ASTOUNDING

MAY '40

SCIENCE-FICTION

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20¢

"SPACE GUARDS"
by Phil Nowlan

MAY, 1940

MAY, 1940 ASTOUNDING SCIENCE-FICTION Phil Nowlan

THAT's the explanation they gave him, but they were letting him go for another reason entirely . . . one that Watkins didn't even suspect. Without realizing it, he had offended a number of the firm's best customers and they had complained to the boss. It was sort of tragic . . . to have this happen just when he thought he was getting some place. A good man, Watkins—and an ambitious one—but just a little bit careless.*

You can't get away with it

Maybe a few super-employees get away with *halitosis (bad breath), but lesser ones shouldn't even try. This offensive condition, of which anyone may be guilty, is the fault unpardonable in business, and social life. Business firms should insist that their employees use Listerine Antiseptic every day, to take precautions against offending.

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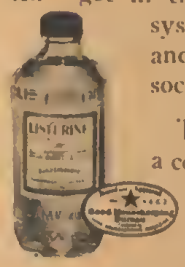

This wholly delightful precaution against a condition that anyone may have at some time or other without realizing it may pay you rich dividends in popularity. Lambert Pharmacal Co., *St. Louis, Mo.*

WHERE DO YOU GO FROM HERE?

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We believe you will find the answer here—a suggestion the soundness of which can be proven to you as it has been to thousands of other men.

The whole trend today—legislation, spirit, action—is to put men back to work, raise earning and spending power, *give every man a fair chance to work out his own salvation.*

The road to success remains unchanged but, bear this in mind, *what it takes to win is radically different!*

No employer today would dare risk an important post in the hands of a man who had not learned the lesson of '29. Why should he, when right at this moment he can pick and choose and get almost any man he wants at his own price?

Business organizations are rebuilding—reorganizing for the new conditions. Before it is over every man and every method will be judged in the cold light of reason and experience—then dropped, remade or retained. This spells real opportunity for the man who can meet the test—but heaven help the man who still tries to meet today's problems from yesterday's standpoint! Out of the multitude still jobless there are sure to be many frantically eager to prove him wrong and take his place.

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All fictional characters mentioned in this magazine are fictitious. Any similarity in name or character to any real person is coincidental.

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THE PERFECT MACHINE

SCIENCE-FICTION being largely an attempt to forecast the future, on the basis of the present, represents a type of extrapolation—and a scientist trusts extrapolation to about the extent he'd trust an automobile dash-panel ammeter as a precision instrument. It might, for instance, be interesting to see what results a veterinarian might have gotten if, working about 1890, he'd extrapolated to determine the number of horses the nation would require in 1940. His results would have been slightly whacky.

In the late eighteenth century, machines were beginning to replace hand labor in repetitive tasks. Even so early, some of the basic necessities had been understood; particularly a number of designers had realized that a machine needn't and generally shouldn't, imitate human or animal motion in performing a given task. That is, even the earliest attempts at automobiles avoided the error of making a steam-operated horse.

Still, it took two thousand years at least for the eye of a needle to move an inch and a half from one end to the other—and the sewing machine had to have the eye at the end opposite from that of the human-operated needle. The tendency to retain old methods is very strong—and that tendency is no more than trying to extrapolate with a straight line.

Trouble is, many times when we try to extrapolate we assume with absolute conviction that the function is a continuous one; we neglect the idea that maybe it breaks off completely ten years hence. The job of kerosene inspector, for instance. There was a steadily increasing demand for kerosene inspectors back around 1900. Why, extrapolate that, and there'd obviously be a demand for tens of thousands by 1940.

There wasn't. There were automobiles instead that used all the gasoline refiners had been tempted to include in kerosene, and the "expanding trade" not merely ceased expanding—it ceased.

The wisdom of the ages rests upon us now. The clarity with which we see the errors of our predecessors is equaled only by the clarity with which they saw their predecessors' errors. Now let's try spotting some of our own errors.

Machines, pretty obviously, form the basis of our present civilization. Three possibilities open out; that our present civilization is going the way of L. Ron Hubbard's "Final Blackout" suggestion. That it will, instead, continue, expand, and improve. That we'll develop something wholly different.

We can't argue about the latter, and L. Ron Hubbard is handling the first, so let's guess about the second.

One guess: We are not going to produce bigger, more intricate mechanisms with more gears, more valves, and more intricate sliding parts. That

is a tendency that's dying on its wheels right now. What would constitute a perfect machine?

I suggest something as follows: A perfect machine would convert one form of energy to another, or one product to another, with one hundred percent efficiency. It would require no attention whatever. Mechanically, it should be extremely simple, no matter how complex its technical-mathematical theory. It should have no moving parts whatever, and hence no wear. It should not corrode. It must be absolutely dependable.

There is one machine in use at the present time that is, on that basis, about ninety-nine percent perfect. It converts one form of energy to another at 99.98 percent efficiency. Mechanically, it is extremely simple—practically the ultimate—though its theory is complex enough to have required the services of one of Mankind's geniuses to elucidate it. It has no moving parts whatever, and hence no wear whatever. It requires nothing tending toward corrosion (as differing from a storage battery, for instance). It is extremely dependable, only violent failures of extraneous equipment or major natural forces causing failure. And it requires a very close approximation to no attention.

At first thought the idea of a machine with no moving parts seems slightly contradictory, perhaps. But—the transformer, that closest approach to perfection, changes energy from one form to another without any motion save on the part of those things absolutely impervious to wear, and not to be considered mechanical, moving parts—electrons and magnetic fields.

The perfect machine, evidently, will make the maximum use of electric, magnetic and, perhaps, gravitational fields. A maximum use of ions, electrons, et cetera. Gears, bearings, rods, mechanical parts of all kinds, will be practically eliminated—or not used, save for starting operations intended to continue for long periods.

We're moving that way now, and undoubtedly there are too many forces tending that way already for us to back water to cruder types. The reciprocating steam engine driving a dynamo with commutator and brushes has given way to turbine-driven alternators with simple slip rings. The turbines, once started, simply run on and on, endlessly, for two years or so before someone makes a brief inspection and restarts them. Molecules of steam—which can't wear out—drive the turbine directly, instead of through wearing pistons and rods.

Mechanism of the future may involve theoretical knowledge immensely beyond anything we have glimpsed—but the further futureward we go on the present type of civilization, the simpler, mechanically, the devices employed are apt to be. Intricacy is the device of a civilization not yet capable of solving its problems directly.

I may be wrong—this being an extrapolation—but I'd still be willing to bet on it if I had some means of collecting!

THE EDITOR.

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SPACE GUARDS

by PHIL NOWLAN

Illustrated by Schneeman

The last story of one of science-fiction's best-known writers—the creator of "Buck Rogers."

I.

THERE was no doubt of it. We were lost, Linda and I, in the miasmic fog that had risen without warning over the swampy Venusian jungle. We blundered blindly against the trunks of gigantic ferns, and tangled constantly in the snarled

strands of parasitic vines that spread their endless webs between them.

Our arms were weary from wielding the heavy machetes we had brought along to hack our way through them. For we were afraid that the use of our heat rays on the moisture-soaked vegetation would raise clouds of smoke and steam to betray our presence.

The fog now had become so thick that we had to hold hands to make sure we didn't lose each other. That in itself, of course, was not unpleasant. A fellow doesn't often get a chance to hold a hand like Linda's, especially when he is only a junior lieutenant in the Space Guard, and the owner of the hand outranks him as navigation officer of the ship.

Linda sighed: "I'm going to rest a bit, Bob, before we go on," and promptly sat down on a hummock of pale, yellowish moss. I plumped down beside her and found out the moss was very wet. But both of us were too tired to care. Linda just made a little face, and remarked we should have worn our porosite uniforms.

"Why go on at all?" I asked. "I'll bet we're just stumbling around in a circle, anyhow."

"Venus is a hell of a planet, isn't it?" she mused wearily. "I don't suppose a single ray of good, honest sunshine has ever penetrated that mess of clouds up there, that they call a stratosphere, since the beginning of time.

"And down here, on the surface," she continued, "not a leaf of healthy-looking green foliage to be found anywhere. Nothing but the dirty white and muddy yellow of these fern trees, and things. *Ugh!* They're almost fungoid! And you wouldn't think a world so much closer to the Sun than Earth is, could get so chilly, would you?"

I shrugged. "It only goes to show what a good insulation a perpetual envelope of water vapor can be."

We mused a while in silence. Not a breath of air was stirring. Not a frond of the fern trees nor a leaf of the snaky vines moved. There was only the constant drip of moisture, and the wet, white blanket of fog that had closed down upon us.

I'm no weakling myself, and Linda, though lithe and slender, has muscles like spring steel, and endurance to spare. Yet we were really weary. Hacking our way through those tough vines for five miles had been no joke. And now, it seemed, it had been in vain.

"It's hopeless to try to go any farther in this fog," she said at last. "And Heaven only knows how long it will be before it clears. Let's go hands before our faces?"

"Can we find our way back," I objected, "when we can hardly see our hands before our faces."

"I don't know, Bob. It will be slow work, I guess, but we ought to be able to feel our way back, along the path we hacked."

"Cap Scudder will be sore."

"He'll blast off, of course," Linda admitted. "But his bark is worse than his bite. He doesn't demand the impossible. And after all, we don't know whether we're even within a thousand miles of Tiger Madden's mysterious, hidden kingdom. Steve Hardie's report indicated Tiger's stronghold is rather thickly surrounded by native villages, but so far, we haven't seen the slightest sign of any inhabitants, savage or civilized. We would have seen or heard something if we'd been anywhere near them."

"All right, then," I said, standing up. "Let's see if we can grope our way back to the rocket glider."

We started off. Linda quite naturally took my hand again. As we had feared, it was slow work. The trunks of the giant ferns were some twenty feet apart, but far above their great fronds spread out until they overlapped and formed, practically, an unbroken roof of foliage under which the mosses and vines grew, the latter climbing the fern stems and draping groundward from the highest of the spreading branches like snarled, tangled nets.

Underfoot were masses of soggy, whitish moss, divided by innumerable twisting, winding little rivulets, and many wide, deep pools. We did a lot of slipping and splashing in the streams, and once Linda barely saved my life by whipping out her machete and lopping off the head of a snake thing that stabbed up at me out of one of the pools when I stepped too close to it.

Our magnetic compasses were worthless. The needles kept constantly dancing back and forth through virtually an entire quadrant. Even our little radiolets, which should have enabled us to converse with the Space Guard up to a hundred miles or more, produced nothing but buzzes and crackles, probably due to the same electronic disturbances that affected the compasses.

So, we groped our way slowly, cautiously, from one netlike barrier of vines to another, feeling our way along it until we came to the hole we had hacked in it.

"When we reach the glider we better blast straight back for the ship," Linda said. "I'm wet to the skin, and I know you must be, too. Besides, both of us could do with a shot of something to take this chill out of our bones, and some hot food."

"Fly in this fog?" I asked doubtfully.

"It probably doesn't reach any higher than the jungle roof. We'll get above it. Then we ought to be able to see the mountain where Scudder landed the *Eagle*—even if the radio compass isn't working."

"And here," I said, as we climbed through another opening in the netted vines, "is the clearing where we left the glider."

Back and forth across the clearing we groped, reaching blindly ahead of us to locate our tiny craft.

But it was gone!

II.

For a moment we stood there staring hopelessly at each other. We had little chance of regaining the Space Guard ship without our rocket glider. Our one slim hope was that the static would fade and enable us to communicate with it before it was too late. But the electric disturbances and the fog might continue for days, and Scudder had expected us back in a matter of hours.

Linda began to swear, softly but fervently, and the phrases, so incongruous in her honeyed, throaty voice, seemed to carry more weight and vehemence by that very incongruity. In truth, these girls of the Space Guard were no sissies. With all his rumblings and boomings, I had never heard even Scudder do a better job than she did as we stood facing each other in that stifling Venusian mist. But I knew she was doing it to help choke back the tears and get control of her nerves in the face of the panic that threatened the pair of us.

Suddenly her eyes widened in alarm and she cut short one of her most lurid ejaculations. She leaned toward me and whispered in my ear, "*Sh!* Did you hear anything?" and then glanced apprehensively over her shoulder.

I shook my head "no."

Again she whispered, so softly I barely heard her, as she took my arm and led me several paces from the spot where we had been standing. Our footsteps made no noise in the spongy moss.

"For a moment I forgot, in the shock of finding our glider gone," she said, "but, Bob, it didn't vanish by itself! And whoever took it—"

"May be waiting right here, to trap us in this clearing when we return!" I finished.

I did have the feeling now that we were being watched, and by many eyes, though I couldn't understand how eyes could pierce such dense fog. Or did any of the denizens of this Venusian jungle perhaps have that power? I seemed to have a vague recollection of having heard somewhere that—

But I had no opportunity to pursue the thought. This time there was a noise, faint and indistinguishable, from one side of the clearing, followed quickly by another from the opposite side.

In a split second we had flopped flat on the ground, facing in opposite directions, our guns in our hands. But the attack did not come from any direction in which we had expected. It came from overhead!

With a swishing, whistling sound, a great net dropped out of the impenetrable mist above us, completely blanketing us. It must have been nearly as wide as the clearing itself.

"Our knives!" I gasped, as we whirled over where we lay, trying instinctively to lift its entangling folds. But handicapped by these and our prone positions we were unable to whip out our machetes. Then, out of the mist, savage forms materialized as though by magic, hurling themselves upon us.

Twice we blasted with our guns, but scored no hits. Then I realized the shapes piling up upon us, and cleverly entangling us further in the meshes of the net, were human, and that they were trying to capture without harming us. The lads on top of me were gasping and groaning under the impact of my fists, elbows and knees, but were making no effort to retaliate, only to pin me down.

"Cut resistance, Bob!" Linda called to me. "They've got us, anyhow!"

That was an order, and of course I obeyed it, in the face of all my instinct to the contrary, forcing myself to lie still without any further struggling. Slowly they climbed off of me, which was a relief, for I think there were about eight of them. But in the process I noticed that my gun and every bit of my gear that wasn't too large, was pulled away from me through the net.

In an unfamiliar dialect of the universal Venusian language a gruff voice said: "You are good fighters, you two! But you surrender?"

Linda laughed bitterly. "What else can we do? You've got us beaten."

"Not beaten," replied the voice, with a crude note of admiration, "but overwhelmed. It took nearly a score of us to pin you down!" Then a command: "Roll back the net, and let them up! But bind their hands behind them. Tiger Madden and Valita Lenoir, the mad Earthlings, are not to be trusted. So ordered Hung-Ho-Mang!"

Linda and I exchanged glances of amazement as we got to our feet. We were barely close enough to see each other hazily through the thick mist, into which our captors busily vanished, quickly reappearing, as they completed the job of stripping

us of the rest of our gear, even to our "tin hats" with their built-in radiolets, while several of their number held sharp knives to our backs, ready to thrust them home at the slightest sign of resistance.

They were big fellows for Venusians, I noticed, having several inches in stature on the average inhabitant of the cloudy planet; in fact, being almost as tall as ourselves. Obviously they were members of one of the semibarbaric races of the tropical jungle. They had the typical Venusian dead-white skin, and features that are so reminiscent of the Oriental peoples of Earth. Their only clothing was a uniform kilt of soft, pleated leather, studded with metal, and a girdle from which hung a straight, heavy-bladed knife, or short sword. In addition, they carried compact, powerful crossbows.

III.

Linda and I were placed side by side, for which we were thankful, since it would enable us to talk, and the middle of a long rope was passed through our belts. Half of the detail took one end of this line and vanished into the mist with it. When we felt the tug, we followed. The other half of the party brought up behind us, holding the other end of the line.

There was a break somewhere among the vines that we had not noticed when first we had landed in the clearing. Through it and others, we found ourselves hustled away at a fairly snappy pace; so fast that I suspected these jungle clansmen really could see through the fog much farther than we could.

"You noticed the names by which the head man addressed us," I said to Linda in English, as we strode along.

"Yes," she replied thoughtfully. "Our savage friends evidently are *not* friends of Tiger Madden and Valita Lenoir, since they think we're them."

"Maybe we can turn this situation to our advantage after all."

"Exactly what I was thinking," said Linda. "We'll play it soft for a while, and see what develops."

"What about Scudder and the Space Guard ship?" I suggested.

She shrugged. "He'll just list us as missing in action, when he doesn't hear from us in a few hours. What can we do about it? Then he'll send out other scouts to try to locate Tiger Madden's tropical empire. Maybe we'll get a break later, and a chance to contact him by radio."

"*This* doesn't look like it," I said gloomily.

"No," she said. Was it by accident or design that her shoulder pressed against mine for a moment as we marched along? "Right now it's just a case of the two of us, alone, against one of the most powerful, sinister and mysterious potentates on this damned waterlogged planet—win or lose—for the honor of the good old Space Guard."

The way she said "two of us, alone," made something convulsive happen under my left row of ribs. The only answer I could make was a gulped "Right!" and I couldn't tell whether her shoulder pressed against mine again accidentally or on purpose.

The ground was rising as we progressed, and soon we were out of the swamplands. The nature of the giant fern trees changed. They weren't so much like ferns. The growth of rank vines thinned out and disappeared, as did the dank moss under foot. Gradually the mist thinned, and vanished. Then, even the fern type of tree vanished, to be

replaced by a coniferous kind of dwarfed shrubbery, until at last we were stringing out over a plain covered with queer, long grasses, under a leaden sky. Ahead loomed a mountainous ridge, the slopes of which were patchily covered with vegetation with a distinct but anemically green tint.

At the base of the ridge, our captors led us into a ravine that wound up the course of a fair-sized stream, until, at last, after a challenge from a sentry behind a huge boulder, we passed on into a little valley, and a village of leathern tents that looked much like the tepees of the ancient American Indians.

Before the largest of the tents we were brought to a halt. Our captors lined up behind us, standing at attention. Their leader stepped forward, and stood with arms stretched wide, while a barbarically impressive figure strode out and paused, looking at Linda and me with mildly puzzled eyes.

The leader of the detail thwacked his left chest resoundingly and said: "See, O Hung! We have captured and brought to you the Earthlings, Tiger Madden and Valita Lenoir, and they are mighty fighters. It took all of us to subdue them! Have we done well?"

The hung—for, as we quickly learned this was his title and not his name—gave us a piercing glance, and actually grinned.

Still smiling, he spoke to the suddenly abashed chief of our captors: "You call them Earthlings? Yes. You are right. But they are not the Madden and the Lenoir."

"Oo-Lah!" cried the detail leader in dismay, and dropped to his knees. "They were in the swamps. We found their bird machine, like those of the Earthlings. We took it apart, and sent its parts here. Then, when they returned for it, we netted them."

"You are not to blame, Gor-Kang," replied the hung, "for you have never seen the Madden or the Lenoir. But I have. And I tell you, these are not they. Have them unbound."

Then he turned to us, still smiling, after a couple of the men had leaped to obey the command. He looked at us curiously, and then at the little heap of our weapons and gear that had been piled nearby.

"Who are you?" he asked.

Linda answered: "I am Commander Linda Darlington, astronavigator of the Earth Space Guard cruiser *Eagle*," she told him. "And this is Lieutenant Bob Manley of the same ship."

"Hm-m-m," mused the hung. "The Space Guard of the Earthlings? I have heard of that. And this strange clothing, and the strange weapons? Yes, you must be right. Why were you where Gor-Kang found you?"

Linda took a chance. "Our orders are to locate Tiger Madden and Valita Lenoir," she announced boldly, "and to arrest them in the name of the Federated Nations of Earth for high treason, mass murder and the larceny of one billion dollars' worth of deltinium from the mines of Luna, the satellite of Earth. This we have the right to do under treaty with the Venusian north and south polar hegemonies."

The hung rubbed his chin thoughtfully.

"The hegemonies have no jurisdiction here," he replied slowly, "but we of the Ho-Mang do not admit that Madden and Lenoir have either, though they claim the right to enslave us. You of the Earth Space Guard have much knowledge and

skill that we of the Ho-Mang lack. You are mighty fighters, Gor-Kang says. We are mighty fighters, too, though simple folk. And we are both enemies of the Madden and the Lenoir. Could we not join forces?"

"Yes!" said Linda and I together, with considerable enthusiasm.

IV.

THE HUNG ordered that our weapons and equipment be returned to us. Then he shouted, in a peculiar high, quavering voice, and the inhabitants of the village began to pour out of their tents and ringed around us, staring at us curiously, yet with a friendly respect.

All—men, women and children—were clad alike, in the same garb that the soldiers wore, only without the metallic studding in their leathern kilts, and without weapons and equipment.

Then, having "met" us, so to speak, they dispersed, going back to the activities which evidently had been interrupted by our arrival. Many were engaged in the curing of a huge luimok hide which they held over a vast smoking fire. Others were grinding grain. Some were chipping stones into convenient shape for their peculiar crossbows, while two or three, with stone hammers, laboriously were shaping bars of metal, at rude forges, into sword blades and other implements.

It was warmer and drier here in the village of the Ho-Mang. There was greater diffusion of light and heat from the leaden sky, and we began to thaw out from the chill of the ground fog of the jungle swamp which had penetrated to our very bones.

The hung invited us to a ceremonial meal to bind our alliance. He escorted us with dignity to a great stone block with a flat top, around which we sat on smaller blocks, while attendants served us on rude platters with such delicacies as great chunks of luimok meat, yaka porridge, unleavened cakes made of boo-ya grain flour, and the strange tropical fruits of Venus. Barbarian etiquette demanded that we keep absolute silence during this meal. But Linda flashed me many an eloquent glance as we sampled this and that, sometimes with the most surprising results. We had had experience with the delicate epicurian dishes of the civilized polar regions, but this tropical diet was new to us.

The luimok meat, as might be expected, was coarse grained, with a slight oily, reptilian flavor; not tempting, but passable when doctored up with tropical spices. Altogether, you wouldn't have called the meal an especially appetizing one, but we were hungry, and the fruit nectar, called ipsong, and served in cups hollowed out of luimok claws, was delicious.

Hardly had we finished when a sudden excitement pervaded the village, and one of the Ho-Mang scouts came leaping and plunging down the mountain slope nearest us. Staggering up to the hung, he slapped his chest in what seemed to be the tribal form of greeting or salute, and gasped out his report so breathlessly that Linda and I were unable to follow the dialect.

The chief looked grave, and turned to us. "He says that in the valley on the other side of this ridge, a vast array of clansmen is approaching, supported by a large detail of Madden's hirelings with big rocket guns and much equipment that float in the air, held aloft by up-falling stones and pulled along by light ropes."

"Inertron lifters!" Linda and I ex-

claimed in the same breath.

"Tiger Madden and Valita have done well by themselves," Linda added. "Well, what was to stop them, with the billions' worth of deltinium they stole?"

"Do they know of your village here? Are they coming to attack you?" I asked.

"It is possible," replied the hung. "But we do not know. We could not stand against them if they attack from the top of this ridge."

"Then occupy the top of the ridge yourselves," suggested Linda, "and drive your own attack down upon *them!*"

"That is a good thought!" he said. "After all, we are their enemies. Why should we wait to find out if they are hunting for us? A very good thought, indeed!" He brightened considerably.

But if he was slow in thought, he was not slow to action. A single barked order and two thirds of the village, including the younger women and the older boys, were congregating in rough order, detachment by detachment, in the open space around his tent, and fully armed with short swords and crossbows. And a moment later, they were scrambling up the steep slope.

THE HUNG followed them, accompanied by Linda and myself. I loosened my rocket pistol in its holster and hitched my belt around until the machete hilt was more ready to my hand. Linda glanced at me with a little half smile of amusement.

We reached the top of the ridge before the enemy column came abreast of us. By rights they should have had flankers out, coming along the ridge, but they didn't, and I doubted if their mission really was concerned with the Ho-Mang in particular. So much the more chance of taking them by surprise.

First came a detachment of clansmen, about a hundred strong, who looked very much like the Ho-Mang, but far better armed. Rocket rifles were slung across their shoulders, and double bandoleers of ammunition. They swung along with the free, easy stride of jungle men.

Next came the mercenaries, men of smaller stature for the most part, probably outcasts and refugees from the more civilized polar regions, effortlessly towing behind them in the air seven big rocket cannon, the weight of which had been neatly counterbalanced by the lifting power of inertron blocks. They were towing along other impediments, too, the nature of which I could not identify at the distance. Mechanical or scientific apparatus by all appearances.

These men were completely uniformed and wore substantial armor, the weight of which they seemed to bear lightly. There probably was built into it a certain amount of inertron to counterbalance all but a few ounces of its weight, I imagined.

Behind them marched another detachment of clansmen, equipped like the first.

Linda and I lay flat beside the hung, raising our heads only occasionally to peer down at the enemy.

"You will watch carefully," the leader of the Ho-Mang pleaded, "and tell us our mistakes?"

We agreed to give him the benefit of our advice, but in the engagement that followed we couldn't see much to improve on in the tactics of the Ho-Mang, considering the nature of the ground and the primitiveness of their arms. Indeed, I think we learned more from them than they from us.

V.

From where we lay beside the hung, Linda and I could see the Ho-Mang, spread out to either side of us, without raising our heads enough to be seen from the column marching below.

The tribesmen were hidden in little groups behind the numerous boulders and outcroppings of rock that lined the top of the ridge.

Linda nudged me. "Do you get it?" she asked.

I looked up and down the line intently. One peculiar thing I noticed, but its significance did not occur to me at the moment.

"They're well hidden behind those boulders," I replied, "all ready, I suppose, to rush down the hillside and fall upon the other crew in a surprise attack. And— And lots of them seem to have spears now that they didn't have when they climbed up here from the village."

"Spears?" she smiled at me.

"Well, they do look a bit heavy for spears," I admitted.

"They're not spears. They're crowbars! And do you notice that it's only the girls and the young boys who are taking shelter behind the outcroppings of stratified rock? That it is the men, who are stronger, who are grouped behind the boulders, with the crowbars? And what are boulders doing up here on top of this ridge? They're all nearly round, too! It's not natural, geologically, to find them here, Bob. They've been placed here, only you don't notice them at first, in the midst of all this rocky formation!"

I got the idea then, but hardly before the Ho-Mang put it in operation.

There was no signal given that I could notice. Certainly the hung made no move, nor uttered any sound. Probably the whole thing was prearranged and rehearsed. At any rate, without warning, under the impetus of the clansmen crouching behind it, one of the huge boulders, dislodged from its place, started rolling down the steep slope, gathering speed as it went. The little group who had started it fell flat on their faces.

Below, the startled column heard, and whirled to watch it as it leaped and bounded like a living juggernaut toward their rear. The tribesmen toward whom it was headed broke their formation and scattered in panic.

Then, while all eyes were turned toward the threatened spot, several more boulders tipped forward and started crashing down the slope.

As yet, not a clansman was visible to the column below, whose officers still didn't realize they were being made the target of a desperate and clever attack. The mercenaries made no attempt to haul down their rocket guns and get them into action. Instead, still towing them in the air behind them, they attempted to swarm up the opposite slope.

"It's funny," Linda commented. "Those men evidently are seasoned soldiers. An undisguised attack by an enemy wouldn't panic them at all. They'd have had those guns unlimbered and in action in a few seconds. But there they are, utterly demoralized, fleeing madly from an avalanche of stones!"

"They're badly disorganized all right," I said. "It will take some time for them to get into action when they do realize what they're up against."

The entire column was in wild disorder now. The two and three-ton boulders, accompanied by a very storm of rocks and débris, were crashing among them with devastat-

ing effect. Scores were crushed or maimed.

By now the Ho-Mang, however, had abandoned all attempts at concealment. As fast as a group would upset the delicate balance of one great missile, they would rush openly to another, and send it hurtling down, too. All were now on their feet, those who were not assigned to duty at the stones standing calmly, grasping their weapons and waiting for the signal to charge.

"How about it, Linda?" I asked, as a couple of the big rocket guns, released from the grasp of injured or frightened mercenaries, went drifting slowly skyward like huge toy balloons. "We're good enough shots to pot a few of those fellows!" I tugged at my holster.

"No!" she said sharply, grabbing my arm. "It might be noticed by some of them, even in this panic, and some survivor might carry the word back to Tiger Madden and Valita. *They* know the Ho-Mang are not equipped with rocket pistols! The hung hasn't asked us to actually take part in this fight, so we might as well keep ourselves strictly under cover! We still have our mission to accomplish, you know."

As THE LAST of the boulders went hurtling downward the hung blew sharply on a whistle, and with a wild yell the Ho-Mang went leaping and bounding down the slope in the wake of the avalanche they had started. Shrieking their battle cry, "Ho-Mang Oo-Lah," women and boys fell upon the enemy like wild beasts, hacking, slashing and thrusting with their heavy swords.

I doubt if the tribesmen below had been aware of the charging Ho-Mang until they hit them, coming as they did, right in the wake of the showering stones and boulders, leaping through the dense clouds of dust like suddenly materialized demons. Only a scattering fire from the rocket rifles met them.

I was more than amazed at the fierceness with which the detachment of girls hurled themselves against the enemy, slashing and hacking their way through the disordered column with furious abandon.

Then the Madden forces broke. Casting away their rocket rifles, ammunition bags and anything that might impede them in their flight, the stranger tribesmen scattered and fled up the valley and along the opposite slope, hotly pursued by the Ho-Mang, while groups of the boys followed, mopping up.

No quarter was shown. Some hundred survivors, as nearly as I could estimate, made their escape simply by outrunning their pursuers. And most of these were the mercenaries who, when they saw how the fight was going, made no attempt to haul down their big guns, but simply let them drift skyward while they raced for safety.

"The Ho-Mang are mighty fighters," said the hung with simple sincerity when, obviously weak from several superficial wounds and covered with blood, he wearily reclimbed the slope to where we stood.

We agreed with him heartily. With boulders, crowbars and their heavy, short swords they had vanquished a force fifty percent stronger than themselves, armed with modern rocket rifles and huge rocket cannon. And I don't think a single crossbow bolt was fired.

VI.

"Now," said Linda, when we were back among the campfires of the feasting Ho-Mang, "you and I better be about our business of finding

out just where Tiger Madden's stronghold is, and scouting the place so Scudder can lay his plans for a raid."

"If we can manage to locate the Space Guard ship," I amended. "It's a cinch Scudder isn't going to hold it there on that plateau forever. He's probably given up hope of our return already, and gone ahead with other plans to locate Madden and Valita."

"Let's try our radiolets again," she suggested.

The electronic disturbances, however, were still heavy, and though we signaled the ship's code for quite a while, we got no other response than loud static. If we could not hear the *Eagle's* powerful transmitter, it wasn't likely that it could pick up the weaker signals of our own tiny sets.

We told the hung our intentions and asked for directions, but to our disappointment, he only waved an arm vaguely eastward, and could tell us nothing about the stronghold itself. Nor had any of the Ho-Mang any further information.

All they knew, it seemed, was that about two years before—which must have been shortly after Madden and Valita had made good their escape from the Moon with the huge fortune stolen from the deltinium mines, of which Madden had been the manager—there had been rumors, passed along from one barbarian tribe to another, of the coming of an Earth man and woman who had set themselves up as supreme rulers of all Sungland. They had persuaded several tribes to accept their rule by promises of the comforts and power of civilization.

To some extent they had made good on these promises. Also, together with luxuries, machinery and scientific apparatus of every description, they had imported mercenaries recruited from the dregs of the northern and southern civilizations, including some Earthmen and even Martian outcasts.

There was no telling how far they might have extended their rule by peaceful methods if they had not permitted these mercenaries to set themselves up as a sort of arrogant aristocracy. But gradually rumors of cruelty and injustice also began to circulate from tribe to tribe.

And just as surely, there grew up among the Ho-Mang and other independent clans, who at first were not entirely antagonistic to the idea of the prosperity promised, a spirit of fierce hatred for this mysterious "kingdom" or "empire," and a determination to preserve their freedom at any cost.

Finally, overtures had been made to the Hung-Ho-Mang indirectly—he had refused them in no uncertain terms—and the clan had begun its preparations for defense, which included the trap we had just seen them spring on their enemies.

But why had the polar hegemonies looked with such complacency on the formation of what threatened to be a powerful tropical state?

We had known the answer to that before we set out on our mission. They simply were indifferent. The tropics produced nothing they needed nor wanted. They had no trade nor communication with them. The thing wasn't taken seriously enough to be "viewed with alarm." Popular feeling was that if a couple of crazy Earthlings wanted to play king and queen to a few barbarian tribes in the beastly climate of the tropics, let them have their fun.

But neither the hung nor any of his clansmen could give us any definite information as to just how far and in precisely what direction Tiger Madden's new city lay.

"In that case," I said to Linda, "maybe we're losing a good bet in not trailing after the survivors of this expedition the Ho-Mang have just licked!"

"That's right!" she exclaimed. "They'll surely streak back there. At least the mercenaries will. We'll follow them, but—"

"But what?" I cut in.

"We'll stand a lot better chance of getting away with it if we discard these brilliant Space Guard uniforms of ours. They were never designed for low visibility in tropical Venusian campaigning—except in fogs, perhaps."

"We've got nothing else to wear," I pointed out. "We forgot to bring a trunkful of disguises."

"Well," she said doubtfully, "we might get the Ho-Mang to outfit us like themselves, only . . . only I'll be damned if I'm going to run around with nothing on me up here."

In the end we consulted our hosts, and found out there was another tribe several miles south who prided themselves on their addition of brief jackets to the usual jungle kilts. The women got busy at once with their thorn needles and soft pieces of luimok hide, and soon we looked like anything but two Space Guard officers.

"It won't matter if the details aren't entirely authentic," Linda remarked. "We don't dare be seen at too close range, anyhow. We could never whitewash our skin to look like Venusians. We haven't got black, slanting eyes, and my hair is yellow. But a cap will cover that."

