is in a good location—low down in the middle of the boat or at both ends. After stirring this pile of dust regularly and patting it gently from time to time to see how warm it is, the whole mess is carefully dumped back into the stainless steel can from whence it came, when it ceases to be warm. This process is repeated as often as desired.

Since lithium hydroxide in perfectly sealed stainless steel cans is expensive, the system used is one way to avoid wastefully squandering a valuable item. It is kind of sloppy, everyone will grant that, but was perfectly satisfactory for the degree of use required by United States submarines during the last war. Only one or two complaints were registered in over a thousand submarine patrol reports. (You don't count the ones that don't come back.)



Actually, the rate of production of carbon dioxide is such that it takes over half a day to reach a three per cent concentration of carbon dioxide inside a submarine. See Page 113 if you are curious. Usually after half a day submerged, a submarine will normally surface to charge batteries. The outside air soon flushes out the boat and the sub is ready for another half a day or so of submerged time. Snorkle-equipped boats merely stick up the pipe, but none the less, they take in fresh air at least twice a day. (In war time a submarine must keep her battery nearly fully charged at all times for possible attack.)

Since the Japanese antisubmarine vessels did not normally make prolonged attacks against our submarines, but usually gave up after a few hours or a half day, no real hardship, carbon dioxidewise was created. Fresh air was quickly available to flush out the boat and remove carbon dioxide as well as a few other gases—stibine, arsine, hydrogen, hydrocarbon vapors, miscellaneous odors, et cetera. As a matter of fact, most United States submarines spent ninety to ninety-five per cent of their time on the surface, submerging only when necessary to avoid detection or to deliver a daylight attack. At night they attacked on the surface, relying on superior radar and low silhouettes for tactical advantage.

Present snorkle submarines, while fully capable of, and usually preferring to stay completely submerged for long periods, such as thirty to forty days, are always using outside air for the engines and the crew to breathe. The periods when a submarine is fully sealed off from the outside world are normally less than a half day long. After that long a time, it is convenient to look around and, among other things, find out where you may happen to be. After all, in some areas, the currents may be faster than the submarine's average submerged speed. While this is going on, the air may just as well be changed for lack of anything better to do with it. Even atomic submarines have a snorkle pipe for bringing in outside air and expelling used air from time to time.

The purpose of the previous, rather long-winded discussion of submarine operation, is to dispel the notion that the submarine is sealed off for long periods of time. It has not been the past custom and it is not likely to be changed particularly in the future, since a submarine must look about from time to time to admire the view, catch up with the baseball scores, count stars or do other similar chores.

The German submarines had a different problem. Allied antisubmarine attacks were prolonged affairs —lasting as long as the attacking ships could be spared from other places—attacks lasting three and even four days were recorded. A certain evidence exists here for the silent, manual, carbon dioxide removal system.

These prolonged attacks subjected the German submarine crews to levels of carbon dioxide high enough to allow the carbon dioxide to get its dirty digs in when not too much could be done about it—especially since the German carbon dioxide removal system was not noticeably silent when operated. The design oversight cost many a U boat dearly.

Now to get down to the meat of the case.

There are two gaseous oxides of carbon-one noted for its dangerous effect, the other, rather ignored.

Carbon monoxide is an odorless, colorless gas, explosive when mixed with air. It is highly poisonous since it combines with the oxygen-hungry hemoglobin of the blood in a permanent fashion, so that the blood loses the ability to carry needed oxygen to the vital tissues. The organism therefore weakens and, if enough hemoglobin is so "fixed," it dies. It is cumulative in effect over a moderate period of time since the body does not manufacture new red blood cells at a very rapid rate. Breathing small, nontoxic doses each day will ultimately result in carbon monoxide poisoning. It is, therefore, quite insidious, and a good many city dwellers probably suffer from carbon monoxide poisoning to a mild degree without realizing the source of their weakness.

Carbon dioxide is the friendly fizz of the soda bottle and the pop of the champagne cork. It is the handy servant of the all-purpose fire extinguisher and the life-jacket inflater. It also is odorless and colorless, but is a heavy gas, twenty-two times as heavy as hydrogen and for that reason, carbon dioxide fire extinguishers work well. It forms a blanket of oxygen-excluding gas at the base of the fire and the fire suffocates the same as a man at the fire's level will also suffocate when the region is full of carbon dioxide gas. This is usually the extent of the generally accepted belief in the danger of carbon dioxide. It is a smothering agent in high concentrations.

It is certainly that and more. In lower concentrations of four to five per cent, when mixed with air for breathing, it is also a narcotic poison with fatal results for moderate exposure for susceptible people—fatal results for long exposures to not so susceptible people. And, though I hate to admit it, there are a few, rare, individuals who do not appear to be inconvenienced by four to five per cent carbon dioxide.

However, since lower concentrations were not noticeably toxic in day-long or two-days-long experiments, it was mistakenly believed that lower concentrations, say three per cent or less, were not harmful to the human organism. The German submarines did not find it so.

In carefully conducted field experiments and in detailed laboratory investigations, the biphasic effect of carbon dioxide has been carefully observed over prolonged periods of time. It is this prolonged exposure

effect which is dangerous and which is contrary to the results to be expected from short-duration experiments.

For instance, it is generally known that the addition of carbon dioxide to low oxygen mixtures has a beneficial effect in alleviating the symptoms of oxygen lack in humans and in preventing their occurrence. This could lead to the easily formed idea that submariners, or spaceship crewmen, were fortunate in having increasing carbon dioxide go hand in glove with decreased oxygen supply. For the short-time view, it is true.

This helpful effect is based upon the stimulation of respiration and circulation by carbon dioxide which results in an increase in tissue oxygen tension. In fact, in short duration experiments, two to four per cent carbon dioxide in the inspired air will help to maintain blood pressure with low oxygen concentration. In real life, however, it is different. In a submarine, as carbon dioxide goes up to two to four per cent and oxygen goes down to sixteen per cent, blood pressure drops in almost all people tested.

The confusion concerning the effects of carbon dioxide is caused by its biphasic nature.

For the first three days of exposure to low carbon dioxide concentration—three per cent—the effect is one of stimulation. During this time, however, the body is adapting itself to live in this new environment. After about three days the physiological adaptation is completed and a state of depression exists.

The stimulus phase is characterized by a feeling of excitation, a feeling of improved efficiency, and a general inability to sleep well. While this state of euphoria or false well-being exists, the actual ability to concentrate and to co-ordinate decrease quite noticeably.

During the depressed period the subject is aware of his loss of attentiveness and of a poor memory. He is not aware, however, that his supply of blood to the skin has been increased at the expense of other tissues. This increased supply of blood to the skin results in greater heat loss and, therefore, the need to oxidize more carbon to make up the loss. Since his ability to consume oxygen is also impaired, in northern latitudes, he gets cold and stays cold. A true vicious circle is set up.

The subject's circulatory system no longer responds well to exercise. His blood sugar level decreases and the ability to produce adrenalin drops markedly. This particular part of the adaptation to low carbon dioxide almost eliminates the normal emergency reaction of increased strength and energy. The alkali reserve of the blood increases. The electroencephalograph reveals a characteristic temporary change in the normal brain-wave patterns. The subject feels continually in a state of waking up.

To illustrate the type of action

prolonged exposure to low concentrations of carbon dioxide can produce, the following examples are given:

A German U-boat engineer repeatedly dropped hammers, wrenches and other tools on the steel deck plates. The resounding banging and clanging, which can easily be detected by searching antisubmarine vessels, was quite hard on his shipmates. Since he was risking his own neck, it does not seem likely that it was deliberate. After the war he became a watchmaker so that the likelihood of plain clumsiness seems improbable. The observing medical officer made particular comments on the remarkably dull, or stupid, expression on the man's face. This dull expression was never observed under normal air conditions when the man was ashore. It is probable that this particular man was a little more susceptible to carbon dioxide than the average, but not exceptionally so.

A more typical reaction is shown by a pair of watch officers. They were particularly noted for their bad voices and their normal reluctance to sing. After prolonged exposure to carbon dioxide, they insisted on singing duets during their long periscope watches. This also was hard on the nerves of their shipmates.

Table I: Estimation of CO_2 production, weight of alkali canisters needed for CO_2 absorption for various periods of submergence on a German fleet type submarine.

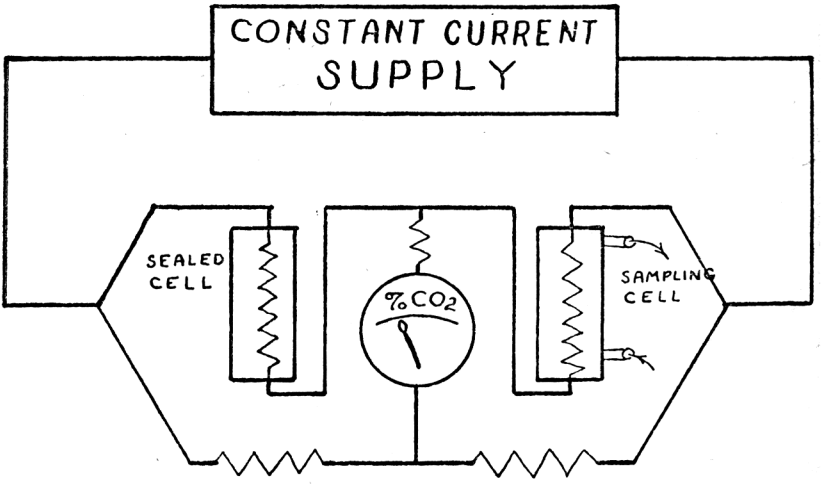
Air volume of boat 500 m^3. Crew 50 men.
Mean CO_2 exhalation per man and minute 350 cc.
CO_2 absorbing capacity of one alkali canister 400 liters
Weight of one canister 2.5 kg.

After	1	4	8	12	16	Submerged hours
Total CO_2 produced (liter)	1050	4200	8400	12600	16800	
CO_2 content in per cent	0.21	0.84	1.68	2.52	3.36	
Alkali canisters needed		10.5	21	31.5	42	per calendar day
for absorption of all the CO_2		525	1050	1575	2100	for 50 days
Weight of		26.25	52.5	78.75	105	per calendar day
these canisters in kg.		1312.5	2625	3937.5	5250	for 50 days

The observing medical officer noted queer ideas—carefully unstated—in his own mind and said later in his detailed report, "Under these conditions—prolonged exposure to low carbon dioxide concentrations—the keenness of mind remained altered, and I am able to state at any rate that the process of thinking does not progress in normal paths."

We now have a picture of the spaceship crewman whose carbon dioxide removal equipment is a "little below par" but is working well enough to keep the carbon dioxide level below the poisonous four to five per cent level and in the two to three per cent region.

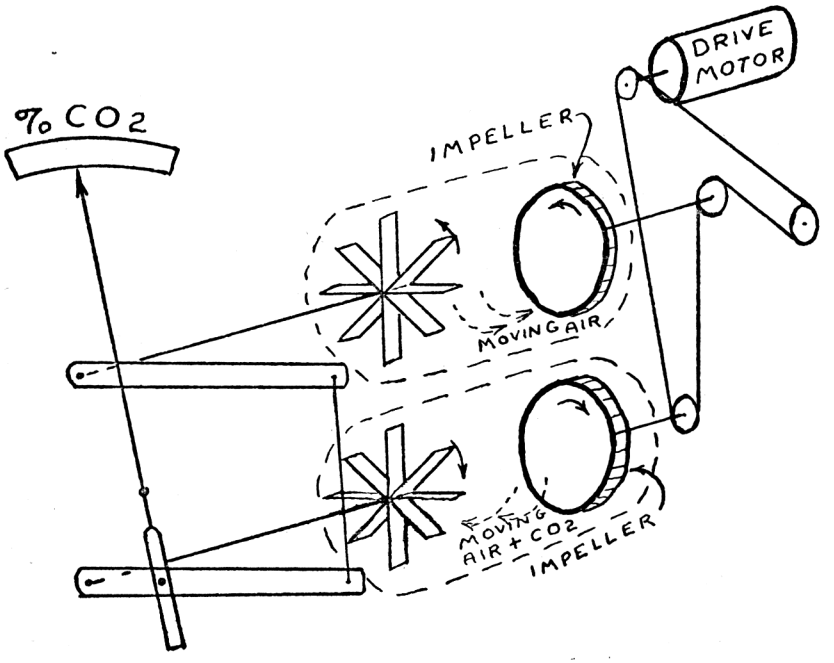
He is a sleepy looking and acting individual even though he actually can't sleep well. He can't concentrate. Strange thoughts run through his head. He is clumsy and poorly co-ordinated. He is cold and slow moving. His ability to respond to an emergency is nonexistent.