"At a distance we won't attract undue attention," I concluded. "Let's go. Those fugitives must have covered a lot of ground by now, and we'll have some catching-up to do."

Outwardly we were equipped like clansmen, with broad, short swords and small but powerful crossbows. Concealed—the Ho-Mang women had provided pockets in our kilts and jackets for the purpose—we had our rocket pistols, heat-ray tubes and radiolets. The machetes we had presented to the hung, who regarded them as priceless gifts.

Over the ridge we went, and up the valley in that unhurried, swinging stride to which the Space Guard aground is trained; which looks slow, but eats up the miles tirelessly. We wasted little breath in talking.

At first, abandoned weapons and pieces of equipment made the trail easy to follow. Later, as our way rose constantly toward the highlands, these indications became more and more scarce. And to make matters worse, there was not enough vegetation to reveal the recent passage of a fleeing horde. There was, of course, no road nor visible trail. We had to guess our way by putting ourselves mentally in the position of the fugitives and picking the most likely direction.

Hotter and hotter it got, always with that dreary, sultry, leaden sky above. But we never flagged in our pace nor paused for rest, and I noted with growing admiration that Linda showed less sign of fatigue even than I. The girl was tough. Anyway you took it, however, this was better than hacking our way, foot by foot, through the tangled mass of the swampy jungle.

It was not until the leaden sky dulled slowly into night that we found the first evidence we had guessed our way correctly along the trail of our quarry. Pinpoints of light flickered up ahead of us. Campfires!

We kept on until we had lessened

The Venusian natives didn't have weapons—but their tactics were perfect. The ambush revealed itself in an avalanche of falling boulders—

the distance somewhat, then finding a spot where a natural rock formation afforded concealment and partial protection, we settled down for the night, taking turn about at keeping watch.

VII.

It was in the darkest period of the night, that which precedes the first leaden gray of the Venusian dawn, and Linda, curled up in a

smooth hollow in the rock, was sleeping soundly when I first became aware of its approach.

I felt, rather than heard it.

I was a few steps away from the rock, concentrating on listening, and staring uselessly into the dense blackness, when I sensed the faintest trembling in the ground. There was no sound at all, and at first I thought it must be my imagination. But gradually the tremors became more perceptible. They were regular and rhythmic, like the footsteps of some incredibly heavy giant, walking too softly to be heard, but so heavy as to set the ground trembling a bit. Every once in a while the footsteps paused, then came on again, slowly, cautiously, until finally I imagined I could actually hear them. A chill raced up and down my spine.

As quickly as I dared, in the utter darkness, I felt my way back to Linda. She was already awake, and sitting up.

"What is it?" she whispered sharply. "I could hear it through the ground. It woke me up."

"I don't know," I replied. "Listen!" The slow, rhythmic thumping came closer. She was on her feet now, standing very close to me. Instinctively we both drew our guns.

Still closer it came.

Then suddenly Linda gasped: "Look! Up there!" she said.

Swaying in the blackness, some thirty feet above us, and not much farther away, two faintly phosphorescent orbs seemed to float and sway against the solid black of the night!

"Eyes!" I whispered.

"A luimok!" she gasped. "Quick, Bob! Before it squashes us!"

I raised my rocket pistol, but in an instant she knocked up my arm.

"No! Not that! The explosion would give us away! The heat ray!"

Even as she spoke, she had whipped out her own tube. And the almost invisible, purplish ray stabbed through darkness to a spot several feet below the eyes. The eyes remained motionless for an instant, apparently focused right on us. A spot began to glow redly where the ray found its target. The eyes blinked rapidly and zigzagged from side to side. A hellish blend of shriek, roar and howl shattered the night.

Suddenly the eyes whirled out of sight. The red spot vanished, and footsteps thundered away from us to be lost in the distance in an incredibly short moment.

Linda gave a great sigh, and slumped against me. I had to put my arm around her to keep her from falling to the ground.

"Thank Heaven!" she gasped. "It . . . it ran . . . instead of attacking!"

"I was afraid myself, we were done for," I admitted a bit shakily.

Ahead of us now, in the east, a dull-gray light began to outline the mountain peaks faintly. And from the same direction came a distant repetition of that infernal cry, while more faintly the shouts of terrified and agonized men were borne on the still air.

"Come on!" Linda said sharply, pushing me away suddenly. "It's stumbled into one of the fugitives' camps!"

We both started to run. There was enough light now to avoid crashing into obstacles or stepping into hollows and ditches.

"Easy, Linda!" I gasped. "We can't keep up this pace. We'll be completely winded before we get there!"

At that we settled down to the regulation double-time trot that we knew we could keep up for twenty

minutes to half an hour without pause.

"Funny!" I commented. "The way that beast actually took your heat ray for several seconds before it went haywire."

"I know," she replied. "It took that long for the sensory impulses to reach its tiny brain, and for the reaction to reach its muscles again. Nearly all of the animals on Venus have primitive organisms compared to those of Earth. And . . . and the luimok is . . . is something like the prehistoric . . . struthiomimus, I think it's called. One of the earliest of the . . . the dinosaurs."

"Yeah. I know what you mean. One of those things with a . . . a neck and a tail like a snake, and a body in between. They . . . they walked erect, on their hind legs, didn't they?"

"Uh-huh," Linda grunted. "Their front legs were practically arms, like those of the luimok, with . . . with three-fingered 'hands' like . . . like claws."

It was lighter still when about a quarter of a mile ahead we saw the giant form of the luimok thrashing about madly, striking great sweeping blows with his huge tail, and leaning down to claw at the ground with its short arms.

As we neared the spot, racing now as fast as our legs would carry us, I saw that it had been the bivouac of a sizable group of Madden's mercenaries, for there were several fires, or rather the remains of them, since the great beast evidently had trampled them to smoking embers. The tribesmen would have built one great fire instead of many small ones.

There were a number of crushed inanimate forms lying around, while here and there throughout the shambles was the gleam of metal armor. The men must have been taken utterly by surprise. On its long neck, so curiously like a snake's, the animal's head was swaying and turning, restlessly but slowly, peering here and there seeking some remaining living thing on which to vent its sluggish rage. Finding none, it rose to its full height, and stared stupidly around, its huge legs stamping thunderously as it turned, and its shorter arms waving constantly with curious, hooking movements.

Then it saw us. We skidded to a halt.

For an appreciable moment it glared balefully. Then suddenly it was racing toward us at amazing speed. And again that hellish cry rent the air.

So swiftly it came that Linda and I barely had time to whip out our pistols and let fly at it. There were two blinding flashes as our explosive rockets both scored hits. In one its wicked little head vanished. With the other a gaping hole appeared in its body that you could have heaved a barrel through. We darted aside, in opposite directions, as its huge hulk came plunging on for a moment as though nothing had happened, and then crashed to the ground between us, its limbs and huge tail flailing madly.

As the beast's last convulsive struggles subsided, a little cry made us whirl about. One of the mercenaries, who had not been killed but evidently had been playing possum, arose and came toward us.

"A girl!" I gasped.

She was taller than a Venusian. Taller, in fact, than Linda. Her hair was as bright as Linda's, too, and even at that distance, the peculiar, elusive, golden tint of her skin was noticeable.

"A Martian!" Linda exclaimed.

"*She* doesn't look like one to be mixed up with Tiger Madden's mercenaries!"

VIII.

"Now we really are in for it," Linda murmured as the girl advanced. "We can't let her go back and report to Tiger Madden that a couple people from Earth are snooping around the countryside, disguised in Venusian clothing!"

"We might take her back and turn her over to the Ho-Mang," I suggested.

"And lose the chance of following the other fugitives?"

"Maybe we could force her to tell us— But careful!" I whispered. "She's noticed."

The Martian girl, who had been walking toward us with the easy grace of a trained athlete, suddenly halted about fifteen feet away, and stared.

"You're not tribesmen!" she said in the Venusian tongue. She frowned. "You're not even Venusians."

"No," Linda admitted simply. I merely stood and looked. She wasn't hard to look at, either.

"Well, at any rate," she said as her eyes roved over us curiously, "I have to thank you for saving my life. There wasn't a weapon within reach, and if I had made the slightest move to get near one, that horrible beast would have trampled me or torn me to pieces in a moment. So . . . so I pretended to be dead. You are from Earth, of course."

"Yes," Linda said, drawing her gun and calmly covering the other. "And you're a Martian. What have you been doing here among this riff-raff? And wearing Tiger Madden's uniform? You don't look like that kind. No! Don't move! You're under arrest!"

The Martian girl tried to ignore the implication, but reddened slightly. Then she straightened up and lifted her head proudly.

"Under arrest?" she said. "By what authority do you presume to order—"

"The authority of the Earth Space Guard!" Linda snapped. "We are officers of the Space Guard. We're here to take Tiger Madden and Valita Lenoir back to Earth to stand trial. And that goes for any of his accomplices, too! No! You'll have no chance to get away and warn him!"

Curiously enough, the girl's concern dropped from her like a cloak. She smiled with relief. "Steve Hardie will laugh when he hears this one," she said.

Linda and I glanced quickly at each other.

"So you do know him," said our captive. "That proves your claim, because you couldn't if you were not officers of the Space Guard. And, as you must know also, the Martian Imperial Government is supporting your Earth council in this matter. Hence the livery I'm wearing." She made an apologetic little gesture. "I have been working with Steve Hardie under cover in Mad-Val, Madden's hidden stronghold!"

"And your name?" demanded Linda, still alert.

"Ainetsu Na Lannaigh," replied the other. "And your ship is the *Eagle*, isn't it? Does that mean anything to you?"

It did. Steve Hardie's reports, which Scudder had shown us, had mentioned her. And it was incredible that there could be another Martian girl in Madden's city who was so deep in the intrigue on the outlaw's side as to be impersonating her. We had to believe her.

Linda holstered her gun, and held out her hand with a smile, and I did likewise. We introduced ourselves, and Ainetsu, with a little bow, touched her fingers to her forehead in the Martian military salute.

"It was with the definite idea of contacting your ship," Ainetsu explained, "that I pulled the wires to be assigned to this expedition—to help you with whatever information I can give you about Mad-Val, its defenses, and the habits of Madden and Lenoir. Steve thought the *Eagle* might be found somewhere in this general locality. I was hoping to find some sign of it, and desert, before we got into action with any of these border clans. But the Ho-Mang beat the expedition to it, and took it by surprise. You saw the fight?"

"Yes," I said. "And the Ho-Mang did a neat little job of it. But I'm afraid we won't contact the ship, not for some time, at least."

"We're lost," Linda explained. "And we can't reach it with our radiolets because of this damned electronic storm. But maybe later—"

"Right now," I interjected, "our main job is to determine the location of the city and find out everything we can about it and its rulers, so that we can plan a raid with some hope of capturing them."

"You see," Linda went on, "an open attack is out of the question. In the first place it actually would amount to a young war—and we're only one lone Space Guard ship—and besides, Madden and Valita would be certain to abandon their followers if the fighting went against them, and they'd have every chance to plan an escape effectively. We've got to make a swift raid, the smaller the better, so long as we can get away with it, and just whisk them off right under the noses of their own people."

"Exactly," Ainetsu agreed. "In fact, Steve and I several times considered the idea of tackling it by ourselves. We could grab Madden and Valita, but the difficulty would be to get away with them. Madden has a few aircraft, but the crews sleep aboard, and it would be impossible to make our getaway on foot, through the mountains and jungles, handicapped by two prisoners. The loyal clansmen would have us surrounded in no time."

"But exactly where is Mad-Val?" I asked.

"Latitude four - point - six - seven North, longitude sixty-eight-point nine-one West," Ainetsu said. "But you could fly right over it and never spot it."

"What?" we exclaimed.

"It's an underground city, far beneath the summits of the Kang-Sih range. The entrances to the main tunnels leading to it are well camouflaged, and many miles away from the city itself."

"So that's the reason for the mystery of its location!" Linda mused.

"No wonder the few ships crossing Sungland between the north and south have never sighted it," I contributed.

"The *Eagle* has a full set of Venusian charts?" Ainetsu asked.

"Of course," said Linda.

"Then you can place the city very easily. About midway in the length of the range you'll find Peaks Seventeen, Twenty-three and Twenty-five. They form an irregular triangle and average about twenty-four thousand feet above sea level. The city is just twelve thousand feet below them in the solid rock. So you see it is absolutely impregnable from air attack, even by disintegrators."

"And how!" I admitted admiringly. "It would take the biggest dis-guns nearly a year to cut that

far through rock, even if they were mounted on solid bases, and not swaying in the air."

Ainetsu went on to describe the city to us in detail. The entrances to the main tunnels, of which there were three on the east slopes of the range, and two on the west, were from twenty-five to fifty miles distant from the city They were all concealed in narrow ravines at about the three or four-thousand-foot level, and protected from sight above by overhanging rocks, foliage and cleverly designed camouflage structures.

IX.

Two of the tunnels, one on each side of the range, were wide highways, smoothly paved, for the movement of large bodies of troops and the transportation of bulky material. The other three were double tubes, through which high-speed trams shot back and forth.

In addition, there were a number of smaller tunnels for special purposes. The existence of several of these was a secret kept from the general population of the city, known only to Madden and Valita, and a few of their most trusted officials.

All of the main tunnels sloped downward from the city, as a drainage safety measure. For the seepage of water, Ainetsu told us, was one of the greatest problems that Madden's engineers had to cope with.

The city itself, blasted and disintegrated out of the solid rock, was a series of perfectly air-conditioned passages and chambers on two levels, in which every modern convenience had been installed, including a marvelous system of phonovision intercommunication.

There was an inner city, reserved exclusively to the rulers and the mercenaries, who were known as the Legion, although there were not more than five hundred of them. Only by the four gates, at the four points of the compass, could it be entered from the outer city, in which the most favored of the clans which had accepted the Madden rule were quartered. There were, however, certain secret exits and tunnels from the inner city, one of which, as it turned out, was to be an especial concern in our plans.

"It's a slanting shaft," Ainetsu told us, "leading straight to the private aerie of Madden and Valita, at the very tip of Peak Seventeen, where they spend much of their leisure. This is reached by a single lift, and its existence is not known to more than a handful of Legion officers, and even these are not permitted to enter it."

The aerie, she said, was camouflaged on the outside to look like an upthrust of stratified rock, but actually was made of impervium painted a rocky gray. It had cleverly concealed windows of monotrans, a plastic that would transmit light inward, but not outward.

"They spend every evening there," she said, "from before dusk until well after dark. Steve and I have experimented with samples of monotrans. It can be blasted instantly with a disintegrator, or melted with a heat ray."

"Then it ought to be all very easy," Linda commented.

"No," Ainetsu said. "There are marvelous detectors, both in the aerie and on the neighboring peaks, that cover every frequency of audio, radio and electrono vibrations. The second we use a heat or a dis-ray, they'd register, and the guard would be on us. Mad-Val, I think, is the most perfectly detector-protected stronghold in the whole Universe."

"Then that stops us completely,"

I commented disgustedly.

"No," Ainetsu replied. "It does make it more difficult, but Steve and I have figured out a way. Monotrans is not so tough that it can't be sawed through by mechanical means. The five guards at the foot of the shaft are not so tough that they can't be silenced with knives or clubs, and the one thing that the outside detectors can't register is a small craft, with its power cut, gliding silently and softly to a landing beside the aerie! Of course, when it took off again—"

"We could risk *that!*" Linda exclaimed eagerly.

"There's one more difficulty, though," Ainetsu went on. "There are five guards at the bottom of the shaft all the time Madden and Valita are up there. Steve and I couldn't possibly handle them alone, too quickly for them to use their rocket rifles or ray tubes, both of which would register with the detectors."

"Or in other words," I began.

"You need *us* inside the city with you," Linda cut in. "The four of us could silently and effectively jump five Venusians any time!"

"That is exactly the plan Steve and I have in mind," Ainetsu replied. "That means, of course, that I've got to smuggle you into the city, and also that you've got to contact your ship to arrange for the landing of a glider, and see that the timing of the whole play is accurately synchronized to the split second. Can you do it?"

"The Ho-Mang have our own glider," I said hopefully. "Of course, they took it apart, but we could assemble it again."

Linda shook her head. "No good," she said. "Maybe they have it all or maybe they haven't. Besides, it's going to need all four of us to overpower the guards at the foot of the shaft."

"Then what?" Ainetsu asked anxiously.

There seemed to be only one answer for this. Though we didn't dare use our radiolets now, we had to contact the *Eagle*, not only to complete our plans, but to warn Scudder of the detector system of Mad-Val. It wouldn't do at all to have the ship's rocket motors heard before we were ready to pull our coup. It would alarm our enemies and cause them to double their vigilance.

In the end, we decided that Linda and I should go back to the Ho-Mang, reassemble our glider and hunt for the *Eagle*, while Ainetsu returned to Mad-Val with the fugitives. Later we could meet her at a rendezvous in the mountains, closer to the city. We agreed on a time and place, and started our trek back to the valley of the Ho-Mang. Ainetsu looked after us, rather wistfully I thought, then turned and set off toward Mad-Val.

FIVE DAYS later Linda and I rocketed skyward from the *Eagle*, which was grounded now in a ravine, high on the slope of the Kang-Sih Mountains about five hundred miles north of Mad-Val, and did not cut our blast until we reached an altitude of twenty miles. This took us a hundred miles toward our destination. But from that altitude it was easy to glide the remaining four hundred without the use of any power whatever, and at such low speed that not even a super-audio detector could pick up the slightest vibration from our wings as they slipped through the dense air.

Linda was at the controls, and as it would take us some time to reach the spot Ainetsu had designated, I dozed off.

I was awakened by Linda's low but fervent swearing, to hear her say: "Fog below! It's rising higher and getting thicker every minute."

I glanced over the side. As far as the eye could reach in every direction, nothing could be seen but a foamy white sea of wispy vapor. Not a peak projected above it by which we could get our bearings.

"Maybe it's just a cloud layer," I suggested hopefully, "and it's clear below it."

"Not a chance, on this planet!" Linda snapped. "That mist is so thick you could almost swim in it, and you can bet it goes right down to the ground."

"Where are we now?"

"Just one mile from the rendezvous, and three above it!"

It looked bad for us. The spot Ainetsu had picked was a wooded vale, not more than a half mile or so from the entrance to one of the secret tunnels. How we were going to hit a small clearing in it, in a fog like this, without cracking up, was more than I could see.

"We've got to circle down," Linda said. "With instruments like the ones on this crate, I know I can hit within three hundred feet of it, but . . . but three hundred may not be enough leeway."

"And we can't glide forever, waiting for the fog to clear."

Suddenly she laughed, and there was a sparkle in her eyes. "We've got to take a chance, shipmate," she said, "and if we don't reach the ground all in one piece—well, there'll be others to carry on! Are you game?"

"Let's go!" I replied, and we nosed down into the misty oblivion.

For a moment a panicky feeling swept over me. There was no telling when we banked, or whether we actually were flying upside down, without looking at the instrument board. But Linda kept her eyes on this, holding the controls in a steady grip. Her eyes were bright, and there was a hard, daring set to her little mouth. We were spiraling down, fast.

Then it came, what we had been dreading.

There was a crashing, rending sound. The tip of our left wing became suddenly motionless. The rest of the ship swung sharply to the left, as though on a pivot, so sharply that it banged me against the side of the little cabin and slid Linda squarely into my arms. Half rising, I bent over to protect her with my body as well as I could, and held her close. There was a jarring, shuddering impact that hurled us against the instrument board. I think I saw all the constellations of the heavens in one blinding flash. Then, with one sickening, stabbing instant's sensation of falling through an eternity of white, suffocating mist, I lost consciousness.

X.

As I was coming to I was keenly conscious of two things: that Linda was still in my arms and that I had a splitting pain in my head. As to the former, I was afraid it wasn't true, and about the latter, I knew only too well that it was.

I tried opening my eyes, cautiously. The pain got unbearable and I had to close them before I could distinguish anything but blinding white fog. Even more cautiously I held the lissome form in my arms closer to me, with feelings far from painful. It was Linda, quite alive, as I could tell by her steady, peaceful breathing. I was content to lie that way with her head pillowed on my arm, until the pain in my head should abate. Not a sound was to

be heard but the steady drip, drip of moisture from the trees.

Evidently Linda had missed the clearing, for which she hardly could be blamed. But at that, I would have wagered we hadn't missed it by much, for she hadn't exaggerated a bit when she said she could land within three hundred feet of a given spot by her instruments alone. Our ship must have barely tipped its wing against one tree, and swung sharply to crash head-on into another giant stem. Branches must have broken our fall somehow.

Again I opened my eyes. My head didn't hurt so much now. I raised myself on my elbow, as gently as I could for fear of disturbing Linda. A quick glance around showed me, hazily, several sections of our wrecked craft.

So far as I could tell, Linda was unharmed, probably just knocked out as I had been by a bump on the head. Sleepily she opened her eyes and for a moment looked full into mine, then sighed and closed them.

Again she opened them, wide, and looked at me in wonder and puzzlement. Then suddenly, before I could utter a word, she had whirled out of my arms and jumped to her feet.

"Lieutenant Manley," she said severely, "I am very much surprised. Your attitude scarcely shows proper respect for your superior officer!"

"Attitude be damned!" I replied hotly, sitting there and glaring up at her in foolish indignation. "We've both been knocked unconscious, and . . . and I didn't know whether you had been seriously injured or not!"

"All right," she laughed. "I won't report you this time, but don't . . . don't—"

"Don't what?" I challenged.

"Nothing," she said, giving me a funny little look that set me wondering happily. "But remember, we still have a job on our hands. We've got to see how much of our equipment we can salvage from this wreck, and see how close we are to the clearing where Ainetsu is to meet us."

By this time the fog was clearing a bit. We found we had indeed come down at the very edge of the clearing we sought, for there was the little cairn Ainetsu had erected to mark it for us. Most of the supplies and gear—we had brought a pretty full supply this time—were undamaged. We carried it all to the other end of the clearing and cached it where it would be safe from anything but the most thorough search.

We were particularly concerned about the four little sealed chronometers we had brought along, for they were vital to the success of our plans to snatch Madden and Valita from under the noses of their guards. They were synchronized exactly with the master clock on the *Eagle*, and were intended for the use of Ainetsu and Steve Hardie as well as Linda and myself.

The zero hour had been agreed on to the very second. Even a few seconds' delay in the landing beside the aerie, of the rocket glider Scudder would send out, might mean death for us. It was equally vital that the detectors of Mad-Val should not spot it and give the alarm a second earlier than we could help.

But we found the tiny electrono devices purring away the seconds in exact unison.

Linda uttered a sigh of relief. "Thank Heaven," she said, "we won't have to worry about that! The whole scheme is desperate enough as it is, and nothing but the most accurate timing is going to see us through it."

"No," I agreed. "Once we start, any attempt at communication with the *Eagle* is obviously out of the

question. There's no telling what the range of Madden's detectors is, and the only safe way to play it is to give them absolutely nothing in the way of electro or audio vibrations to detect. But when is Ainetsu due to meet us here?"

"There's nothing more definite, of course, than what she told us before," Linda replied. "This is the place and the day, but—" She shrugged.

"I wish we knew more about Mad-Val," I mused. "Then we might spend the time chewing over the details of our plans while we're waiting for—"

I was interrupted by a chorus of blood-curdling shrieks from the other side of the clearing, as no less than a dozen barbarians, wearing the scarlet kilts that were the livery of Madden's clansmen, burst into the open and came charging across at us.

Taken completely by surprise, we hesitated for a split second.

"Back! Into the woods!" Linda snapped, and we leaped for cover, tugging at our guns. But we couldn't make it. Whirling about, we let them have it.

Seven of them went down in that brief charge. Then it was hand to hand—our guns and knuckle-knives against their short, slashing, thrusting swords. And they were still yelling like demons.

Two of them came at me together. I blew the belly out of one at short range, and ducking the sword-swing of the other, drove my bladed fist into the side of his neck as he whirled under the momentum of his swing.

"Two down!" my brain clicked subconsciously, and hearing the roar of a rocket bullet from Linda's gun. "Three!"

Two more were coming at me now, close. And I knew that left her facing one. There was no time for even a flickering glance in her direction. The pair were closing in on me from both sides.

I flipped up the muzzle of my pistol blindly and blasted off the leg of the one to my right, even as I saw the other drive his point straight for my middle. Instinctively I flung myself backward, but my heel caught on a root projecting from the mossy ground, and I went down. His sword grazed my scalp and buried itself in the ground as he plunged over me and sprawled headlong.

Rolling over to spring to my feet, I saw the down-flashing sword of Linda's adversary strike the pistol from her numbed grasp. Instantly, before he could recover his balance, she hurled herself upon him and, whimpering in blind rage, drove her keen-bladed little left fist deep into his side.

Glancing back at my own opponent, I saw that he was still prone, stunned. And I whirled around to have Linda, her arm bathed in gore, stagger limply and fall into my arms, still whimpering hysterically.

"Huh-huh-hell!" she sobbed. "Th-those beasts can't *fight!* They leave themselves w-wide open when they swing!"

XI.

I was still trying to comfort Linda, though I wasn't at all sure exactly what it was she wanted to be comforted about, when we heard a slight noise, and turned to see a tall, slender figure in the uniform of a captain of Madden's mercenaries. It was Ainetsu. She trailed behind her, on a light line, a bundle lightened by a small lifter, like a toy balloon.

She was staring about her incredulously, counting the twelve prone figures.

"Who's responsible for this sham-

bles?" she asked us with a puzzled stare.

"We are," said Linda simply, pushing me away. "They attacked us—took us by surprise—so what could we do?"

The Martian girl's eyes opened wider. "Good Heaven!" she exclaimed. Then, as Linda turned all the way to face her: "Your arm! Are you—"

"It's not her own blood," I explained, "but that of that animal there."

Ainetsu turned to stare unbelievingly at the ghastly hole in the side of Linda's last adversary. "But what did you do it with?"

"My knuckle-knife, of course," Linda said testily, holding her arm away from her side with an expression of disgust.

I showed Ainetsu my own knife, which wasn't quite so gory, and she marveled at its peculiar construction, with its razor-sharp blade of impervium running across the width of the fist. I told her it was standard equipment with the Earth Space Guard for in-fighting.

"What a viciously effective weapon!" she exclaimed. "And clever! Whoever thought it up? Martian recorded history goes back about twenty-five thousand of your years, but I never heard of a weapon like this."

"Well," I replied, "the basic idea is an old one on Earth. The ancient Romans used something like it they called a cestus, with spikes instead of a knife edge. And thugs of the nineteenth century often carried brass knuckles, simply to knock people out with. But the impervium blade is a modern improvement."

"Oh, cut the lecture, Bob," said Linda. "How am I going to get rid of this swine's blood?"

"There's a stream over there a little way," Ainetsu suggested. "I just crossed it on the way here."

So the two girls left me to my own devices, which I must admit for the moment consisted entirely of wondering at Linda and her scrapping ability no less than Ainetsu had. Too late, I remembered my own last opponent, who had been only stunned.

He had come to, retrieved his sword, and cautiously climbing to his feet, hurled himself fiercely upon me just as I turned in sudden anxiety toward the spot where he had lain. By an instinctive twist I avoided his slash, but went down like a ninepin under his rush, and in a second he was poised to give me the death stroke.

At this instant a familiar cry rang across the glade: "Ho-Mang Oo-Lah!" A crossbow twanged, and a heavy iron bolt smashed through his head. He fell like a log.

And, somewhat shaken, I got to my feet to greet our old friends, the Hung-Ho-Mang and Gor-Kang, who had headed the party that had captured us in the jungle swamp.

"You are a mighty fighter, Bob-manley," said the hung gravely, "but—" He shrugged.

"Even a mighty fighter is handicapped when his enemy leaps on him from behind," finished Gor-Kang.

At this juncture the two girls returned. Linda had washed away the evidences of battle, and seemed more her normal self.

"So you have come," Ainetsu addressed the pair. "It is good! How many warriors have you brought with you?"

"Seventy men and forty girls," the hung said. "All ready to die if they may help in overthrowing the false king and queen!"

We looked questioningly at Ainetsu.

"A little addition of Steve Hardie's to our plan," she explained, and then to the hung, "I hope it will not be necessary for any of you to die. I shall lead you to a spot close to one of the tunnel mouths, where you may lie concealed. I have set a bomb on the mountainside, to be fired by a time fuse on the appointed day. When you hear it, fall suddenly upon the guards. Make as much noise and do as much damage as you can, but by no means try to penetrate deeply into the tunnel, for all the tunnels are mined. Your raid should create some confusion inside the city, and help to divert attention from what we will be trying to do. Do you understand?"

"Understood!" replied the hung and Gor-Kang.

"And where are your warriors?"

"Two langs behind. We thought it best not to approach the meeting place in large numbers."

"That was wise. Return now to them, and bring them here."

The two chieftains slapped their chests resoundingly in the clansmen's salute, and vanished into the woods.

"Now," Ainetsu said, undoing the lifter-lightened bundle, which she had tied to a tree, "here are uniforms for you, those of privates in Madden's mercenary legion. There is no use trying to disguise you as clansmen. It would take only a glance at close quarters to know you are not even Venusians. Besides, you wouldn't be admitted to the inner city and, of course, it's vital that you must be. Put them on, and we'll be on our way as soon as the hung and his warriors return."

We approached the tunnel entrance from the mountain slope above. It was thickly wooded, affording good cover, and here Ainetsu posted the Ho-Mang, who quickly and skillfully effaced themselves even from our sight.

Then Ainetsu, Linda and I, making a wide circle, approached the station from down the ravine by the regular road, which was concealed from above by overhanging rocks and cleverly constructed camouflages.

It was a nervous moment when we were challenged by the Venusian guards, whose leader appeared somewhat more alert and intelligent than the average tribesman.

"I am Captain Holman, of K Company," Ainetsu said haughtily. For this, as she had explained to us, was the name by which she was known in the Legion.

"And these other two, captain?" the officer made bold to ask, though hesitantly. "According to the register they were not with you when you were passed out, and—"

"Silence, fool!" the Martian girl scowled. "They are two of my own company, or would they be with me?" Her hand crept toward her gun threateningly. "Get out of our way before I blast you down!"

Linda and I tried to act like wooden-faced privates.

Sullenly the guard stood aside and saluted. With our chins high, we marched past them into the tunnel, tingling with the feeling that we were followed by hateful and suspicious stares.

"You have to treat them like that," Ainetsu murmured as we got beyond earshot, "or they'll be even more suspicious that you're not what you seem to be. All of the mercenaries are overbearing and arrogant."

Farther on a number of tube cars were parked in sidings hewn out of the solid rock. They floated free in

the air, held there by the action of the four automatic repulsion rails which ran into the tunnel, at the sides as well as top and bottom.

"Get in," said Ainetsu. "Take the back seat, and be as stiffly impassive as possible. You're supposed to be at attention constantly in the presence of an officer." She, herself, got in the front, and snapped a switch.

Slowly, soundlessly, and without the slightest jar, the car swung into the main repulsion field, gathering speed until the wind shrieked in our ears as it flashed up the slanting tunnel, toward the mysterious city in the core of the mountain range—and the most dangerous part of our mission.

XII.

We found Mad-Val a truly remarkable little city, even in these days of superscience and interplanetary travel.

The streets, of course, were merely corridors disintegrated out of the volcanic rock of the mountain core, with floors and walls smoothly polished. Most of them were only ten or twelve feet wide. Many had moving sidewalks that slid along in absolute silence, without the slightest jar or vibration.

Only a few of the streets were wide enough to accommodate crowds of any size. This, Ainetsu told us, was because there were so many of them, and since those of the two levels were arranged at an angle of forty-five degrees to each other, it was possible to travel in a direct line from almost any part of the city to another. Moreover, there was no necessity for the congregation of crowds or large bodies of troops, since the elaborate intercommunication system permitted the leaders to talk to their followers either individually or en masse, in their own quarters.

"Here are my rooms," she said at last, stepping off the continuous sliding platform. We followed. She paused before a metal door in which there was a little depression which was the only break in its smooth surface.

"This thing's rather clever, I think. Did you ever know that everybody has a distinct physical oscillatory rate?" she said. "No two persons have the same rate, any more than they have the same fingerprints.

"When the lock is 'set' for you, all you have to do is insert your finger in this hole, and it opens at your touch—but to no one else's." She suited the action to the word. The door swung open and we stepped in.

"There's no denying the skill of Madden's engineers and architects," Ainetsu said as she snapped a switch. The room was lighted with a rosy glow that seemed to come from nowhere, but actually emanated from the ceiling and floor as well as the walls. "It can be changed to any tint or intensity desired," she informed us.

Most of the furniture was of the built-in type, of utilitarian yet artistic design. She snapped another switch. Instantly the wall opposite us became a mountain scene. She swung a little dial a couple of notches. The mountain scene faded out, and we were looking at a bleak Venusian shore line and seascape. The giant fern trees swayed in the wind, and unending lines of breakers came rushing toward us, while from somewhere came the muted sound of the surf.

"It's marvelous," said Linda. "I'd swear I was looking at the real thing through a great plastic window."

Ainetsu went to another wall, into which was set what appeared to be a full-length mirror. But it wasn't. It was a phonovision viewplate. She dialed a number. The picture

of another apartment appeared. Then a tall figure stepped into view. He was a long, lean lad, with a square jaw and piercing blue eyes, which began to twinkle as he saw her. He also was clad in the scarlet uniform of a Legion officer. His voice seemed to come from the viewplate itself.

"Hello, Netsy," he said, looking at us curiously. "Shall I come over?"

"Yes," the Martian girl said. "That's why I called you," and snapped off the connection.