ELECTRICAL CO_2 METER

Our spaceship crewman is hardly the clear-eyed, clever, composed, quick-witted creature we expected. He is not the man he was when he started. But suppose that this thick-headed, dull-witted creature realizes the dirty trick his carbon dioxide removal machine has played on him and is eventually able to repair it after a couple of weeks of faulty operation. Will this cure him right away? Not on your tintype, it won't. If his gadget has been out of order for a couple of weeks before our hero could fix it, after its repair he will still be the same blear-eyed dolt until another week or two has gone by.

The condition, physiological adaption to carbon dioxide, takes a while to arrive and it takes nearly as long to depart as the total exposure period. This is a cheerful thought which is not likely to make



MECHANICAL CO_2 METER

our hero feel a bit better about the whole thing.

A natural question is, what happens if we carry some chemical carbon dioxide-removal material for these emergencies. The weight aspect is shown in Table I, and the general comment that if submarines can't carry much, spaceships can carry even less, may cover it adequately. Unfortunately though, once the initial adaptation period of about three days has been completed, breathing low carbon dioxide concentrations *intermittently* will maintain the condition of adaptation. The victim must have many days of pure, sweet, fresh air to adapt himself to his normal environment again.

What can be done? Well, the diagrams included are for those who are inclined to figure a little just to see "what if . . ." And, of course, there are all kinds of carbon dioxide-removal devices possible. For instance, you could compress the air, cool it sufficiently so that when it is expanded to room pressure, the carbon dioxide will liquify out or perhaps even freeze out. Of course, the cold air will have to be reheated, positive cooling must be provided for, inspection and repair must be provided for without loss of carbon dioxide removal ability, so some parts may have to be in duplicate . . . hm-m-m, sounds kind of heavy for a spaceship.

Well, you could pass the air through an organic dye or complex chemical solution that will absorb carbon dioxide under one condition and will give it up under another condition. Sounds more likely, but we must be certain that this reversed hemoglobin type stuff doesn't get poisoned by some unexpected event aboard the craft. Carbon monoxide can do it to people. Perhaps cosmic ray bombardment may bother this stuff.

A clever fellow can imagine merely a piping system allowing air to radiate its heat away on the shady side of the vessel and carbon dioxide to condense in the cold pipes. The air reheating can be done on the sunny side. It had better be designed very carefully to be free from clogging up, and orientations of a vessel are possible where almost all sets of coils would be on the sunny side. Inventing devices of varying complexity is no problem, insuring absolute reliability is a little tougher.

Carbon dioxide sensing systems are available. One type utilizes the differences in thermal conductively between carbon dioxide and normal air. Heated wires in a Wheatstone Bridge circuit are checked for variations in resistance. One wire radiates its heat in a sealed cell through normal air and comes to an equilibrium state and a fixed resistance at some definite value. The other similar wire radiates its heat in a similar cell which has air contaminated with carbon dioxide passing through it. The greater thermal conductivity of the carbon dioxide gas carries away a little more heat, the wire varies

its resistance and settles at a value different from its reference counterpart. If the galvanometer is balanced for no deflection when air is in both cells, then the later galvanometer deflection caused by carbon dioxide in one cell can be translated directly into carbon dioxide content.

Another type of indicator depends upon the weight differences between normal air and air with carbon dioxide. Basically, a stream of air is blown against an impeller which rotates in an opposite direction to an impeller against which a similar stream of suspected air is blown. The difference in torque produced by the two impellers is a function of the carbon dioxide content. These two types of equipments, mechanical and electrical, can be indicating and recording to provide a check on what has been transpiring.

Chemical devices based upon the color change in litmus or ph sensitive solutions can be used as a rough, quick check against the state of affairs. In this kind of unit, a sample of suspect air is bubbled through a tube of indicating solution. The color change is compared either to a printed color chart or against a little rack of sealed tubes of different colors representing the expected color for different carbon dioxide concentrations.

A more accurate chemical device utilizes the carbon dioxide absorption qualities of an alkali solution. A washed sample of air is placed in a space of known volume. The alkali solution is sponged through the air a few times, the decrease in volume of the sample is the measure of the carbon dioxide content.

Just out of curiosity, I wonder how much the failure-free carbon dioxide removal system and the measuring, recording system would weigh? Hm-m-m . . . well, you could always use mustard plants or add on a greenhouse.

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THE END

LOVE STORY

***The hardboiled** old military commander had no respect for this sloppy, sentimental stuff, love...he kept saying!*

BY ERIC FRANK RUSSELL

Illustrated by van Dongen

General Romaine growled irefully, "The trouble with the fighting forces today is that they're no longer wholly in the hands of military leaders. They're bewitched, bothered and bewildered by vote-catching politicians, sentimental mammas, psychiatrists, psychologists, physiotherapists and a horde of other pulse-takers, muscle-pinchers and bump-feelers."

"You may be right," agreed Harding, recognizing the other's need to blow off surplus steam.

"I *am* right. A soldier isn't a soldier any more. Not like he was when I was young. He's something else now, a mess of repressions, inhibitions, complexes and all sorts of juvenile tantrums that once we cured quite effectively with a hearty kick in the pants."

"You may be right," repeated Harding, automatically.

"I *am* right," asserted Romaine. "Terra is rapidly going to the dogs. Some day we'll be taken over by a life form with more virility and plain horse sense. It will serve us as we deserve."

"Oh, I don't know," Harding ventured. "The Pharaohs thought the world was tumbling headlong from bad to worse. They inscribed dire prophecies upon their temple walls. After me, the deluge. Gaze on my works, ye mighty, and despair."

"Hell with the Pharaohs," snapped Romaine. "They've been dead ten thousand years. I'm talking about today, the here and now."

"What's gone wrong?" invited Harding. "Anything I can do to help?"

"No." Brushing aside the high stack of papers on his desk, Romaine scowled at the resulting space. "We've opened up a complete system in the region of Sirius. So we've got to establish ourselves there with minimum of delay. That means we must plant a permanent garrison upon the six worlds we've claimed. You'd think that would be easy, wouldn't you?"

"I don't see why it should be difficult."

"Twenty-five or thirty years ago it'd have been no trouble at all. Today things are different. We have progressed, see?" He let go a short, harsh laugh. "Progress, they call it."

Harding offered no comment.

"So I order the transfer of three regiments of the Centaurian Guard, eighteen thousand men in all. In days gone by they'd have jumped to action complete with ships, stores and all equipment. In jig time they'd have settled down to being the new Sirian Holding Force. But what happens now?"

"You tell me."

"There's a lot of bureaucratic delay while three thousand eight hundred forty-two men claim protection from the move on the grounds that they're married, have wives, families and homes rooted on Centauri. About eleven hundred more plead for elimination from the drafting-list because they're engaged and soon to be married. Politicians,

psychiatrists, religious leaders, psychologists and other nonmilitary types uphold all these claims. Love, they say, is a biological necessity and the family is the foundation-stone of society."

"Love is natural enough, isn't it?"

"Natural for the landbound lugs," asserted Romaine, raising his voice. "Spacemen are different. Their only devotion is to the cosmos. They're a dedicated profession."

"That's a mighty hard way of looking at it," Harding offered.

"It's the proper way. The men of the Centaurian Guard signed on to serve Terra faithfully and well no matter where they may be sent. They signed with their eyes wide open, knowing what they were doing, knowing it meant personal sacrifice. I've no time for the whining lout who makes a legal contract and then tries to evade his responsibilities."

"But surely we can dig up enough single, unattached men to serve as replacements?"

"We can—after wasting valuable time. But that's not the point. The point is that the Centaurian Guard should obey orders promptly, without question. Once upon a time it would have done so. Today we get all this stuff about love and family obligations and biological necessities." He paused, spat out, "Love—it makes me sick."

"The Terran Government encouraged marriage in the Centaurian sector," Harding pointed out. "You can't maintain permanent grip on a world by populating it solely with fighting men. You've also got to have women and children."

"The problem could have been solved by boosting civilian emigration from Terra," Romaine retorted. "That would have left space-troopers free to do their proper job, untied, unhampered. From the military viewpoint a trooper burdened with a family is a gone goose. He's just no use as a fighting unit." He jerked an indicative thumb at the big stack of papers. "And there's the proof: letters giving the names of men who mustn't be shipped Siriusward. They're all unfit for drafting, being contaminated by love."

"Well, I see what you mean," said Harding, "but I can't say I agree with you."

"Why not?"

"I suspect you might talk differently if you had been married yourself."

"You do, do you? I've got news for you: I've had both the opportunity and the desire."

"But did nothing about it?"

"No, certainly not. Duty comes first. Love and space-service don't go together. They're completely incompatible. When a spaceman gives way to the pangs of love the rot has set in. Show me a trooper riddled with sloppy sentiment and I'll show you a guy who is no use on the star-trails."

"That's a sweeping statement."

"Love," declared Romaine, warming to his theme, "is not a word in the true spaceman's vocabulary. It

belongs to a life he has repudiated, as if he were a monk. The fellow who thinks of it is endangering his own vow to serve. Maybe it's an old-fashioned viewpoint, but it's a good one."

"So all your life you've kept love at a safe distance, eh?"

"I have."

"Every form of it?"

"Every form no matter what."

"Then," said Harding, "I'd like to see your reaction to this love letter." He flipped hurriedly through the pile at the side of the desk, extracted a missive, passed it to the other. Then he lay back and watched interestedly as Romaine frowned over it.

Sirian Force Assembly Center
Centauri

My General:

I don't suppose you remember me. Thirty-two years ago we enlisted together, you as an officer, I as a private, but there were a lot of us that day.

Since then I have seen the Centaurian Guard grow and develop from a small cluster of frontiersmen to a great military body of much pride and many battle honors.

It has been a wonderful privilege to serve in the Centaurian Guard. All my adult years have been given to it gladly, without stint. It has been my life and my only true love.

Now see the trap into which I have fallen. I am willing to go anywhere and because of that I have been transferred into something called the Sirian Holding Force.

General, they have taken away my helmet-badge, the silver horse of Centauri. I have never asked much of life . . . only that I should be allowed to wear it to the end of my useful days . . .

(Signed)
Rafael Amadeo. T/Sgt.

"I think it's rubbish," declared Romaine, very loudly. "Utter balderdash!" He dumped the letter on the desk.

The other shrugged, strolled toward the door.

"Harding!"

He halted. "Yes?"

"Are you concealing the belief that I am a stinking liar?"

Harding hesitated, said, "I know you are."

"Dead right," said Romaine. He grabbed his desk-phone, dialed, said to someone, "1914778 T/Sgt. Rafael Amadeo will be retained in the Centaurian Guard as a permanent instructor. Request his commanding officer to report on his suitability for a commission." He planted the phone, glanced up, rasped, "Well, why are you looking at me like that?"

"Love," informed Harding, "is a remarkable thing."

Romaine bawled, "Get out of my sight!"

THE END

BEAST OF PREY

There are two general types of unknown dangers; the unknown danger in a known thing, and the known danger whose source is unknown. The latter is, of course, far worse....

BY JAY WILLIAMS

Illustrated by Freas

The little party came through the air lock bearing a limp figure on an improvised litter.

"Who was it this time?" Fenner asked.

Gorsline pulled off the transparent hood that covered his head and face, and unzipped his suit. He dug his fingers wearily into his eyes.

"Bodkin," he said. "Same as the others." He turned back to the group. "Get him right to the infirmary. Not that it'll do much good," he added, in an undertone, to Fenner.

Fenner sighed, glancing at Bodkin on the litter. Behind the plastic protection of his mask the man's face was a dark purple; his chest rose and fell spasmodically and there was a faint line of foam on his lips.

Gorsline slipped off his suit, and put it over his arm. Then he and Fenner walked together up the ramp to the Common Room.

"I need a drink," he said. "And a smoke. It's awful not being able to smoke out there."

"You should cultivate Aristotelian moderation," Fenner said, with a grin. "It is far wiser in a Planet Biological Survey Station."

"Moderation didn't do poor Bodkin any good." Gorsline threw his suit into a corner and touched the stud on the dispenser. A lighted cigarette dropped into the trough. "Make me a drink, will you, Luke?" he asked, dropping into a reclining chair.

Hagen, the chief of the Station, came bouncing through the iris, walking as usual as if he had springs under his heels. He was a little plump man with a goatee, which he was tugging in a sort of ecstasy of exasperation.

"Hello!" he cried. "Ha, Fenner. Listen, Gorsline, I've just seen Bodkin. This is dreadful. Three in one week!"

"I agree," Gorsline said, taking the drink Fenner had made for him. "Let's pack up and go home. Shall we?"

Fenner relaxed on the middle of his spine in an easy-chair, and folded his hands together, peering over them at the chief who sat down and stood up and sat down again. You'd never know that man was a capable organizer, he said to himself. Astonishing how people can betray their own appearances—seldom what they seem. Aloud, he said, "Excuse me, Hagen. I want to ask Gorsline—did you see any animals nearby when it happened?"

Gorsline shook his head. "I remembered what you said, but I didn't notice anything at all. It was just the same as in the other two cases; well, almost the same." He drank and sat upright. "We were in Area B, you know. Bodkin was taking a series of photographs of the pollination of those red flowers by *leptorrhinus*. Hakim and I were digging up bulbs and collecting the larvae that live at the roots—you know the ones I mean?"

Hagen nodded. "Go on."

"Let's see. Staines and Petrucci were taking soil samples. And Bon-

dieu was chasing what he likes to call butterflies. It was very quiet. Those tall plants were just hanging limply. I remember Hakim saying, 'If we were home, I'd say we were going to have a storm.' I said something like, 'It'd be nice to see grass again for a change, even in a storm.' About that time, Bodkin got up and walked away from his cameras. I said, 'Where are you going?' He didn't answer. He took his head in his hands, and stood still, and I knew immediately what it was. But before I could get to him he collapsed."

"Did you look for insects?" Fenner asked.

"Yes, we thought of that at once. We looked to see if any of the *leptorrhinae* were on him, or any other bugs. There wasn't a thing, not a mark, not a sting or a puncture. Nothing."

He stopped and drew a long breath. "Well, then I thought about animals. I asked Bondieu—he'd been running around, after all. He said he thought he saw the oil-bushes moving, but he couldn't be sure. I set Staines and Petrucci to beating the bushes, but nothing turned up. I thought, then, if we could get Bodkin right back something might be done for him."

Hagen nodded slowly. "Quite right."

As Gorsline had been talking, the others had come in and now Hagen turned to them. "What about Bodkin?" he asked.

Bondieu, the tall, thin, gloomy-looking entomologist, said, "Not much hope, I'm afraid." He tapped his head. "The doctor says he's gone, like the others. Alive, but empty."

Fenner sat up abruptly and slapped his hands together. "I'm certain I'm right," he said. "It must be some sort of animal. The fact that you didn't notice anything doesn't mean a thing; any hostile animal would be exceedingly cautious and probably carefully camouflaged as well. The one thing you noticed—that it was so quiet—seems to me to indicate that *something* was prowling nearby."

"That is so," said Gorsline. "You remember, Hakim, there were no bird calls, no rustlings, none of the amphibians cheeping."

Dark-faced Hakim nodded.

Fenner went on, "I've said this before, and I'll say it again. It is possible—just possible, mind you—that this mental paralysis represents an emanation of some kind from a predator, a method of paralyzing its prey before attacking. Wasn't Bodkin off more or less by himself, away from the rest of you?"

"That's right," Gorsline said.

"And the same was true of Lermontov and Parson, both of them were alone, or at any rate, a little apart from the rest."

He got to his feet. "I'll tell you one more thing I've noticed, on my own field trips, not only in areas A and B, but also in the bush. You're familiar with this, Bodkin, you were with me all four times.

But I haven't told you yet, Hagen. Those large banks of red flowers always grow near marshy areas. The marshes are thick with those furry reeds, the ones that look like giant bulrushes that have opened their seed pods. I have found two things: one, numbers of bones and exoskeletons among the flowers and the reeds, and two, in one place, in the mud, a definite mark as if a heavy body had rested there. There was a scent-spoor; the tracker confirmed it."

Hagen twisted the point of his goatee between two fingers. "This is hardly proof of anything," he said. "Now, one minute. I agree, it's interesting and provocative. Was the spoor fresh? It was? Well, it gives us something to think of. We have no definite indication, however—"

"No, of course not," Fenner said impatiently. "But we can't go on this way, losing a man almost every time we send out a party. We'll be afraid to set foot outside, after a while. And how the devil can we study ecology under these circumstances? We've got to *know* what we're up against."

Hagen stood up, too, and suddenly his wiry little body assumed great poise and authority. "Let me think about this," he said. "We'll have a meeting tonight of the entire Station personnel, and we'll discuss the matter. But I want time to consider all the aspects of it."

He went to the iris. "I want to look at Bodkin, too," he said. "Take it easy, gentlemen."

There was a short silence after he had left. Then Gorsline, looking speculatively at Fenner, said, 'Luke, if you're right—you know, it's interesting that in the month we've been here we haven't seen a single large animal, not one larger than a rabbit."

"That doesn't mean much," said Hakim. "Imagine a Station being set up in, say, Sussex. In one month —barring the animals that go with civilization—you would hardly expect to find anything larger than a fox. And nowadays you'd be hard put to it to find a fox, at that."

"Not quite apt, Hakim," Fenner said. "Because in Sussex a larger predator—Man—has cleared away all his lesser rivals. Is it possible that something has swept this region clean, and perhaps only a last few survivors are now hanging about? Perhaps they're delighted to have us visit them, eh?"

He cracked the knuckles of his long, bony fingers, and strode restlessly to the iris. "I'm going to think about it, too," he said.

Gorsline, as if with a sort of clairvoyance, said, "Don't go jumping into things, Luke."

"No, no, of course not."

Fenner went out into the corridor. There was a faint odor of pine that blew from the air conditioner, and contrasted oddly with the almost hospital bareness of the hall. He walked down to his own room, musing, and glanced through the

large window at the Orphic landscape.

As the Station's head ecologist, it was his duty to evaluate a great many aspects of the survey which might not be apparent even to the chief. For instance, assuming there were such a predator in the neighborhood, what might be the probable results of trying to exterminate it? Or what was its relationship to a region in which there were so many winged creatures — "birds," they called them for the sake of simplicity, although they were actually flying marsupials and some very large insects—and so few ground animals that might serve as its prey? Was it itself winged, or, he asked himself, did its mind-paralyzing ability serve to pluck birds out of the trees?

He stiffened. Even while his mind had been busy with the subject, he had been automatically scanning the view with the involuntary precision of his profession. From the Station, the cleared ground sloped away to a cluster of tall tree-ferns whose upper branches, long and drooping like greatly oversized date-palm fronds, brushed the mossy earth. And among those branches Fenner had seen something long and glossy move swiftly.

All his attention focused at once on that spot. In the same instant, he whipped out the tiny binoculars he always carried in a side pocket, and put them to his eyes.

There was no doubt of it, something was crouching in the shadow of the fronds. He had difficulty making it out, for it was a pale blue-green, but he had an impression of a heavy head and shoulders, and what appeared to be, incongruously, a bunch of feathers.

"Feather crest?" he thought to himself, with a grin. "Indians?"

The creature moved again. It slid sinuously out of the shadows and crouched on the moss. Its color then changed to a darker green dappled with brown. Fenner saw through the glass that the bunch of feathers was a pair of antennae, similar to those of the larger moths, that sprang from the top of its narrow head. It had short legs and a slender body covered with short, fine fur. The general effect was that of a smallish mountain lion.

As he watched, the creature turned on its own length somewhat as a snake might turn, and glided out of sight over the edge of a ridge.

Fenner did not hesitate. Without a second thought, he snatched up his plastic suit and zipped it on. The air of Orpheus was breathable, but the suits had been designed to prevent contact with possibly poisonous spores, pollen, plants, or insects. He took down a Remington which was capable of delivering a bolt sufficient to stun a bear at thirty yards; his intention was to capture the beast for study, not to kill it. He also clipped to his belt a Mark III collecting net, a light, strong, fine-mesh net in a capsule the size of an old-fashioned hand grenade. Then he let himself out the side lock and ran

quickly across the moss towards the spot where the beast had vanished.

The moss was crushed and flattened where the thing had lain, and he touched the selector of his wrist tracker and held it over the spot. The scent-cell glowed, and the tiny needle swung over to point. Fenner followed it over the ridge and down the hill on the other side.

The forest began at the foot of the hill, and beyond, looming above the foliage, were the peaks of distant mountains, hazy in the faintly greenish air. Somewhere beyond those peaks the Archeological Survey was at work, and there was something comforting and neighborly in the thought.

The light was always crepuscular here, and because of the color of Orpheus' sun, the sky had a green tint as of a summer pool. This green, against which the dark brown moss and lighter colors of the trees shimmered like waterweed, was extremely restful and yet alien so that in four weeks Fenner had not been able to accustom himself to it. He felt always as if he were walking in a dream, as if his limbs were weighted and languid, although in fact the purity of the air made him feel more vigorous than ever before in his forty-five years.

He entered the forest which here was composed chiefly of a gray-stemmed tree, very slender and rigid

with a crown of glossy red-brown leaves. The tall boles rose straight out of the moss, and there was little underbrush so that it was almost like a planted park. The needle of the tracker led him on a winding course but he was not afraid of becoming lost for if by some mischance his homing compass, which was always set for the Station, should fail, he had only to follow his own footsteps back with the tracker.

The trail led for half a mile or so through the gray trees. Now and then one of the long-tailed "birds" flashed like a shining jewel across some cleared space, the yellow-green sunlight glistening on its fur. Once in a while, a giant jointed thing, like a centipede, fluttered lazily past on wide, scaly wings. From the treetops came whistles and hoarse calls. He came at last to the bank of a rushing stream and the needle halted. The beast had taken to the water.

Fenner decided to cast up and down the bank for a little way, in case it had come out on the same side again. He had walked only a short distance, when suddenly he had the distinct feeling that he was under observation. He glanced down at the tracker. The needle had swung over to the right.

He turned slowly in that direction, at the same time cautiously raising his gun. In the corner of his eye, movement flickered. He braced himself and tapped the firing button. A halo of white light surrounded the muzzle, and there was the dull "crump!" of the discharge. He saw a flurry in the leaves of the oil-bushes that grew here and there among the trees. Leaves and bits of branches flew. A mottled gray and brown shape darted like a streak away between the trees.

Fenner ran after it. He began to pant for breath, and sweat dripped into his eyes. The trail led upstream, now, and soon the stream grew more sluggish and broadened, and the gray trees thinned away. There were dank, twisted plants here, some of them eight or ten feet high, and wide stretches of reeds between which gleamed brown water and patches of oily mud. A chorus of chirps sounded from the marsh, dying away at his approach and starting again when he moved on.

Without warning, the needle of the tracker spun round, and Fenner stopped. At the same instant, a lithe form shot out of the reeds towards him. He dodged, throwing himself to the ground. The beast bounded past him, and turned. Fenner rolled over and sat up, groping in the moss for his gun. For a moment they regarded each other, Fenner trying to bring his gun into position. The creature, he saw, had a wedge-shaped face, narrower at the top where the feathery antennae were, wide at the jaw which now gaped showing a double row of small but sharp teeth. Its eyes were round and large, and bulged as a frog's do; they were completely dark purple showing no trace of white. They

swiveled forward to stare at him, and as he braced his weapon the beast made a coughing sound and sprang into the reeds.