"That's Steve Hardie. He'll be here in a few minutes, and we can go over our plans."

While we waited she showed us some of the other marvels of the luxurious apartments Madden and Valita had provided for their chosen followers. Purchases could be made from the central stores by phonovision. They were delivered through a panel by an automatic carrier system. Food was prepared in central kitchens, and slid quietly into the room on automatic tables through another wall panel. There was almost instantaneous humidity and temperature control, and even pleasant breezes from any direction could be obtained through concealed vents.

"And," said Ainetsu, "even the refreshments are 'on the house,' as you say on Earth. What will you have?"

We both elected ipsong. Ainetsu pressed a couple of ornamental buttons beside a small panel, and in short order it snapped open to reveal a tray with three goblets.

While we were sipping this slightly fermented and wholly delicious nectar, the like of which is not to be found on Earth or any other planet, there was a slight buzzing sound from the door, and a little light shone over it.

Ainetsu pursed her lips and whistled. To our astonishment, the door began to swing open.

"It's automatic," she explained. "Any whistling sound opens it. The only objection is that you can't whistle in your bath. That can be very embarrassing." Then to the tall figure who stepped into the room: "Hello, Steve!"

"Any difficulty getting into the city?" Hardie asked, after introductions.

"No. At least, I wouldn't call it any difficulty," Ainetsu replied. "But I didn't like the looks of the barbarian in charge at the Wang-Ming tunnel. Evidently a new man with exaggerated ideas of his own importance. He tried to make something of the fact that I went out alone, and came back with two troopers." She indicated us with a nod.

"He backed down quickly enough, though, when you told him off," Linda remarked.

"But I don't think he was satisfied," I said. "Would there be any danger of his reporting the matter?"

"There's always a chance that he might," said Hardie. "The main thing would be exactly to whom he reported it. Who's officer of the day, Ainetsu?"

The Martian girl thought for a moment, and her eyes widened a bit in alarm. "Vega Natsara!" she exclaimed. "And he hates me!"

"Hm-m-m. Not so good," Hardie mused. "He'd make trouble for you —and me too—if he possibly could. Let's hope our barbarian friend has decided to drop the matter. After all, tribesmen who antagonize legionnaires are not popular in Mad-Val."

"But you said he was a new man, Ainetsu," Linda put in.

"It's chiefly in that fact that the danger lies," Hardie explained. "A

veteran in the city's service would know better."

"Well," Ainetsu shrugged, "there's nothing we can do about it but hope for the best. I can see now, I would have been wiser to leave the city by another gate than that by which I meant to bring you in. But nothing can be done about that, either. So let's go ahead and get our plans set."

We gave Ainetsu and Hardie two of the four electronic chronometers we had brought. All four were still precisely synchronized.

"A rocket glider will land beside the aerie for us and our prisoners at exactly six forty p. m. tomorrow evening," Linda informed them. "You'll have to work out the rest of the timing from that."

"Not hard," Hardie remarked, and proceeded to outline the details of the schedule he had worked out.

XIII.

Our difficulties included not only the overcoming of the guard at the foot of the elevator shaft running up to the aerie, and forcing an entrance to the latter and subduing Madden and Valita, but we first had to get inside their luxurious section of the inner city, for it was from there that the shaft ascended to their quarters on the mountaintop.

"There's only one entrance," Ainetsu said, "and the guard there is too strong for the four of us to attack alone. Besides, the second we did attack them the alarm would be given, and we wouldn't have a chance to reach the foot of the shaft."

"We've got to find a pretext, Netsy," said Hardie. "Since we're only company commanders, and not members of the Council, it's going to be hard to find an excuse."

"Oh, we'll bluff our way through somehow," Ainetsu said confidently.

"Let's figure that out later. But first, how does your schedule run? You said the rocket glider would land beside the aerie at exactly six forty, didn't you, Linda?"

Hardie figured thoughtfully for a few minutes. "It takes exactly three minutes to ascend the shaft," he explained, "and the same length of time to bring the car down, for, of course, Madden and Valita will have it at the top with them. That makes a total of six minutes. We dare not allow ourselves more than two minutes to dispose of the shaft guards, for then the alarm is likely to be given."

"In short," I put in. "We go to work on the guards at the bottom of the shaft at exactly six thirty-two, and hope to Heaven the top of Peak Seventeen won't be swarming with guards and covered by guns at six forty—eight minutes later?"

"Eight minutes is a long time," murmured Linda, "for well-trained troops to get into action."

Ainetsu said: "We're relying on the Ho-Mang to cause some confusion first. They'll go into action seven minutes earlier—at six twenty-five. Their time-bomb signal is already set on the mountainside above the mouth of the Wang-Ming tunnel. It's a big one, and in itself, it ought to cause a lot of commotion."

"The chances are ten to one that it will attract so much attention that our attack on the guards will be unnoticed," Hardie added.

But Linda raised another point. "How about Madden and Valita?" she asked. "They'll surely get the alarm, too, when the Ho-Mang attack, won't they? Do you expect them to loll around up in their aerie and pay no attention to it?"

Steve Hardie grinned. "If they don't, so much the better for us. It will give us that much more time.

He fought with a handicap—the handicap of a bitter suspicion the rendezvous was, in fact, a deadly trap—

We'll be there, at the foot of the shaft, and if the indicator shows the descent of their elevator, we'll simply dispose of the guard a few minutes in advance of schedule and rush the lugs the second their lift door opens!"

"Always provided," I commented wryly, "a couple of dozen legionnaires don't happen to be around to jump us."

"That's a risk we've got to take, anyhow," said Ainetsu, "whether at exactly six thirty-two or several minutes earlier. But in any event, it will be only after the Ho-Mang have started their diversion."

"Well, I guess it would be too much to expect, to arrange it without any risk at all," Linda admitted. "So, O. K. on that!"

It was Linda who suggested a pretext to get by the guard at the gate of the royal quarters. Prior to the Ho-Mang demonstration we would let Hardie and Ainetsu drag us to the gate with the claim that they had found a couple of spies in their companies whom Madden would want to question in person.

"Good!" declared Hardie. "That will get us by! And once past the gate guard, you can drop the prisoner pose."

But meanwhile, there was a twenty-four-hour period to be passed in which Linda and I had to lie in concealment, and there was always the danger that the suspicious chief at the mouth of the Wang-Ming tunnel might report Ainetsu's return to the city with two unexplained companions.

If that happened, Steve and Ainetsu explained to us, there would be sure to be an inquiry, possibly a general search of the city—the corridors and all public rooms by the corridor police, and all private rooms by Phonovision Central.

"Your best bet is to separate," Ainetsu said, "because if there is a search, they'll be looking for two people, not one. Steve, you take Bob, and hide him somewhere in your quarters. I'll fix Linda up."

I objected strenuously to this when I learned that most of the following day Hardie and Ainetsu would have to be on duty. If Linda and I had to remain alone during this period, I felt it would be safer for us to be "alone together." I pointed out that one of us might be discovered without the other knowing anything of it, and our whole plan thereby wrecked.

But the consensus of opinion was against me, and as finally Linda put it somewhat testily in the form of an order, I shut up. But I had forebodings.

ALONE with Hardie in his quarters, which were not far from Ainetsu's but on the level below, I spoke to him about the vast fortune in deltinium Madden and Valita had stolen.

"While our mission is primarily to arrest the pair and take them back to Earth to stand trial," I explained to him, "Captain Scudder is also very anxious to recover the deltinium if he can.

"He thinks that in the confusion following their capture, the *Eagle* might make a successful raid, in force, on the leaderless city. Where is the deltinium stored?"

"It's not in the city at all," Hardie said, "but cached somewhere in the mountains to the south of here. I'm pretty sure there isn't even a tunnel connecting the place with the city. I've noticed that in every case when they've been in need of large funds, Madden and Valita have made a quiet trip somewhere, by air, and without any attendants. These trips have always been southward."

"Then no one but those two thieves knows where it's hidden?" I asked.

Steve shook his head. "Not a chance," he answered.

"All right," I decided. "We'll have to find a way to make them talk."

He grinned. "I might be able to suggest certain ways. I've seen something of the things they've done in the way of refined torture to the natives around here."

Time in Mad-Val was not figured by days and nights, but simply by watches, as on shipboard, so presently Hardie and I ate, and after a couple of hours of comfortable conversation, he pressed a couple of buttons in the far wall from the phonovision mirror. Panels slid silently back from recesses inclosing built-in beds.

I slept well for hours. Just how many, I didn't know, for I had neglected to look at my chronometer on retiring. But when I awoke I noticed it was midnight.

But as I rolled over to compose myself again the room was suddenly filled with a fiendish, moaning sound.

With the instant alertness of old campaigners suddenly aroused at night, Hardie and I were both on our feet, grabbing for our guns. Steve let out a heartfelt oath.

"The alarm!" he gasped. "That means your entrance into the city was reported! Every room and corridor will be searched."

XIV.

"So WHAT do we do?" I demanded, expecting to see the light flash up in the phonovision mirror any second.

He said quickly: "There's just one place in this room that that thing can't see, though most of these dumb clucks don't realize it. That's the wall it's set in, alongside or underneath it!"

I didn't need a second hint. I plunged for the floor directly underneath the viewplate and rolled over to lie tightly against the wall.

"Good lad!" Steve said, as he quickly slid the panel across in front of my bed. "But don't breathe hard. You're pretty close to the thing, and the mike in it is sensitive as the devil! And—"

I never got the rest of what he was going to say, for at that instant glaring light from the mirror flooded the room, and he choked off his words, suddenly stretching and yawning like a man having trouble in waking from a sound sleep.

"Captain Rockoff!" said a coldly official and slightly metallic voice. Rockoff was the name by which Hardie was known in Mad-Val.

"Yeah?" said Steve. "What's the matter?"

The voice told him a search was being made and asked him if he knew anything about two spies.

"Huh?" exclaimed Hardie in simulated astonishment as he sauntered closer to the mirrorlike viewplate. "Of course not! Or wouldn't I have reported—"

"Very well, captain," the voice cut in coldly. "Kindly keep to your quarters until further notice. The police are 'sweeping' the corridors." There was a click, and the phonovision light faded.

I started to get up, but Hardie stopped me. "Stay where you are, Manley!" he warned. "They might snap on again any second. They're a suspicious crew at Phonovision Central. We might even have the police stopping in here to make a personal inspection."

I stayed where I was, but did some mighty quick and intensive worrying. If it was the tribal chieftain at

the Wang-Ming gate who had turned us in—and it couldn't have been anyone else—Ainetsu must be very definitely under suspicion! And Linda was there with her in her rooms! If any particular suspicion attached to Hardie, it was only because "Captain Rockoff" was known as a friend of "Captain Holman."

Whispering something of all this to Hardie, I was startled at the sudden anguish in his face, and knew it was not for Linda alone.

"I realize," he breathed, "that they must have crashed in on them by now. But we can't help them any by being caught ourselves. We simply can't afford to have you caught here—and you'd be caught even quicker if you went out into the corridors."

"So that leaves what?" I asked.

"We've got to find some way of concealing you, right in here."

"How? I couldn't even try to hide under any of the furniture. Everything's solid to the floor."

I don't think he even heard me. He was so busy thinking. Then his face lightened. He went over quickly and inspected a grating set pretty high in the wall.

"Ventilator!" he muttered. "The flue runs straight back, horizontally, from the grating. You could squeeze yourself in there if—"

"If we could get the grating off," I cut in. "But we can't unscrew it. It's set solidly into the wall, isn't it?"

"Yes," he admitted. "But just the same, I think we can get it off!" He was moving swiftly now. From a wall-closet shelf he took a little instrument, about the size of a pencil, which, indeed, it looked like.

"A disintegrator," he explained softly. "It's got a beam as thin as a razor edge. I'll just slice the bars of the grating and lift it out!"

He went to work with it at once. The tiny blue-green ray was so thin that it showed hardly the faintest glow, and the hissing noise of atomic destruction was practically inaudible.

It took some fancy wriggling to get up and into the vent feet first, but with Steve's help, I managed it.

Then he replaced the grating, using soap to rejoin the bars, and smearing the soap over with dust to conceal its whiteness. So I lay in the vent, pretty much squeezed, but invisible from the room.

Hardie swiftly eliminated every trace of occupancy other than his own. And none too soon.

For hardly had he finished and thrown himself back lazily in an easy-chair, when the little light flashed over the door, and a faint buzz sounded. Hardie whistled and the door opened.

A squad of corridor police bounded into the room, to skid sharply to a halt, looking around in amazement. Their officer seemed the most amazed of all. He was an ebony-hued Mercurian of magnificent proportions.

"Whuh-whuh-why!" he gasped, "there's no one here but yourself!"

Hardie had jumped to his feet, facing him indignantly.

"Yes?" he said bitingly. "And whom did you expect to see here? The two spies Central was talking about a few minutes ago?"

The Mercurian was flustered. He stammered a bewildered apology. "I'm sure you understand, captain. I . . . I was only obeying orders. But there really are two spies loose in the city and—"

"And you thought sure they were in here? Is that it?"

"No, no! Of course not, captain, but . . . er . . . that is . . . of course, we have to search all quarters." He looked uncomfortable.

"I see," Hardie said dryly. "Just a matter of form, I gather. So you had to come leaping in here like a bunch of wild wadikoos? All right, lieutenant. You must do your duty, naturally. So go ahead. And I'll ask you to be very thorough about it."

Despite their embarrassment, the officer and his men did make their search a thorough one, departing finally with many courteous apologies, in the course of which Steve winked slyly in the direction of my grating.

After they had gone, he frowned and shook his head negatively at me. So I stayed where I was. But when fifteen minutes had passed with nothing happening, I came out.

Hardie paced the room restlessly. "I can't stand it any longer," he said. "I've got to find out if anything has happened to them."

"By phonovision?" I suggested.

He shook his head. "Too dangerous. Central will be listening in —maybe looking in, too—on all calls. There's less risk in just going up to Ainetsu's, now that the police have swept the corridors past this point. Come on!"

It didn't take us long. Ainetsu's quarters were on the level above, only a short distance away. Hardie buzzed at the door. Nothing happened.

"I don't like it," he muttered. "They ought to be in here, unless . . . unless they've been arrested."

"In which case, our plans will all flop," I said.

He glared at me. "Plans?" he said indignantly. Then, more quietly: "Yes. Of course. I . . . I was thinking of something else."

"Isn't there any way we can get in?" I asked.

"Yes," he said. "The door is set for me as well as herself. Get your gun ready." He drew his own, and pressed his finger into the depression of the vibro lock. Slowly the door swung open.

We leaped into the room. It was empty. The door closed behind us.

Hardie looked dazed. The place was in perfect order, almost as though it had been unoccupied. Evidently, there had been no struggle.

"Strange!" he muttered. "Ainetsu would certainly have put up some kind of a battle, under the circumstances."

"Do you suppose they could have gotten out before the police came?" I asked.

"It could be," he said thoughtfully. "But I can't imagine where they could have gone. And she wouldn't have dared leave a note for me—for the police to pick up."

And now I became definitely aware of certain sounds without, which I had been uneasily sensing for a moment or two; muffled footsteps, voices, vague activity. Hardie got it at the same moment, and looked at me with widening eyes.

"They did get out before the police arrived," he whispered. "These are the police now!"

"And here *we* are—trapped!" I gasped.

XV.

"We're trapped, all right!" Hardie whispered. "Nothing to do now but fight it out—if we can! Back! Into the bath!"

Swiftly and silently we leaped for this temporary concealment, and stood there, ready, with our guns in our hands, scarcely breathing.

But the corridor door did not open at once. Faintly we heard the sound of voices and shuffling feet. Then these faded out. Some miracle must have happened, I thought, to divert search from Ainetsu's rooms. But a

moment later, I knew I was wrong. We heard the corridor door open, softly. Steve gave me a startled, wondering glance.

There was someone in the room all right, but apparently only one!

Someone who was moving quietly about, as though searching for something. Hardie held up a warning hand to me and then, after a moment, peered cautiously around the edge of the doorway. He jerked his head back again as though he had been stung. Frowning, he leaned toward me and breathed in my ear: "It's Vega Natsara, himself! Officer of the day!"

"What do we do?" I mouthed soundlessly at him.

"Take him!" he whispered. "I'll step out into the room. When I've drawn his attention away from this door, you come out and cover him!" I nodded. Hardie stepped out. I heard Natsara's surprised gasp and Hardie speaking.

"Well, Natsara," he said. "What are you doing here?"

"S-s-so, Rockoff!" the other hissed, with a peculiar and not unfamiliar intonation. "So it's you! I might have known as much. No! Keep your distance, or I'll blast you! When you go out of here it will be as a prisoner, bound for the execution chamber!"

Hardie laughed easily. "On what charge, Natsara? Have you gone crazy? And how are you going to explain your presence here, in Captain Holman's room?"

"Treason is the charge!" said the other in his peculiar, hissing voice. "And no explanations from me will be needed. Holman brought two spies into the city with her. She was caught red-handed, by the tunnel guard, who reported immediately. I've been wondering how to tie you into it. I've suspected for a long time that you two have been together in some undercover game. But now you've saved me the trouble of proving the connection. The mere fact that I've found you here, in her quarters, is enough."

"So you've arrested Holman, too?" Hardie said in pretended surprise.

"No. But she's proved her guilt, by skipping out after the general order from Central to stay in quarters. She can't escape from the city, and she can't hide in it for very long. I've got you both, Rockoff! Stop edging toward that door!"

If Hardie were doing that, I knew Natsara must be facing away from me somewhat. I stepped into the room and covered him.

"Drop that gun," I snapped, "and reach for the ceiling!"

THE FELLOW did neither, but whirled toward me with a gurgle of surprise, and I just had time to note that he, too, was an Earthman, a Japanese—which explained the odd hiss in his speech—and that he was whipping up his own gun to shoot it out with me, when Steve Hardie's fist caught him flush on the side of the head. He literally bounced off that fist and thudded full length to the floor.

"Nice work, Manley," said Hardie, bending over him quickly, and then straightening up with a look of satisfaction while he rubbed his knuckles. "He's out like a light! Nice judgment on your part to wait until he spilled the dope about Ainetsu."

"We better tie him up, and gag him before he comes to," I suggested. "He looks like a particularly nasty customer."

"A whiff of anæsthetic will do him more good," Hardie said thoughtfully. "I wonder if Ainetsu hasn't got some around here. I know she has a gas pistol." He searched

among the panel closets and finally found a small can of superchlor. Spilling a few drops on a handkerchief, he held it over the unconscious man's nose and mouth for a moment, and said: "There! No need even to bind him now. That will hold him completely paralyzed, mind and body, for from eighteen to twenty-four hours."

"And by that time," I put in, "we ought to be far away from Mad-Val with our two 'royal' prisoners."

"Right," Hardie agreed, "and that gives me another idea. I'll just stick this superchlor in my pocket. It may save us a good bit of trouble handling that pair of lugs!"

Suddenly a pang of fear shot through me again. What of Linda, and Ainetsu? Assuming that they actually hadn't been picked up by the Corridor Police, how were we going to contact them?

"I don't know," Hardie admitted despondently. "That's a poser. I can't imagine where they could have found any safe concealment in this underground warren. And every thug in the mercenary corps will be on the lookout for Ainetsu by now —and for me, too, in all probability, because I don't imagine our sleeping friend here neglected to send out the pick-up order, even before he ran into us."

"Can't you think of any place where the girls could have hidden?" I persisted.

He rubbed his chin thoughtfully. "Hm-m-m. In one of the storerooms, perhaps, if they were able to put the guard away without raising an alarm. Or possibly in the quarters of someone they knew to be on duty. But there they'd be in constant danger of being spotted by a second phonovision search."

"And how long do we have to wait for zero hour, now?" I asked.

"Eh?" he said in sudden surprise. "I'd almost forgotten. Ainetsu and I are both supposed to be on duty this afternoon." He looked at his chronometer and made a mental calculation. "We've got about nine hours to wait," he said.

"You better not try to bluff out a whole watch on duty," I advised. "Certainly not if you think a pick-up order on you has been sent out."

He sat down and put his head between his hands. "What a jam we're in!" Hardie groaned. "How are we ever going to get away with it?"

"There's always a way out," I said grimly. "If we can only find it. But . . . but I can't see it now, either! You and Ainetsu, don't either of you dare show your faces in the corridors. You're both officers, and therefore too well known. Linda and I might, though. There's no description of the two spies out, and we're uniformed only as privates. We wouldn't be likely to attract attention. Only—"

Hardie laughed harshly. "Only you wouldn't know how to find your way around, or what to do! And even if you did, how would we—Ainetsu and myself—be able to pass the guards into the royal section?" He groaned again. "You and Darlington couldn't handle the whole job alone. Besides, we don't know where, or how, to contact those gals!"

The situation looked pretty hopeless, and the pair of us gloomed over it for an hour or more. At last I had a thought.

"Listen!" I said. "Why can't we just reverse the trick by which we were going to get by the guard? You were going to take me through by the scruff of the neck, saying you had captured one of the spies. Why can't I, in the guise of a loyal private, march you in, with your hands tied and at the point of a gun?"

Hardie jumped to his feet. "Great!" he enthused. "We can work it, but—"

"But what?" I said.

"You're forgetting about the gals." He flopped back in his seat. "Maybe they'll figure out the same thing, and show up at the bottom of the aerie shaft at zero hour." I'll confess I wasn't very hopeful about it. But still—

Hardie gave me a scornful glance. "Maybe? Yes, maybe! But if they don't?"

"Well," I said gloomily, "in that case there's nothing for us to do but carry on, by ourselves."

"And leave them to their fate?"

I shrugged, and winced. "This is war, Hardie," I reminded him. "You can't give up the battle for a couple of casualties. At least, we of the Space Guard, can't. I'm sure Commander Darlington would order us to go ahead."

Hardie was staring at the corridor door. "I guess you're right," he was saying as it started to swing open. He sprang up to leap for it, but started back as a slender figure sauntered in.

"Right as rain!" said Linda, and smiled at us as she backed up against the door to close it.

XVI.

I WAS OVERJOYED to see Linda safe and sound, and I started toward her, my arms half raised. But she checked me with a glance.

"You're quite right, Lieutenant Manley," she said coolly. "Emotion has no place in the life of a Space Guarder, where duty is concerned. I was very glad to hear you were ready to go ahead without me, in case I didn't show up."

Hardie had quite a spell of coughing at this point. "Then you heard what we said?" he asked gravely, when he got under control.

"Naturally," she said, "I had to listen. I wasn't going to barge in without knowing who was in here."

"And Ainetsu?" he asked. "She's safe? She wasn't arrested? Where is she? How did you avoid the police? What—"

"Cease firing!" Linda laughed, throwing herself wearily on a couch. "One question at a time, please. Yes, Ainetsu is quite safe. At least, as safe as she could be in a deal like this. Neither of us was arrested. She's in the royal section. And we didn't avoid the police. We just gassed 'em!"

My jaw must have dropped in sheer astonishment. I know Hardie's did, and he was spluttering in surprise.

"Perhaps I better tell you just what happened?" she smiled.

"Please do," Hardie said weakly.

AFTER we left them it seems the girls had sat and talked for a long time. And when they finally retired, Ainetsu spread an air-foam mattress for Linda on the far side of her couch from the phonovision viewplate, which foresight they were to feel thankful for.

They were awakened, as we had been, by the midnight broadcast alarm and search. But Linda had remained quietly on her mattress, and so had not been seen nor heard.

Afterward they speedily straightened the room, and slipped into the corridor. Ainetsu knew several rooms nearby that were vacant at the time, their occupants being on duty. They were fortunate in finding the door to one of these unlocked, and went in.

They heard a small searching party come down the corridor, stopping in apartment after apartment.

But apparently the search was more or less perfunctory in all but that of Ainetsu. They had stayed in there a long time.

At length the master lock of the door behind which they were hidden clicked, and two guardsmen came into the room.

The rest was easy. Taken completely by surprise, they had slumped to the floor as the gas from Ainetsu's pistol hissed in their faces, and Linda softly closed the door behind them.

For an uneasy quarter of an hour the girls waited, alert and on edge, expecting any moment the pair would be missed and that their companions would be back hunting for them. But nothing happened.

In the end, they slipped back into Ainetsu's quarters again, where the Martian girl made a very effective transformation. A hair dye, which she had been keeping for a long time in case of emergency, turned her golden hair black. Likewise, she had stained her skin, changing its natural golden glow to a slightly swarthy tone. The blueness of her eyes was not so noticeable after this.

Then, Linda told us, she had changed the collar insignia of her uniform to the rank of major in a different unit.

On the theory that the last place a fugitive would hide would be in the royal quarters themselves, in the heart of the city, the pair had walked boldly to the gate. There they found some little excitement and confusion, with many officers passing in and out. Ainetsu took leave of Linda and, with a perfect air of self-assurance, had walked in past the guard without even being challenged.

"And so," Linda said simply. "I came back here on the chance that you two might try to find us here, if you also had escaped the search. Who's your intoxicated friend?" She nodded toward the unconscious form of Natsara, who was breathing stertorously in the bunk where we had laid him.

"The officer of the day," Hardie grinned. "But in addition, he's the dirtiest scoundrel, and the most dangerous one, with the exception of Madden, himself, in all Mad-Val. He's the head of Madden's spy system."

"But he's not plastered," I put in. "He came snooping in, so Steve socked him. He's gassed. He won't wake up until hours after we're gone —or caught."

Linda sauntered over and stood looking down at him for a moment. She turned away with a little grimace of disgust.

She was about to speak, but checked herself, staring at us with widening eyes, listening.

Silently she jabbed a finger a couple of times toward the wall opposite the corridor door, apparently a solid wall with no panel closets.

Then we heard a faint, muffled sound that her sharp ears had caught before we did, the sound of metal clinking against stone or composition.

And before any of us could move, a concealed panel slid back, revealing a recess from which steps ascended, and a startled figure in a scarlet uniform appeared.

In a flash the fellow's gun was in his hand. But in that same instant, a slender figure dived headlong for his knees, and he went down with a grunt and a crash. Steve and I both flung ourselves at him. I wrested his pistol from his hand while Steve gave him a blast of superchlor.

"Well," said Linda with satisfaction, as we climbed to our feet. "We didn't waste much time on him, did we? But what is he all about? And

what's that closet, with the stairs going up?"

"I'm beginning to understand," Hardie said thoughtfully. "This bird is evidently one of Natsara's stooges, who came hunting for him. The steps and closet are news to me, however.

"But now that I come to think of it, a number of suspected officers have vanished mysteriously of late, and . . . and it wasn't so long ago that Ainetsu's quarters were changed."

"You mean there's some sort of a secret passage from which all the rooms on this corridor can be entered?" Linda asked.

"Must be," Hardie answered.

"Come on, then!" she suggested brightly, heading for the closet. "We'll explore it and see where it goes!"

XVII.

Above we found a narrow passage that stretched away into the distance, dimly lighted by a ceiling glow. It was high enough above the regular corridors to pass over the intersecting ones, and was paved with some kind of plastic material that effectively deadened the sound of footsteps. At each apartment there were stairs going down into a closet with a panel door like that into Ainetsu's that could not be operated from the apartment side, and which presumably was unknown to the occupant.

With drawn weapons we hastened swiftly and noiselessly along. A full quarter of a mile farther on it came to an end at another door, which was open.

We approached this with the utmost caution, though not a sound could be heard in the chamber beyond. The room proved to be unoccupied. Its walls were covered with maps, evidently of the city corridors and apartments, in some of which little lamps glowed, with what significance we could not tell. There were also a couple of desks equipped with viewplates, switchboards and microphonic devices.

"Natsara's lair, by all that's holy," Hardie breathed.

"His stooge must have been worried when he didn't return from Ainetsu's apartment, and he came to see what had happened to him," I ventured.

"Is this any closer to that elevator shaft, do you suppose?" Linda asked.

"It must be right inside the royal section, and very close to it," replied Hardie. "Natsara must have close access to Madden."

To check on this I volunteered to slip out in the main corridor and do a little quiet scouting. "They may know there are spies in the city, but they have no description of us," I argued, "while you're well known, Steve. And besides, as an officer, you'd attract more attention than I would in this uniform."

Hardie gave me a description of the layout of the royal section, especially the part surrounding the shaft to the aerie, so I was sure I'd be able to locate it, even though we didn't know the exact location of the room we were in.

All this time Linda was looking at me peculiarly. "I'm coming with you," she said as I started for the door, and gave her gun belt a little hitch.

This resulted in an argument, which I finally won by pointing out that if I were captured, there would still be two of them, with the strong hope of Ainetsu's assistance, whereas, if Linda came with me, and we were both captured, there would be small hope of successfully carrying out our plan.

There was a viewplate, we found, that allowed inspection of the corridor, and, choosing a time when there was no one in sight, I quietly stepped forth, and strode off with a businesslike but unhurried air.

It didn't take me long to locate the elevator, with its highly decorated, solid metal door, and handful of alert guards. It was but a hundred yards or so from the room where I had left Hardie and Linda, around a corner where the cross-corridor widened out to spacious proportions. There were several scarlet-clad figures passing by, all apparently bent on their own affairs, and my appearance seemed to attract no particular attention. But there was no sign of Ainetsu anywhere. Like Hardie, I wondered where she could have hidden.

I walked on past, looking the ground over without seeming to do so, and some distance beyond, in another corridor that for the moment was deserted, I turned and retraced my steps to Natsara's headquarters.

Linda looked relieved, but she was markedly stoical about it.

Nothing had happened to disturb them in my absence, nor, of course, had Natsara or his underling returned from Ainetsu's room, where they would lie for hours yet under the influence of the superchlor.

It was close to our zero hour now, and we went over our plans once more, in even greater detail, then sallied forth to put our luck and courage to the test.

As Linda and I sauntered past the elevator shaft at some distance, we noted there were fewer officers and men about.

"This is the meal hour, Steve told me," she said. "But I don't see Ainetsu yet—anywhere, do you?" The Martian girl was nowhere in evidence.

At a pace and distance carefully calculated to bring him in front of the elevator door at the moment when Linda and I, having passed on, would return, we passed the shaft. We were waiting for the sound of the time-bomb Ainetsu had planted on the mountainside above the Wang-Ming tunnel as a signal for the Ho-Mang to start their diversion.

It came, like a dull thud, through the miles of tunnel and rock, and surprisingly loud, at that.

We ran, back toward the elevator shaft. Alarm sirens shrieked throughout the city. Others were running, too, in apparent confusion, but each toward his appointed post, we knew.

The guards at the shaft door looked startled and a bit confused.

Distant shouting and unidentifiable clamor reached our ears.

Then we hit them. Linda and I from one side, and Steve Hardie from the other.

Completely taken by surprise, two of the guards went down under our first rush. Hardie promptly gassed them and turned to meet two more who were closing in on him.

A few mercenaries running through the square noticed the fracas and gave us bewildered stares, but so strong was their habit of discipline that they kept on running for their own appointed posts.

With our knuckle knives, which we had unobtrusively fitted to our fists, Linda and I took care of the two fellows who charged at us, and turned to Hardie's aid. But it was unnecessary. He had accounted for them already with his gas pistol, and was backing away, choking, from the little cloud of fumes that was settling over their prone forms.

Then he threw the lever that would bring down the elevator.

The moments that followed were our greatest danger. It would take the car three minutes to descend. Meanwhile, there we had to wait for it, surrounded by the crumpled forms of the guards.

But Hardie had an inspiration. While Linda and I assumed the positions of guards before the door, Steve shouted mightily and waved all newcomers on by pointing to the prone figures, and also in the direction from which the clamor was coming.

Exactly what meanings the different ones took from this we never knew, of course, but with startled glances at him they all ran on, for officers' orders were not to be flouted in Madden's Legion.

It was not until the door opened and we leaped into the car that it occurred to any of the running crowd to question the situation. Then there was a shout, and some score of them swung about in their stride to charge straight at us.

We clanged the door in their faces. The lift shot upward. For the moment we were safe. But there would be no return by that route.

Above were our quarry, Madden and Valita. How much idea would they have of what was going on by the time we reached their aerie? Would our rocket glider land in time —without being too quickly spotted in its descent? Would we be able to get away with our prisoners without being blasted to atoms? All these things hung in the balance.

Hardie groaned.

Linda and I swung sharply toward him. He was resting his forearm against the side of the car, leaning upon it as though for support. And on his face was a look of agonized pain.

"Ainetsu!" he moaned. "What will happen to her? What has happened to her?"

XVIII.

Accelerating better than a mile a minute for part of the upward trip, the lift gradually lost speed and finally came to a silent stop at the tip of Peak Seventeen, twelve thousand feet above the city.

The door slid open softly, and across a foyer sumptuously furnished and lighted by its own glowing walls we saw a curtained door.

Half stunned, I ducked as the pencil beam of a disintegrator flashed from the curtains, splitting the air past my ear like a thunderclap. An answering ray of Hardie's gun melted the curtains, but revealed only the circular expanse of the aerie itself, just beyond.

Hardie kept playing his beam continuously through the door. Madden and Valita had jerked back out of sight. The three of us hurled ourselves into the foyer, separating as we did so.

I bore to the left. Linda slipped nimbly to the right. Hardie planted himself squarely before the door, covering the opening with a steady hand.

"We've got you, Madden!" Linda called. "Will you two throw down your weapons and surrender? Or would you rather shoot it out and take what's coming to you, right now?"

A growling, bitter curse was the only answer from the room beyond.

"All right, then! He's asking for it!" said Linda, and motioned to me as she crept along the wall toward the edge of the door. I did likewise on the other side. Slowly, cautiously, Hardie stepped straight forward.

I thought Linda's idea was for the three of us to dive into the room at the same time, in different directions.