All was quiet again. Fenner got up slowly, holding his gun ready, and glanced at his tracker. There was a crack across the face of it, and the needle was motionless. It had struck against a stone, when he fell.

He tried to see into the reeds, but he knew it was hopeless. By now, the animal must have changed its color and pattern, and without the tracker to guide him he could distinguish nothing. He commenced to walk upstream, in the hope of somehow flanking it. He unclipped his net capsule and held it ready.

It seemed to him that there was a slight movement in the marsh. He stopped. There was no sound about him; the chirpings in the water had ceased, and there was a quality of hush in the air, of almost ominous tenseness as though the marsh itself were waiting for him.

He began to feel a little frightened. He looked from side to side. Where was the thing? He had not realized how much he depended on the wrist tracker. He found that he was trembling, and the perspiration stung his eyes so that he had to keep blinking. Cautiously, he slipped one of his gloved hands under the edge of the hood and wiped his eyes.

Something rustled slightly in the oil-bushes. These were thick clumps of low shrubs, their branches a naked and repellent pink, covered with spiny leaves on which a thick, pungent oil gathered during each day. It apparently served to attract small insects which the leaves closed over in much the same way as the Venus fly-catcher, of Earth. Fenner went towards the bushes, moving very slowly, his gun tight against his hip, his net-capsule in his left hand.

There was nothing in the bushes, and yet he thought the moss beneath them looked flattened, as if something had lain there watchfully. Were there two of the beasts? Was one still in the marsh, among the reeds, while its mate stalked him here? His spine crept, and he glanced over his shoulder.

He went softly on. Beyond the bushes, the ground rose again in a high bank that overlooked the marsh, and all along this bank grew the lustrous red flowers. They were larger than poppies, emphatically vermilion so that they stood out among the dark greens and browns. They had hairy stalks as thick as a man's wrist, and all about them buzzed the snouted little beetles the survey team had named *leptorrhinus*.

Fenner stood before the flowers thoughtfully. Their leaves were broad, and close to the ground, but underneath one of them he could see a small cage of white: the clean rib bones of some animal. He went closer, bending to peer. Brittle bones, some with rags of skin clinging to them, were scattered here and there on the ground. There were also

the empty wing-cases of some very large flying insects, as big as crows, spotted yellow and black.

If he was right, this was the lair of the beast itself. And just beyond these flowers, or even among them, itself vermilion now, the thing might be lying.

He straightened cautiously, holding himself ready for a sudden attack. And as he came erect, he was conscious of a curious light-headedness.

It was like inhaling too much oxygen. His ears rang and he felt giddy. He took a step, and it was as if the ground heaved under his feet like a living thing. A group of flowers before his eyes appeared to increase in size, and to sway towards him.

He shook his head to dispel the illusion. He staggered a few steps away, and it seemed to him that the flowers reached after him on stalks that became incredibly elongated, like red worms, bristling all their length with coarse hairs.

At that precise instant, the beast charged.

Fenner saw it in midair, and in his dizziness it seemed to move very slowly, so slowly that his automatic movement with the net-capsule was, by comparison, leisurely. He squeezed the capsule; the net shot out and opened in the air. It missed the beast by an inch or so and fell among the flowers. The beast struck Fenner full in the chest and bowled him over. Its antennae bent towards his face, all his weight rested on him. Its jaws were open. He closed his eyes.

Gorsline and Hakim, using their wrist-trackers, found them less than half an hour later. Hakim, a little in the rear, threw up his gun but Fenner snapped, "Don't shoot!"

"Are you all right?" Gorsline said incredulously.

Fenner was sitting up with one arm around the neck of the beast which, at Hakim's movement, had recoiled.

"I'm fine," he said. "Speak softly."

"What . . . what *is* that thing?" Hakim asked.

Fenner looked at the animal. It was now brown, with a bluish tinge from the surface of his plastic suit. He patted its head, and the thing put out a slender tongue and licked his mask.

"I can tell you what it isn't," he grinned. "It isn't very dangerous. Judging by its teeth and general appearance, I suspect it hunts amphibians in the swamp, or perhaps goes after water-creatures like an otter."

"So it does live in the swamp," said Gorsline.

"Yes."

"Why haven't we seen it before?"

"It's timid," Fenner replied. "There were always so many of us, and we made so much noise. Alone, as I was, it was less frightened of me, although I must have scared it by firing at it. I thought it was stalking me. As a matter of fact," he

added, "it *was* stalking me. But not for the purpose I imagined."

"What do you mean?" Hakim said.

"Why, appearances are deceiving. If a man who had never seen a dog before were to see one jump up on its master, he might think the creature was attacking the man. Putting two and two together, I was sure this animal lived among the red flowers and was stalking me for its dinner. But it was stalking me, and it rushed at me, only because it wanted to protect me."

"Protect you? From what?"

"Well, I was right, you see. There *is* a beast of prey here which uses a form of mind-paralysis in order to stun its victims." He motioned over his shoulder. "Those are the real predators, those red flowers."

He looked at the lovely bank of vermilion, and shuddered. "I should judge that their use of the mind-paralysis is automatic, but we are too big and too many for them to actually attack us. That is why, although poor Bodkin and the others succumbed, the flowers never tried to go for them. If you'll look over there, you'll see the remains of my Mark III net. It fell amongst them and they devoured most of it before they realized that it wasn't alive."

He stood up. The beast nuzzled his calf and he stroked its neck, behind the feathery stalks.

"I can't tell you how it's done," he went on, "because it only just happened to me. We'll have to study it. But apparently this creature has the ability, by means of these antennae of his, to counter, or nullify the mind-destroying waves of the flowers."

"Great heavens!" Gorsline exclaimed. "Then it must have been lurking—one like it, at any rate—each time we came near the flowers."

"Yes. It would have saved Bodkin," Fenner said, "but it was afraid of the rest of you. You were so many, so noisy—"

"But why should it try to save us?" Hakim said. "If it is an animal, I mean."

Fenner shrugged. "Why did the first dog become domesticated, and how did it happen? Perhaps," he said softly, "there were once other beings here who were its masters. One thing is clear to me: this creature is very intelligent. And like all intelligent creatures it has a profound need—"

"For food, you mean? Or shelter?"

"Oh, of course, for food, shelter, propagation, and so on. No," said Fenner, smiling, "it is a deeper need than that."

"What?"

"Affection," said Fenner, and he set off walking, with the beast at his heels.

THE END

THE REFERENCE LIBRARY

BY P. SCHUYLER MILLER

PSIENCE OR PSILLINESS

The scientific and popular journals of the last month or two have understandably enough been full of the demolition of "parity" as a principal, if not a law, of nuclear physics. The demonstration that some of the confusing swarm of so-called "fundamental" particles come in right-handed and left-handed varieties promises to produce a major break-through in theoretical and experimental science, comparable, perhaps, to the Michelson-Morley demonstration that the velocity of light is invariant, or the statement of Heisenberg's uncertainty principle. Writing in the April *Scientific American,* Dr. Philip Morrison of Cornell University suggests: "It may also be that there is some connection between the two major asymmetries we now see in the physical world—the right-left asymmetry of weak particle reactions and the fact that our world is overwhelmingly made up of one kind of matter, to the near exclusion of anti-matter. Perhaps this lead could forge a

bridge between the microphysics of the fundamental particles and the physics of the great distances—that is, cosmology."

But this is not to be a belated report on parity. I have cited it only to point out that the certainties of the most orderly physical sciences may, in fact, be very uncertain. The pot that has been shouting at psi investigations may be a very sooty vessel itself.

The storm that has been raging in science-fiction circles seems to have been stirred up by two not unrelated phenomena: the wave of psi-themes in current stories, good and bad, and John Campbell's experimentation with what he calls "psionics" and his frank discussions in these pages of the paradoxical results that have come out of his probing. Sprague de Camp has been the most outspoken of the right-wing conservatives, with his article in the April *Fantastic Universe,* "Pfui on Psi," and his abbreviated statement of much the same points in a three-cornered discussion in the March issue of the top-notch fan magazine, *Inside*. Now, to counteract Sprague's rather impatient appraisal, there is an article in the March *American Scientist,* by Dr. R. A. McConnell, University of Pittsburgh biophysicist, whose own field of investigation has been the ultra-left-wing one of psychokinesis or matter-moving. He calls it 'Psi Phenomena and Methodology," and it is an eminently calm statement of the psi position.

Dr. McConnell, incidentally, makes the same point that John Campbell has cited in some of his recent editorials: the opposition to psi research and its reported findings is basically cultural. Because parapsychology concerns itself with events which have traditionally been considered supernatural, and because most of the early investigations were carried out by societies for psychic research which had an openly spiritualistic bias, telepathy, clairvoyance, precognition, direction-finding, and the rest are *by definition* held to be nonscience and hence not the concern of scientists.

There is, of course, a point of view which more or less expresses my own attitude toward psi: that any phenomena which exist must somehow have a scientific explanation. That can be taken to include witching, lycanthropy, demonic possession, ghosts, and flying saucers—if someone will show me that they exist. It does, of course, open the way for a down-the-middle split when you're confronted by something like ESP and the psi effects in general. You can take the Pentagon's cue in its dealings with UFO's, and deny categorically that the phenomena exist or can exist. Or you can, if you're convinced they exist, argue that we have to develop a science which will explain them. That is what the people whom McConnell dubs "psychological physicists" are trying to do.

Most sciences have gone through

a cataloguing stage. Astronomy is deep in it, we're still turning up "fundamental particles" in the atom, and my personal enthusiasm of archeology may never get out of it. This defining the field and discovering what happens is what McConnell dubs the "extensive research" phase. "Intensive research" is what you're doing when you start organizing your catalog data, setting up experiments, and trying to find the regularities in what you've observed. McConnell cites a few of these in his article, among them a psychological study which seems to show a correlation between personality and psi powers. Well adjusted people get high card-guessing scores.

Critics of psi research seem to me to be facing in two directions, if not spinning like a dervish. In effect they say: "You've been investigating psi phenomena long enough to get out of the cataloguing stage and show us what makes things tick"—and in the next breath, "Of course, you haven't shown *us* that there's anything to catalogue." Dr. George R. Price, in his now famous attack in *Science* for August 26, 1955 and the follow-up in the issue of January 6, 1956, went whole-hog and argued that the simplest explanation of all psi phenomena is that they're frauds or delusions.

So, since these things don't exist, you can't explain them scientifically—and since you can't explain them scientifically, they obviously don't exist.

Since some Rhine cards were poorly printed, so that the symbols could be seen or felt on the backs, the assumption is made that *all* Rhine cards are similarly deficient, and the really extraordinary lengths to which investigators have gone to eliminate unconscious or conscious sensory clues are ignored. Yet I am sure the same people would object violently to the parallel argument that since some scientists are Communists, all scientists must be Communists.

Sprague's really quite reasonable objections in *Fantastic Universe* set up some standards by which to appraise any alleged new science such as parapsychology. Can you repeat the experiments yourself and get the same results? Do the proponents of the new discipline have the stigmata of quacks? Can the phenomena be objectively recorded and reproduced? Do the phenomena "make sense" and fit together in a logical, consistent scheme?

Leaving the "quackishness" of a pretty large group of investigators out of the argument—a rather large number of otherwise respectable and esteemed physicists, chemists and engineers exhibit the obviously unbalanced trait of enjoying and even writing science fiction—let's look at some of the other points.

Psi phenomena admittedly can't be reproduced at will. Not everyone can guess cards better than chance, or consistently fall below chance for a significant negative score. But this is a quite ordinary characteristic of

many accepted scientific phenomena, especially in psychology. You can't repeat the dream I have just had, and chances are I can't either. I can't reproduce Van Doren's mental gymnastics on TV. Astronomers can't repeat or reproduce the explosion of a supernova—they simply have to wait around for another to happen, as the psi-researchers look hopefully for another Basil Shackleton or a Mrs. Stewart. In archeology, and I should say in anthropology or biology, there is no such thing as repeating an experiment: you have to find *an analogue,* near enough to the origianl to give about the same results, but in no sense a duplicate.

Can psi phenomena be recorded? If you accept the seemingly demonstrated fact that at least one and possibly two people must be involved, they can be and have been. If you mean that a roll of film in a movie camera must somehow be made to photograph the symbols on a pack of cards one hundred miles away, since a person is able to "record" them, you're simply talking about two different things.

Do they add up? Well, people are trying, but that's a late stage in any science. Will someone tell me what memory is and how it works and fails to work so elusively? Will someone tell me what "I" am, and what makes me different from "you"?

And while we're at it, may I urge that you read "The Three Faces of Eve," by Corbett H. Thigpen and Hervey M. Cleckley, both M.D.'s. It's published by McGraw-Hill, a firm responsible for many, many sober scientific works, and costs $4.50. It is the true account of a Georgia housewife who had four personalities: Eve White, a mousy individual with frequent headaches and periods of "blackout," after which she sometimes awoke to find a closetful of new clothes she couldn't afford; Eve Black, a slangy girl-about-town who knew everything that happened to Eve White but "took over" during the blackouts and had herself a ball; Jane, a mature, quiet woman who may have been the source or the integration of the other two, and who was suddenly "born" one day in the doctors' office—and Evelyn, the personality in which the others were finally, somehow merged.

What seems to be a sensationalized version of the story, based on a novel which was probably based on the original reports of the Eve White case, is circulating the neighborhood theaters under the name of "Lizzie." And the two doctors are reported to have sold the motion pictures rights to their own account. But this book is not fiction, except insofar as names and places have been changed to protect Evelyn. Tape recordings of interviews with all three major personalities, and motion pictures of the changes from one to the other, are available to qualified students. There was even legal recognition of the situation: both Eves, as well as Jane, signed

a divorce agreement, since there was no way of predicting which of the three would emerge as the survivor.

Let's apply the same criteria to the Eve White case that we have been using on ESP. Again, I am ruling out the supposition that Drs. Thigpen and Cleckley are quacks.

Can the experiment be repeated? Yes and no. After a time, Eve White, Eve Black and Jane could all be "called out" by the therapist and "shown" to outsiders. But other psychiatrists, or the same psychiatrists, certainly can't produce three equally well defined personalities in any subject they pick up in the street. Does this mean it's all illusion—that there were no "three faces of Eve"?

Can the phenomena be recorded and reproduced? Yes, in this case—though as far as I remember, we are never told whether, after the rapport between doctor and subject was established, another psychiatrist could or did evoke the three "persons" in Eve.

Do the phenomena add up to a logical, consistent theory of personality? One of the most telling sections of the book comes near the end, where the authors show the utterly conflicting explanations that are given by following the assumptions of different schools of psychiatry. The facts fit *too many* theories. Drs. Thigpen and Cleckley deserve a round of applause for not cramming the facts they observed into any one conceptual strait jacket.

Multiple personalities are among the standard gimmicks of science fiction. You will find people who deny that they do or can exist. In "The Three Faces of Eve," and in other similar books and reports the authors list, you will find ample evidence that they do. Yet—like telepathy or precognition—they follow laws or principles quite different from those of physics. The brain is perhaps the most complex mechanism that we know. Most cyberneticists would deny that we can ever reproduce its complexity or all its functions and operations physically or electronically. Because it seems to do things that a vacuum tube won't, are we to refuse to learn all we can about what it will do, and to try to find predictable regularities in its operation?

If we do, *that* is non-science. That is psilliness.

THE MAN WHO JAPED, by Philip K. Dick

THE SPACE BORN, by E. C. Tubb. Ace Books, New York. 1956. 160/158 pp. 35¢

Ace is rather uneven in the quality of its original science-fiction novels, with or without accompanying reprints, but this is one of their best. It adds one more bit of evidence that Philip K. Dick is coming along fast as a master of the sociological twist, and it gives us what I believe is the first American book by an English author who, I am assured,

stands up there shoulder-to-shoulder with Wyndham and Clarke.

"The Man Who Japed" is a bit less shocking in its picture of a future than the author's "Solar Lottery," but for my money it is better developed and more believable. Allen Purcell, director of a small agency that is selling packaged productions to the Entertainment and Propaganda wing of the Morec —Moral Reclamation—government, is also the man whose jape consisted of beheading the statue of Major Streiter, father of the whole distorted mess. He is, of course, promptly in trouble not only with Morec but with the bosomy front for the Mental Health Resort, and the vicious Cohorts who consider themselves Streiter's elect heirs. Purcell's final, devastating jape is beautifully logical.

"The Space-Born" is another story of the generations-ship that is taking mankind to the stars. This society has not gone quite so far astray as those of some other books of this type, but it has become ingrown and perverted in understandable ways. Not the least of these is the unofficial policy of assassinating anyone who reaches forty, in the name of genetics and the food supply, and Jay West is one of these undercover killers who is ordered to eliminate the father of the girl he loves. Trite? Maybe, but it's well worked out and well done in plot and detail. I hope some of Mr. Tubb's more ambitious novels will follow this one across the Atlantic.

THE CIRCUS OF DR. LAO AND OTHER IMPROBABLE STORIES, edited by Ray Bradbury. Bantam Books, New York. 1956. 210 pp. 35¢

I hadn't intended to mention this here, because it is avowedly an anthology of fantasies. But two of the twelve stories originally appeared in *Unknown,* and three or four could appear in almost any present-day science-fiction magazine without causing too much talk—so here we are.

The title story, Charles G. Finney's "The Circus of Dr. Lao," has earned itself a classic rating in the twenty-two years since the book appeared. Ostensibly it is the story of a strange circus that an old Chinaman brings into the hamlet of Abalone, Arizona, and what the effect was on certain people of that sun-dried bit of nowhere. Actually—but that is something you must discover for yourself, if there is anything there for you. The whole book is there, appendix and all, lacking only the superb plates by Boris Artzybashek.

Nigel Kneale, in "The Pond," tells us what happens to an old man obsessed with frogs. E. B. White's "The Hour of Letdown" is an inimitable robot story that belongs in every definitive robot collection. In "The Wish," Roald Dahl takes us terrifyingly into a little boy's intense mind as he plays a game of death, and in "The Summer People" Shirley Jackson, as only she

can, has turned a very ordinary situation into implied nightmare.

"Earth's Holocaust," by Nathaniel Hawthorne, is a morality, as most of these stories are moralities—it describes a vast bonfire into which Mankind throws its outworn, outmoded traditions and institutions, leaving only emptiness. Loren C. Eiseley, who is probably the ablest typewriter-rattler of American anthropologists, gives us a straightforward little anecdote from a bone-hunter's memories in "Buzby's Petrified Woman"—and as counterpoint another ethnologist, Oliver La Farge, friend of the living Indians as much as student of the dead, has a beautifully poetic fantasy in "The Resting Place."

The two items from *Unknown* strike another note, or two other notes. Henry Kuttner's "Threshold" is a pert, sassy, bargain-with-a-demon tale in the mood that magazine made its own. "Greenface," by James H. Schmitz, is a monster story of the thing that crawled out of a bunch of bananas into a northern forest, and began to feed. James Seymour Sharnik—this time from Astounding's well-to-do sister, *Charm*) tells us in "The Limits of Walter Horton" how a strange telepathic talent came to a necessary end. Finally, Robert M. Coates has a story that has already been in the SF anthologies: "The Man Who Vanished."

Most of these are stories that you would not ordinarily come across if you stick to the main-line SF magazines, or to one or two of them. Even though you may not like "fantasy," I'd recommend your trying this excellent selection by the poet of the spaceways.

THE DOOR INTO SUMMER, by Robert A. Heinlein. Doubleday & Co., Garden City. 1957. 188 pp. $2.95

Sooner or later Robert Heinlein had to come to grips with time travel, and this he has done in a typically complete and double-barreled manner in his newest adult novel. It seems, incidentally, to be unchanged from the serial version in *Fantasy and Science Fiction*, but it reads better as a unit.

Daniel Boone Davis, a level-headed young inventor of the year 1970, is neatly and mercilessly swindled out of his household automaton business by his partner and his fianceé. He decides to take his gloriously uninhibited tomcat, Pete, and head for the next century via the Long Sleep. This is simply suspended animation at 4°C, with insurance providing an income on awakening. He does get the sleep, but not in the way he had planned, and comes to in late 2000 without his cat and without a cent.

Davis' first problem is to make a living. The slightly but drastically changed details of society after a thirty-year lapse are as lovingly worked out and offhandedly tossed in as you would expect in a Heinlein book. And then he discovers

that a time machine has been invented, and resolves to go back and swindle the swindlers. How he does it may not be too surprising to a generation brought up on the variations in time travel, but it's the story.

Heinlein, I guess, is now writing along two parallel courses. His teenage books for Scribner's are just as lovingly and meticulously worked out in their details of setting and logic as his adult novels, but they remain stronger in plot and for the most part better reading. Meanwhile, in his avowedly adult fare, he is concentrating on character, so that Lorenzo Smythe and Dan Davis are by far his most plausible heroes. But it's still the plus values that make his books inimitable—such as that terrific three-cornered cat-man-woman fight in this one.

THE NAKED SUN, by Isaac Asimov. Doubleday & Co., Garden City. 1957. 187 pp. $2.95

The one-two punch with which Doubleday has opened its 1957 round—Heinlein followed by Asimov—should leave the opposition groggy. Of course, you've read the serial right here, so I needn't outline these further adventures of Earth detective Elijah Baley and his robot partner, R. Daneel Olivaw. They're right up there with his best books, shouldering "Caves of Steel" and "I, Robot" and way ahead of the "Foundation" series.

If I don't like "The Naked Sun" as well as "Caves of Steel," it is probably because the focus of interest has shifted from Lije and his relationship with R(obot) Daneel to the puzzle of an out-world society in which murder is impossible, but one—in fact several—occur. Lije does have the personal problem of his exaggerated hereditary agoraphobia, but it seems quite superficial and easily handled. The way in which the Solarian society with its utter isolationism has inevitably bred crime, and in which another loophole has been jimmied in the author's beloved Three Laws of Robotics, takes over.

It's still a grand book—and I see from the credit page that I've missed two more of his biochemistry books for teen-agers. I'll report if I see them around.

THE MILKY WAY, by Bart J. Bok & Priscilla F. Bok. Harvard University Press, Cambridge. 1957. 269+vi pp. $5.50

This survey of our own galaxy, one of the "Harvard Books on Astronomy," has also been one of the best since the first edition appeared in 1941. The authors know their field as intimately as anyone in the profession, and they have the ability to screen out the technicalities and present the lay reader with an intelligible picture of what we know and how we know it.

This third edition is completely new. (It has also, by the way, been

printed by one of the most promising of the newer printing processes, in which the type is assembled photographically and the illustrations added directly to the lithographic negative.) It has had to be new, for the whole field of radio astronomy, its confirmation of the two different-aged families of stars—the Boks suggest there are at least three such families—and its filling in of the map which is showing the spiral structure of the galaxy, has grown up since the last edition appeared in 1945.

Often such revisions are produced merely by tacking on comments and deleting errors: this looks like a new book throughout, right down to the amazing and impressive new photographs. You shouldn't miss it.

THE BEST SCIENCE FICTION STORIES AND NOVELS: 1956, edited by T. E. Dikty. Frederick Fell, Inc., New York. 1957. 242 pp. $3.50

If you glance at the credits for this collection, you'll see that four of the thirteen stories were published in 1956, the rest in 1955. Apparently, as these collections have appeared later and later, the editor is trying to catch up with the calendar. Next year, the "1957" in the title may actually refer to 1957 stories, and give him a chance to compete on better terms with Judith Merril and Anthony Boucher.

Going strictly from memory, I think this is a better selection than last year's first collection without Bleiler. Earl Kemp's book index, which does hold itself to 1955, is more complete than his last year's summary. Needless to say, the title isn't to be taken literally: most of the real "best" of 1955 and 1956 were snapped up first by someone else, but the average is fair and there are a few real winners—two, anyway: Walter M. Miller's "A Canticle for Leibowitz" and Cordwainer Smith's "The Game of Rat and Dragon."