But suddenly she transferred her gun to her left hand, and thrusting it around the door frame, blazed into the room, sweeping her ray across it at a slightly downward angle.

An answering flash blasted the gun from her hand, and vanished instantly to a howl of pain as my own weapon squirted its destroying beam into the room at a sharp angle. I had caught sight of Madden's foot.

The foot simply ceased to exist, as the ray hit it and dug a hole in the floor beyond. Madden's unconscious form thudded down in full sight. From somewhere in the room came Valita's shrill scream.

Steve and I, closely followed by Linda, dashed through the door, to bring up short in amazement.

A frightened girl, her face contorted in animallike fury, stood trembling, with her arms raised high, and looking rather foolish in her regal robes. Behind her, smilingly holding the muzzle of a gun to her spine, was Ainetsu!

A pane had been cut out of one of the broad monotrans windows.

Steve's eyes spoke volumes as he stared at Ainetsu for a moment. But what he said was: "Hello, Netsy!"

And I don't think her eyes were quite dry as she replied: "You better look after Madden, you three. You want him alive, don't you? He'll bleed to death in another couple of minutes. I'll take care of this she-snake."

We improvised a tourniquet for Madden's leg, although he had lost so much blood already that it was a question in my mind whether even a transfusion would save him now. And all the while Valita was pouring forth a stream of shrill, blasphemous invective, writhing madly in Ainetsu's grasp, hysterically ignoring her captors' ability to blast her out of existence by the pressure of a finger on a trigger.

Yet so great was Hardie's confidence in the Martian girl, that he never so much as paused for a glance over his shoulder as we worked on Madden's leg.

"Now," said Hardie with a sigh, as we straightened up. "Let's get this thing straightened out."

Valita, bound and gagged very effectively, was twisting and gurgling on the floor where Ainetsu had unceremoniously dumped her.

"You certainly saved the situation up here, Ainetsu," Steve went on. "How did it all happen? We thought, when you didn't show up at the door to the shaft that—"

"That I had been caught? I almost was." Ainetsu adjusted her uniform, which had gotten pulled somewhat awry in her struggle with Valita. "It was a sudden impulse that made me leave Linda and wander into the royal section when I saw how easy it would be. Afterward I didn't find it so easy to find any place to hide. I wandered around the corridors until I sensed I was attracting attention by reappearing in the same places so often.

"Then I got a real break. I just happened to near the shaft as the guard was being changed. For a moment there were ten or twelve of them clustered near the door, you see. There was some kind of a heated discussion going on among them, over the gandik fight tomorrow night. They paid no attention as I sauntered right up behind them. So I took a desperate chance.

"The indicator showed the car was down. So, as quickly and silently as I could, I slid the door open enough to slip inside, and closed it quietly after me. I know it sounds unbelievable. But nobody noticed. So up I came!"

"But," Linda marveled, "how about Madden and Valita? You couldn't have entered the aerie without their seeing you!"

"That was before they came up," Ainetsu explained. "Then I partially cut through the pane of that window with my knife, enough to bend it a bit and squeeze out. When I shoved it back into place, the curtains inside concealed nearly all of the cuts. And I simply waited outside. This window, you see, is on the far side from the look-outs on the neighboring peaks. Then when I heard the rumpus inside, I cut out the whole section as quickly as I could. And . . . and there you are!"

"Nice work," Linda congratulated.

But at this instant Steve gasped, and pointed.

"The elevator!" he exclaimed. "It's coming up! They're after us from below! What a dumbbell I am! I should have jammed it!"

"No way of stopping it?" Linda snapped.

"None!"

"Then outside with our prisoners, as quick as we can!" She dashed to the window. There was a faint hissing and bumping outside. "The rocket glider!" she called out. "Just in time!" and turned back to us.

Steve was already halfway across the floor, carrying Madden's unconscious form. Ainetsu was having difficulty in lifting Valita, who writhed and struggled desperately.

"Help her!" Linda commanded, running over to where I had planted myself before the elevator door, gun in hand.

"Like hell!" I snapped back at her. "You do it! I'm staying here to hold these devils back!"

Linda's eyes blazed, and she drew herself up angrily. "It's an order! Who's in command here?"

"I am, right now!" I roared. To her amazement, I whirled her about and gave her a violent shove toward where Ainetsu was struggling with Valita. And turned to face the shaft. The indicator showed the door was about to open.

Then it did open, and—

XIX.

Nearly a score of Legionnaires poured out and hurled themselves at me.

Massed as they were, four or five of them plunged on their faces, horribly mutilated travesties of men, as the ray of my gun sliced right through the center of the bunch.

For an instant they recoiled, then throwing themselves sidewise and opening up, they dived at me again. I leaped backward and let go with my gun again. This time there were answering blazes, and the foyer seemed nothing but blistering light and deafening noise.

I couldn't think, but acted solely by instinct. Why I was not hit, I don't know.

Then something crunched under my foot. I think a disintegrator beam had crumbled the flooring from under it. And I went down. They hurled themselves at me again.

Then there was a fresh outbreak of stabbing, blinding beams, this time from behind me, and two slender legs bestrode me as I lay there. Linda had come back for me.

Momentarily the Legionnaires seemed dazed and befuddled, not an uncommon reaction, even among the best-trained soldiers, in the midst of a disintegrator fight at close quarters. No less dazed myself, I was instinctively crawling free and rising to my feet. It was hearing Linda's voice, I think, between the deafening detonations that kept me going.

"Quick . . . for the ship . . . prisoners . . . no time . . . chance . . . peak guns—"

In an instant we were racing, stumbling, back across the aerie, and literally diving out the window, into ready hands that literally hurled us aboard the rocket glider.

With an upward jerk, the little ship was off.

Weak, gasping for breath, I pulled myself up and stared over the side. The two observatory peaks were suddenly ablaze with searchlights concentrated on the aerie, now dropping swiftly from under us, and madly sweeping the night.

Several times they caught us in their blinding glare. But our gliders was ducking, twisting, whirling in the maddest air dance I had ever experienced. Miraculously, the disbeams did not hit us.

Our own two guns were blazing all this time, and the peak batteries themselves were but the vortexes of blazing hells. It was pretty difficult shooting for them.

After we were well aloft, beyond effective range of the guns, I began to get my bearings. The rocket glider's crew was composed of Pete Gorgas and Bull Dunstan, with two of the *Eagle's* best engineers.

"We ain't the best glider pilots on the old space tub," Pete explained apologetically, "but the skipper says we're the shootin'est. So he sent us to pick you up."

"You sure covered yourselves with glory the way you smothered those peak guns," I admitted. "How are the prisoners?"

"Well, Madden, I guess he'll live. If he's lasted this long, he'll pull through with a bit of medical attention. The gal's still tryin' to chew her way loose. But she ain't gettin' nowhere."

"Scudder will make them talk, when we get them aboard the *Eagle*," I mused. "Then we'll lift their cache of deltinium—and then—"

Then Linda was standing before me, her fists on her hips. She glared and said: "Well?"

"I'm . . . I'm sorry," I stammered, "that I had to sling you out of the way, back there in the aerie, but—"

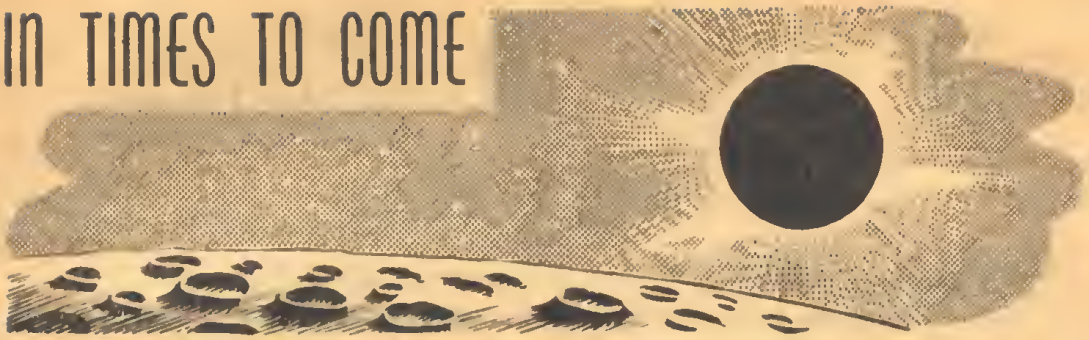
If looks could have killed, I would have expired right there.

"Why!" she said, softly but with venomous intensity, "you insubordinate space louse! I ought to have you broken for that! Only—"

Without any warning, she slumped into the seat close beside me and put her head on my shoulder.

"Only I love you too much," she whispered.

IN TIMES TO COME



One thing we have for next month interests me as much as any story we have coming up—an article by Peter van Dresser. Van Dresser is best known to science-fictionists for his interest in rocketry—meteorological rockets. What hasn't been as widely appreciated is that that interest was, with Mr. van Dresser, a secondary interest deriving from that frustrated feeling produced in a man who wants very badly to learn a little something about the atmosphere one hundred miles up in pursuance of his objective —meteorology.

So van Dresser has an article coming up that is not on rocketry. Neither is it on meteorology. I am unable to tell you what it is about because—well, the title of the article is "Introduction to a Nameless Science." It is so new that no name has been given it yet. And it is so completely astounding, its material so weird and suggestive, that I genuinely feel called upon to point out definitely and firmly that the article is *purely fact*. It is, furthermore, something that is going to make a lot of changes in descriptions of space in science-fiction stories!

Also next month comes Robert A. Heinlein's first novelette—remember, he graduated from shorts to novels all at once?—and as unusual and interesting as his other work. "The Roads Must Roll" poses a different kind of question for the science-fictionist—and a Grade A yarn it makes.

Among the shorts, there's Norman L. Knight back with "The Testament of Akubii," regarding a spaceship that went out with two men and came back with one—and why.

ANALYTICAL LABORATORY

Cramped for room again, and with two months' Laboratories to show.

February:

1. If This Goes On—	Robert A. Heinlein
2. And Then There Was One	Ross Rocklynn
3. The Professor Was a Thief	L. Ron Hubbard
4. Locked Out	H. B. Fyfe
5. Bombardment in Reverse	Norman L. Knight

March:

1. If This Goes On—	Robert A. Heinlein
2. Cold	Nat Schachner
3. The Emancipated	L. Sprague de Camp
4. A Chapter From The Beginning	A. M. Phillips
5. In The Good Old Summertime	P. Schuyler Miller

THE EDITOR.

THE LAST OF THE ASTERITES

By Joseph E. Kelleam

Civilization tends to go in waves that reach out—then fall back for a thousand years before they sweep on again. This is a tale of people thrown up and deserted at the tip of one wave.

Illustrated by Orban

LONG, long before, the men of Earth had come shuttling out into space and had planted their colonies like seeds upon the asteroids. Argonauts of space, eager to find gold and spice and food for the teeming hordes of Earth, had come out to the planetoids and had incased them in sheaths of crystal. Adventurous scientists had built atmospheres for these colonies, drawing the precious oxygen like smoke from the barren rocks.

Eros had become a sparkling gem of the sky vaults; Vesta had been known throughout space for her rubies and diamonds; the fur farms of Pallas had brought her colonists such wealth that the city of Astarte had become a poem in stone, Astarte with her emerald towers and her jade battlements. But Ceres, the largest of the planetoids, had little wealth and scant fame. Ceres offered little to the spoilers save the teeming gardens that her artificial atmosphere generated. Nor gold nor rubies had she; Ceres was only a vast hothouse of space wherein the cheapest of vegetables were raised for the dwellers of another world, a world now grown barren and old.

Once, the argosies of the heavens had stopped at Ceres to take on the tons and tons of concentrated food that this garden of space produced. Once, the ships had come often. Then fewer ships came, and finally, none at all. Whether some catastrophe had overtaken Earth, or whether her navies had been recalled for some last Armageddon, the people of Ceres did not know. In time Earth became a dream, a legend sifted out of space upon the steaming jungles that sweltered where once the gardens had grown. The people of Ceres did not care. It was only a tale to be told by firelight, when the swift, short darkness was wresting the heat from their world.

Alph, the son of Alph, awoke in the middle of the morning. Of the seven hours of intense light that Ceres received from the Sun, three were already gone. Alph had stayed up late the night before, poring in perplexity over one of the leather-bound volumes that Old Nathan, the Wise Man, had left him. He had wrapped himself in a thick blanket for his night's sleep, but now that the day had found him in bed he was uncomfortably warm. He arose, threw off his heavy sleeping robe, and washed his face and hands in a broken bowl that was half-filled with dirty water. Then he donned a thin shirt that was torn in a dozen places, and a pair of ragged pants that came to his knees. They were Alph's complete wardrobe and, like Alph, were in need of a scrubbing.

He moved over to the window, a

tall, gangling youth, slack-mouthed and awkward. The window had once been filled with stained glass, but that had gone long before, and in its place a tattered quilt had been hung. Alph shoved the quilt aside and looked down upon the ruined city. His room—he had inherited it from Old Nathan—was in the highest tower of the city. He looked down upon broken rooftops and crumbling walls. Directly below him, in a street that was now filled with twisted trees and heavy undergrowth, he detected a crowd of people dancing about a leaping fire. For a moment he left the window and returned with a battered pair of field glasses—also inherited from Old Nathan. Putting these to his eyes, Alph stared down intently at the scene below. After his first glance he took the glasses away in horror, but in a few seconds he reluctantly put them back to his eyes as though at once fascinated and horrified by the sight.

Below him, nearly twoscore of men and women, all of them tall and long-limbed and slant-browed like Alph, were leaping and shouting about something that was writhing and roaring amid the flames. "A captive Trog," thought Alph, and shuddered when the screams of the tortured one rose higher and higher and were cut off in a thin, bubbling squeak. Since infancy, Alph had been taught to hate the Trogs, but he could never bear to take part in their burnings. His people, even his brother whom Alph hated intensely, had shared many a jest over Alph's chicken-heartedness. Probably that was why Old Nathan had taken Alph to his room in the high tower; Old Nathan had not taken part in the tortures, either.

Alph centered his gaze upon the

blackened thing that was crumpled amid the dancing flames. The figure was silent now, and still save for an occasional shudder that shook the entire frame. It was a man, though different from Alph and his fellows. The Trog was short and broad, where they were tall and thin. The shoulders were nearly four feet across. But there was that same look about the face—the protruding chin, the slanting brow heavily ridged above the eyes, the same irresolute expression about the mouth—that Alph was wont to see every day in his fellows of the ruined city. It was as though one of Alph's people—Nargs they called themselves—should look at his reflection in a trick mirror and find himself made broad and squat when he was tall and thin.

Alph turned away from the window and hastily hid his field glasses. He had no desire to go down there; he would rather die than to take part in the ritual that was to follow. In haste, he gathered up his weapons, a rude sword that he girded about his waist and a long spear that was no more than a sharpened stick. Then he turned to go.

At the door he hesitated and turned back. Going warily to a dark corner of the room, he knelt and lifted up a concealed trapdoor. His hand went into the blackness and came out with a worn buckskin bag. Then he closed the door again, and rising to his feet patted the little pouch lovingly, as though all his wealth was contained within it. The mouth of the pouch was closed by a thong which was tied together at the ends, and this Alph looped around his neck, hiding the leather bag within the front of his tattered shirt. Again taking up his weapons he went out the door, locked it behind him, and stumbled down a dusty, timeworn corridor.

At the rear of the tower he came to a sagging flight of stone steps. Alph went down carefully, the old blocks grating and rocking beneath his soft tread. Down he went, through dusty halls, past shattered rooms, down more flights of rickety stairs, and still down. At last he crawled through a broken arch that marked where a large door had been, and stood in the warm sunlight.

The shouting of his people sounded louder here although the building was between him and their revels. Alph shuddered again. He did not want them to see him; did not want them to taunt him with being a coward. So, taking a firm hold on his spear and ducking low, he ran as fast as he could through the tangled undergrowth and the ruins of the city, in the opposite direction from the shouting.

When his lungs were gasping for air and when the shouting was no more in his ears, he halted and flung himself down in the high grass that grew about a gnarled tree.

At length, Alph sat up and propped himself against the bole of the tree, grateful for the scant shade it afforded against the glare of the tremendous Sun that was now directly overhead. Alph, the son of Alph, was thinking. A perplexed frown was on his dull face. It had been two months since Old Nathan had died. He missed him terribly, and remembering Old Nathan's last words, he shook his head slowly, a little frightened at the task that Old Nathan had left for him.

"Remember," Old Nathan had said, "we are men, not beasts. We are descendants of men who annihilated space, who built cities and even created this world. These men came up from squat creatures who

fought with fang and claw, came up from hunted things to rule the Universe. And our people have sunk back to the beast. We are not worthy of the name of Man. But even yet, there is a chance. We must work for their betterment. This business of sleeping in ruins, of eating only when we can catch some creature of the woods, of burning captives at the stake, that is not a man's business. Alph, I have labored as my predecessors have labored. And like them, I have watched my people sink a little lower in the scale. I leave the task to you. They must be made to remember their heritage."

This, and more, Old Nathan had said to Alph. Then, just before he died, he had given Alph his most treasured possession, the little buckskin pouch that had been guarded so carefully by generations of Wise Men.

Remembering the pouch, Alph felt within his shirt and drew it out. Opening it, he took out its contents —a few ornaments and a yellowed sheet of parchment. For a few moments he toyed with the jewels, watching them flash in the sun. Then he unfolded the sheet and read it again, for the hundredth time. He scratched his head, puzzled as always, by what it meant. Was the secret of saving his people there? If not, why had the Wise Men treasured it so? What did it prove? It did prove that Old Nathan was right. His people had come from the Green Star. They had been as gods. But how could the words of magic on the faded parchment help his people? He read the page again. And again the thought came to him. Had the words of magic been kept to save his world or to destroy it when all was lost? It was a terrible responsibility that Old Nathan had left him.

In a way, Alph had been a disappointment to Old Nathan. Alph had learned slowly. He was not very bright, but he was the best material that Old Nathan had found to work with. Still, Alph was a failure. The Nargs had trusted Old Nathan, although they had derided his teachings. But Alph was nothing. He was only a coward that Old Nathan had left upon them. No one called Alph a Wise Man.

With a sigh, Alph arose to his feet. He was growing hungry. He slunk through the tall grass cautiously. Now that the Nargs had captured a Trog, the Trogs would be out for vengeance. It had been that way for ages. At last Alph's spear brought down a small squirrel, and squatting on his haunches Alph ate it raw—for he dared not kindle a fire.

And later he wandered on, knowing his danger at being out at such a time, but dreading to go back and face his people. Soon it would be night. Soon the night creatures would be prowling, and the age-old feasting and dying would again be staged until the sun drove the shadows away. And, thought Alph, there would be the ghosts of all the dead things wandering restlessly about. Hosts of them. Ceres was glutted with the dead.

The men of Earth had only brought domestic animals out to Ceres, but the planetoid with its relatively thin coat of air, its weaker magnetic field, could not protect the life plasm as well as Earth could. Mutations had occurred, normal creatures and plants had brought forth living monstrosities. Just as man had divided into two altogther different strains, so had the animals and plants. There were wild cats on Ceres as large and as fierce as any on Earth. There were savage dogs

as large as bears. And there were packs of fierce rats as large as sheep.

Toward sundown, Alph was headed for a cave that he knew well. He was still thinking of the worn parchment within the pouch that was fastened about his throat, or he would have gone more carefully. Suddenly he felt a sharp stab of pain about his right ankle. He leaped back, but whatever had caught him held fast, so that Alph fell headlong. Racked by pain, he fought with the thing that held him. It was a large plant, somewhat similar to a Venus' flytrap. A pair of toothed and fleshy leaves had fastened about his ankle, the spines going deep into the flesh; and as he watched, a flush of crimson began to seep through the plant.

Silently and savagely he fought against it. In the fall his spear had been thrown aside and now lay beyond his reach. With his rude sword, Alph hacked and slashed at the leathery leaves and the tough stalk to no avail. At each slash the thing bit deep into his ankle and shook him as a terrier shakes a rat, so that most of his blows fell upon the air.

Alph's struggles grew weak. The plant was crimson now, and still those toothed and jagged leaves clamped more savagely upon his foot and shook him more violently. Then, suddenly, the jaws of the plant relaxed their hold upon him. As through a red haze, Alph looked upon his rescuer—a girl.

She was not like any woman that Alph had seen. The Narg women were thin with legs and arms grotesquely long, while the women of the Trogs were short and squat and very fat. The women of his people were horse-faced, while the women of the Trogs were so fat that their faces looked like full moons with two tiny pig eyes set into them, and a long slit of a mouth, and a snub nose that was little more than nostrils.

Alph's rescuer was neither a Narg nor a Trog. She was midway between. Taller than a Trog, she had not that uncouth lankiness of a Narg. Her face was a perfect oval; neither long and lean nor round and fat. Her hair was black, but it was not bristly; it was coiled about her forehead like a band. Her mouth was small and her lips were red. She was standing there with his spear in her hand. She had thrust it deep into the fleshy stem of the carnivorous plant, just below where the jagged branches began.

For a moment Alph thought she was a spirit. If so, then he had escaped one fate to meet a worse, for everyone knew that spirits sucked the brains of men even as the large bats sucked one's blood. Alph shuddered. Then he saw the green bracelet about her wrist. A Trog, after all! Weakly he clutched his sword and tried to rise.

"D-don't," she begged in a low, frightened voice.

Alph was puzzled. Trog women were as fierce as their mates, he knew. Why didn't she draw the spear from the writhing plant and plunge it into his breast? Or beat his brains out with a convenient rock? Why had she saved him in the first place? For the Trog fires, probably. After all, a Trog had died today. But she seemed as frightened of Alph as he of her.

"I will not hurt you," the girl pleaded.

And then the Sun descended behind the low hills. Suddenly, long, leaping shadows rushed over them. And as suddenly, all the fire drained from the sky, and a swarm of stars danced out.

With the shadows came other things on velvet wings, things that glided through the air like shadows, but made a horrible clicking sound with their teeth that did not at all belong to shadows. One of the things swooped upon the girl, and with a low cry of terror she brushed it away. Alph knew what the shadows were. They were large vampire bats that had evolved from the harmless insect-eating variety that men had brought to Ceres to protect their gardens of nights. Alph knew what the shadows were, and a cold fist seized upon his heart. Another moment he, too, was fighting with the gliding shadows.

As the stars grew brighter the black night was suffused with a pale glowing. Their blows began to tell. The bats came at them more warily. "Quick," Alph called as he moved to the girl's side. "There is a cave near. I was headed for it when the gasher caught my foot."

Moving slowly, he led her through the darkness toward the cave. The bats came, circling above them, now and then descending with little squeaks of anticipation. The two flailed them away. Then they were at the mouth of the cave.

"Stand here," Alph instructed. "Keep them back."

Leaving her at the cave's mouth, he rushed into the darkness. At the rear of the cave he had stored a pile of leaves for just such an occasion as this. Carrying a handful of leaves to the door, he knelt, and from the folds of his tattered shirt took out a piece of steel and a flint. The moments passed agonizingly as he struck spark after spark. Bravely, the girl stood over him and fought the bats away. She had impaled one upon the spear and it hung there like a sable banner, fluttering its wings weakly and gnashing its teeth. Then a tiny flame crept over the leaves. Slowly Alph fed it until the entrance of the cave was filled with leaping flames. The winged shadows circled low and flitted away into the darkness.

And Alph was left there, squatting before the fire, nursing a crushed foot, looking up into the face of the girl who stood before him, her drooping arm still clutching the blood-stained spear. Some tide of ancestral courage was rising in the veins of the usually irresolute Alph. "Well, Trog," he sneered, "why don't you strike? Or are you saving me for the stake?"

But instead of raising the spear the Trog flung it at his feet, and knelt beside him, and buried her face in her hands, and wept.

Alph's foot did not heal quickly; it grew swollen and black. For three days Alph huddled in a dark recess of the cave staring with feverish eyes at another Alph who walked amid writhing shadows. Old Nathan was there in the shadows, pointing at a smoky sky. And across the sky the words of the parchment were written in mile-long, quivering letters. Then Old Nathan was gone, and in his stead was a charred Trog who still trembled amid a coil of dancing flames. Then the flames died, and the Trog had changed to a huge bat that came slowly toward Alph and gnashed its teeth.

And then the shadows faded before a burst of light, and Alph found himself in the cave. The girl was bending over him. The light came from the cave's mouth, and it seemed very clean and very white. Alph tried to sit up, but he fell back weakly. The girl had a small fire going. Something was roasting above the coals, filling the room with a good, hungry smell.

"You have been very sick," the girl told him. She spoke the same language as Alph—a syllable changed here and there, perhaps—an inflection altered occasionally—but basically, the same language.

"How long have we been here?" he asked.

"Three times the Sun has gone to bed while you have lain here. I have kept the fire going. The night things have stood at the doorway."

To Alph this was unbelievable. None of his people would have stayed here with him. They would have left him to die. "Why did you stay?" he questioned.

She appeared confused. "Why? I do not know. Perhaps it was because I had nowhere else to go."

"You could have gone back to the Trogs."

She shook her head. "No. I will never go back."

Later, after Alph had eaten, after he felt stronger, she told him her story, this girl with the black, curling locks, this Trog who did not look like a Trog—whose delicate countenance resembled that of no woman Alph had ever seen.

Her name was Myra. As far back as she could remember, she had been different from other Trogs. The Trogs, even her parents, had feared this girl who was a throwback to those pioneer women of space who had come out with their men to conquer the stars. They said that she was not one of them, that the Night Spirits had probably exchanged one of their own sprites for her when Myra was but a babe. So they had driven her from their camp. They would have killed her had they not feared the Night Spirits.

A week passed and Alph's foot had healed. He had no desire to go back to his tower. And Myra was content to stay here in the cave with him.

But one night a great cat discovered them. Time and again, it rushed the doorway, while Myra and Alph stood there with burning brands which they thrust into its snarling, screaming face. All night it stood there by the entrance, its horrible yowling deafening their ears. When morning came it was gone.

Then Alph knew his dream of happiness for what it was—a dream. The cats never forgot. This one would remain in the vicinity until it disposed of these two puny humans who had dared to defy it. Alph knew that they must return to his tower. Only in the ruins of the old cities were men safe from these marauders of the night.

When he spoke of his resolve to Myra she drew away in fear.

"The Nargs," she exclaimed. "They hate the Trogs. They will kill me."

"They will not. Myra, I am not like the Nargs. They hate me, but they leave me alone because I am the adopted son of Old Nathan, the Wise Man. They do not come about me. No one will see us when we go up to my tower. None will know that you are there."

The sun was nearly down when they reached the ruined stairway that led up to Alph's tower. When they reached his room, night had fallen. Alph barred the door behind them, pulled the old quilt tightly about the broken window, and lit a taper. Myra looked about her in wonderment. Never had she seen such a splendid room. Alph must be a very great man in his city. She looked at the faded pictures, touched the crumbling chairs, looked at her reflection in the broken mirror, and when Alph showed her his precious field glasses she was as delighted as a child.

She could not have been happier than Alph. Never before had anyone, man or woman, admired Alph. His joy knew no bounds. And then he thought of his great secret. What would she, who was delighted with these baubles, think of him when she knew the magic that he controlled?

She was still admiring the field glasses. "Pshaw," said Alph indifferently, "that is only a toy. Look here."

He took the leather pouch from about his throat. He opened it and displayed the parchment. She did not appear impressed. "A very great magic," Alph told her. "It was given to me by Old Nathan, the Wise Man, who swore me to secrecy. But I will show you this magic because—" For some reason, Alph could not complete his sentence.

On one wall of the room a picture of a great peacock was painted. Going to this, Alph stood on tiptoe and drew his hand across the faded picture. Three times he pressed down on the eye of the peacock, twice his fingers touched the tip of the beak, and once more he gouged at the painted eye. Slowly the picture slid downward into the floor, leaving a hollow square of darkness in the wall.

Alph took the taper and thrust it into the aperture. Beyond it was a tiny room. Alph stepped into it and motioned for Myra to follow. She stood close to him, a little frightened by the strange room and the odor of infinite age that it contained. Alph pressed a button upon the wall. Slowly the door closed; and as it closed the little room creaked dolefully, gave a tired little shudder, and slowly began to sink downward. The girl cried aloud and gripped his arm. Still holding the taper aloft, Alph placed his free arm around her shoulders.

"Do not be frightened, Myra. I have made this journey before. Old Nathan showed me the way."

At length the little room stopped in its descent. Alph opened a door. He led her out into a dark tunnel, the light from his flare sending their shadows dancing away into the blackness. Before them was a large box of glass mounted upon four little wheels. Alph felt over its smooth sides and worked an invisible door open. He motioned her into the glass cubicle. He followed and closed the door after him. There were two chairs within the car. Before one chair was a board upon which were mounted several buttons of different colors. He pressed one. The little car shivered a moment, then began to glide noiselessly down the dark corridor.

Faster and faster it went, Alph's flaming taper making strange, fleeting hieroglyphs along the tunnel's walls. Then in the distance they saw a light. The car slowed and stopped.

ALPH LED Myra into a room that was alight with a white brilliance. One wall was covered with a silver screen, and in the middle of this screen was a great ball of fire that burned like the Sun.

"See, Myra," Alph explained. "This is a place of great magic. Though it is night outside, here the Sun is shining."

She still clung to his arm. "Perhaps this is where the Sun goes when it sinks beyond the hills."

He laughed: "That is what I thought, but Old Nathan told me different. That is but the reflection of our Sun which is still shining on the other side of our little world. And look—" He motioned to the huge clumps of machinery that rose like beehives from the rock-strewn floor. "There is a greater magic."

"They frighten me," Myra said. "What are they, Alph?"

From his leather pouch Alph took the treasured parchment. "I will read it to you, Myra."

He read dramatically:

"In the year 3001 the chief scientist decided, that, if Ceres should ever be colonized, her orbit should be shifted nearer to the sun. By installing huge masses of magnetic machinery at the planetoid's core and by carefully controlling them the work was done. And when the work was completed, a great question arose: What should we do with this machinery that had been installed with such tremendous labor and at such enormous expense? It was then decided that this work was too costly to destroy, but too dangerous for everyday knowledge. So the way to the controls has been hidden; word has gone out that the work has been destroyed. But this paper shall be left in the hands of the chief scientist of Ceres and in the hands of the chief scientist to come after him. And if ever there should come a need to move the planetoid again—or to destroy it—there is a way. Here is a description of the way to the hidden controls as well as the method of using them—"

Myra was puzzled. "It frightens me, Alph. Are we the only ones who know of this?"

"Yes," Alph admitted, a bit disappointed at her reaction.

She shivered. "It is a great magic, Alph. Too great for us. Take me away, Alph."

When Alph awoke the next morning, Myra had his breakfast ready. Motioning her to join him, he sat at the little table and ate hungrily.

Like a child, she flitted about the room, eager to know of the many magic things that Old Nathan had bequeathed Alph. And though Alph knew little of these mysteries, he tried to recall the words that Old Nathan had told him, building scientific explanations upon legends. She was still dazzled by the broken mirror, and when Alph placed a ruby pendant about her neck she strutted before her reflection, as proud as the faded peacock upon the wall.

Suddenly Alph heard a scraping noise at the door. "Quiet," he warned. He stole to the door, slipped the bars noiselessly, and flung it open.

He was too late. He caught a fleeting glimpse of a long, gray, malignant face. The intruder, an old, bent woman, fled down the ruined hall before he could reach his spear. He turned to Myra, a worried look on his face.

"Alph, what was it?"

"It was Cleeta," he said wearily.

"And who is Cleeta?"

"She is an old woman who hates me. Some say she is a witch. Old Nathan said she was a fraud. She hated him, and now that he is dead, she hates me. Quick, Myra, she will tell them of you. They will be here any minute now. There is but one way out. We must go back to the Room of the Sun."

She clasped her hands in terror. "No, Alph, no! I would rather die than go back there. The place frightens me. I am used to the woods and the sunlight. Let us go back to the woods."

His shoulders arose in a shrug of helplessness. Hastily they packed their few belongings—a few pots and pans, a basket of dried food, Alph's field glasses, and lastly, the broken mirror.

They turned to the door. They threw back the bars. Alph opened it and closed it just as rapidly. But before he could bar it a spear was thrust into the aperture. Outside was an armed group of Narg men. In the crowd was Alph's own brother. With all his might, Alph leaned against the door, trying to shove the

spear out so that it would close. Then the others were pushing and hacking at the door from the other side.

"Bring out the Trog woman," they called. "Alph, bring her out, and we will let you go."

"Never," Alph answered, matching curse for curse, with his fellows.

"Then you shall pay—" And they redoubled their efforts against the door.

Myra leaned her shoulder against it. For a moment, she and Alph held it against the score. Then, inch by inch, it gave way, and finally burst open, throwing the man and woman back against the far wall.

They had their weapons ready as the Nargs advanced. Alph rushed forward with his sword to meet the men. He parried a thrust and split the skull of one onrushing Narg. Myra stayed close behind him, deftly thrusting here and there with her long spear.

But the fight was short-lived. He thrust his sword through the belly of another man, and turned to parry a spear that was thrust at Myra. As he did so, his own brother dropped to his knees and thrust upward with his spear. Alph felt a burning pain in his side. Before his brother could regain his feet, he swung his sword. The Narg fell, his head hanging by a shred. Then Alph pitched to his knees and rolled forward.

When Alph awoke, the room was deserted. Weakly he struggled to his knees. The floor was covered with his blood. The room was wrecked; his few belongings were scattered about the floor in tumbled array. Myra was gone. The Nargs had even taken their dead with them. Then a faint cry drifted up from the broken street far below him. He staggered to the window and flung the torn quilt aside. People were down there in the street, dancing and shouting about a smoking fire. Alph wiped his forehead. That crumpled figure amid the flames—

He left the window and searched about the floor for his field glasses. He found them, and going back to the aperture, he put them to his eyes. He gave a low cry. The glasses dropped from his hand. "Myra!"