Astounding has contributed four stories, one blown up into the only "novel" in the book. (The original intent of picking up the neglected long stories has seemingly gone by the board.) L. Sprague de Camp's "Judgment Day" is a study of the psychology of a man who can blow up the world, written with a lot more feeling and conviction than anything Sprague has had published in some time. "The Man Who Always Knew," by Algis Budrys, is little more than a vignette, an entertainment, which may be said to suggest another possible field of parapsychology. Mark Clifton's "Clerical Error" is a good, solid, thoughtful approach to one of the more important flaws in our present culture, and Thomas N. Scortia has made the story originally published as "Sea Change" into the longer, now largely new "The Shores of Night." This shows a group of dedicated scientists trying to force one approach to the stars on a reluctant world, and forced by circum-

stance into quite a different one.

If you're one of those readers who settle on one or two magazines and let the rest go by, you should find the selections from other sources interesting. Miller's "Canticle for Leibowitz" is from *Fantasy and Science Fiction,* one of the best they've published and one of the few science-fiction stories, apart from a couple by Anthony Boucher, to project religious problems into the future without becoming grotesque or ridiculous. "The Game of Rat and Dragon" is a fascinating near-fantasy from *Galaxy,* in which man and cat have formed a partnership to fight off the unseen horrors of deep space. *Galaxy* also contributes R. DeWitt Miller's "Swenson, Dispatcher," a delightfully unambitious yarn of interplanetary skulduggery, in the vein of some memorable series in the old *Thrilling Wonder. Wonder's* now-deceased partner, *Startling,* lasted long enough to provide Robert F. Young's "Jungle Doctor," in which a strayed psychiatrist from a galactic culture finds plenty to do here on Earth. It's rather nicely done, too.

Frank M. Robinson and *Imaginative Tales* have contributed "Dream Street," the pleasant story of a boy determined to get into space. From Tom Godwin and *Fantastic Universe* come "You Created Us," a mutant-monster story which sounds as if it might have been done with a hopeful eye turned toward Hollywood. The same magazine contributes Ivan Janvier's "Thing," a tricky little superman tale. *F&SF* is in again with Robert Bloch's "I Do Not Love Three, Doctor Fell," another study in abnormal psychology which sustains its puzzle element characteristically well, and *If* has the pleasant story of an eccentric versus the machines in Frank Riley's "The Cyber and Justice Holmes."

Not bad at all—but by no means the definitive annual that this series used to be.

ALIEN DUST, by E. C. Tubb. Avalon Books, New York. 1957. 223 pp. $2.75

I'll confess that this disappointed me. E. C. Tubb, for some time, has been mentioned as a writer who is giving John Wyndham and Arthur Clarke a run for their money, and this book—the English edition was out some time ago—is supposed to be his best work. They needn't worry.

This is the story of the painful conquest of Mars through the twenty-five years from 1995, when the first expedition is cut off there by the wreck of one of its supply ships, until 2020, when the colonists have at last consolidated their toe hold. It's a good theme, the problems and their development are logical, and either Wyndham or Clarke would have made quite a book of it. Tubb, somehow, doesn't.

Some of the detail is good; some just doesn't hold water. Why the human base should be set up under

the worst possible conditions, in the middle of the desert instead of in one of the dark, presumably vegetated areas, is never explained. Why they should select the dry northern hemisphere and the small northern polar cap for a source of water, isn't mentioned. And using that corny "unknown radioactive element" to explain the deadly qualities of the Martian dust, is pretty old-fashioned. Even in the small first party, most of the men aren't named and there is no real attempt to characterize anybody, even rudimentarily.

Avalon has had some very good books in the last few months. This one is simply old-fashioned.

POLICE YOUR PLANET, by Eric van Lihn. Avalon Books, New York. 1956. 224 pp. $2.75

This is an attempt to transplant the Micky Spillane-Mike Hammer school of sadistically oriented crime story to Mars. Taken at its own valuation, I don't think it's as bad as some readers have called it. Rather, I see no reason why we should find this type of story acceptable—though unsavory—in crime fiction and rule it out of science fiction—the literature without false limitations.

Bruce Gordon is the crusading journalist who came up against the government and was railroaded to Mars, with the choice of spying for Security or slugging his way to the top in a society of well organized squalor and corruption. Bitter, he starts with crime, becomes a corrupt cop, tangles with gangsters and politicians, slugs, slashes and is too busy to rape. Eventually, since he is the hero, he comes up on top after a career as ruthless as anything Peter Cheyney has chronicled.

Since no credit is given, I haven't run down the magazine version of a couple of years ago. Presumably the book has been "hotted up" with a little extra roughness for the sophisticated rental library trade.

PLANET OF NO RETURN, by Poul Anderson

STAR GUARD, by Andre Norton. Ace Books, New York; No. D-199. 1957. 105/214 pp. 35¢

The original section of this Ace Double appeared here as a two-part serial in 1954, under the name "Question and Answer." You'll recall it better, perhaps, as the parallel to Isaac Asimov's "Sucker Bait." Both stories were written to develop the same setting and situation, but there the similarity ends. Asimov fattened his cast with the neurotic human thinking-machine; Anderson is content to throw in some paradoxical, furry natives who—to tangle a phrase—seem not to be what they seem. The conflicting personalities of the crew of the *Hudson* contribute some nice touches, but the whole story is run-of-the-mill.

The reprint half is one of Andre Norton's competent, fast-moving

contributions to interstellar adventure yarns. The book was out in 1955, and it's good reading on an entertainment level—which is all the author ever intended it to be.

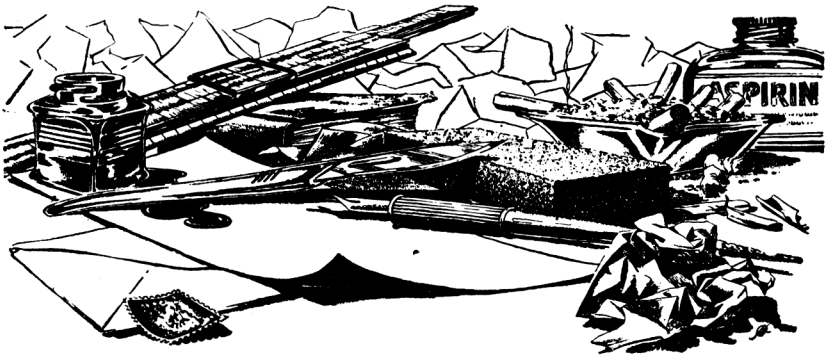
THE GOLDEN ARCHER, by Gregory Mason. Twayne Publishers, New York. 1956. 296 pp. $3.50

This oddity apparently was not generally reviewed when it appeared, and may sneak up on you via the remainder table. However, you'd better know what it is.

Subtitled "a satirical novel of 1975," the book is all of that. It gives us a United States in which organized bigotry is on the verge of stamping out free-thinking and science, and in which the nudist, bridge-maniacal set of geniuses in the Archer family have set up a kind of counter-revolution and are doggedly hounding down the heresy of anti-heresy. Mixed up in all this are a red-headed whore, an inconvenient corpse, a fickle undertaker, a philosophical jackass, a noble FBI agent, a New Jersey nudist camp, assorted clergymen, and the opinions of numerous pertinent philosophers and natural philosophers, plus one small and climactic puffer—*Sphoeroidus maculatus.*

The author is a professor of journalism and sometime anthropologist. His style is uneven, falling somewhere between Thorne Smith and Elliott Paul, and sniggering as often as it is honestly bawdy. In juvenile hands it can set science fiction back a generation or so, and I can't see that it advances either pornography or satire significantly. Yet parts of the thing are fun, and it all could have been. Too bad.

THE END



BRASS TACKS

As one of the earlier contributors to Astounding, as well as a student of what is now called "psionics," for upwards of a half-century, I was interested when you asked whether readers wished to have articles on psionic machines. I almost wrote; when you published your article and editorial in the issue for February, I realized that unless I hurried up, I wouldn't have much to say that you had not already figured out. The impulse was strengthened by the current article "Pfui on Psi," by L. Sprague de Camp in *Fantastic Universe* for April.

Before going on to the main points, note the following in his article: (a) he claims that the "sticky" feeling on the Hieronymus plate is due to fatigue after a dozen strokes. Well, I have just tried a hundred strokes on a similar surface, and I have to say that if Mr. de Camp is fatigued enough by a dozen to note any difference in feel, he had better see a physician forthwith. Also, this argument has no relation whatever to the experiences you had with subjects who caught the resistance systematically on certain arcs, independently of number of strokes. (b) He further shows his incompetence to deal with any subject in which his prejudices are engaged, by naming Kilner's "aura" as a delusion. Obviously a man who spells "Kilner" as "Kilmer" has hardly seriously studied the matter.

To go on with the subject: the main points I was going to make before you got to them yourself were:

(a) The nature of the Hieronymus machine as a *symbol,* or set of symbols, rather than as a machine in the proper sense of the word.

(b) That such a "machine" is of

the nature of what has been called "Magic."

(c) Nothing in "psionics" can be brought under the usually recognized laws of "space, force, and matter."

It was with some tickling of my sense of humor that I recognized in the Hieronymus machine, which I first heard of via your article, the good old "sticky plate" principle which has been used for years by various kinds of charlatans and some people who were not charlatans. I have had in my possession for over fifteen years a sample of one of those machines that has had a remarkable history. It has produced some surprising effects on some people, none on others, painful ones on still others. It is a "healing" machine for some. It may have saved lives and may have taken some, by causing people to neglect more orthodox methods. Some day I am going to open up its sealed case. Don't know what I will find there; am sure it will be nothing whatever that will work on any known scientific principle.

Your article and editorial were delightful, aside from their main subject matter, in your analysis of various scientific situations. However, I have to take exception to one of your contentions. You throw "radiation" and "vibration" out of the window as explanations of telepathy because of the lack of influence of distance. There are two holes in this argument. If by "radiation" you mean spherical diffusion of vibration, you are right, as that is subject to the law of inverse squares. However, a tight beam vibration through an elastic medium would be free from that influence in proportion as the beam is tight and the medium elastic; *i.e.,* in proportion as there is no energy loss by conversion of the energy of vibration into heat or other leakages.

Also, if the radiation or vibration is a trigger or relay effect, releasing stored energy at the receiving end, there will be no distance effect up to the point where the transmitted energy will not suffice to trip the relay. In view of the unknown nature of the whole field, you will have to admit both these possibilities if you are to cover the ground scientifically.

I would point out a rather close analogy to the postulated relay effect: let us say that someone informs you that your child has been run over in the street. The effect on your mind will be quite as violent if you hear this as a faint, barely audible shout across a golf links, as it will over a loud-speaker on the golf-club porch where you are standing. The tight beam analogy is illustrated by the regulation kid's "telephone" consisting of a string connecting the bottom of two tin cans. However, it is also my own opinion, arrived at by another route, that you cannot explain psi effects by laws related to those of physics, save by analogy and symbol.

I have a suggestion to make for your next experiments: you say that if one of the connections on the

Hieronymus machine is broken, even though the connection is a pure dummy, the machine won't work. Have you ever tried rigging it so that the connection will be broken during the test, at a moment that is both unpredictable and unknown to any of the parties to the experiment? Maybe it would stop working and maybe it would not. Looks like an interesting thing to try.

Another thing you might try is to design various alternatives to the Hieronymus machine, tailored especially to the type of symbolism most likely to appeal to the mentality and background of the particular operator. (As for instance, the famous cave paintings of animal hunts, which are usually considered exhibits of "sympathic magic" aimed at getting game, could have been the Cro-Magnon version of the Hieronymus machine.) You can easily think of other possibilities. I used to know an "electronics" practitioner who could locate a pain in the back of a patient by running a finger along a silver model of a spine while using the "sticky plate" with the other hand. He could really do it, too.

I might suggest another experiment. Instead of using people on the arc who are accustomed to thinking in aliquot parts, try a technologist or somebody else whose mind runs strictly on the decimal system; or a pure mathematician who thinks in radians rather than degrees. I don't guarantee that either; but might also be worth trying.