His first impulse was to go down there, to kill as many as he could. He staggered to the door. His foot struck against something sharp. He stooped and picked it up. It was a piece of the broken mirror, the mirror he had given to Myra. Holding it up, he looked at his own face in it. He laughed.

Why, he, too, was a Narg! Like them, he was only a caricature of the men who had come out from Earth. They had gone back, back along the rough road that man had traveled in his ascent from the beast. They were no more than the brutes who fought out there of nights over their kill. And what had Old Nathan said? "They must remember their heritage." Their heritage was forgotten. It was lost in the drift of time, along with the spaceships of Earth.

Then he remembered the parchment. "If ever there should come a time to move the planetoid again—or to destroy it—" To destroy it! That was the answer. Like a wild song, the words drummed in Alph's ears. "Or to destroy it."

He moved to the wall and leaned against the faded picture of a peacock that was painted there. His fingers went up to the picture. They moved from the eye to the beak and back to the eye again, pressing hidden catches. The wall sank down into the floor. He found a broken taper and struck a light. He en-

tered the little room that the picture had concealed. He pressed another button. The wall closed noiselessly.

Alph staggered dizzily as the elevator descended. It slowed and stopped, and with the taper held aloft, he stepped out into the tunnel. For a moment he leaned weakly against the glass-covered car. Then he opened the door and stepped in. Noiselessly the car sped through the long tunnel. Then, far away, he saw a light—the light that had burned in the control room for so long. The car stopped. He staggered out. The parchment was in his hand. The directions for handling the complex machinery were written there clearly enough, in words that a child might understand. Even Alph—

He shifted a lever. There was a buzzing as timeless atomic motors were stirred into action. He slid into a seat behind the central control panel. For another moment he studied the parchment, then shifted another lever cautiously. There was a feeling of unendurable weight. He moved the lever back, then advanced it again as slowly as a clock's hands crawl.

Hour after hour passed as Alph sat there like a bloody gargoyle over the controls. Interminable hours passed, and the great ball of fire that glowed in the center of the silver screen had noticeably grown. Hour after hour passed. Alph had no food or water. Nor did he need any. His entire being was centered on that one thought: to handle the controls.

But, as the hours passed, another thought crept into his stunned mind. It was a sentence from a book that Old Nathan often quoted: "Man goeth to his long home." The words rioted through his mind. A brute no longer, a man.

Hours passed. He slept. He awoke. He slept again. Twice the glowing sphere of light shifted from the middle of the screen to the edge. But each time he skillfully moved it back. That sphere of light was growing. Hidden televisors at the poles of Ceres were flashing the news upon that silver screen.

Hours passed. The heat was growing unendurable. The sphere of light now filled the entire screen, but it was a sphere no longer. It was more like a great molten saw, with leaping, twisting tongues of flame along its serrated edges.

And at last Alph weakly set the controls of the machines, and slumped over across them.

An astronomer, had there been one left on the planets, might have seen a strange sight—a great golden tear that slid across the sky and vanished into the Sun.

RIM OF THE DEEP

by CLIFFORD D. SIMAK

RIM OF THE DEEP

By Clifford D. Simak

Men may reach other planets before they reach the depths of their own world—to find that they've been very slow—

Illustrated by F. Kramer

THE RAT slouched into the Venus Flower and over to the table where Grant Nagle was settling down to the serious business of getting drunk.

The newspaperman eyed the Rat with unconcealed loathing. But the Rat didn't seem to mind. He pushed his cap farther over his left eye and talked out of the corner of his mouth, his words hissing out alongside the smoke-trickling cigarette.

"I got a message for you," he declared.

"Let's have it," said Grant. "Then get the hell out of my sight."

"Hellion Smith is loose," said the Rat.

Grant started, but his face didn't change. He stared at the other icily and said nothing.

"He left word two years ago," explained the Rat, "that when he cracked the crib I was to bring you a message. I'm bringing it, see?"

"Yes?"

"It was this. Hellion said he was going to get you. Himself, personal, see? Some of us boys offered to do the job for him, but he said no, he was saving you for himself. The chief is funny that way."

"Why?" asked Grant.

The question took the Rat by surprise. His cigarette drooped suddenly, almost fell from his mouth. His watery eyes blinked. But he recovered his composure and hunched farther across the table.

"That's a funny question, Nagle. Funny question for you to be asking. When you put the chief out in the Alcatraz of Ganymede."

"I didn't put him there," said the newsman. "All I did was write a story. That's my job. I found out Hellion was hiding on Ceres with a bunch of assorted cutthroats, waiting for the heat to let up. And I wrote a story about it. Can I help it if the police read the *Evening Rocket?*"

The Rat eyed the reporter furtively.

"You're smart, Nagle," he said. "Too damn smart. Some day you'll write yourself into a jam you can't get out of. Maybe you done that already."

"Look here," asked Grant, "why did the chief send you around? Why didn't he come himself? If Hellion's got business with me, he knows where he can find me."

"He can't come now," said the Rat. "He's got to lay low for a while. And this time he's got a place where no snooping reporter is going to find him."

"Rat," warned Grant coldly, "some day you're going to talk yourself into a jam. I don't know what your game is, but it is a game of some sort. Because Hellion can't get out of the prison on Ganymede. No man ever has gotten out of it. When a man goes there, he stays there. When he comes out he's either served

his sentence or he comes out feet first. Nobody escapes from Ganymede."

The Rat smiled bleakly, drew a paper from his hip pocket and spread it on the table. It was an *Evening Rocket*, the ink still damp. The banner screamed:

HELLION ESCAPES

"That," said the Rat, tapping the paper, "should tell you what the score is. I ain't talking through my hat."

Grant stared at the paper. It was the five-star edition, the final for the day. And there it was in black and white. Hellion Smith had escaped from the impregnable Alcatraz on the airless, bitter, frigid plains of Ganymede. A mauve-tinted likeness of Hellion's ugly mug stared back at him from the page.

"So what you told me is true," said Grant softly. "Hellion has really escaped. And the message is the goods."

"When Hellion says something he means it," sneered the Rat.

"So do I," declared Grant grimly. "And I got a message for you to take back to Hellion, if you can find him. You tell him I only did my duty as a newspaperman before—nothing personal about it at all. But if he comes messing around again I'll take a sort of interest in him. I'll really put some heart into it, you understand. You tell Hellion that if he tries to carry out his threat I'll rip him up by the roots and crucify him."

The Rat stared at him with watery eyes.

Grant lifted the bottle off the table and filled his glass.

"Get the hell out of here!" he roared at the man across the table "Just looking at you makes me want to gag."

THE COPY BOY found Grant at the table, twirling the liquor in his glass. He shuffled across the floor toward him.

Grant looked up and recognized him. "Hello, Lightnin'. Have a snort."

Lightnin' shook his head. "I can't. The boss sent me to get you. He wants to see you."

"He did, did he?" asked Grant. "Well, you go back and tell the boss I'm busy. Tell him I can't be bothered. Tell him to come over and see me if he's in a rush."

Lightnin' scuffed his feet uneasily, caught between two fires.

"It's important," he persisted.

"Hell," said Grant. "There's nothing important. Sit down, Lightnin', and rest your feet."

"Look," said Lightnin', pleadingly, "if you don't come, the boss will give me hell. He said not to let you talk me out of it."

"Oh, well," said Grant. He tossed off the liquor and pocketed the bottle.

"Lead on, Lightnin'," he said.

On the street outside the mechanical newsboys blatted their cries.

"*Hellion Smith escapes. Hellion Smith escapes from Ganymede. Police baffled.*"

"They're always baffled," said Grant.

Soft lights glowed in the gathering dusk. Smoothly operating street traffic slid silently along. Overhead the air lanes murmured softly. The city skyline was a blaze of vivid color.

ARTHUR HART beamed at Grant. "I got a little assignment lined up for you," he said. "One that will be a sort of vacation. You've been

working hard and I thought a change might do you good."

"Go on," said Grant. "Go on and give it to me both barrels. When bad news is coming I like to meet it face to face. The last time you got all bloated up with kindness you sent me off to Venus and I spent two months there, smelling those stinking seas, wading around in swamps, interviewing those damn fish men."

"It was a good idea," Hart protested. "There was every reason to believe—still is—that the Venusians are a damn sight smarter than we think they are. They have big cities built down under those seas and just because they've never told us they didn't have spaceships is no reason to believe they haven't. For all we know, they may have visited Earth long before Earthmen flew to Venus."

"It's all over now," said Grant, "but it still sounds screwy to me. What is it this time? Mars or Venus?"

"Neither one," said Hart smoothly. "This time it really will be a little vacation jaunt. Down to sea bottom. I got it all fixed up. You'll take a sub tonight down to Coral City and from there you'll go to Deep End."

"Deep End!" Grant protested. "That's the jumping-off place. Right on the rim of the deep."

"Sure," snapped Hart. "What's wrong with that?"

Grant shook his head sadly. "I don't like it. I'm a claustrophobiac. Can't stand being shut up in a room. And down there you got to wear steel armor. Take Coral City, now. That's not a bad place. Only a couple hundred feet under and you meet nice people."

"Nice bars, too," suggested Hart.

"Bet your neck there are," Grant agreed. "Now, I could go for a couple of weeks in Coral City."

"You'll go for Deep End, too," declared Hart grimly.

Grant shrugged wearily, felt the comforting bulge of the bottle in his pocket.

"All right," he said. "What's the brainstorm this time?"

"There's some sort of trouble down there on The Bottom," said Hart. "Rumors, unconfirmed reports, nothing we've been able to get our teeth into. Seems the glass and quartz used in suits and domes hasn't been standing up. There have been tragedies. Entire communities wiped out. A story here, a story there, over the period of months, from all parts of The Bottom. You've read them yourself. Inquiries that have gotten nowhere."

"Forget it," said Grant. "That's only what's to be expected. Any damn fool that goes down a half mile underwater and lives under a quartz dome is asking for trouble. When it comes he hasn't got anybody but himself to blame. When you go monkeying around with pressures amounting to thousands of pounds per square inch you're fooling around with dynamite."

"But the point," said Hart, "is that every catastrophe so far reported has occurred where one manufacturer's quartz is being used. Snider quartz. You've heard of it."

"Sure," said Grant, unimpressed, "but that don't add up to anything. Most of the quartz used down there is Snider stuff. It's no secret Snider has a pull with the Underocean Colonization Board." He looked at Hart squarely. "You aren't figuring on sending me out on a one-man crusade against Snider quartz, are you?"

Hart stirred uneasily.

"Not exactly," he parried. "You won't be working alone. The *Evening Rocket* will be behind you."

"Behind me is right," snorted Grant. "A long ways behind. A hell of a lot of good the *Evening Rocket* will do me if I get into a jam a half mile down."

Hart tilted forward in his chair. "The point is this," he said. "If we can find there's something wrong with Snider quartz, we'll put the heat on Snider. And if we find the UCB has been winking at Snider stuff when they know it's wrong, we'll have them across the barrel, too."

"What a sweet nature you have," said Grant. "The sort of a guy that would send his old grandma to the gallows for a ninety-six-point streamer."

"We have a duty to the public," said Hart solemnly, looking almost like an owl. "It's our duty to work for the common good of mankind."

"And for the good of the dear old *Evening Rocket*," said Grant. "Up goes the circulation list. Full-page ads telling the readers how we exposed the dirty crooks. And maybe, after we smack Snider quartz flat, there'll be another quartz company just dying to insert about a million bucks' worth of advertising in our columns."

"It isn't that," snarled Hart, "and you know it isn't." He became oratorical. "Out there is a great empire to be conquered. The ocean bottom. An area two and one half times as great as all the land areas on the Earth. A great new frontier. We've made a start at conquering it. Out there are pioneers—"

Grant waved him to silence. "I know," he said. "Vast riches. Great fields for exploitation. A heritage for the future. I know it. But save it for an editorial."

Hart leaned back in his chair. "The latest reports of quartz failure come from the rim of the Puerto Rico deep," he said. "Your job will be to find what's in the cards."

"I warn you," said Grant. "When I get back from this one I'm going to get drunk and stay drunk for a month."

Hart reached into his desk and drew out an envelope. "Your tickets for the sub," he said. "The bank at Coral City will have instructions to let you draw expenses."

"O. K.," said Grant. "I'll catch you an octopus for a pet."

THE WATER was blue, shading to violet—a dusky blue like the deeper shade of twilight but still with a faintly luminous quality about it. Long ago the more showy seaweed beds had been left behind and the character of the sea bed had changed. No more beautiful stretches of sand with vegetation and fishes of unearthly colors, delicate and shifting. No more waving sea plumes or golden sea fans. No more unbelievable brilliancy of color.

Now one seemed to be moving into the maws of night. The blue of the water deepened and blurred only a short distance away and even the powerful light of the underwater tank penetrated for only a hundred yards or so.

There was muck underneath, muck and ooze that was deepening as Grant followed the contour of the bottom down toward the deep. Once the tank floundered into a muck trap with its treads spinning helplessly, and he had been forced to use the retractable gear to lift it out—the gear acting like legs, searching for and getting solid footing, heaving the massive tank along.

The character and pattern of life was changing down here, too. Changing to a grimmer pattern—a more ferocious, unrelenting life.

A thing, that was little more than

a living mouth, swam across the vision panel, turned back, pressing its blunt face against the glass, mighty mouth agape, wicked fangs shining. A dark shape slithered by, just outside the beam of light.

Grant dropped his eyes to the instruments. Five hundred and fifty feet down. Pressure two hundred fifty-three pounds per square inch.

The other instruments were shivering slightly, but all read correctly. Everything was going fine.

Grant wiped perspiration from his face. "Running this damn tub gets on my nerves," he told himself, but instantly was reassured with the thought of the massive steel walls, constructed to maintain a maximum of resistance to buckling and bending, of the ports of shatter-proof quartz, laminated, one with the rest of the construction.

But quartz sometimes didn't stand up—that was what had brought him here. Quartz sometimes went haywire and when it did men died, men who had put their trust in it—men who otherwise could not have hurled their challenge into the teeth of The Bottom with its chilly depths, its monstrous pressure.

The thing that was all mouth had retreated from the vision glass, but another nightmare of the twilight zone had replaced it—a grotesque thing that resembled nothing that ever should have lived.

Grant cursed at it—swung the spotlight back and forth, trying to pick out landmarks. But there was nothing—he was moving across what appeared to be a murky plain, although the indicator showed it had a decided downward slope.

Down there, somewhere ahead, was the Puerto Rico deep, one of the deepest—five and a half miles down. Down there the pressure ranged around six and a half tons a square inch. Too deep for man as yet. Conquest under the four-mile mark would have to await work in the industrial laboratories, would have to wait on man's ingenuity to build steel and glass that was a little stronger, man's ability to design new engineering kinks that would give greater strength—or perhaps the construction of a force screen or some other approach as yet merely speculative.

Grant studied his chart. He had kept the course the communications bureau back at Deep End had outlined for him, but as yet there was no sign of the man he sought. Old Gus, they called him, and it seemed he was a sort of local legend.

"A queer old coot," the dapper little communications-bureau head had told him. "Depth dippy, I guess. He's been out there for years, prospecting, fooling around. Couldn't make him leave now. The Bottom gets in your blood, I guess, if you stay there long enough."

Grant swept the light back and forth again, but still there was nothing.

Half an hour later the light picked up the dome crouched under a sudden upsoaring of black rock, rising abruptly from the sea floor.

Running the tank in close to the cliff, Grant stopped it and entered the airlock.

Clambering into the mechanical suit, he tightened the lock and slid into the small operator's chamber with its nightmare of controls. Clumsily, as yet unused to the operation of the suit, he opened the outer lock control.

Outside it was easier and the suit ambled jerkily along, shaking him at every stride. He was within only a short distance of the dome when a shadow detached itself from the cliff

and dropped upon him. Grant felt the thud of its impact, saw waving tentacles crawl across the plate, white gristle suction cups seeking to get a hold.

"An octopus," said Grant disgustedly.

The cephalopod threshed wildly, swinging its tentacles in mighty swipes and then slid off the suit, landing in front of it, hopping to one side. A moment later it scuttled out of the twilit gloom and humped along ahead of Grant.

"I'd like to take a swift kick at you," Grant told the octopus, "but if I did, I'd lose my balance sure as hell, and a fellow would have to be a magician to get one of these tin cans right side up if it fell over."

The octopus was a monster. His body was as big as a good-sized watermelon and his eight tentacles would have spanned close to twenty feet.

A suited figure was emerging from the air lock of the dome and Grant shoved a lever to swing his suit's arm in greeting. The arm of the other suit raised in reply and hurried toward him.

The octopus galloped forward, raising a cloud of murk in its path, and launched itself at the other suit. An expert arm flashed out and warded it off. Steel fingers closed on a tentacle and the suit marched forward, hauling a protesting, squirming octopus along by one of its eight long arms.

"Howdy, stranger," said the man inside the advancing suit. "Glad you happened along."

Grant spoke into his transmitter.

"Glad to see you, too. I was looking for a man named Gus. Maybe you're him."

"Sure am," said the other. "I suppose Butch jumped on you."

"Butch?" asked Grant, bewildered.

"Sure, Butch. Butch is my octopus. Raised him from a pup. Used to sit around inside the dome with me until he got too big and I had to shut him out. He still tries to sneak in on me every now and then."

Butch squatted to one side, his tentacle still clutched in the steel hand of his master's suit. His eyes seemed to glint in the deep blue water.

"Sometimes," Old Gus went on, "he gets kind of gay and I've got to trim him down to his natural size. But he's a pretty good octopus just the same."

"You mean," asked Grant, slightly horrified, "you keep the thing for a pet."

"Sure," declared Gus. "Safe enough as long as he can't get at you. Another fellow up north a ways had one and he kind of noised it around his octopus could lick anything that swam, so I took Butch and went up to see him. That, stranger, was a brawl worth seeing. But Butch had it all over that other octopus. Polished him off inside of fifteen minutes and then wouldn't give up the corpse. Lugged it around for days, taking lunches off of it."

"Sort of a tough citizen," suggested Grant.

"Butch," said Old Gus pridefully, "can be downright ornery when he takes a mind to be."

Old Gus talked as he brewed the coffee. "A man gets sort of lonesome down here once in a while," he explained, "and you like some company, even if it ain't nothing but a thing like Butch. Sharks, now, are downright friendly once you get to know them, but they ain't no account as pets. They wander too much. You never know where they are.

But octopuses are home bodies. Butch lairs out in the cliff back there and comes a-humping every time he sees me."

"How long have you been here?" asked Grant.

"Only four or five years here," said Gus. "Used to live up around three hundred feet, but when they put out this improved quartz I moved down here. Like it better. But, all in all, I been living on The Bottom for nigh onto forty years. Last time I was up on the surface I got a terrible headache. Too many bright colors. Greens and blues and reds and yellows. All you get down here is blue, more of a violet really. It's restful."

The coffeepot sent out tantalizing odors. The electrolysis plant chuckled. The heat grids sang softly.

Outside the dome, Butch squatted dolefully.

"This a Snider dome?" asked Grant.

"Yep," said Gus. "Set me back a couple thousand bucks. And then I had to pay to get it hauled down here. Thought I could do it with my old tub, but it was too risky."

"I hear some of the Snider domes aren't working out too well," said Grant. "Breaking down under pressure. Maybe something wrong with their construction."

The old man lifted the coffeepot off the stove, poured coffee into the cups.

"There's been a lot of failures," he said, "but I ain't had no trouble. Don't think it's the fault of the glass at all. Something else. Something funny about it. Some of the boys around here have been talking of getting up a vigilante party."

Grant had his cup half lifted to his lips, but set it down suddenly. "Vigilante party?" he asked. "Why a vigilante party?"

Old Gus leaned across the table, lowered his voice dramatically. "Ever hear of Robber's Deep?" he asked.

"No," said Grant. "I don't believe I ever have."

The old man settled back. "A little over a half mile down," he declared. "A sort of little depression. Bad country. Too rough for tanks. Got to go on foot to reach it."

He sipped the steaming coffee noisily, wiped his whiskers with a horny hand.

Grant waited, sipping his own coffee. Butch, he saw, was swarming up the dome's curving side.

"There's been too dang many robberies," said Old Gus. "Too much helling around. This country is getting sort of civilized now and we ain't going to stand for it much longer."

"You think there's a gang of robbers down in that deep?" asked Grant.

"That's the only place they could be," said Gus. "It's bad country and hard to get around in. Lots of caves and a couple of canyons that run down to the Big Deep. Dozens of places where a gang could hide."

Gus sipped gustily at the coffee. "It used to be right peaceable down here," he mourned. "A man could find him a bed of clams and post the place and know it was his. Nobody would touch it. Or you could stake out a radium workings and know that your stakes wouldn't be pulled up. And if you found an old ship you just slapped up a notice on it saying you had found it and nobody would take so much as a single plank away. But it ain't that way no more. There's been a lot of claim jumping and clam beds have been robbed. We kind of figure we'll have to put a stop to it."

"Look," said Grant, "the *Evening Rocket* sent me out here to find out

why so many domes were failing—why there were so many catastrophes on The Bottom. You tell me robbers are responsible—desperados of the deep. Would they go to the length of smashing a man's dome to get what little treasure he might have inside?"

Old Gus snorted. "Why not?" he asked. "Up on the surface your thugs kill a man, shoot him down in cold blood, to get the little money he might have in his pocket. Down here there are fortunes in some of the domes. Radium and pearls and priceless treasure salvaged from old wrecks."

Grant nodded. "I suppose so. But it's not only here it's happening. Domes are failing all over. On all parts of The Bottom."

"I don't know about them other places," said Old Gus brusquely, "but I know out here most of the failures ain't the fault of the glass. It's the fault of a bunch of thieving cutthroats and if it keeps on we'll sure make them hard to catch."

The old man sloshed the last of the coffee down his throat and rattled the cup down on the table. "I got a bed of clams posted not very far from here and if them fellows get into that bed I'll just naturally go on the warpath all by myself."

He stopped and looked at Grant. "Say," he asked, "have you ever seen a real clam bed?"

Grant shook his head.

"If you can stay," said Old Gus, "I'll show you one tomorrow that'll make your eyes pop. Some of them five feet across, and if one old girl is open I'll show you a pearl as big as your hat. It isn't quite as perfect as it should be yet, but given a little more time it will be. The old girl is working on it and I'm watching it. But I haven't been over there for a month or so."

He shook his head. "I sure hope them Robber's Deep fellows ain't found her," he said. "If they ever touch that pearl I'm going to declare me a war right then and there."

Butch lolloped happily along ahead of them, soaring awkwardly over occasional boulders and making furtive side trips into the deep-blue darkness on either side.

"Just like a dog," said Old Gus. "He gets cantakerous at times and I have to give him a good whaling to cool him down, but he seems to like me anyhow. But to anyone but me he's meaner than poison. That's his nature and he can't help it."

They plodded on. Grant was having less difficulty working his suit.

"The clam bed," said Old Gus, "is just up this way a piece. Robber's Deep is down in that direction." He swung his arm toward the down slope, half turning his suit. He did not turn back again. "Nagle"—his voice was a husky whisper—"I don't remember ever seeing that before."

Grant turned and through the haze of the water he saw a queer formation, a shady thing rising out of the ocean bed.

"What is it?" he asked. "It looks— Damned if it don't look almost like a piece of machinery."

"I don't know," said Gus softly, "but, by the good Lord Harry, we're going to find out."

They moved forward slowly, cautiously. Grant felt an unaccountable prickling at the back of his neck—an eerie sense of danger.

Butch gamboled ahead of them. Suddenly he stopped, stood stiff-legged, almost bristling. He pranced forward a few steps and waved his tentacles. Then he became a bundle of unseemly rage, rushing about, his eyes red, his body color changing

He clung desperately to the side of that submarine cliff and watched the deadly messenger sink downward—

from black to pink, to violet and finally to a dull brick-red.

"Butch sure has got his dander up," said Old Gus, half fearfully.

The octopus ceased his demonstration of rage almost as suddenly as it had started and headed straight for the hazy mass before them. Old Gus broke into a sprint and Grant followed.

The towering mass was machinery, Grant saw. Two great cylinders standing close together, with a massive squat machine between them, connected to both of the cylinders by heavy pipes.

The muck and ooze had been scraped away for some distance around the cylinders and machine,

probably to make way for secure anchorage, and a mighty hole had been blasted in the sea-bed rock.

There was no sign of life around the cylinders or the machine, but the machine was operating.

Butch reached the cylinders and whipped around them and the next instant something that looked like a merman shot out from behind the cylinders, with Butch in close pursuit.

The manlike thing flashed through the water with astonishing ease, but Butch was out for blood. With a tremendous burst of speed he drew nearer to the fleeing thing, launched his body in a great leap and closed in, tentacles flailing.

Old Gus was running now, yelling at the octopus. "Damn you, Butch; you stop that!"

But, by the time Grant reached them, it was all over. Old Gus, still furious, was prying an angry Butch from his prey, which the octopus still held in the death-grip of his tentacles.

"Some day," Old Gus was saying, "I'm going to plumb lose patience with you, Butch."

But Butch wasn't worrying much about that. His one thought at the moment was to retain the choice morsel he had picked up. He clung stubbornly, but finally Gus hauled him loose. He tried to charge in again, but Gus booted him away and at that he withdrew, squatting at the base of one of the cylinders, fairly jigging with rage.

Grant was staring down at the thing on the bare rock. "Gus," he said, "do you know what this is?"

"Danged if I do," said Gus. "I've heard of mermen and mermaids, but I never did set no stock by them. I been roaming these ocean beds for nigh forty years and I never seen one yet." He moved close, touched the body with the toe of his suit. "But," he declared, "this is the spitting image of those old pictures of them."

"That," said Grant, "is a Venusian. A native of Venus. A fish man. The boss sent me to Venus a couple years ago to find out what I could about them. He had a screwy idea they were further advanced in science than they ever let the Earth people suspect. But I couldn't do much about it, for it would be sheer suicide for a man to venture into a Venusian sea. The seas are unstable chemically. Always with more or less acid—lots of chlorine. They stink like hell, but these fellows seem to like it. The acid and pressure and chemical changes don't seem to harm them and maybe the stink smells good to them."

"If this is a Venusian, how did he get here?" asked Gus suspiciously.

"I don't know," said Grant, "but I aim to find out. To my knowledge a Venusian has never visited Earth. They can stand almost any pressure under the water, but they don't like open air, even the Venusian air and that's half water most of the time."

"Maybe you're mistaken," suggested Gus. "Maybe this ain't a Venusian but something almost like one."

Grant shook his head behind the plate. "No, I'm not mistaken. There are too many identifying marks. Look at the gills—feathered. And the hide. Almost like steel. Really a shell—an outside skeleton."

The newsman turned around and stared at the cylinders, then shifted his gaze to the machine squatting between them. It was operating smoothly and silently. Several large blocks of stone lay in front of it, and several similar blocks protruded from a hopperlike arrangement which surmounted the machine. The dang-

ling jaws of a crane showed how the blocks had been lifted into the hopper. To one side of the machine were a number of small jugs.

"Gus," Grant asked, "what kind of rock is this?"

The old man scooped up a couple of splinters and held them before his vision glass. The suit's spotlight caught the splinters and they blazed with sudden moving light.

"Fluorite," said Gus. "Crystals embedded all through this stuff." He flung the splinters away. "The rock itself," he said, "is old; older than hell. Probably Archean."

"You're sure about the fluorite?" asked Grant.

"Sure, it's fluorite," sputtered the old man. "The rock is lousy with it. You find lots of it on The Bottom. Lots of old rock here, and that's where you find it mostly."

Grant dismissed the subject of the rock and turned his attention to the engine and the tanks. The engine seemed simple in its operation—little more than a piston and a wheel—but it seemed without controls and it ran without visible source of power.

The hopper was a hopper and that was all. Across its throat flashed a ripple of fiery flame that ate swiftly at the block of stone, breaking it up and feeding it into the maw of the machine below.

Grant rapped against one of the tanks with his steel fist and it gave back a dead clicking sound unlike the ring of steel.

"Would you know what those tanks are made of?" he demanded of Gus.

The old man shook his head. "It's got me all bogged down," he confessed. "I seen some funny things in forty years down here, but nothing like this. A Venusian feeding rock into a machine of some sort. It just don't add up."

"It adds up to a hell of a lot more than we think," said Grant gravely.

He picked up one of the jugs and rapped it. It gave back the same clicking sound. Carefully he worked the stopper out and from the neck of the jug spouted a puff of curling, deadly-appearing greenish yellow. Swiftly he jabbed the stopper in again and stepped back quickly.

"What is that stuff?" Gus shrieked at him, his blue eyes wide behind the plate of quartz.

"Hydrofluoric acid," said Grant, a strange tenseness in his voice. "The only acid known that will attack glass!"

"Well, I be damned," said Old Gus weakly. "Well, I be damned."

"Gus," said Grant, "I won't be able to look at those clams today. I've got to get back to Deep End. I have a message to send."

Gus looked gravely at the cylinders, at the body of the Venusian. "Yes, I guess you have," he said.

"Maybe you'd like to go with me. I'll come right back again."

Gus shook his head. "Nope, I'll stick around. But you might bring me back a couple pounds of coffee and some sugar."

Out of the twilit waters came a charging black streak. It was Butch. He had made a flanking movement and now was coming in to get the dead Venusian.

His strategy succeeded. Gus rushed at him roaring, but Butch, hugging the body, squirted himself upward at a steep angle and disappeared.

Gus shook a fist after him.

"Some day," he yelped, "I'll give that danged octopus a trimming down that he'll remember."

HART had been wrong, apparently, about the Snider glass, but he had been right, that time before, about the Venusians. For there could be no doubt of it. The Venusians were coming to Earth—might have been coming to Earth these many years, roaring down out of the sky in their ships, diving into the ocean, their natural habitat—quietly taking over Earth's oceans without making any sort of fuss.

And then Man, pressed by economic necessity, by the love of adventure, by the lure of wealth, spurred on by scientific and engineering developments, had invaded the sea himself. For centuries he had ridden on it and flown over it, and now he had walked into it, embarking upon the last great venture, invading the last frontier little old Earth had to offer.

Strange tales of flashing things that dropped into the sea—strange reports of mystery planes sighted in midocean, planes that had a strange look about them. Planes tearing upward into space or dropping like a flash into the water. For years those reports had been heard—way back in the twentieth century—even in some instances in the nineteenth century, when planes were yet a thing unheard of.

And tales much older yet—tales from antiquity—from the old days when men first pushed outward from the shore, tales of mermaids and mermen.

Could the Venusians have been coming to Earth for all these centuries? Quietly, unobtrusively dropping out of space—perhaps carrying on a lucrative trade for many years with treasures snatched from Earth's ocean beds. Perhaps even now there were many Venusian colonies planted on The Bottom. That could easily be so, for Man as yet had only started his exploitation of the sea beds. His health and tourist resorts, his sea farms and oil fields, his floral gardens and mines only fringed the continental shelves, and at no point was The Bottom thickly settled. A few depth-dippy coots like Old Gus, spending their lives on The Bottom, caught by the mystic love of its silences and weird mystery, had pushed ever deeper and deeper, but they were few. The Bottom, to all intent and purpose, was still a wilderness. In that wilderness might be many colonies of Venusians.

Grant Nagle pondered the matter as he headed his tank back into the depths from Deep End, back to Old Gus' dome.

He chuckled as he remembered the result of his visaphone call to Hart.

He could imagine Hart now—cussing up and down the office, ripping things wide open, laying down the law to Washington. By nightfall Hart would have every government submarine in the entire world combing the ocean bottoms.

Combing the ocean bottoms to ferret out Venusians and their deadly little chemical plants where they were manufacturing hydrofluoric acid.

Maybe they didn't mean anything by manufacturing the acid. Maybe it was for some perfectly innocent purpose of their own. But the fact that hydrofluoric acid was the only acid known to have effect on glass, the fact that quartz domes had been failing all tied up too neatly to be disregarded.

After all, wouldn't that be the logical way for the Venusians to proceed if they wished to keep the oceans for themselves. If they wished to drive Earthmen from the beds of their own seas, how better might they do it than by making Earthmen

fear the sea, by destroying their confidence in the quartz that made possible domes and submarines and tanks and underwater suits? Without quartz man would be practically helpless on The Bottom, for quartz was the eyes of men down here. In time to come, of course, television could be worked out so that quartz would be unnecessary, but that would be an unsatisfactory substitute—indirect sight instead of direct sight.

And if the worst came to worst, might it not be possible that the Venusians, with their chemical factories, might entirely alter the chemical content of the oceans? The material lay at hand. Fluorite for hydrogen fluoride. Most of the compounds in the oceans' waters were chlorides—simple to juggle them chemically. Vast deposits of manganese.

Grant shuddered to think of the witches' broth that well-directed chemical effort might stir up in these depths. A great job, truly—but not impossible—especially when one considered the Venusians might have developed chemical treatment, might hold knowledge of chemistry which was still a closed book to Man. That machine and the hopper and the cylinders—nothing like one would find in an Earthly chemical plant—but apparently efficient. With unlimited raw material, with many machines such as that—what might not the Venusians be able to do?

And it didn't make a bit of difference to them. In Venus they lived in seas that frothed and bubbled and stank to the high heavens—seas that seethed with continual chemical change. A few chemical changes in Earth's seas wouldn't bother them at all, but it would the people and the creatures of the Earth. All sea life would die, men would be driven from The Bottom, perhaps many sections of country lying close to the sea would become virtually uninhabitable because of the fumes.