The logical outcome of all this is that the whole field of "magic"—and for that matter, "witchcraft"—rests on discoveries made many millennia ago by empirical means, and by people who were not handicapped by the preconceptions surrounding the development of the physical sciences. Magic, or psionics, disappeared from common practice and belief before the advance of reason, for two causes. One was that, psionics being empirical for the most part, based on practice and experience only, its results were apt to be as unpredictable as they were startling; on the whole, the material and scientific methods were more efficient, and in some respects less dangerous. (The sad case of the "sorcerer's apprentice" is probably an all too graphic "symbol" of the hazards.) The other is that physical science itself set up a series of "symbols," that acted as mental blocks against the functioning of the older, "mystic" sets of symbols. I would not be surprised, however, if psionics still operated in mechanics to an unsuspected degree; why, for instance, out of a thousand cars run off the same assembly line, by the same workmen, out of the same melts of metal and same batches of other materials, on the same day, one, and one only, will turn out to be a "lemon"? Not only because of some scientific defect in one part, but by a number of defects in different parts, which could have no relationship to each other in fabrication? Is there not some possibility

that in this field, as well as others, a lot of unrecognized, unintentional "hexing" goes on? I don't think you can rule out such possibilities on the basis of your own findings; though you might find it advisable to keep quiet about them in the present controversial situation. Obviously, to open the scientific door even a crack to such possibilities, is to open it to all the ghosts and witches, all the gods, demons, and magicians, of total human history, and to bring them back under solid scientific endorsement at that. The actual possibility of such a thing is enough to drive any orthodox scientist quite mad, because it would threaten to reverse the picture and put his science as far in the discard as science has placed "magic." Some of that desperation is already appearing; when a supposedly respectable scientist accuses a man like Rhine of outright faking—and that has been done—then scientific detachment and impartiality have indeed departed from that quarter.

However, from what I know of psionics, the usual technical methods don't have much to fear from them, in the handling of mass. There is such a thing as levitation, and also teleportation. They can't be used commercially because it takes special and rare idiosyncrasies to be able to use them, and because the actual feat itself is a lot more difficult than to operate cranes and bulldozers. Telekinesis in dice-throwing is in active use and always has been; but the faculty is too rare to be economically significant. Einstein's existence proved that *an* Einstein could exist. It didn't measurably increase the percentage of Einsteins in the population. Even in the heyday of magic when it operated in a climate of universal credence, unhindered by scientific symbol and preconception, successful magicians were rare enough to be regarded with awe, dread, or respect. Even the sponsoring of psionics by eminent scientists of today could not popularize effective use, because in order to do so both scientists and laymen would have to accept a view of the universe totally at variance with what is believed today. They would not merely have to accept it intellectually and speculatively. It would have to become the innate background of their thought. Even then it would be difficult. The race will have to evolve toward that very slowly. It is just as well; a general vogue of effective psionics at the present time, in the mental field alone, could collapse civilization worse than an atomic war.

Telepathy as a spy system would be highly significant and also highly dangerous to the telepath, once its possibility were popularly recognized. Since none of these powers in themselves require any ethical competence as prerequisites, any and all of them are potentially very dangerous socially. The world is struggling to survive right now under the impact of various powers and special advantages badly distributed, and for which it is entirely

unready morally and socially. At the present time, a recognized telepath would be very lucky to escape sequestration in a secret government project as a secret weapon, and the best that any real "psionics" expert could hope for would be a hell of publicity and pursuers looking for special benefits for themselves.

Special powers are worked for by people who want them, and they are not necessarily nice people. The United States Army is reported to be looking for a telepath able to read the Kremlin minds and perhaps to influence them. If they got such a telepath, it would not be long before they would realize that he could also be reading their own minds for future plans, and telepathing same to somebody in the Kremlin. A lady dressing in her boudoir might not relish the notion of some unknown male inspecting the operation through the wall. Politicians would not care to have their real thoughts known to strangers, or bankers to have the combinations of their safes read on the street. I imagine quite a few of us ordinary citizens have occasionally had thoughts, or done things, we would not want advertised. I have just been reading a story in one of your contemporaries about a planet where there was an iron stake for burning psionicists in every village square. Brother, *really* convince the populace of psionics and you wouldn't have to go to *another* planet!

Well, back to philosophy.

In your magazine you set forth some "hunches" that you refuse to try to substantiate factually. That gives me leave to do the same thing, so I will set forth the following:

1. Matter, time, and space as we know them are mental constructions and not physically self-existent as conceived.

2. The "real" universe is a mental construct upon a conscious substratum, said substratum being represented by the awareness in the human mind.

3. The physical configuration or "illusion" is the product of cosmic mental action. (Not "God," but a universally distributed and impersonal power of thought, of which the human mind is a specialization.)

4. Since the human mentality is continuous with the universal mental substratum, it shares the same powers of construction of apparent material things, but in its individual aspect is conditioned and limited by local conditions, and by the influence of mental action coming from the subjective into the objective by other channels.

5. Insofar as the individual mentality breaks the local molds of thought, it can create apparently material or physical new conditions.

6. The power of suggestion, or of the fixed idea, or crystallized conceptions, is the limiting and conditioning factor in this creative action.

7. Accepted and fixed lines of rational thought constitute one class of such conditioning factors; hence

actual psionic power is found so much more in children, primitives, and uneducated adults than in scientists. In other words, scientific thought kills psionic power.

8. Psionic powers of various kinds occur sporadically and erratically in the human race, and always have, because they are qualities of mind. Some of them occur even in animals. (An animal is completely practical and completely unprejudiced. If something works, he doesn't give a thought to proving why it can't work, or to how it *does* work. Hence in that respect he is a really free being, mentally speaking. It is only developed and self-conscious intelligence that is able to imprison itself in mental molds.)

9. Mentation proceeds naturally by suggestive symbols. Hence psionic machines, amulets, talismans, and incantations. (The most powerful incantation I know is $E=MC^2$.) Hence all modes of communication and representation that convey ideas from one mind to the other depend on symbols, from the alphabet to the blueprint. A mind deprived of symbols is practically immobilized; on the other hand, a mind free from conflicting symbolism can seize upon various odd kinds of symbols, such as the sticky plate or your Hieronymus arc, and using it as a skyhook, go some surprising places with it.

10. Psionic powers being always spontaneous, and indigenous sporadically in the human race, it was inevitable that some people would make a serious study of them for the purposes of usability. For reasons above mentioned, the most fruitful periods for that would inevitably be the primitive periods.

11. Insofar as this study remained in the empirical realm, it was also inevitable that the results should be accompanied by the growth of superstition—ideas of miracles, divine favor, the intervention of gods, goddesses, and demons. "God," for instance, is a power-symbol. Hence the—occasional—efficacy of prayer. (The intervention of "magicians" is no superstition, but fact.) Superstition logically would possess the minds of the empirical operators as well as of the populace. (A woman driver is an empiricist *par excellence.* She knows how to *run* the car, but so far as her actual knowledge of what's under the hood is concerned, it could be gnomes. When I was a very little boy they told me that the locomotives—of that day—had seventy-five horse power. I spent *hours,* whenever I had the chance, trying to find out just where those horses were stashed away in the contraption; but if I had sneaked into the cab and pulled the throttle, the horses would have run as fast for me as anybody else.)

12. At a certain stage of mental development, the psionic field of the primitive mind overlapped the rational field of nascent science; and there came to be some psionic experts who uncovered the laws and rationale of the thing, and were no longer empiricists.

13. These laws are just as systematic and dependable as physical laws; but as they are laws of mind in fields not investigated, they look miraculous, choatic, or impossible. (Nothing could seem more ridiculous to a savage than the idea of words being carried a thousand miles through a wire a sixteenth of an inch in diameter. But talking to a friend in a dream—and verifying the conversation the next time they meet—is a matter of course to him. It's all a matter of viewpoint.)

14. Owing to the handicaps and dangers previously mentioned, these psionicists formed a secret society—the most secret the world has ever known—and went permanently underground with what they knew, leaving sporadic manifestations to the empiricists, mystics, and fakers.

15. They continue to operate—but one can't find them by answering ads or buying "sealed" books over the counter. "Don't call them—they'll call you." (If you qualify.)

As I said, I won't argue these points: you asked for it when you refused to argue your own "hunches"—most of which were correct.

I might add for your information that I am a practicing civil engineer and research man, with a fair degree of recognized achievement, and not unacquainted with the scientific methods. Member of A. A. A. S. and various other scientific and technical groups.—Victor Endersby, Box 427, Napa, California.

Ooooh! That naughty word! Magic!

Dear John:

As you well know, I have read Astounding ever since its inception, as well as most of the other science-fiction and fantasy magazines. Of late years, Astounding has had some hard competition for excellence of material.

Notwithstanding this, and in spite of some differences of opinion on my part as to certain of your policies, I consider that your magazine continues to maintain a most marked superiority in the field.

My compliments to H. Beam Piper for "Omnilingual," in the February, 1957, issue. That yarn is deeply interesting, highly thought-provoking, scholarly and, above all, superbly well-written.—Richard R. Murray, Major, USA-Ret, 4015 South 7th Street, Arlington, Virginia.

A lot of people liked that one. It seems to me that was one of the best and clearest statements that some things are not *"just a matter of tribal opinion" that I've seen.*

Dear Ed:

Let's try to de-astonish Mr. Walter Yergen who is no-end perplexed by the Astounding Fiction that plus one sometimes equals minus one, and that a positive something can equal negative itself!

Nothing is wrong with his mathematics. However, mathematicians do

get mixed up—including me. But the equations need some exegesis. Nothing is odd, when even explanations follow.

Any positive equals negative itself, as by mirror reflection, which is pure image, or imaginary. This image is equal in all respects to its source, except it does not have substance, being imaginary. The color, size, shape, clarity, all are faithfully reproduced. Even thermal characteristics, such as heat, are reflected. The heat is real, not imaginary. So is the color, shape, size, et cetera, real. Only the image is not real. Therefore negative.

Look at starlight in any serene pool and you'll see one of our universe's imaginary dimensions. Does the real stretch away to infinity? So does the reflection.

Now hold a mirror to the pool, and you'll see an imaginary reflection of the imaginary image in the water. Which may be expressed as radical i, or something such.

Brighten the human cerebrum in one direction and you darken it in another. Hence this mathematical acatamathesia in brilliant minds.

Your readers'—and your own—comments are scholarly and excellent. But don't strain yourselves trying to locate the axle-tree on which the heavens ride!—D. J. Struven, 11830 Barnwall Street, Norwalk, California.

But what of the disproof of the Principle of Parity?

Dear Mr. Campbell:

While re-skimming through the Ley-von Braun-Bonestell book, "The Conquest of the Moon," an idea stuck me, which I think should be noted. Here it is in story form.

Joe (Twist 'er Tail) Blow, world hero—pending a landing on the Moon—decided to correct his flight path. Being lazy by nature, he hated to go to all the trouble of figuring a new glide path; he probably wouldn't have done it at all if it wasn't for the small detail that, in his present orbit, he would miss the Moon and take up an unknown orbit about the sun.

He called Florida Base and asked for a flight tape. Then he went though the tedious procedure of flywheeling his ship's long axis on the Moon's orbit—to make it easier to align his new tape—and brought his swiveled motors to the general direction.

The flight tape came through the "teletaper," Joe studied it for a few seconds and put it into the auto-pilot. Base gave him a count-down, and at zero, Joe flicked the red switch—and absolutely nothing happened.

He checked the gauges, found nothing, mentally resolved to shoot the construction crew and the designer.

He oozed into his stifling spacesuit; and systematically checked everything he could see.

The ship was a small, one man, non-streamlined Moon ship with spherical tanks. He checked everything, nothing was wrong. He start-

ed back for the cabin to re-check the wiring and for no particular reason he picked up a protective flap and looked through a piece of transparent plastic—he saw what the trouble was . . .

The tanks were of fairly thick and strong plastic. They were filled with a tiny amount of nitrogen which was supposed to 1) keep the tanks the right shape—like a balloon—and, 2) give the fuel a slight push to the pumps, on the fuel, so as to start and lubricate the pumps.

In the OGG conditions, however, all the fuel had congregated into several very slowly moving balls, occasionally one would hit another and make a larger one.

He tried to force the liquid down to the pumps by increasing pressure, nothing happened to the spheres, but the tank got hard, then he tried . . .

. . . And so, after all these years, gentlemen, the great martyr Blow's spaceship has reached a fairly steady orbit with a major axis of 1.4 AU, and a minor axis of 1.2 AU . . .

I hope you excuse the awful writing, but, under some conditions, this might be the cause of us losing a few hundred-million dollars worth of spaceship.—Larry Cantrell, 135 Capp Street, San Francisco 10, California.

Sorry—your story is rejected for technical flaws. It wouldn't happen that way! The fuel would flow properly. Anybody want to explain why?

Dear Mr. Campbell:

Hurrah for Isaac Asimov—crackerjack novelist, social scientist, biochemist, geneticist, and now philosopher extraordinary in "The Unblind Workings of Chance." I hope he does not go the way of Stanley Weinbaum, who was the last of your top writers to make generalizations about the blindfolded goddess—on the night side of Venus with Ham Hammond.

Both Asimov's article and "Call Me Joe" in the same issue, touch on the subject of life on Jupiter—which isn't as crazy as it sounds. The big problem has always been, "Where do you get your free energy?" since chemically active radiation cannot penetrate more than a small fraction of that thousands-mile-thick atmosphere.

Recently it has been suggested that some of the curious color phenomena of Jupiter's atmosphere come from vast quantities of free radicals produced by ultraviolet on the upper layers of hydrogen, methane, ammonia, et cetera. Here is both a source of free energy available to the lower layers of atmosphere—through convection—and a source of precursor compounds of life. The evidence that such radicals exist is pretty convincing, and I would say that if they do, it is almost certain that some kind of low-temperature life can exist and does exist on Jupiter. Perhaps this system does not produce as much free chemical energy per square foot as the chlorophyll system on Earth, but

Jupiter has a lot of square feet to spare—uninterrupted by Arctic and Saharan wastelands.

I shall watch for Asimov's article on this subject with considerable interest.

On "The False Immortals"—you ought to know by this time that I read editorials—I liked your main point: moral values do change, and the subsidiary point: culture hybrids tend to be more advanced, and more powerful, than their "parents."

There is a pitfall in the argument, however, that may trip anyone who tries to carry it farther—the question of mortality. An individual of any of the higher metazoan species, including man, is a *noncompetitive system;* and for all such systems death is inevitable and as predictable as the laws of chance can make it. A culture, by contrast, is a *competitive system*—in fact, two competitive systems, even three. By this I mean that its elements compete with each other for survival, or power, or both; and for such a system death is not inevitable, nor is senescence. When a culture "ages," it is an unpredictable business like the "aging" of a group of animals such as the dinosaurs. You can find no more agreement as to the cause of the decline of the Roman Empire, than you can as to that of the dinosaurs.

One of the implications of this is that Progress will not stop or slow, but increase its speed, once the different cultures of the Earth are united into one under a World Government, as appears likely to occur within a few more years. For the rate of production and evolution of ideas, the "hybridizing" process itself, is actually improved by the increase in numbers of communicating minds and improvements in communication. Since Progress itself causes improvements in communication and in the number of brains the world can support—educational improvements considered as communication also—Progress becomes a self-accelerating affair. Thus it might be expected to follow laws of increase somewhat like those of multiplying bacteria—or for a better analogy, try the multiplying neutrons in a critical mass of plutonium.

This brings up your last question, what should an enlighened culture do? For there is plenty of evidence that Progress is already too fast for our own good. Constantine Brown ("The Triumph of Modern Materialism," Oakland *Tribune,* March 4, 1957) comments that "Most of mankind . . . really longs for stability. Any man likes to know where he is and where he is going. . . . He likes to think that the institutions of his society . . . will not change enough in his lifetime to upset his way of life. . . . But today, a materialistic world has managed to achieve a shattered society. . . . It is almost as if the man who invented the clock had discovered . . . that there was no longer any reason why he should know what time it is . . ."

Social evolution is adaptive only to a limited degree because the chief

selective agency, our brains, cannot anticipate all the effects a new idea will have; the nexus is too complicated, and we are included in it. And beyond this primary and ineradicable source of non-adaptivity is the competition between human beings for power—war, et cetera which has effects just a little bit worse than non-adaptivity.

But non-adaptivity is quite bad enough. Fresh from Asimov's discussion of the workings of Chance, it is easy to see that neither a biological nor a social system can function on a chance basis alone; a fair amount of rather precise non-randomness must be present for either to operate.

In the past, Progress was slow enough so that the non-adaptive workings of a new idea could work their way into the nexus by mutual adjustment; a crude biological analogy is the adaptation of a population's genes to an introduced deleterious gene when the latter cannot be eliminated outright. To carry the analogy a bit further, if deleterious genes are introduced too fast for the controls of Natural Selection, the species becomes nonviable. Cannot Progress become too fast for a culture to adjust to itself? If this point be conceded, the self-accelerating propensities of Progress become a pretty serious matter—even if we eliminate from consideration the non-adaptive effects from power competition.

A doctor is liable to be pretty conscious, for instance, of "Guilty Parents" (*Harper's,* April 1957), arising from rapid changes in theories of child-rearing. Perhaps the totalitarian state is another example, although this cannot really be separated from power competition. What about the genetic effects of diagnostic and therapeutic X-rays—and of industrial applications of the atom? Even the liberal and humanitarian ideas of the West have had their repercussions in today's population explosion. Industrial slums, mental diseases, the revolt of the young, juvenile delinquency—they are all symptoms of Progress tripping over its own feet.

Why not an editorial on this one subject?—Alfred B. Mason, M.D., Concord, California.

The problem seems to be to work out a sociological system that has inherent dynamic balance; past cultures have been postulated on static balance,—and that postulate is, now, false!

Dear Sir:

Some time ago you published Finnagle's Laws beginning with "If anything can go wrong, it will."

I have just run across Finnagle's Fourth Law which seems to have been neglected in the literature. It reads, "No matter what happens, there is always someone who knew it would."—Maxey Brooke, Box 379, Old Ocean, Texas.

Accepted!

(*Continued from page* 7)
hope of doing what he wanted, now and forevermore. He can *not* make that chemical compound, because the geometry of the molecule is such as to make it impossible.

What human being wants that sort of promise?

Given a choice of going to the Liberal Arts school, where it is held that a man has a right to his own opinion, and the only requirement is that he let other people have theirs, or of going to a technical school and having it ground into his soul that he does *not* have a free right to his own opinion . . . it's human to prefer the warm, friendly, gentle attitude of the Liberal Arts school.

I have a hunch that it isn't that technical schools don't offer enough, that the rewards of technology aren't great enough to attract the student today. I suspect that they offer too much; they offer discipline, they offer strong, hard limitations on the right to think what you will. They offer discipline that isn't arguable.

The Liberal Arts schools offer a far more democratic-seeming atmosphere of thought. A man is free to think what he will, to follow his own line of understanding, so long as he allows others the same privilege.

The modern American Liberal Arts schools developed from the traditional European Classical Education schools. There was an important change, however, in the course of the development. The old Classical education included, as a basic, many years of study of Latin and Greek. "For discipline" they used to say.

They were right, too! The characteristic of a dead language is that it is absolutely immune to human opinion. What Virgil said in Canto V isn't open to argument; it's a forever-immutable fact. The grammar of English changes; "It's me," is now accepted as correct usage, because that's what most well-educated speakers of English say. A point in grammar in English, because it is a living language, is debatable.

But Latin, or Greek, being dead languages, are what they *were*—and forever will be.

The traditional Classical education was strongly tied to the study of something that was rigid beyond any possibility of alteration by human opinion. Whether Virgil's poems, or Aeschylus' plays were good, bad, or indifferent was something debatable—but what they were-in-fact was *not* open to argument. The language was dead, and rigid as any fossilized thing.

It provided a rigid discipline to act as the skeleton of an education.

It produced a certain confusion, however. A student who learned the discipline became a disciplined thinker; he learned the importance of working *with* facts, instead of trying to work against them. He became a sound thinker. The confusion arose from this: the discipline was built around study of dead lan-

guages, and dead traditions, and the result was a sound thinker. Therefore since A goes with B, A causes B! It became accepted that studying Latin and Greek were the *cause* of sound thinking.

When technically trained men began to appear who were sound, disciplined thinkers, yet men who had not studied Latin or Greek, the old theory broke down. "See," it could be said, "this business of studying Latin and Greek 'for discipline' is a lot of nonsense! These technicians haven't studied any dead languages, and they're sound thinkers, so all that 'discipline' is nonsense."

It seems to me that A went with B; they threw out the old traditional six-years-of-Latin and writing Latin poetry—and threw out the concept that discipline was necessary along with it! Because the old Classicists had confused "Latin" with "discipline" so thoroughly, to them "Latin" *was* discipline, and the only possible mental discipline. They, therefore, could not see that physical science was, actually, an even more ultimately rigorous (and inherently rewarding!) discipline. To the Classic education orientation, to prove "Latin is not essential to sound thinking," was, by the Latin-equals-discipline argument, proof that "Discipline isn't necessary to sound thinking." Equals substituted for equals, the results are equal.

The generation of students now entering colleges, moreover, are

those who came along as babies about the time Child Psychology was off on a rip-roaring toot of "Let the little darling express his precious ego. Don't frustrate his growing ego; let him express himself freely."

In extreme cases, that yields our magnificently unrepressed juvenile delinquents, of course. It's not too amazing that there's somewhat of a rise in that field. Even if the parents of the child did not, themselves, subscribe to the "don't repress his precious little ego" theory, the kids were bound to find that delightful-sounding theory among some of their school or playground friends. They would, of course, remember that wonderful idea, and feel that their parents were unjust, unfair, and backward barbarbians not to realize how important Junior's dear little ego was. Any parent with children between seven and seventeen is acutely aware of the astonishing rapidity with which they can learn, on a one-exposure-only basis, such philosophies. It's particularly frustrating to parents to observe that practically-instantaneous and highly enduring learning process, when it is so extremely difficult to induce lasting memory of such things as the philosophy of self-discipline.

Since the current Liberal Arts philosophy is almost an adult-life extension of "don't repress his ego" philosophy, while the technical schools offer the shocking-to-the-unrepressed experience of having their ego put in a strait jacket of facts, with compulsory elimination of mutually exclusive desires and beliefs, it's not too surprising that technical school registrations are falling off.

The "Don't repress his little ego" concept penetrated quickly into the PTA groups. That didn't help any; the same mother who swatted junior, but good, for irritating her, would see to it that a teacher who said her little darling didn't behave was fired for trying to repress his precious ego. After all, Junior's behavior in class wasn't bothering his mother any, while Junior's anger at being punished came home with him, and did bother her.

Maybe it isn't too surprising that there's a shortage of technical school students. It takes a certain moral courage to voluntarily walk into a situation guaranteed to force you to give up your own opinions, willy nilly—and kids brought up in the Unrepressed Philosophy haven't been encouraged to develop that form of courage.

The lowest form of courage is that of the lion—pure physical courage. Even a rat has that.

The next level up is the courage of your convictions. All men have that in some degree.

The next level up beyond that is rarer; it's the courage to give up your convictions. It can be developed through training, of course—and only that level of courage can make a scientist.

THE EDITOR.

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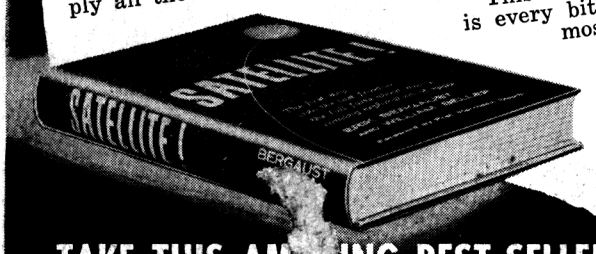

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