Grant cursed at himself. "You damn fool," he said, "creating a world catastrophe when you aren't absolutely certain of any fact as yet."

No facts, of course, except that he had actually found a Venusian operating a machine which produced hydrofluoric acid. He studied his chart closely and corrected his course. He was getting close to Old Gus' dome.

Half an hour later he sighted the black, shadowy cliffs and cruised slowly in toward them.

He didn't see the dome until the tank was almost on top of it. Then he cried out in amazement, jerked the tank to a halt and flattened his face against the glass, playing the spotlight on the ruins of the dome.

Old Gus' dome had been literally blown to bits. Only a few jagged stumps of its foundation, firmly anchored to the rock beneath, still stood. The rest was hurled in shattered fragments over The Bottom!

There was no sign of Old Gus. Apparently the old man had been away when the dome had crashed or his body had been carried away.

But there was little mystery as to what had caused the dome to fall. The broad wheel marks of a large undersea tank led away from the scene of destruction. Deep footprints still made a tracery about the dome site and the interior of the dome had plainly been rifled after the dome itself had been destroyed. This had been the work of men. A shell, loaded with high explosive, driven by compressed air, had smashed the dome.

"Robber's Deep," said Grant, half to himself, staring along the direction in which the tank trail led. The

tale of Robber's Deep, as he had heard it from Old Gus, had sounded like one of those tall tales for which The Bottom men were famous. Tales inspired by superstition, by loneliness, by the strange things that they saw. But maybe Robber's Deep wasn't just a tale—maybe there really was something to it after all.

Grant turned back to his waiting tank. "By Heaven," he said, "I'm going to find out!"

THE tread marks were easy to follow. They led straight away, down the slope toward the Big Deep, then angled sharply to the north, still leading down.

The water grew darker, became a dirty gray with all the blue gone from it. Sparks flittered in the darkness—flashes that came and went, betraying the presence of little luminous things—sea life carrying their own lanterns. Arrow worms slid across the vision plate, like white threads. Copepods, the insects of the deep, jerked along with oarlike strokes, like motes of dust dancing in the sunlight. A shrimp, startled, turned into a miniature firecracker, hurling out luminous fluid which seemed to explode almost in Grant's face.

A swarm of fish with cheek and lateral lights flashed by the glass and a nightmare of a thing, with flame-encircled eyes, bobbing lantern barbels and silver tinsel on its body, crawled over the nose of the tank, perched there for a moment like a squatting ogre, then slipped out of sight.

The gauges were swinging over. Deeper and deeper, with the pressure rising. The grayness of the water held and the lights outside increased, like little fireflies rustling through the gloom.

What had happened to Old Gus? And why had his dome been smashed?

Those two questions pounded in Grant's brain. If Gus was still alive, where was he? Out rounding up the vigilantes he had spoken of? Hurrying back to Deep End to inform the police? Or haunting the trail of the marauders?

Grant shrugged his shoulders. Old Gus probably was dead. The old coot was depth-dippy. He would fight at the drop of the hat, no matter what the odds. Somewhere a blasted tank or a shattered suit was hidden in the ocean's mud, marking the last resting place of the old Bottom man.

But why the attack on the dome? Could Old Gus have had treasure there? It was not unlikely. He had talked of old ships loaded with treasure, he was watching a five-foot clam with a pearl as big as a man's hat. Even at the lower price of pearls due to their greater abundance now, that pearl itself would represent a small-sized fortune.

The trail led deeper and deeper, down into a darker gray, with more fireflies dancing, with monstrous shadows slipping through the water. Weird formations began to thrust themselves out of the ocean bed and the trail dipped swiftly. The track of the larger tank wound tortuously around the outcroppings.

Without a doubt they were approaching Robber's Deep. The depth gauge read slightly under two thousand feet and the pressure gauge sent a shiver of fear along Grant's spine. Exposed to that pressure for an insant, a man would be jelly—less than jelly, less than a grease spot on the floor.

The trail led into a narrow canyon, with mighty rock walls rearing up straight into the water. There was

barely clearance for Grant's tank—the larger machine must have almost brushed the walls.

Suddenly the canyon debouched into a wider space, a sort of circular arena, with the walls sweeping to left and right and then closing in again narrower than ever, forming a little pocket.

Grant jerked the machine to a stop, tried frantically to spin it and retreat. For in that little arena were other tanks, a battery of them, large and small.

He had run slam-bang into a trap and as he ripped savagely at the controls he felt the cold perspiration trickling down his chest and arms.

A voice boomed in his radio receiver: "Stay where you are or we'll blast you!"

He saw the snouts of guns mounted on the tanks swiveling around to menace him. He was beaten and he knew it. He halted the tank, switched off the motor.

"Get into your suit and get out," boomed the voice in the receiver.

He was in for it now—clear up to his neck.

Out of the tank, he walked slowly across the arena floor. A man from one of the tanks came out to meet him. Neither of them spoke until they were face to face.

Then, in the dim light, Grant recognized the man in the other suit. It was the Rat!

"Nice hide-out you have here, Rat," said Grant.

The Rat leered at him. "Hellion will be glad to see you," he said. "This is a sort of unexpected visit, but he'll be glad to see you just the same." The Rat's face twisted. "He liked your message."

"Yes," said Grant, "I figured that he would."

Alcatraz on Ganymede had done something to Hellion Smith, had instilled in him a deeper, sharper cruelty, a keener cunning, a fouler bitterness. It showed in his squinted eyes, his twitching face with the jagged scar that ran from chin to temple, the thin, bloodless lips.

"Yes," he told Grant, "I have a nice place here. Convenient in a good many ways. The police would never think to hunt for me down here and if they did and we wanted to make a fight of it, we could hold them off until the crack of doom. Or if we wanted to run for it, they'd never be able to trail us through those canyons that run into the Big Deep."

"Clever," said Grant. "But you always were clever. Your only trouble was that you took a lot of chances."

"I am not taking them any more," said Hellion, but his tone still held that puzzling, light note of pleasant conversation.

"By the way," he said, "the Rat told me you remembered me. Sent your regards to me. I appreciated that."

"Here it comes," Grant told himself. Involuntarily his body tensed.

But nothing came.

Hellion waved his arm to indicate the mighty dome which nestled in another larger, deeper arena in the canyon. Through the quartz, even in the murkiness of the gray water, one could see the towering canyon walls that ran up from the ocean floor.

"Just like on the surface," said Hellion proudly. "All the comforts of home. The boys like it down here. A few things to do and a good place to loaf around. Lamps that take the place of daylight, latest electrolysis equipment, generators—everything. We have it cozy." He turned to face Grant squarely. "I wish you could

stay with us a while," he said, "but I suppose you will want to be going back."

Grant gasped. "Why, yes," he said. "The chief will be expecting me."

But there was something wrong. No word or action. Nothing in the atmosphere. Nothing at all—except that Hellion Smith hated his guts. Hellion Smith wouldn't let him walk out of this place and go back to the surface.

And yet—that was what he had said: "—you will want to be going back."

"I'll walk to the lock with you," Hellion offered.

Grant held his breath, waiting for the joker. But there wasn't any joker. Hellion chatted amiably, his scarred face twitching, his eyes a-glitter, but his voice smooth and easy. Small talk about old times back in New York, gossip of the underworld, life in the Ganymedean prison.

Grant's suit stood within the lock, just as he had left it.

Hellion held out his hand.

"Come and see us again," he said. "Any time. But maybe you had better get started now." And for the first time Grant sensed a note of warning and of mockery in Hellion's voice.

"So long, Hellion," said Grant.

Still puzzled, he clambered into his suit, screwed shut the entrance port, snapped on the interior lights. Everything all right—dials intact, mechanism O. K. He snapped on the power and tested the controls. But there *was* something wrong. Something missing. A soft purr that should have been in his ears.

Then he knew, and as the realization struck him the strength seemed to go out of his body and a cold dew of perspiration dampened his entire body. "Hellion," he said, "my electrolysis unit has gone haywire."

Hellion stood just outside the lock, ready to slam home the port. He smiled engagingly at Grant, as if Grant might have just told him a funny joke. "Now," he said, "isn't that too bad."

"Look, Hellion," shouted Grant, "if you want to wipe me out, use your guns."

"Why, no," said Hellion, "I wouldn't think of that. This is so much neater. You have your emergency reserve of oxygen, enough for three or four hours. Maybe in that time you can figure out a way to save your neck. I'm giving you a chance, see? That's more than you gave me, you dirty little pencil pusher." He slammed the port and Grant watched it spinning home.

Water was hissing into the lock, shattered to fog by the mighty pressure, raising the pressure inside the lock to that outside the dome.

Grant stood still, waiting, mad thoughts thundering in his brain. Four hours' air at the most. Hours short of the time that would be necessary to get back to Deep End. If Old Gus' dome still stood, no problem would have existed, for he could have made the dome easily. Probably there were other domes as near, but he had no idea where they were.

There was just one thing—and he had to face it—death within his suit when his air gave out. Four hours. Plenty of time to get to Gus' dome.

His mind snagged and held, revolved around one idea. Time to get to Gus' dome. Follow the tracks left by the tanks. Scale the canyon walls and cut southward to intersect the tank tracks.

The site of the Venusian's machinery was a scant quarter mile from Gus' dome. Two hours would do it, less than two hours. Two

hours to go there—two hours to come back.

He wondered grimly what a dozen jugs of hydrofluoric acid, dropped into the canyon, would do to the dome. He chuckled and the chuckle echoed ghastily inside the suit. "We go out together, Smith," he whispered.

CLIMBING the canyon wall had been no child's play. Several times he had nearly fallen when the mighty grip of the suit's steel hands had slipped on slimy rock. Not that such a fall would have been fatal, although it might have been.

But now Grant was near the top. Slowly, carefully, he manipulated the right arm of the suit toward a projection, hooked the fingers around it, tightened them savagely with a vicious thrust of a lever. The motors droned as the arm swung the suit, scraping along the rocky face of the looming wall. Now the left arm and the fingers hooked upon a ledge, anchored there. Grant jerked on the arm several times to make sure of the grip, then applied the power. The arm bent, mechanical muscles straining, and the suit moved upward.

Time was valuable, but he must be careful. One slip now and he would have to do it all over again—if he could, for the fall might crush him to death on the rocks below, might crack his visor, might damage the suit so it wouldn't operate.

It had taken him longer than he thought to reach the top, but there was still time enough. Time to reach the Venusians' camp and get the acid. Time to get back and hurl jug after jug out into the canyon. Time to watch the jugs settle and break on the glowing dome down on the canyon floor. Time to watch the yellow-greenish liquid creep over the quartz. Time to see the quartz walls crumple inward beneath the terrific pressure of the deep.

"A message, Hellion?" he shrieked into the watery canyon. "I'll have one for you. I'll have a dozen of them—in jugs!"

But maybe he was just kidding himself. Playing at dramatics. Jousting with windmills. Maybe that much acid wouldn't touch the dome—maybe it would take hundreds of gallons of the stuff, dumped into the canyon, before it would affect the quartz. Maybe the jugs would collapse under the pressure before he could get them down this deep. That was funny stuff they and the cylinders were made of—neither steel nor quartz, and steel and quartz were

the only two materials that would stand up even at five hundred feet. In the laboratories on the surface hydrofluoric acid was kept in wax containers, but that, of course, would be just as crazy at this depth as quartz containers.

Those jugs must be made of some new material, some material unknown to Earthmen, but developed by the Venusians. The Venusians, naturally, would have developed materials of that kind—materials that were immune to acid action, could withstand tremendous pressures.

The oxygen jet, hissing warningly, roused Grant from his speculations. His eyes went to the reserve-tank pressure gauge and what he saw was like a blow between the eyes. Of the two tanks, one was empty—or almost empty, just enough for a few more minutes. The second tank was at full pressure—but something had happened to that first tank. He had counted on it carrying him almost to the Venusians' camp—on not being forced to call upon the second tank until he was ready for the return trip to the canyon's edge. Some imperfection, perhaps a faulty gauge—it didn't matter now, for the damage was done. The hissing of the jet ebbed lower and lower and Grant snapped on the second tank.

Well, that settled it.

He'd never live to get to the Venusians' camp and back to the canyon. Two hours—that was all that was left to him of life—perhaps not even that much. And that wasn't long enough.

Someone else would have to get Hellion Smith. Perhaps Old Gus, if Old Gus were still alive. Perhaps some stony-eyed veteran of the Undersea Patrol—perhaps one of the government submarines, nosing around to find other camps of the Venusian invaders.

"The last story," said Grant Nagle, staring out over the canyon, down into the depths where the dome gleamed dimly. "The last story and I won't write it."

GRANT SWUNG the right arm of the suit upward, found a handhold with his spotlight, hooked the steel fingers on it, tested their grip and geared the motors. The suit bumped and scraped against the rock as the arm levered it up a few feet.

Only a few feet more and he would reach the top of the canyon wall. What would he do then? What was there to do? What does a man do when he has just an hour or two to live?

He shifted the spotlight to find a hold for the fingers of the left arm and, as he did so, a shadowy, ghostly thing leaped over the canyon's lip and plunged out into the watery space behind him. An oblong thing, a tubelike thing, that seemed to be spinning as it fell. A thing that plunged down, straight at the dome below.

Grant twisted the peroscopic lenses to watch and, as he recognized it, he sucked in his breath. That falling thing was one of the cylinders from the Venusians' camp! One of the great cylinders to which the motor had been connected! The cylinder was falling faster now, faster and faster, still spinning along its axis.

From above came a coughing hiss, as if someone had uncorked a bottle, and down toward the spinning cylinder flashed a shimmering projectile. Someone had fired an airgun!

In the split second before the projectile struck, Grant found a handhold for the left hand of the suit, clamped the steel fingers into it savagely. The concussion of the exploding projectile as it blasted against the spinning cylinder bat-

tered his suit against the wall. But the fingers held and, hanging there against the canyon rocks, he saw the cylinder split open as if a man had sliced it with a knife. Saw it spill a flood of curling greenish-yellow substance down upon the dome.

With little regard for safety, Grant swarmed up the wall those few remaining feet, pulled himself over the edge and turned to stare down into the depths.

The dome was gone—flattened out—shattered into a million shards as the acid had weakened it, allowed the pressure to get in its deadly work.

Hellion Smith was dead. So was the Rat and all the others. Except for a few, perhaps, who might be guarding the tanks.

The waters of Robber's Deep were painted a ghastly yellow—a yellow that swirled and crawled and eddied like fiendish, writhing arms.

"Who the hell are you?" asked a voice.

Grant whirled. "Gus," he cried. "Gus, you old devil, you did it!"

The suited figure stood stolidly in the gloom, a gun clutched in one hand. Behind it bulked the outline of an underwater tank.

"I kind of got my dander up," Old Gus explained. "First they knocked over my dome and that put me out of sorts, and then they took my pearl and that made me downright sore."

He turned his spotlight on Grant's vision plate. "It's Nagle," he said. "I was wondering where you were."

"It's a long story," said Grant.

"You can tell it to me in the tank," said Gus. "I got to be getting back."

"Where are you going?" asked Grant.

"I got to get Butch," said Gus. "When I went up to the Venusians' camp and got ready to haul the cylinder down here, Butch was bound to follow me. I told him the pressure would be too much for him and I tried to make him stay. But he got stubborn, so I had to stake him out."

Gus chuckled thinly. "I bet he's madder than hell by now," he said.

ASTROCHEMISTRY?

The study of the spectra of the very cool, red stars is beginning to show the existence of comparatively complex molecules—or molecular fragments, at any rate. Methane, CH_4, is cracked by the heat of even the coolest stars—about 3,500° C.—to the radicle CH–. But quantities of CN–, and various other carbon compounds, including carbon vapor, have been detected.

There's more than one type of red star. The above type is now known as the "carbon star" type. It's atmosphere is a sooty, heavily carbonized and hydrogenized reducing flame, the type of flame well known to chemists and produced by burning gas in an atmosphere deficient in oxygen. The second type of red star is the oxidizing flame—an atmosphere rich in oxygen characterizes it, and its spectrum shows no signs of these carbon compounds.

In these oxidizing stars, all the carbon has been locked up in carbon monoxide, stable enough to resist even the high temperature present. But, whereas CH– and CN– radicles have a spectrum in the visible light region, carbon monoxide has a spectrum in the further ultraviolet, a spectrum completely blanketed by our own atmosphere.

The oxygen, combined now with titanium and other metals to form vaporized metal oxide, can be detected spectroscopically to give strong evidence of the definitely oxidizing nature of the atmosphere.

Astrophysical studies of these red stars indicate that neither type could properly be classed as "shrunken, cooling shells." They seem to average well over three hundred times as luminous as our own Sun—which, considering the much lower surface temperatures, and the consequent smaller radiation per square mile of area, means that they are red giants.

The question would seem to be, what sort of planets would these different chemical types produce—and are there, perhaps, still other types? Apparently, our own Sun classed as a reducing-flame, for most of the planetary matter (Jupiter, Saturn, Uranus and Neptune) represents strongly hydrogenated, reducing atmospheres. Perhaps elsewhere in the Galaxy are giant planets with atmospheres composed not of hydrogen, methane and ammonia, but of water and oxygen as our small planet's atmosphere is—largely, in the case of Earth—because it was too small to retain hydrogen while the planet was hot.

SPACE DOUBLE

By Nat Schachner

If a crook can't bribe an honest man —he may be able to pull something extra in the way of replacements!

Illustrated by Rey Isip

THE little air scooter dropped swiftly to the ground in front of the grimy, old-fashioned stone house on the outskirts of Great New York, and two men jumped out. One was lean and dark and wore a perpetual scowl that matched the thin upcurve of his pencil-line mustache. The other was chunky and moonfaced, and smiled interminably. But the smile was a matter of surface muscles only and was belied by a pair of hard, pale-blue eyes. Of the two men the chunky one was by far the more dangerous.

The lean, dark man held tight against his body a short, metal cylinder of the kind used for carrying films. He scowled doubtfully at the sign that stretched across the front of the house.

JOJO

Dealer in Secondhand Robots.
Expert Repairs and Reconditioning.
Reasonable Rates.

In confirmation, several robots stood stiffly at attention behind a dirty, long-unwashed screen of lucite. They were of the ordinary cheap, mass-production type; rusty,

battered and seemingly fit only for the melting furnace.

"It looks sort of crumby to me," observed the lean man. "You sure this is the place, Al?"

The dumpy man widened his grin. "Don't judge by appearances, Jem. I've been trying to pound that into your skull for years now. There ain't no one in the Federal Americas can hold a search beam to Jojo when it comes to robots. What did you want for his kind o' game? A snappy Boulevard get-up with custom-built robots pirouetting on a floodlit stage? That'd be a swell way to get a lot o' snooping inspectors digging into his business."

Jem wilted under the reproof. "O. K., Al; I was only saying—"

"*I'll* do the saying—an' the thinking, too, for this outfit." Al's voice was cold and hard, even though his smile was still turned on.

They stood in the photoelectric scanner the prescribed period; then the dingy door slid open and they went in. For a moment they stood blinking in the dim half light that filtered in from outside. There was no other illumination.

The interior was even more of a worthless junk shop than the lucite screen. Rusty robot parts, old metal hands, outmoded power packs, discarded legs and a profusion of coils, generators and broken springs were scattered all over the place. Mustiness, gloom and decay pervaded everything.

Then a gnomelike figure that had seemed but another robot in the corner stirred and came slowly to them. His face was as sharp as a file, and his eyes were two glittering beads that darted over his visitors with the precision of a scanner.

"What is your business?" he demanded.

"We want to have a robot made," said Al, grinning.

The gnomelike man stared at him hard, then shook his head. "You've come to the wrong place, mister. I only do repairing and sell second-hand stuff. Sorry!"

"Stow it, Jojo," said the dumpy man rudely. "I'm Al Barlow and this here's Jem Scudder. You've heard of us. We came here to talk business, not to gab."

Jojo's face underwent a transformation. There was respect in it, abasement even. "Every glimmer hide-out from here to Jupiter has heard of Al Barlow. You must forgive me, but I didn't know—"

"How could you?" retorted the dumpy man affably. "Ain't but a few ever seen me what kept on living. Now let's go to your real layout, so's we can talk properly."

THE DINGY SHOP was only a blind, a mask for prying inspectors. Underneath it, solidly ensconced in search-proof illurium walls, stretched the real layout. Luxury was the keynote here, as squalor had been in the shop above. A long, magnificent chamber, amply furnished with deep, soft divans, neo-silk draperies, silent-teed floor coverings, multi-hued lights that were exceedingly easy on the eye.

An inconspicuous panel opened into the workshop. A girl came out of it, took their hats with a graceful gesture. Jem stared at her admiringly. She was slim, patrician and beautiful. Her cheeks were pink and soft. She smiled provocatively at the thin, dark man and she said something in a low, tinkling voice.

Jem swallowed hard and started up: "Gee, sister, you look good tuh me! What d'ya say—"

Al did not change his smile as he shoved hard with the palm of his

hand at Jem and pushed him sprawling back into his seat. "You poor dope!" he said. "She's a robot. Jojo makes 'em like that."

The thin man gulped. He did not resent the push, but he blinked unbelievingly at the girl who was turning away. "Gee, a robot? You're foolin'."

The gnomelike man rubbed his hands, coughed modestly. "Oh, she's not much. I've done much better. I get some curious jobs. Take George Wallace, for instance."

"The hermit millionaire?" queried Al.

"Yep; the fellow that lives all by himself on Ceres. I did his wife for him."

Al stared. "You're nuts! I remember the wedding five years back. She was a Martian gal."

"She *was*," Jojo nodded, "but she died last year. Wallace hushed it up. He almost went crazy; he loved the kid a lot, it seems. Then he got wind of me. I made him up a robot that set his hair on end. He swore he couldn't tell the difference nohow. They're living together pretty happily on Ceres, I understand."

Al's eyes glittered. "Swell! If you kin fool a husband with a wife, *my* job should be easy. Take a look at these here pictures what Jem's got."

They sat in the projection room, watching the film. It was a three-dimensional stereoscope with a sound track. The subject was a heavy-set, firm-jawed man dressed in the dark-blue uniform of the Jovian Transport Line. The golden comet that flared across the high collar band denoted his rank as captain.

The film brought him to life in a score of different settings. Obviously he had not known he was being scanned. One setting was a complete run on board a liner from Earth to Jupiter, with stopovers at Mars and Ganymede. Another showed him in the privacy of his own home, with his wife, a matronly, comfortable woman, and a tousled-haired boy of six. Still another showed him roaring it in the company of a gang of hard-bitten space-hounds in a pulka dive on Ganymede. Others set him forth to the life walking the streets of New York, in conference with the chief of the line, and so on.

The films took four hours to run. When they were through, Jojo said with a note of respect: "You've certainly not missed up on much, Mr. Barlow. How did you manage to get 'em?"

Al chuckled. "That's Jem's job. He's not good for much in a scrap, but he sure can manipulate the stereo-scanners. He's been following that guy around like a shadow for the last two months. So you think there's enough there to reconstruct him from head to foot?"

The gnomelike man said briskly: "Leave it to me. I'll get you a robot that Captain Zachary Dow's own wife won't know the difference."

Al leaned forward. His voice was soft and he grinned merrily, but Jojo shrank from him suddenly as though he were a coiled rattlesnake. "So you know who he is, eh, Jojo?"

The gnomelike man spoke hastily. "Who, me? Don't know him from Adam. I forgot I even said a thing just now."

Al's hand released its steel grip. "That's better," he approved. "You're a sensible guy, Jojo; and you want to stay healthy. Now about this robot; I gotta have him by Friday noon. That's five days."

"It's a short notice," Jojo said, still shaking, "but seeing it's for you, Mr. Barlow, I'll manage it."

Al nodded. "I'm sure of it. I'm

used to gettin' things done on time. Jem and me'll be back Friday noon."

SATURDAY morning was clear and warm. Captain Zachary Dow drank a third cup of coffee that the robot servant had handed him, wiped his lips and got up from the table. He stood a moment buttoning his dark-blue tunic, then picked up his cap, set it on his grizzly head and bent down to kiss his wife. She was crying.

"Now, now, Maria!" he soothed awkwardly. "Don't take on so. I'll be back in a couple of months; then we'll have a real long vacation together."

She clung to him, the tears streaking her comfortable features. "You said that before you went on the last trip. It's gotten so I don't know if I got a husband or not. A week at home, two-three months out in space."

Captain Dow smoothed her hair with tenderness. "It's tough, I know. The Line promised me a three months' lay-off after the last run. But this is a special run. Chief Matson said he wouldn't trust anyone with it but me. You ought to feel proud. It's supposed to be strictly confidential, but there's a government shipment on board, under seal. Half a billion in the latest osmo-iridium currency. It's supposed to represent the balance of trade for the past year with the Jovian colonies."

"That makes it worse," she exclaimed tearfully. "Now I'll have to worry about hijackers. I've heard that that dreadful Al Barlow has been operating among the asteroids lately."

Captain Dow grinned. "Don't you worry about Barlow, honey. The patrol's hunting him pretty hard. They'll get him sooner or later. And even if they don't, the *Flying Planet's* the latest and fastest boat in space, guaranteed to show a clean pair of heels to any private. Besides, she carries six torpedo tubes." His granite jaw snapped shut with a click. "I'd like to see Barlow get within our sights."

He looked hastily at his timepiece. "Say, I'd better hurry! Got a few things to take care of, and the *Flying Planet's* due to blast off at noon sharp. 'By!"

He kissed her again, snatched up a brief case, and literally ran out of the house.

"Damn this life!" he growled to himself as he fled toward his private hangar across the lawn. "I'm going to talk turkey to Matson after this trip. Either I get a month's lay-off between runs or I quit."

The photoelectric scanner picked up his shadow, swung the door smoothly open. Inside he saw the trim lines of his two-seater air scooter. He could be at the rocket-port in twenty minutes; then—

Menacing figures straightened up on either side of the door. Short, flexible blackjacks swung skillfully. Captain Dow went down without a sound.

"Think we've killed 'im?" asked the thin, dark man anxiously.

"Naw!" grunted the short, chunky assailant. "I've conked people before. He's got a hard nut. Here, give me a hand with 'im. We ain't got much time tuh lose."

THE *Flying Planet* quivered in its launching rack like a giant ovoid bird eager to be off. Its beryl sheath dazzled in the warm sunshine. The great airfield hummed with movement and last-minute scurryings.

Cliff Dunstan, very trim and athletic in his dark-blue uniform, with a solar sunburst on his tunic—sign

manual that he ranked second in command—stared for the tenth time at his timepiece.

"I haven't the faintest idea where Captain Dow is, Mr. Matson," he explained patiently for the fifth time to the fidgety, stoutish man at his side. "I just contacted his home, and Mrs. Dow said he left two hours ago. Don't worry, though; he'll be here on time. He's as reliable as the Solar System."

"But, damn it!" spluttered Matson. "It's fifteen minutes to starting time. He has no right to shave it this close. Especially with the kind of cargo we're carrying."

Cliff bit his lip, looked around to see if anyone had been listening. Matson was like an old woman sometimes. While he didn't anticipate any trouble, there was no sense in shouting the news. Half a billion in currency might give ideas to an eavesdropper.

But no one had heard. The usual last-minute stream of passengers was darting out of aërocabs and panting up the gangway. The purser checked them against his list as they filed into the bowels of the ship.

Then his keen eye caught sight of a cab dropping to the ground close to the ship. Three men got out. The short, chunky one paid the driver; and all three turned toward the *Flying Planet*.

"There he is now," exclaimed Cliff, taut muscles relaxing in his throat. He didn't mind now admitting to himself he had been worried. It was unheard of for Dow to be so late.

Captain Dow strode along stiffly, swinging the battered brief case he always carried wherever he went. It was as much a part of him as his uniform. Flanking him on either side were the two men. They were strangers to Cliff. One was dark and thin, and scowled as though it were a habit. The other was short, dumpy, and smiled broadly all over his moonface.

"Thank God!" Matson exclaimed, and darted forward to meet his captain. "We never thought you'd get here, Dow. Don't you know the ship's taking off in ten minutes?"

Dow stared at the chief of the Jovian Line from under bushy brows. He did not change expression. "Had some last-minute things to take care of," he countered briefly. "If you'll excuse me, I'll be getting on board."

"Sure, sure!" Matson agreed hastily, and stepped aside. He wiped his shiny pate anxiously. He had been in a dreadful stew, but now everything was all right. Good man, Dow! Had never let them down before. Matson left, more comfortable in the thought that it would be Dow piloting that fabulous sum through space rather than one of the other captains. If anything should go wrong, the Jovian Transport Line would be sunk.

Cliff met Dow with a grin. "You had us on the anxious seat for a while," he greeted. "Everything's shipshape, though, and ready to take off the moment you give the word."

The captain smiled back. They were good friends, even though there was a difference in rank. "I knew I could depend on you for that, Cliff. Hop on board. We blast off in five minutes."

He nodded curtly to the purser at the head of the gangplank. Galligan saluted, stepped aside to let the two officers pass; then stopped the two men following.

"Names, please!"

"Why—uh—" coughed the short, chunky man.

Captain Dow half turned. "Oh, that's all right, Galligan. They're friends of mine who decided to take

the trip to Callisto at the last moment. Their names are—uh—Barlow and Scudder."

The purser said: "Very good, sir."

Cliff was surprised. Dow was a stickler for formalities, and this was decidedly informal. Unless, of course, the two men were secret agents sent on board to guard the treasure. Then he grinned.

"Barlow, eh? Not by any chance Al Barlow, sky raider extraordinary?"

The chunky man missed a step, then resumed his steady march into the open port. The thin, dark man half whirled, and his hand moved toward his pocket.

Captain Dow said, without any expression, "No; this is Mr. Frank Barlow, a good friend of mine. Come on, Mr. Scudder."

Cliff stared after their retreating backs. Though Dow didn't show it publicly, he had a good sense of humor. He should have come back with some biting wisecrack. He didn't.

Another thing. He was exceedingly meticulous about his uniform; especially at the start of a run. Yet the dark-blue tunic and trousers were rumpled and a bit dirty.

Cliff turned to the purser. "Have the gangplank pulled in, Mr. Galligan. We're blasting off in two minutes."

Then he hurried to the control room. It was one minute before noon. Invariably he stood side by side with Captain Dow at the intricate bank of controls at the zero moment.

The door was closed and locked. He pressed the buzzer. There was a confused murmur, but the door did not open.

Then the great ship lifted smoothly, swiftly, the anti-acceleration plates working beautifully. Not a passenger would be jarred, not an inch of cargo shifted; though the ovoid liner had rocketed from the rack at an initial velocity of three miles per second.

Cliff went down the luminous corridor toward the crew quarters, frowning. He could have sworn he had heard voices inside the control room with Dow. And they weren't the voices of any of the ship's officers. He didn't like the way the voyage was commencing.

It took Captain Zachary Dow almost an hour to struggle free from the tough lashings of cello cord with which he had been bound. He was bruised, a bit bloody, with a sizable bump on his head, and mad clear through. What made him still more furious was the fact that he had lain trussed like a pig, clad only in his shorts.

He didn't remember very much. Only a fleeting glimpse of two men coming at him suddenly in his aërogarage, an uplifted arm, and everything going black. When he weltered back to awareness he was alone, securely bound, and without tunic or pants.

The last strand finally gave. He staggered to his feet, growling like a wounded bull. He did not recognize the place where he was. An obviously deserted, ramshackle shack somewhere in the woods.

Luckily the timepiece fastened to his wrist was still intact. He glanced down at it, and his heart almost stopped functioning. It was ten after twelve. The *Flying Planet* would be late starting for the first time in Dow's career as a spaceman.

Just why he had been knocked out, kidnaped and his clothes stolen he did not know; nor care at the moment. He had to get to the airport, and in a hurry.

He set burly shoulder to the sagging door, crashed into woods. The sunlight pricked out a road through the thin line of birches. He raced for it. Out on the highway, heedless of the figure he cut, he waved his arms violently. An aërocab was skimming by, close to the ground, its yellow pennant streaming to show it was empty. It twisted violently and dropped beside him.

Dow yanked the door open, darted in. "To the airport," he rasped, "and in a hurry!"

The cabby's eyes popped. In his game he ran across plenty of unusual sights, but a bloody madman in a pair of shorts was a bit thick.

Dow yelled at him. "Hurry, you blithering idiot. I'm Captain Dow of the Jovian Line. My ship's past blasting time. I've been shanghaied; my clothes snatched by a brace of blankety-blank horse thieves."

At twelve forty flat they dropped to the smooth floor of the port. Dow's head was already out, his eyes glaring in disbelief.

The launching rack stuck its struts toward the sky like skeleton fingers. The *Flying Planet* was gone!

An attendant hurried by. Dow yelled at him. "Where's the *Flying Planet?*"

The man, intent on his own affairs, did not turn toward the source of the bellow. "She went forty minutes ago, on schedule. Tough luck if you missed it."

The cabby looked suspiciously at his passenger. He had never heard of a liner going off without its captain. "Now look, mister, you'd better pay the fare. I ain't got all day to—"

Dow disregarded him. He saw Matson outside the patrol booth, talking to a ground cop in gray.

"Hey, Mr. Matson!" he roared. "Come over here. This is Dow!"

The stoutish chief whirled as if he had been stung. His eyes bulged in his forehead; he made inarticulate, choking sounds as he came on the run. Finally he found his voice.

"Wh-what's the meaning of this, captain?" he gasped. "Y-you're on your ship, millions of miles out already. What in the name of Saturn's rings are you doing here; dressed like a lunatic?" He pressed a feverish hand to his head. "Or am I going whacky?"

Dow said coldly: "I'm myself in person, and no stereo; and I'm not on any hornswoggled ship in any blankety-blank space. What do you mean, Mr. Matson, by clearing the *Flying Planet* without its captain? Haven't you read Article 4, Section 3 of the Spaceways Code recently?"

Matson disregarded the insubordination of the remarks. He was fighting for his own sanity. "But I tell you, Dow," he literally pleaded with the apparition, "I saw you plain as daylight going on board. Why, dammit, man, Cliff Dunstan, the second, greeted you and went in with you. You came along with two strangers —friends of yours, you said."

Dow began to shake a bit. He made a ludicrous appearance, standing there in his underwear, but he wasn't interested in that. There was something with an awful smell about it going on. If Cliff Dunstan had seen him, too, then maybe that conk on the head had done things. Maybe he *wasn't* Captain Dow. Maybe—

He gripped the stout, perspiring chief in a grip of steel. "Good Heaven, Matson!" he cried hoarsely. "That half billion on board! I'll swear whatever this screwy business means, it involves that. Get the visors humming to Sparks on the *Flying Planet;* rustle up every patrol

boat between here and Jupiter."

The frantic calls to the speeding liner drew blanks. They didn't answer. "Their screens and sending apparatus must be out of commission, sir," reported the ground operator.

Matson looked ready to faint. "And she's faster than any patrol ship," he wailed. "If there's anything wrong, they'll never be able to catch her."

On board the *Flying Planet* no one knew that there was anything amiss. The great spaceliner moved serenely along her appointed arc, accelerating steadily as it cleared Earth. The passengers had already adjusted themselves to the methods and routine of space traveling—aided by skilled and deft stewards—and flocked to the bar, where the milder liquors were served, or danced in the lounge to the strains of an orchestra.

Cliff was too busy at first to frequent the lounge or even to enter the control room. It was his job to set up the co-ordinates for the flight, and to feed them into the integrators. The results were flashed automatically on the controls, and corresponding impulses set the proper jets to roaring.

Underneath, in the hold of the ship, under triple seals of diamond-hard stellite, rested the precious cargo.

When he finally emerged from his cubby, it was to meet a worried-looking Sparks just leaving the control room.

"What's on your mind?" demanded Cliff. "You look off your feed."

Sparks saluted. "It's about the visors, sir. I've just been telling Captain Dow about them. They're out of commission."

"Those things happen. Better get them fixed in a hurry."

"That's just it, sir. Every tube has been blown; every line in the series and the screens themselves have been shorted and fused. I haven't nearly enough spares to do anything about it."

Cliff stopped in his tracks. "That sounds bad. How could it have happened?"

Sparks shook his head. "It might have been one of those one-in-a-million chances. Captain Dow seems to think so. But it looks to me more like a case of deliberate sabotage."

"Nonsense!" Cliff snapped. "No one has access to the screens but yourself and Captain Dow."

"Exactly, sir."

Cliff didn't like Sparks' tone as he moved hastily for the control room. In fact, the more he thought of it, the less he liked the whole picture.

Dow greeted him calmly. The two strangers were with him. Cliff pulled himself up short. "I'd like to see you alone, captain," he said significantly.

Dow said: "It's quite all right to talk in front of these gentlemen. I might as well tell you—Mr. Barlow and Mr. Scudder are undercover agents of the government. They're posing as passengers; but their actual job is to protect the specie shipment."

"Yeah!" the moonfaced man smiled blandly. "The department got a report that the outlaw, Al Barlow"—his smile broadened—"my namesake, sort of—is gonna try an' hijack the boat somewheres outside of Jupiter."

"Yeah!" the thin, dark man agreed heavily. "It's upta us tuh see everything's jake, see?"

Cliff saw, and felt somewhat relieved. It explained the informality

of their presence. True, he took an almost instant dislike to these two Secret Service operatives, and he felt sure that Dow and himself, with the assistance of their regular crew, were fully competent to take care of the noted outlaw; nevertheless, he could understand how an uneasy officialdom would have shipped their own men along.

"Sparks just told me about the screens," he told Dow.

The captain waved it aside. "Annoying, but accidents happen. We're just as well off without fussy bureaucrats sending us contradictory orders every few minutes."

Cliff grinned. This was more like Dow. He hadn't been able to place a definite finger on anything, but the crusty, strong-jawed captain hadn't seemed quite himself.

"So you don't think it's sabotage?"

"Utter nonsense! Sparks must have overloaded the lines and fused the works."

It was possible, Cliff thought; though Sparks was as good a man as any on the ether waves.

Dow bent over the controls in a gesture of dismissal. His tunic collar sagged slightly away from his weather-beaten neck. Cliff, turning to go, ejaculated involuntarily. "Hello, cap! What happened to that big wart on the back of your neck?"

Ever since they had first shipped together ten years before, Cliff had known of that wart. Dow had had it from birth, and the high collar hid it. When his second would suggest that he have it removed, Dow would run his big, capable hand inside his collar and growl: "I'd feel naked without it, Cliff. Might just as well get rid of my old woman."

Dow came up quickly at his ejaculation. Barlow made a little noise that sounded oddly like an imprecation. Scudder went sallow and pinched. His thin fingers slid into his coat pocket.

Then Barlow's hand also went into his coat pocket.

Dow said: "Why . . . uh . . . I had it operated on back home."

"Good for you! But I thought you'd never do it."

"Uh—my wife got after me finally."

The two outlaws hastened to lock the control room after Cliff left. Jem was shaking as with ague. "Jeez!" he husked. "I thought I'd 'a' had tuh burn him down. Who'd of thought Dow had a wart on the back of his neck!"

For once Al's smile deserted him. "You keep those dumb fingers o' yours away from your rayer, Jem. Yuh gotta keep your wits about yuh in this here business." He took a tiny disk out of his pocket, examined it lovingly. He became complacent again. "Lucky I think of everything. That's why I'm so good. I tapped out a message quicklike to the robot, and he responded just like I wanted. Jojo sure knew how to rig 'im up."

The robot duplicate of Captain Dow paid no attention. He went calmly and efficiently about his controls, checking, steadying, making certain that the ship was on its proper course.

Cliff found nothing new to arouse his suspicions during the next week. Aside from the blown visor screens, the journey was smooth and uneventful. The *Flying Planet* lived up to its name. It careened through space at terrific speed, but anti-accelerators and gravity intensifiers kept everything normal within. The passengers complained at first at the lack of news from Earth, but since there was no help for it, they turned

to the bar and to the various amusement centers on board for relief from the monotony of the voyage. The usual number of drunks had to be tactfully but firmly squelched, and the usual number of romances began to blossom forth between impressionable specimens of either sex.

There *was* a difference. Dow was strangely reserved, and stuck to the control room the greater part of the time. The two undercover agents were with him practically all the time. Very little of the old easy-going camaraderie manifested itself between Dow and Cliff. The captain was invariably polite, but curt and businesslike. He never sought out Cliff, as of old, and discouraged meetings as much as possible.

Cliff felt hurt, and a trifle resentful. Then he shrugged shoulders and laughed at himself. After all, the captain was laboring under a terrific responsibility. A half billion in the hold was nothing to sneeze at. There were those who would have no hesitation in wiping out a whole space fleet in order to get control of it. As for his constant association with Barlow and Scudder, that, too, was understandable. It was part of their orders, no doubt.

Several times he went below to test the seals on the treasure personally, though it was not his job. Everything was shipshape and intact.

A week out they passed as close as they would get to Mars. About twenty-three million miles. Cliff happened to be in the control room at the time, making his daily report to Dow. The two operatives were lounging in chairs as they invariably did when Cliff was due. Barlow's hands were, as usual, in his pockets.

Cliff did not like them. The dislike had been growing on him all through the trip. These men were different from any government operative he had ever met. There was something tense and watchful about them, as well as something shifty.

He had finished his report, and Dow merely nodded. Dow was getting more and more monosyllabic with him. After this trip, thought Cliff, he'd be damned if he'd ship with Dow again. Ten years evidently were enough!

As he turned to go, his eye fell on the space scanner. It was open—accidentally, as it later appeared.

A long, slim gray ship was cutting across their bow. Its rockets were jetting behind it in long, arcing streamers of fire. To Cliff's experienced eye it was obvious that the ship was blasting every ounce of acceleration it possessed.

It was a patrol ship.

Light flashes played on its dun-gray surface. The flashes were definite and staccato in their beat. Like code signals. The signals began to make a pattern to his startled gaze.

Flying Planet. Flying Planet. Heave to for boarding party. Heave to. Space patrol ship Meteor calling.

"She's ordering us to stop," gasped Cliff. "She's heading us off."

Dow lifted his head, but otherwise made no move. The other two men, however, jerked to their feet as if they were puppets on a string.

"What the hell!" Barlow cursed. His ever-present smile was wiped out as if with a rag. His pale eyes bulged on the scanner.

"A patrol ship!" husked Scudder, going a dirty greenish-yellow. "We're sunk!"

"Shut up, you fool!" Barlow said sharply. He spun on the expressionless captain. "Hurry, Dow. You know what to do."

Dow quivered; then nodded. His fingers rippled over the controls. The scanner went blank. The ship swerved and dived. Tail and side

jets opened to maximum firing. In spite of anti-accelerators, Cliff felt leaden weight in his limbs. The tracery of red lights that denoted their course danced like mad. The fleet liner strained and groaned. The velocity needle spurted to three hundred and fifty miles per second, a speed faster than that ever attained by a spaceship before. If they hit the asteroid belt at that terrific speed—

Cliff forgot discipline, everything. He sprang forward, crying: "Are you crazy, captain? Don't you know what the penalty is for ignoring the signals of the space patrol?"

Barlow was short and dumpy, but he moved like chain lightning. His rayer was out, snouting toward Cliff. His body hurled between them.

"He's taking orders from me, Dunstan," he grated.

Cliff came up short. His eyes glowed; his voice was crisp and hard.

"Captain Dow is in command here under the code of the spaceways. No one can issue orders in his own control room but himself. Get out of my way, Barlow, or by all the constellations—"

Dow turned slowly. He said: "It's all right, Cliff. We know what we're doing. We saw the treasury chief before we left. That was what delayed us. He warned us to stop for no one."

"Not even a patrol ship?"

"Especially not a patrol ship. Word came through that the outlaw, Al Barlow, and his gang had surprised and captured one of the patrol. Which one was not known as yet. That way he could make contact with us without any suspicion on our part."

"Yeah, that's so!" Scudder agreed hastily.

Cliff looked from one to the other; then shrugged. "I'm sorry. If that's the case—"

He left the sentence unfinished as he spun on his heel and left the room.

Jem Scudder said: "Whew! That bird's getting too nosy."

Al Barlow pocketed his rayer, spat reflectively. "Yeah! He gave in too easylike. He suspects something. We'll have to get rid of him."

Captain Dow said nothing.

Al was quite right. Cliff Dunstan did suspect something. But what it was he wasn't quite sure. The two Secret Service men struck false notes in the sounding board of his brain. Worse still, Captain Dow was also striking unresponsive chords. He certainly wasn't himself. Cliff had been too intimate with him for ten years not to note the discords. And there was the matter of that wart. He had almost spoken, and then held back the words. His keen eyes hadn't seen the slightest scar. Surgery was skillful; but, after all, the wart was supposed to have been removed within the week.

It may sound surprising that Cliff didn't grasp the whole truth at once. That was because such robots as Jojo manufactured were strictly against the rules of the World Council. Legitimate robots were obviously that, and nothing more. Either metal men and women, or things of wax carrying a record plate in their foreheads with name and number. It was to avoid any such possibility as had now arisen that the Council had promulgated the rule and decreed severe penalties for its breaking. And even so, no one had ever done the remarkable, lifelike work of Jojo.

For the next few days Cliff came and went in the control room as usual. He said no more about the

episode of the patrol ship. He noted, however, that the scanner clicked shut every time he opened the door.

Their course had swerved back to normal. The *Meteor* had been left helplessly behind. Cliff watched the recording lights without seeming to do so; and the two alleged agents watched him. Dow was polite and spoke as little as possible.

But elsewhere Cliff stirred into activity. He spoke guardedly to men whom he knew to be loyal and close-mouthed. Men like Turgot, the chief engineer; Dorsey, the second steward; Galligan, the purser; all old-timers who had sailed the spaceways for years. He said nothing much—he really had nothing definite to go on—but he intimated that poor Captain Dow was not quite himself, that the two passengers who were always closeted with him were queer fish, and that perhaps—perhaps—

He always let his voice trail off meaningfully at that.

With Sparks, however, he was a bit more explicit. Together they checked the fused circuits. Cliff took a deep breath.

"You're right, Sparks, this was deliberate sabotage. There are queer goings on in this ship. I've a feeling something's going to happen before we hit Callisto."

Then he told Sparks about the vast treasure on board. Thereby he broke every rule in the code. If found out, he was through on the spaceways. But Sparks was a good man, and he had to count on someone.

The visor operator's eyes bulged. He whistled softly. "But, gee, Mr. Dunstan, what can we do?"

"Nothing; just sit tight and watch. Any false move and we'd both land in the clink with our licenses just scraps of paper."

The *Flying Planet* was close now to the asteroid belt. The regular plotted course that all ships en route to Jupiter took switched here from the smooth arc of flight to a path lifted some twenty-three degrees above the ecliptic. This was to avoid the swarming little bodies that might spell disaster and crack-up to a ship whose maneuverability was approximately one second of arc per hundred miles.

In the control room things were beginning to happen. Al pored over charts, pale-blue eyes blinking with the effort. His stubby finger traced red dots; his voice barked instructions.

"O. K., Captain Zachary Dow," he said with jeering sarcasm. "You're about reaching the finish. Soon you'll be just a lot o' melted wax and twisted coils. Can't say I'm sorry, neither. You hadn't oughta made that guy Dunstan suspicious."

"Not my fault," the robot said expressionlessly. "I do whatever my recording mechanisms direct."

"No back talk," growled Al. "Go on an' change the co-ordinates o' flight. We're swinging in tuh Hidalgo, our base." He chuckled. "Ain't no patroller ever found our hide-out, eh, Jemmy?" When he called Scudder Jemmy that was always a sign he was in a good humor. "Best little asteroid in the whole damn haystack. Swings in close tuh Mars so's we kin make our raids; then way the hell and gone out to Saturn, while the patrollers almost knock their silly heads together searchin' the reg'lar belt for us."

But the thin, dark man looked anxious. "How about this here Dunstan guy? He's due here in five to ten minutes. When he sees the change o' course—"

Al's eyes were pale, washed-out

pebbles. "We're taking that bozo right now. We're too close to take any more chances."

CLIFF walked in, alert as usual; but not expecting anything particularly startling. It was too soon, according to his calculations, for any new developments to arise.

So that he was taken wholly unprepared.

The door sealed tight behind him, as it always did. Barlow sprawled in his chair, as negligent and as gross as ever. Scudder, however, did not appear immediately in his line of vision. Dow stood as usual at the controls, and did not raise his head.

"I wish to report everything normal, Captain Dow," Cliff began in his most formal tone. "As for the integrations—"

He saw then the shifting red flames on the control screen. The bright little points were tracing a new arc, diving directly into the thick of the asteroid belt, into the area strewn with the wrecks of ships that had ventured too close and met disaster.

"Man alive!" he exclaimed. "You're way off your course. You'll crack us up sure as fate."

Dow said tonelessly. "I'm handling this, Cliff."

Cliff's gesture was sudden. A short, stubby, rayer swept into his hand, covered both Dow and the sprawling Barlow. "You're wrong, Captain Dow." His voice was edged with durasteel. "*I'm* handling this from now on. Sorry to have to do this, but the whole set-up is entirely too fishy. Either these two alleged Secret Service birds have some hold over you or you've been taken in like a child. They're no more operatives than I am. In fact, I wouldn't be surprised if Barlow *was* Barlow—*Al Barlow*, though, not Frank."

The seated outlaw sprawled lazily. He seemed to be enjoying himself. "A pretty good guesser, hey? So what're you goin' to do about it?"

"This!" Cliff snapped. "Put you and your precious friend in irons for the rest of—"

"Drop that rayer, wise guy," snarled Jem Scudder behind him, "or I'll blast you into dust." Jem plastered against the wall next the door, stepped out. He held a black rayer in his hand.

Cliff let his weapon fall slowly. He had been outmaneuvered.

"What do you think you're going to do?" he demanded.

Al got up. His smile had a baby innocence about it. "We sorta thought we'd land the whole caboodle on Hidalgo an' make you birds sweat a while helpin' improve our hide-out afore we bumped you off. But you're too smart fer your own good. Can't afford tuh have you around while we're dropping. It'll take about six hours yet. So we'll get rid of yuh now. Dow'll have an emergency lock opened an' we'll drop yuh out." He grinned. "Garbage, so to speak; li'ble tuh leave a bad smell if it hangs around."

"Should I blast 'im now?" queried Jem.

"You was always a fool," Al grunted. "That there rayer'd knock our controls tuh hell an' gone." He reached in his pocket, took out a flexible length of metal rod, hefted it lovingly. "A sap's better."

Cliff knew he had no chance. These men were cold killers. With a half billion at stake, he could expect no mercy.

"You're a bigger fool than your partner," he said quietly. Out of the corner of his eye he had seen a small, double-disked instrument fall

to the floor as Al had taken out the blackjack. It made no noise on the silent-teed covering, and it came to rest about five feet from himself. "In the first place, I expected something like this. Right now Sparks, the chief engineer and the purser are bringing up a crew gang. If I'm not out in five minutes, they'll come in after me."

"The old space racket," Al said contemptuously. "That sorta tripe was pulled back in the Middle Ages. Yuh don't expect us tuh fall fer that?"

"In the second place," Cliff went on, trying to inch his feet imperceptibly along the floor, "you've forgotten all about Captain Dow. No matter what hold you may have over him, he won't permit me to be killed."

He really banked on Dow for a diversion, long enough for him to get his hands on that tiny disk.

THE DIVERSION came; but the manner of it was so unexpected and surprising that for the moment Cliff just stood and gaped.

Al and Jem were laughing. More, they literally howled. The control room rocked with their merriment; and Captain Dow made no move.

"The poor dope's gonna appeal tuh Dow's finer instinc's," choked Al. "Can yuh tie that, Jemmy?"

The thin, dark man almost doubled up. "Jojo sure is good. He fooled him brown. Even your best friends can't tell the difference." He went off into a new fit, pawed blindly in his pocket for a handkerchief.

Cliff stared from one to the other as though they had gone crazy. "What's so funny?" he demanded. And meanwhile, stalling for time, he managed to get closer to the disk. One dive—

"Funny!" wheezed Al. "Yuh dummox, that there ain't Dow. Dow's back on Earth, where we conked 'im. That there's a robot we fixed up tuh take his place."

The unutterable humor of it gripped him again, and he threw back his head and exploded. Jem was wiping the tears out of his eyes.

Cliff dived then. He scooped up the disk, pressed frantically. He knew what it was—a remote-control unit for transmitting orders to robots not covered by their internal, self-acting mechanism. He punched out rapid commands in the universal code.

Al's head snapped forward; his eyes widened with sudden rage and alarm. He whipped up his blackjack, shouted a warning to Jem. Jem struggled wildly with his rayer.

Two streams of crackling, incandescent flame spurted across the control room. Al, metal rod uplifted, seemed to break in two. Jem screamed terribly and dropped in his tracks.

The robot Captain Dow held the still-sizzling rayer in his hand; he looked down at it without expression, then thrust it back into his belt.

"Well done, old-timer!" Cliff approved. His limbs felt a little shaky. "Dow himself couldn't have done better."

There were hammerings, shoutings outside the sealed door. Cliff pulled himself together, pressed the opening mechanism.

Sparks and Turgot came tumbling into the room, riot blasters thrusting forward. "We heard a racket, sir," Sparks cried. "What's happened? Are you all right?"

Cliff said calmly: "Everything's under control. Captain Dow's just

killed the two most notorious outlaws in the system—Al Barlow and his henchman, Jem Scudder."

Sparks gasped. "But . . . but," he stammered, "I thought you said he—"

"Captain Dow," Cliff interrupted smoothly, "was playing them along until they exposed themselves. It was a grand piece of work on his part."

He turned and saluted the robot. "Now that it is all over, captain, I suppose you will return the ship to its proper course."

"Naturally," the robot assented gravely, and moved quietly to the controls.

Cliff released his breath. Everything was going to be all right. Zachary Dow was his friend as well as commander. Dow's record of never having missed a voyage would not be marred by any act of his. Dow had *started* the trip, and Dow would *finish* it.

WHACKY DESIGN INEVITABLE!

The early designers of steam engines had a somewhat difficult problem facing them. Machine tools being (or not being) what they were, low boiler pressures were not only desirable, they were downright necessary. But it's an axiom of a modern steam engineer that the higher the pressure, the higher the temperature, the more efficient the engine. Sometimes that desire—and need—for low pressures resulted in some remarkable design.

Early transatlantic steamers, because of the frightful inefficiency of the engines, could just about stagger across the sea on the load of boiler coal they could carry. But no one knew what efficiency was! The one basic concept absolutely necessary to the invention of the idea of "efficiency" was the realization that there was a fixed and determinable absolute maximum. That involved the idea of the conservation of energy; that there was, in a ton of coal, a certain maximum available amount of energy. And the law of conservation of energy had not been invented when James Watt and his contemporaries started designing steam engines.

To men of that time, then, there would appear to be no particular reason why, if you just made the steam engine work well enough, you couldn't get an improved steamer that would cross the Atlantic burning only one hundred pounds of coal. Until someone figured out "how good was perfect," they just tried to do better—and had no particular idea of which way to head.

The result was that, since they had fairly efficient condensers, sometimes, when the steamer's engineer opened his throttle wide, the engine would consume steam faster than the boiler would produce it. The condenser would maintain a pretty good vacuum on that side, and, presently, the liner's boiler pressure would drop *below* atmospheric. In their anxiety to avoid boiler blowups, they discovered they'd arrived at a situation that so thoroughly prevented that calamity that the boilers were collapsing inward instead! The partial vacuum resulting from efficient condensers and impressively inefficient boiler design invited the atmosphere to step on the boiler—which it frequently did, crumpling it messily.

The result was that early steamers carried two relief valves on their boilers; one a safety valve to prevent the (justly!) feared explosion by popping off if the pressure got too high, and one opening inward to prevent the atmosphere from crushing the boiler if the engineer got too enthusiastic in his use of steam.

HINDSIGHT

By Jack Williamson

The fate of worlds may hang on tiny things, which, if altered—wouldn't alter anything!

Illustrated by Schneeman

SOMETHING was wrong with the cigar.

But Brek Veronar didn't throw it away. Earth-grown tobacco was precious, here on Ceres. He took another bite off the end, and pressed the lighter cone again. This time, imperfectly, the cigar drew—with an acrid, puzzling odor of scorching paper.

Brek Veronar—born William Webster, Earthman—was sitting in his big, well-furnished office, adjoining the arsenal laboratory. Beyond the perdurite windows, magnified in the crystalline clarity of the asteroid's synthetic atomsphere, loomed a row of the immense squat turret forts that guarded the Astrophon base—their mighty twenty-four-inch rifles, coupled to the Veronar autosight, covered with their theoretical range everything within Jupiter's orbit. A squadron of the fleet lay on the field beyond, seven tremendous dead-black cigar shapes. Far off, above the rugged red palisades of a second plateau, stood the many-colored domes and towers of Astrophon itself, the Astrareh's capital.

A tall, gaunt man, Brek Veronar wore the bright, close-fitting silks of the Astrarchy. Dyed to conceal the increasing streaks of gray, his hair was perfumed and curled. In abrupt contrast to the force of his gray, wide-set eyes, his face was white and smooth from cosmetic treatments. Only the cigar could have betrayed him as a native of Earth, and Brek Veronar never smoked except here in his own locked laboratory.

He didn't like to be called the Renegade.

Curiously, that whiff of burning paper swept his mind away from the intricate drawing of a new rocket-torpedo gyropilot pinned to a board on the desk before him, and back across twenty years of time. It returned him to the university campus, on the low yellow hills beside the ancient Martian city of Toran—to the fateful day when Bill Webster had renounced allegiance to his native Earth, for the Astrareh.

Tony Grimm and Elora Ronee had both objected. Tony was the freckled, irresponsible redhead who had come out from Earth with him six years before, on the other of the two annual engineering scholarships. Elora Ronee was the lovely dark-eyed Martian girl—daughter of the professor of geodesics, and a proud descendant of the first colonists—whom they both loved.

He walked with them, that dry, bright afternoon, out from the yellow adobe buildings, across the rolling, stony, ocher-colored desert. Tony's sunburned, blue-eyed face was grave for once, as he protested.

He looked up at the great cross-lined screen, and down at the little jeweled chronometer—and pulled a switch!

"You can't do it, Bill. No Earthman could."

"No use talking," said Bill Webster, shortly. "The Astrarch wants a military engineer. His agents offered me twenty thousand eagles a year, with raises and bonuses—ten times what any research scientist could hope to get, back on Earth."

The tanned, vivid face of Elora Ronee looked hurt. "Bill—what about your own research?" the slender girl cried. "Your new reaction tube! You promised you were going to break the Astrarch's monopoly on space transport. Have you forgotten?"

"The tube was just a dream," Bill Webster told her, "but probably it's the reason he offered the contract to me, and not Tony. Such jobs don't go begging."

Tony caught his arm. "You can't turn against your own world, Bill," he insisted. "You can't give up everything that means anything to an Earthman. Just remember what the Astrarch is—a superpirate."

Bill Webster's toe kicked up a puff of yellow dust. "I know history," he said. "I know that the Astrarchy had its beginnings from the space pirates who established their bases in the asteroids, and gradually turned to commerce instead of raiding."

His voice was injured and defiant. "But, so far as I'm concerned, the Astrarchy is just as respectable as such planet nations as Earth and Mars and the Jovian Federation. And it's a good deal more wealthy and powerful than any of them."

Tense-faced, the Martian girl shook her dark head. "Don't blind yourself, Bill," she begged urgently. "Can't you see that the Astrarch really is no different from any of the old pirates? His fleets still seize any independent vessel, or make the owners ransom it with his space-patrol tax."

She caught an indignant breath. "Everywhere—even here on Mars—the agents and residents and traders of the Astrarchy have brought graft and corruption and oppression. The Astrarch is using his wealth and his space power to undermine the government of every independent planet. He's planning to conquer the system!"

Her brown eyes flashed. "You won't aid him, Bill. You—couldn't!"

Bill Webster looked into the tanned, intent loveliness of her face—he wanted suddenly to kiss the smudge of yellow dust on her impudent little nose. He had loved Elora Ronee, had once hoped to take her back to Earth. Perhaps he still loved her. But now it was clear that she had always wanted Tony Grimm.

Half angrily, he kicked an iron-reddened pebble. "If things had been different, Elora, it might have been—" With an abrupt little shrug, he looked back at Tony. "Anyhow," he said flatly, "I'm leaving for Astrophon tonight."

THAT EVENING, after they had helped him pack, he made a bonfire of his old books and papers. They burned palely in the thin air of Mars, with a cloud of acrid smoke.

That sharp odor was the line that had drawn Brek Veronar back across the years, when his nostrils stung to the scorched-paper scent. The cigar came from a box that had just arrived from Cuba, Earth—made to his special order.

He could afford such luxuries. Sometimes, in fact, he almost regretted the high place he had earned in the Astrarch's favor. The space

officers, and even his own jealous subordinates in the arsenal laboratory, could never forget that he was an Earthman—the Renegade.

The cigar's odor puzzled him.

Deliberately, he crushed out the smoldering tip, peeled off the brown wrapper leaves. He found a tightly rolled paper cylinder. Slipping off the rubber bands, he opened it. A glimpse of the writing set his heart to thudding.

It was the hand of Elora Ronec!

Brek Veronar knew that fine graceful script. For once Bill Webster had treasured a little note that she had written him, when they were friends at school. He read it eagerly:

Dear Bill: Ths is the only way we can hope to get word to you, past the Astrarch's spies. Your old name, Bill, may seem strange to you. But we—Tony and I—want you to remember that you are an Earthman.

You can't know the oppression that Earth now is suffering, under the Astrarch's heel. But independence is almost gone. Weakened and corrupted, the government yields everywhere. Every Earthman's life is choked with taxes and unjust penalties and the unfair competition of the Astrarch traders.

But Earth, Bill, has not completely yielded. We are going to strike for liberty. Many years of our lives—Tony's and mine—have gone into the plan. And the toil and the sacrifices of millions of our fellow Earthmen. We have at least a chance to recover our lost freedom.

But we need you, Bill—desperately.

For your own world's sake, come back. Ask for a vacation trip to Mars. The Astrarch will not deny you that. On April 8th, a ship will be waiting for you in the desert outside Toran—where we walked the day you left.

Whatever your decision, Bill, we trust you to destroy this letter and keep its contents secret. But we believe that you will come back. For Earth's sake, and for your old friends, Tony and Elora.

Brek Veronar sat for a long time at his desk, staring at the charred, wrinkled sheet. His eyes blurred a little, and he saw the tanned vital face of the Martian girl, her brown eyes imploring. At last he sighed and reached slowly for the lighter cone. He held the letter until the flame had consumed it.

Next day four space officers came to the laboratory. They were insolent in the gaudy gold and crimson of the Astrarch, and the voice of the captain was suave with a triumphant hate:

"Earthman, you are under technichal arrest, by the Astrarch's order. You will accompany us at once to his quarters aboard the *Warrior Queen*."

Brek Veronar knew that he was deeply disliked, but very seldom had the feeling been so openly shown. Alarmed, he locked his office and went with the four.

Flagship of the Astrarch's space fleets, the *Warrior Queen* lay on her cradle, at the side of the great field beyond the low gray forts. A thousand feet and a quarter of a million tons of fighting metal, with sixty-four twenty-inch rifles mounted in eight bulging spherical turrets, she was the most powerful engine of destruction the system had ever seen.

Brek Veronar's concern was almost forgotten in a silent pride, as a swift electric car carried them across the field. It was his autosight—otherwise the Veronar achronic field detector geodesic achron-integration self-calculating range finder—that directed the fire of those mighty guns. It was the very fighting brain of the ship—of all the Astrarch's fleet.

No wonder these men were jealous.

"Come, Renegade!" The bleak-faced captain's tone was ominous.

"The Astrarch is waiting."

Bright-uniformed guards let them into the Astrarch's compact but luxurious suite, just aft the console room and forward of the autosight installation, deep in the ship's armored bowels. The Astrarch turned from a chart projector, and crisply ordered the two officers to wait outside.

"Well, Veronar?"

A short, heavy, compact man, the dictator of the Astrarchy was vibrant with a ruthless energy. His hair was waved and perfumed, his face a rouged and powdered mask, his silk-swathed figure loaded with jewels. But nothing could hide the power of his hawklike nose and his burning black eyes.

The Astrarch had never yielded to the constant pressure of jealousy against Brek Veronar. The feeling between them had grown almost to friendship. But now the Earthman sensed, from the cold inquiry of those first words, and the probing flash of the ruler's eyes, that his position was gravely dangerous.

Apprehension strained his voice. "I'm under arrest?"

The Astrarch smiled, gripped his hand. "My men are overzealous, Veronar." The voice was warm, yet Brek Veronar could not escape the sense of something sharply critical, deadly. "I merely wish to talk with you, and the impending movements of the fleet allowed little time."

Behind that smiling mask, the Astrarch studied him. "Veronar, you have served me loyally. I am leaving Astrophon for a cruise with the fleet, and I feel that you, also, have earned a holiday. Do you want a vacation from your duties here—let us say, to Mars?"

Beneath those thrusting eyes, Brek Veronar flinched. "Thank you, Gorro," he gulped—he was among the few privileged to call the Astrarch by name. "Later, perhaps. But the torpedo guide isn't finished. And I've several ideas for improving the autosight. I'd much prefer to stay in the laboratory."

For an instant, the short man's smile seemed genuine. "The Astrarchy is indebted to you for the autosight. The increased accuracy of fire has in effect quadrupled our fleets." His eyes were sharp again, doubtful. "Are further improvements possible?"

Brek Veronar caught his breath. His knees felt a little weak. He knew that he was talking for his life. He swallowed, and his words came at first unsteadily.

"Geodesic analysis and integration is a completely new science," he said desperately. "It would be foolish to limit the possibilities. With a sufficiently delicate pick-up, the achronic detector fields ought to be able to trace the world lines of any object almost indefinitely. Into the future—"

He paused for emphasis. "Or into the past!"

An eager interest flashed in the Astrarch's eyes. Brek felt confidence returning. His breathless voice grew smoother.

"Remember, the principle is totally new. The achronic field can be made a thousand times more sensitive than any telescope—I believe, a million times! And the achronic beam eliminates the time lag of all electromagnetic methods of observation. Timeless, paradoxically it facilitates the exploration of time."

"Exploration?" questioned the dictator. "Aren't you speaking rather wildly, Veronar?"

"Any range finder, in a sense, explores time," Brek assured him urgently. "It analyzes the past to predict the future—so that a shell fired from a moving ship and deflected by the gravitational fields of space may move thousands of miles to meet another moving ship, minutes in the future.

"Instruments depending on visual observation and electromagnetic transmission of data were not very successful. One hit in a thousand used to be good gunnery. But the autosight has solved the problem—now you reprimand gunners for failing to score two hits in a hundred."

Brek caught his breath. "Even the newest autosight is just a rough beginning. Good enough, for a range finder. But the detector fields can be made infinitely more sensitive, the geodesic integration infinitely more certain.

"It ought to be possible to unravel the past for years, instead of minutes. It ought to be possible to foretell the position of a ship for weeks ahead—to anticipate every maneuver, and even watch the captain eating his breakfast!"

The Earthman was breathless again, his eyes almost feverish. "From geodesic analysis," he whispered, "there is one more daring step—control. You are aware of the modern view that there is no absolute fact, but only probability. I can prove it! And probability can be manipulated, through pressure of the achronic field.

"It is possible, even, I tell you—"

Brek's rushing voice faltered. He saw that doubt had drowned the flash of interest in the Astrarch's eyes. The dictator made an impatient gesture for silence. In a flat, abrupt voice he stated: "Veronar, you are an Earthman."

"Once I was an Earthman."

The black, flashing eyes probed into him. "Veronar," the Astrarch said, "trouble is coming with Earth. My agents have uncovered a dangerous plot. The leader of it is an engineer named Grimm, who has a Martian wife. The fleet is moving to crush the rebellion." He paused. "Now, do you want the vacation?"

Before those ruthless eyes, Brek Veronar stood silent. Life, he was now certain, depended on his answer. He drew a long, unsteady breath. "No," he said.

Still the Astrarch's searching tension did not relax. "My officers," he said, "have protested against serving with you, against Earth. They are suspicious."

Brek Veronar swallowed. "Grimm and his wife," he whispered hoarsely, "once were friends of mine. I had hoped that it would not be necessary to betray them. But I have received a message from them.

He gulped again, caught his breath. "To prove to your men that I am no longer an Earthman—a ship that they have sent for me will be waiting, on April 8th, Earth calendar, in the desert south of the Martian city of Toran."

The white, lax mask of the Astrarch smiled. "I'm glad you told me, Veronar," he said. "You have been very useful—and I like you. Now I can tell you that my agents read the letter in the cigar. The rebel ship was overtaken and destroyed by the space patrol, just a few hours ago."

Brek Veronar swayed to a giddy weakness.

"Entertain no further apprehensions." The Astrarch touched his arm. "You will accompany the fleet, in charge of the autosight. We take off in five hours."

THE LONG black hull of the *Warrior Queen* lifted on flaring reaction tubes, leading the squadron. Other squadrons moved from the bases on Pallas, Vesta, Thule, and Eros. The Second Fleet came plunging Sunward from its bases on the Trojan planets. Four weeks later, at the rendezvous just within the orbit of Mars, twenty-nine great vessels had come together.

The armada of the Astrarchy moved down upon Earth.

Joining the dictator in his chartroom, Brek was puzzled. "Still I don't see the reason for such a show of strength," he said. "Why have you gathered three fourths of your space forces, to crush a handful of plotters?"

"We have to deal with more than a handful of plotters." Behind the pale mask of the Astrarch's face, Brek could sense a tension of worry. "Millions of Earthmen have labored for years to prepare for this rebellion. Earth has built a space fleet."

Brek was astonished. "A fleet?"

"The parts were manufactured secretly, mostly in underground mills," the Astrarch told him. "The ships were assembled by divers, under the surface of fresh-water lakes. Your old friend, Grimm, is clever and dangerous. We shall have to destroy his fleet, before we can bomb the planet into submission."

Steadily, Brek met the Astrarch's eyes. "How many ships?" he asked.

"Six."

"Then we outnumber them five to one." Brek managed a confident smile. "Without considering the further advantage of the autosight. It will be no battle at all."

"Perhaps not," said the Astrarch, "but Grimm is an able man. He has invented a new type reaction tube, in some regards superior to our own." His dark eyes were somber. "It is Earthman against Earthman," he said softly. "And one of you shall perish."

DAY after day, the armada dropped Earthward.

The autosight served also as the eyes of the fleet, as well as the fighting brain. In order to give longer base lines for the automatic triangulations, additional achronic-field pick-ups had been installed upon half a dozen ships. Tight achronic beams brought their data to the immense main instrument, on the *Warrior Queen*. The autosight steered every ship, by achronic beam control, and directed the fire of its guns.

The *Warrior Queen* led the fleet. The autosight held the other vessels in accurate line behind her, so that only one circular cross section might be visible to the telescopes of Earth.

The rebel planet was still twenty million miles ahead, and fifty hours at normal deceleration, when the autosight discovered the enemy fleet.

Brek Veronar sat at the curving control table.

Behind him, in the dim-lit vastness of the armored room, bulked the main instrument. Banked thousands of green-painted cases—the intricate cells of the mechanical brain—whirred with geodesic analyzers and integrators. The achronic field pick-ups—sense organs of the brain—were housed in insignificant black boxes. And the web of achronic transmission beams—instantaneous, ultrashort, nonelectromagnetic waves of the subelectronic order—the nerve fibers that joined the busy cells—was quite invisible.

Before Brek stood the twenty-foot cube of the stereoscreen, through which the brain communicated its

findings. The cube was black, now, with the crystal blackness of space. Earth, in it, made a long misty crescent of wavering crimson splendor. The Moon was a smaller scimitar, blue with the dazzle of its artificial atmosphere.

Brek touched intricate controls. The Moon slipped out of the cube. Earth grew—and turned. So far had the autosight conquered time and space. It showed the planet's Sunward side.

Earth filled the cube, incredibly real. The vast white disk of one low-pressure area lay upon the Pacific's glinting blue. Another, blotting out the winter brown of North America, reached to the bright gray cap of the arctic.

Softly, in the dim room, a gong clanged. Numerals of white fire flickered against the image in the cube. An arrow of red flame pointed. At its point was a tiny fleck of black.

The gong throbbed again, and another black mote came up out of the clouds. A third followed. Presently there were six. Watching, Brek Veronar felt a little stir of involuntary pride, a dim numbness of regret.

Those six vessels were the mighty children of Tony Grimm and Elora, the fighting strength of Earth. Brek felt an aching tenseness in his throat, and tears stung his eyes. It was too bad that they had to be destroyed.

Tony would be aboard one of those ships. Brek wondered how he would look, after twenty years. Did his freckles still show? Had he grown stout? Did concentration still plow little furrows between his blue eyes?

Elora—would she be with him? Brek knew she would. His mind saw the Martian girl, slim and vivid and intense as ever. He tried to thrust away the image. Time must have changed her. Probably she looked worn from the years of toil and danger; her dark eyes must have lost their sparkle.

Brek had to forget that those six little blots represented the lives of Tony and Elora, and the independence of the Earth. They were only six little lumps of matter, six targets for the autosight.

He watched them, rising, swinging around the huge, luminous curve of the planet. They were only six mathematical points, tracing world lines through the continuum, making a geodesic pattern for the analyzers to unravel and the integrators to project against the future—

The gong throbbed again.

Tense with abrupt apprehension, Brek caught up a telephone.

"Give me the Astrarch. . . . An urgent report. . . . No, the admiral won't do. . . . Gorro, the autosight has picked up the Earth fleet . . . Yes, only six ships, just taking off from the Sunward face. But there is one alarming thing."

Brek Veronar was hoarse, breathless. "Already, behind the planet, they have formed a cruising line. The axis extends exactly in our direction. That means that they know our precise position, before they have come into telescopic view. That suggests that Tony Grimm has invented an autosight of his own!"

STRAINED hours dragged by. The Astrarch's fleet decelerated, to circle and bombard the mother world, after the battle was done. The Earth ships came out at full normal acceleration.

"They must stop," the Astrarch said. "That is our advantage. If

they go by us at any great velocity, we'll have the planet bombed into submission before they can return. They must turn back—and then we'll pick them off."

Puzzlingly, however, the Earth fleet kept up acceleration, and a slow apprehension grew in the heart of Brek Veronar. There was but one explanation. The Earthmen were staking the life of their planet on one brief encounter.

As if certain of victory!

The hour of battle neared. Tight achronic beams relayed telephoned orders from the Astrarch's chartroom, and the fleet deployed into battle formation—into the shape of an immense shallow bowl, so that every possible gun could be trained upon the enemy.

The hour—and the instant!

Startling in the huge dim space that housed the autosight, crackling out above the whirring of the achron-integrator, the speaker that was the great brain's voice counted off the minutes.

"Minus four—"

The autosight was set, the pickups tuned, the director relays tested, a thousand details checked. Behind the control table, Brek Veronar tried to relax. His part was done.

A space battle was a conflict of machines. Human beings were too puny, too slow, even to comprehend the play of the titanic forces they had set loose. Brek tried to remember that he was the autosight's inventor; he fought an oppression of helpless dread.

"Minus three—"

Sodium bombs filled the void ahead with vast silver plumes and streamers—for the autosight removed the need of telescopic eyes, and enabled ships to fight from deep smoke screens.

"Minus two—"

The two fleets came together at a relative velocity of twelve hundred thousand miles an hour. Maximum useful range of twenty-inch guns, even with the autosight, was only twenty thousand miles in free space.

Which meant, Brek realized, that the battle could last just two minutes. In that brief time lay the destinies of Astrarchy and Earth—and Tomy Grimm's and Elora's and his own.

"Minus one—"

The sodium screens made little puffs and trails of silver in the great black cube. The six Earth ships were visible behind them, through the magic of the achronic field pickups, now spaced in a close ring, ready for action.

Brek Veronar looked down at the jeweled chronometer on his wrist—a gift from the Astrarch. Listening to the rising hum of the achron-integrators, he caught his breath, tensed instinctively.

"Zero!"

The *Warrior Queen* began quivering to her great guns, a salvo of four firing every half-second. Brek breathed again, watching the chronometer. That was all he had to do. And in two minutes—

The vessel shuddered, and the lights went out. Sirens wailed, and air valves clanged. The lights came on, went off again. And abruptly the cube of the stereo screen was dark. The achron-integrators clattered and stopped.

The guns ceased to thud.

"Power!" Brek gasped into a telephone. "Give me power! Emergency! The autosight has stopped and—"

But the telephone was dead.

THERE were no more hits. Smothered in darkness, the great room remained very silent. After an eternal time, feeble emergency lights came on. Brek looked again at his chronometer, and knew that the battle was ended.

But who the victor?

He tried to hope that the battle had been won before some last chance broadside crippled the flagship—until the Astrarch came stumbling into the room, looking dazed and pale.

"Crushed," he muttered. "You failed me, Veronar."

"What are the losses?" whispered Brek.

"Everything." The shaken ruler dropped wearily at the control table. "Your achronic beams are dead. Five ships remain able to report defeat by radio. Two of them hope to make repairs.

"The *Queen* is disabled. Reaction batteries shot away, and main power plant dead. Repair is hopeless. And our present orbit will carry us far too close to the Sun. None of our ships able to undertake rescue. We'll be baked alive."

His perfumed dark head sank hopelessly. "In those two minutes, the Astrarchy was destroyed." His hollow, smoldering eyes lifted resentfully to Brek. "Just two minutes!" He crushed a soft white fist against the table. "If time could be recaptured—"

"How were we beaten?" demanded Brek. "I can't understand!"

"Marksmanship," said the tired Astrarch. "Tony Grimm has something better than your autosight. He shot us to pieces before we could find the range." His face was a pale mask of bitterness. "If my agents had employed him, twenty years ago, instead of you—" He bit blood from his lip. "But the past cannot be changed."

Brek was staring at the huge, silent bulk of the autosight. "Perhaps"—he whispered—"it can be!"

Trembling, the Astrarch rose to clutch his arm. "You spoke of that before," gasped the agitated ruler. "Then I wouldn't listen. But now—try anything you can, Veronar. To save us from roasting alive, at perihelion. Do you really think—"

The Astrarch shook his pale head. "I'm the madman," he whispered. "To speak of changing even two minutes of the past!" His hollow eyes clung to Brek. "Though you have done amazing things, Veronar."

The Earthman continued to stare at his huge creation. "The autosight itself brought me one clue, before the battle," he breathed slowly. "The detector fields caught a beam of Tony Grimm's, and analyzed the frequencies. He's using achronic radiation a whole octave higher than anything I've tried. That must be the way to the sensitivity and penetration I have hoped for."

Hope flickered in the Astrarch's eyes. "You believe you can save us? How?"

"If the high-frequency beam can search out the determiner factors," Brek told him, "it might be possible to alter them, with a sufficiently powerful field. Remember that we deal with probabilities, not with absolutes. And that small factors can determine vast results.

"The pick-ups will have to be rebuilt. And we'll have to have power. Power to project the tracer fields. And a river of power—if we can trace out a decisive factor and attempt to change it. But the power plants are dead."

"Rebuild your pick-ups," the

Astrarch told him. "And you'll have power—if I have to march every man aboard into the conversion furnaces, for fuel."

Calm again, and confident, the short man surveyed the tall, gaunt Earthman with wondering eyes.

"You're a strange individual, Veronar," he said. "Fighting time and destiny to crush the planet of your birth! It isn't strange that men call you the Renegade."

Silent for a moment, Brek shook his haggard head. "I don't want to be baked alive," he said at last. "Give me power—and we'll fight that battle again."

THE WRECK dropped Sunward. A score of expert technicians toiled, under Brek's expert direction, to reconstruct the achronic pick-ups. And a hundred men labored, beneath the ruthless eye of the Astrarch himself, to repair the damaged atomic converters.

They had crossed the orbit of Venus, when the autosight came back to humming life. The Astrarch was standing beside Brek, at the curved control table. The shadow of doubt had returned to his reddened, sleepless eyes. "Now," he demanded, "what can you do about the battle?"

"Nothing, directly," Brek admitted. "First we must search the past. We must find the factor that caused Tony Grimm to invent a better autosight than mine. With the high-frequency field—and the full power of the ship's converters, if need be—we must reverse that factor. Then the battle should have a different outcome."

The achron-integrators whirred, as Brek manipulated the controls, and the huge black cube began to flicker with the passage of ghostly images. Symbols of colored fire flashed and vanished within it.

"Well?" anxiously rasped the Astrarch.

"It works!" Brek assured him. "The tracer fields are following all the world lines that intersected at the battle, back across the months and years. The analyzers will isolate the smallest—and hence most easily altered—essential factor."

The Astrarch gripped his shoulder. "There—in the cube—yourself!"

The ghostly shape of the Earthman flickered out, and came again. A hundred times, Brek Veronar glimpsed himself in the cube. Usually the scene was the great arsenal laboratory, at Astrophon. Always he was differently garbed, always younger.

Then the background shifted. Brek caught his breath as he recognized glimpses of barren, stony, ocher-colored hills, and low, yellow adobe buildings. He gasped to see a freckled, red-haired youth and a slim, tanned, dark-eyed girl.

"That's on Mars!" he whispered. "At Toran. He's Tony Grimm. And she's Elora Ronee—the Martian girl we loved."

The racing flicker abruptly stopped, upon one frozen tableau. A bench on the dusty campus, against a low adobe wall. Elora Ronee, with a pile of books propped on her knees to support pen and paper. Her dark eyes were staring away across the campus, and her sun-browned face looked tense and troubled.

In the huge dim room aboard the wrecked warship, a gong throbbed softly. A red arrow flamed in the cube, pointing down at the note on the girl's knee. Cryptic symbols flashed above it. And Brek realized

that the humming of the achron-integrators had stopped.

"What's this?" rasped the anxious Astrarch. "A schoolgirl writing a note—what has she to do with a space battle?"

Brek scanned the fiery symbols. "She was deciding the battle—that day twenty years ago!" His voice rang with elation. "You see, she had a date to go dancing in Toran with Tony Grimm that night. But her father was giving a special lecture on the new theories of achronic force. Tony broke the date, to attend the lecture."

As Brek watched the motionless image in the cube, his voice turned a little husky. "Elora was angry—that was before she knew Tony very well. I had asked her for a date. And, at the moment you see, she has just written a note, to say that she would go dancing with me."

Brek gulped. "But she is undecided, you see. Because she loves Tony. A very little would make her tear up the note to me, and write another to Tony, to say that she would go to the lecture with him."

The Astrarch stared cadaverously. "But how could that decide the battle?"

"In the past that we have lived," Brek told him, "Elora sent the note to me. I went dancing with her, and missed the lecture. Tony attended it—and got the germ idea that finally caused his autosight to be better than mine.

"But, if she had written to Tony instead, he would have offered, out of contrition, to cut the lecture—so the analyzers indicate. I should have attended the lecture in Tony's place, and my autosight would have been superior in the end."

The Astrarch's waxen head nodded slowly. "But—can you really change the past?"

Brek paused for a moment, solemnly. "We have all the power of the ship's converters," he said at last. "We have the high-frequency achronic field, as a lever through which to apply it. Surely, with the millions of kilowatts to spend, we can stimulate a few cells in a schoolgirl's brain. We shall see."

His long, pale fingers moved swiftly over the control keys. At last, deliberately, he touched a green button. The converters whispered again through the silent ship. The achron-integrators whirred again. Beyond, giant transformers began to whine.

And that still tableau came to sudden life.

Elora Ronee tore up the note that began, "Dear Bill—" Brek and the Astrarch leaned forward, as her trembling fingers swiftly wrote: "Dear Tony—I'm so sorry that I was angry. May I come with you to father's lecture? Tonight—"

The image faded.

"Minus four—"

The metallic rasp of the speaker brought Brek Veronar to himself with a start. Could he have been dozing—with contact just four minutes away? He shook himself. He had a queer, unpleasant feeling—as if he had forgotten a nightmare dream in which the battle was fought and lost.

He rubbed his eyes, scanned the control board. The autosight was set, the pick-ups were tuned, the director relays tested. His part was done. He tried to relax the puzzling tension in him.

"Minus three—"

Sodium bombs filled the void ahead with vast silver plumes and

streamers. Staring into the black cube of the screen, Brek found once more the six tiny black motes of Tony Grimm's ships. He couldn't help an uneasy shake of his head.

Was Tony mad? Why didn't he veer aside, delay the contact? Scattered in space, his ships could harry the Astrarchy's commerce, and interrupt bombardment of the Earth. But, in a head-on battle, they were doomed.

Brek listened to the quiet hum of the achron-integrators. Under these conditions, the new autosight gave an accuracy of fire of forty percent. Even if Tony's gunnery was perfect, the odds were still two to one against him.

"Minus two—"

Two minutes! Brek looked down at the jeweled chronometer on his wrist. For a moment he had an odd feeling that the design was unfamiliar. Strange, when he had worn it for twenty years.

The dial blurred a little. He remembered the day that Tony and Elora gave it to him—the day he left the university to come to Astrophon. It was too nice a gift. Neither of them had much money.

He wondered if Tony had ever guessed his love for Elora. Probably it was better that she had always declined his attentions. No shadow of jealousy had ever come over their friendship.

"Minus one—"

"This wouldn't do! Half angrily, Brek jerked his eyes back to the screen. Still, however, in the silvery sodium clouds, he saw the faces of Tony and Elora. Still he couldn't forget the oddly unfamiliar pressure of the chronometer on his wrist—it was like the soft touch of Elora's fingers, when she had fastened it there.

Suddenly the black flecks in the screen were not targets any more. Brek caught a long gasping breath. After all, he was an Earthman. After twenty years in the Astrarch's generous pay, this timepiece was still his most precious possession.

His gray eyes narrowed grimly. Without the autosight, the Astrarch's fleet would be utterly blind in the sodium clouds. Given any sort of achronic range finder, Tony Grimm could wipe it out.

Brek's gaunt body trembled. Death, he knew, would be the sure penalty. In the battle or afterward—it didn't matter. He knew that he would accept it without regret.

"Zero!"

The achron-integrators were whirring busily, and the *Warrior Queen* quivered to the first salvo of her guns. Then Brek's clenched fists came down on the carefully set keyboard. The autosight stopped humming. The guns ceased to fire.

Brek picked up the Astrarch's telephone. "I've stopped the autosight." His voice was quiet and low. "It is quite impossible to set it again in two minutes."

The telephone clicked and was dead.

The vessel shuddered and the lights went out. Sirens wailed. Air valves clanged. The lights came on, went off again. Presently, there were no more hits. Smothered in darkness, the great room remained very silent.

The tiny racing tick of the chronometer was the only sound.

After an eternal time, feeble emergency lights came on. The Astrarch came stumbling into the room, looking dazed and pale.

A group of spacemen followed him. Their stricken, angry faces made an odd contrast with their gay

uniforms. Before their vengeful hatred, Brek felt cold and ill. But the Astrarch stopped their ominous advance.

"The Earthman has doomed himself as well," the shaken ruler told them. "There's not much more that you can do. And certainly no haste about it."

He left them muttering at the door and came slowly to Brek.

"Crushed," he whispered. "You destroyed me, Veronar." A trembling hand wiped at the pale waxen mask of his face. "Everything is lost. The *Queen* disabled. None of our ships able to undertake rescue. We'll be baked alive."

His hollow eyes stared dully at Brek. "In those two minutes, you destroyed the Astrarchy." His voice seemed merely tired, strangely without bitterness. "Just two minutes," he murmured wearily. "If time could be recaptured—"

"Yes," Brek said, "I stopped the autosight." He lifted his gaunt shoulders defiantly, and met the menacing stares of the spacemen. "And they can do nothing about it?"

"Can you?" Hope flickered in the Astrarch's eyes.

"Once you told me, Veronar, that the past could be changed. Then I wouldn't listen. But now—try anything you can. You might be able to save yourself from the unpleasantness that my men are planning."

Looking at the muttering men, Brek shook his head. "I was mistaken," he said deliberately. "I failed to take account of the two-way nature of time. But the future, I see now, is as real as the past. Aside from the direction of entropy change and the flow of consciousness, future and past cannot be distinguished.

"The future determines the past, as much as the past does the future. It is possible to trace out the determiner factors, and even, with sufficient power, to cause a local deflection of the geodesics. But world lines are fixed in the future, as rigidly as in the past. However the factors are rearranged, the end result will always be the same."

The Astrarch's waxen face was ruthless. "Then, Veronar, you are doomed."

Slowly, Brek smiled. "Don't call me Veronar," he said softly. "I remembered, just in time, that I am William Webster, Earthman. You can kill me in any way you please. But the defeat of the Astrarchy and the new freedom of Earth are fixed in time—forever."

THE LONG WINTER

By Raymond Z. Gallun

And not Earth's six-month season: the forty-year winter of Uranus, where a man can die, hopelessly lost, 100 feet from camp—

Illustrated by F. Kramer

JAN VIBORG did not sneer. Not even a smile crossed his lips. His confidence allowed him to act with complete naturalness. He was that sure of himself—sure that his scheme, and the bleak, white blizzard of the planet Uranus, could not fail him now.

It wasn't wealth that he wanted, and it wasn't especially the death of his companions, either. For though they had to die, his hatred for them was mild. It was something else that he craved—something that a man like himself dreamed of from childhood. Either Jan Viborg's name would go down prominently in the eternal honor roll of science, or he would remain almost a nobody, among other nobodies, forever. And Jan Viborg could not endure the latter mediocrity.

The Uranus Expedition's air-tight shelter re-echoed with almost festive sounds. Lights burned in it, and there was plenty of electric heat. Its thick, curved, insulated walls, devoid of windows, shut out the inconceivable cold, and the howling of that eternal blizzard out there—a blizzard that racked along at two hundred miles an hour, driving white snow, not of congealed water, but of frozen methane gas.

Carson, the engineer, was strumming a mandolin with scrubby fingers. The other boys, Schmidt, Haelbeck, Klariday, and Harnett, were sitting around, smoking and bull-sessioning. Irvin Farmer, the hard-bitten, gaunt-faced leader of this first group of men to set foot on Uranus, sat on a canvas-covered pack of supplies, struggling to work up a complicated bundle of notes into something understandable. "Shut up, you dopes!" he said frequently, good-naturedly, and without much effect.

Jan Viborg was his usual, quiet self, in one corner. He was maybe forty. He looked husky, and his seamed checks were ruddy. But you could tell that he'd been tired out inside many times. Too much ambition, and too much failure. He sat on a box, ostensibly checking over his spacesuit, limp across his knees.

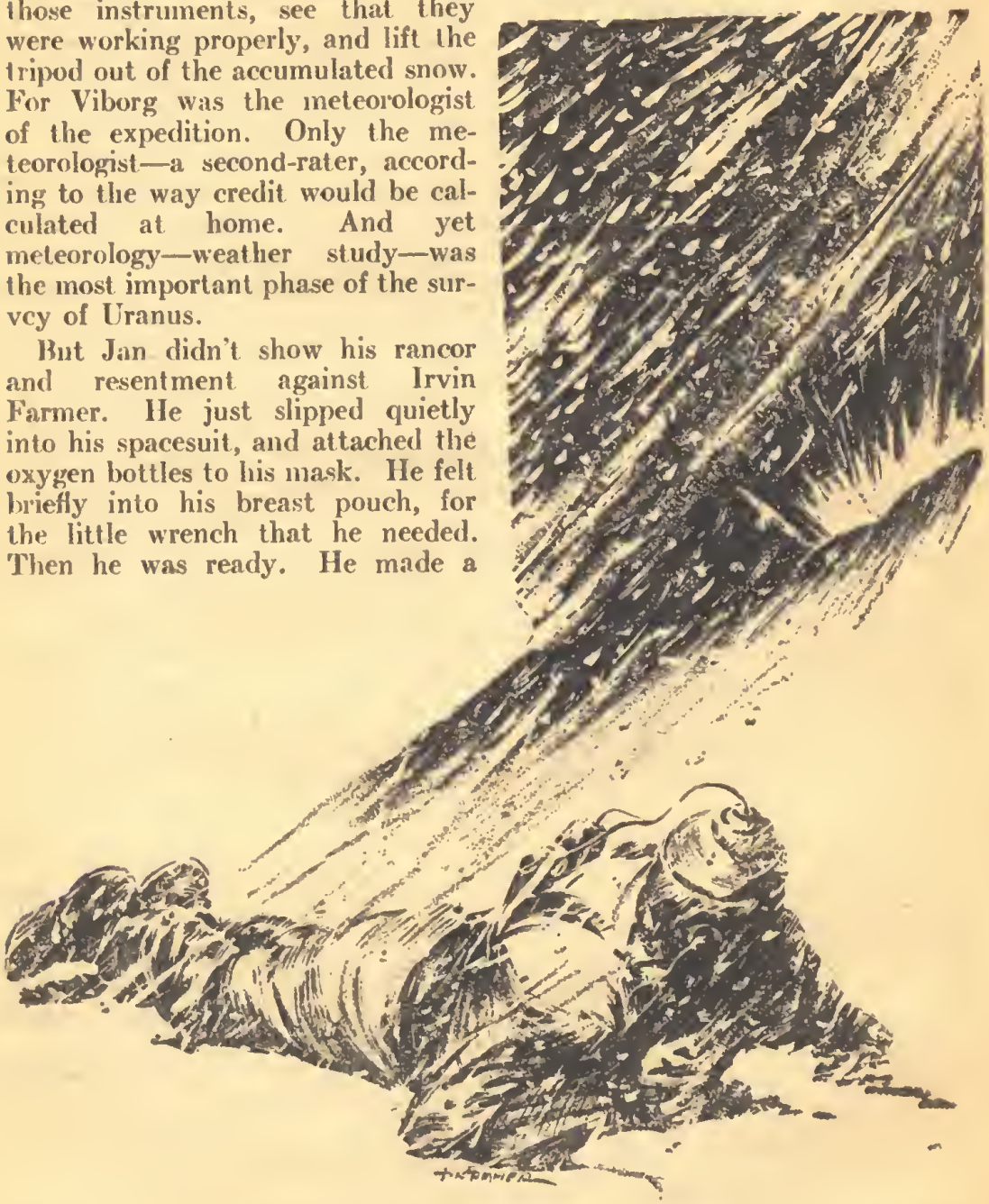
Farmer, the leader, glancing at his wrist watch, announced: "Eight o'clock, Jan!" They were running on Earth time, since in the monotonous darkness of the Uranian winter, any adjustment to the shorter rate of rotation of Uranus, would have been without meaning.

"O. K., chief," Viborg breathed quite naturally. But there was a faint tremor in his nerves. The zero hour, which only he knew about. The moment—his moment! Every six hours it was his job to go out there into that blizzard hell, and

creep a short yet horrible seventy-five feet of whistling, hammering, utterly frigid damnation, to the dynamometer, or wind-velocimeter, and other instruments, situated on a low metal tripod, clear of the shelter, and of the spaceship that huddled against it. He had to read those instruments, see that they were working properly, and lift the tripod out of the accumulated snow. For Viborg was the meteorologist of the expedition. Only the meteorologist—a second-rater, according to the way credit would be calculated at home. And yet meteorology—weather study—was the most important phase of the survey of Uranus.

But Jan didn't show his rancor and resentment against Irvin Farmer. He just slipped quietly into his spacesuit, and attached the oxygen bottles to his mask. He felt briefly into his breast pouch, for the little wrench that he needed. Then he was ready. He made a little salute to the crowd with a black-gloved hand, as he walked to the air lock, and opened its inner portal.

"Hurry back, Jan!" Haelbeck, the kid of the expedition, ribbed banteringly. "We'll start a game of poker!"



He crouched, waiting for the blast where he would be safe from flying metal—and men!

"Yeah, and don't catch cold out there!" Harnett, the small, mousy electrician, tossed in with benignant sarcasm.

It was just the usual light talk between men of action—all for a good, comradely purpose. But sealed and unseen in the duralumin cabinet of the air lock, Jan Viborg allowed himself the luxury of a wan, knowing, contemptuous grin, beneath his mask. They were fools, all of them. They didn't know that they would be dead in ten minutes! Then he, Jan Viborg, would take over everything. He didn't mind being alone. He didn't mind work. And he could fly the *Argonaut* back to Earth alone too—to one-man fame as lasting as the annals of achievement. The death of his companions would be easy to explain, considering everything.

JAN UNDOGGED the air lock's outer door. Settling to his knees, he turned the latch handle slowly. The awful wind screamed hideously, even through the heavy insulation of his helmet and mask, as he opened the door a crack, widened it, and squeezed through, amid a whistling streamer of white flakes. He pushed the air lock portal shut with his feet.

To stand in that terrific gale, was all but impossible. Viborg didn't try to. He scrambled along on all fours, around the curve of the building. He could see almost nothing. Except for the light on the beacon tower, which topped the turtlelike back of the shelter along with the windmill that provided power to turn the generators below, he would have been surrounded by absolute, chaotic blackness. As it was, he could see hardly more than a little light, which gave scant hint of form to anything. For that streaming, unearthly snow, in a wind of superchilled hydrogen, was like densest fog.

So Jan Viborg relied almost entirely on his sense of touch. He groped along the side of the building with his electrically heated gloves, counting the rivets and the plates. The ninth plate—he knew its position exactly, relative to what was beyond it, for his investigations had been complete. Feeling over the metal surface, he located a nut burr. With his back against the thrust of the gale—it was important that this was directly on the windward side of the shelter—he drew out his wrench and went to work. The tool, of course, fitted the nut perfectly. Viborg had seen to that beforehand.

The nut, made large enough to allow for contraction caused by the cold, turned easily. In a moment it was free in his glove. With the slim handle of his wrench, he poked the bolt itself inward, leaving a threaded hole an inch in diameter.

Jan chuckled hellishly. This was all he had to do—absolutely all—except to retreat, as from a charge of high explosive, whose fuse has been ignited. What he had done—unfastening that bolt—had not weakened the structure of the shelter materially, though it was part of the connecting framework of the large sections that had been swiftly assembled in the building of the Expedition's comfortable house—so much better than a cramped spaceship cabin. This was not the point. It was the hole, left by the removal of the bolt, that was significant. Snow was driving into it—that thick, white snow of congealed methane, utterly chilled, and hurtling along at two hundred miles an hour. Beyond the hole was the two-foot layer of insulation between

the double walls of the shelter—tight-packed glass wool. But that speeding snow would penetrate among the dense fibres easily. And embedded in the glass wool, just opposite the hole, was a rubber-covered cable, carrying a powerful electric current.

Jan Viborg was pleased with himself. It was an interesting situation that he had produced here—from the standpoint of physics. And he was diabolically sure that he knew just exactly what would happen—just how violent forces would break out from cold and electricity and congealed gas. In just a few minutes, all his unsuspecting comrades in the shelter would be dead.

But he had to get himself out of danger, now. With helmeted head down, he began to creep back the way he had come, around the curve of the shelter. The beginning of a faint, nervous panic made him hasty. His armored knees bumped over the great, vertically arranged tractor treads, which turned slowly, like clock hands, climbing the shelter itself, and the connected platform on which rested the spaceship, always to the surface of the snow, so that it would not be buried by that eternal winter blizzard of Uranus, so far from the warmth of the Sun.

Viborg got to the door of the air lock. Here he turned at right angles, and headed toward the tripod of the dynamometer and other instruments, seventy-five feet away. There was a little metal rail to guide his hand. He crept along as swiftly as he could, into the teeth of the wind. But he did not stop when he reached the tripod. He wasn't interested in the spinning cups of the wind-velocimeter now.

He looked back once, wiping the white incrustation from his goggles. There was just a blur of light from the beacon atop the shelter, but it was enough to assure him that he would not get lost. Because he didn't care to get hurt, by what was going to happen, he kept on for another seventy-five feet or so, away from the tripod. There he halted, and looked around at the light again, to reassure himself.

It must be almost time, now. He was beginning to feel cold. His eyes hurt with frostbite. The hell around him was far more deadly than space itself—for that screaming wind absorbed and tore away heat, as no spacial vacuum could ever do. His space armor wasn't good for protection of longer than half an hour—but that should be ample time.

Viborg waited, with his head down, and his arms wrapped around it. He knew just what was happening back there, as the blizzard screamed. Frozen methane penetrating that bolt hole and the glass wool behind it. There must be a lot of that dreadfully chilled stuff around the electric cable, now. And by the laws of physics, the metal of the cable was contracting at that point behind the hole. It was stretching taut between its supporting insulators. In a moment it would snap. But because there was electricity in it, under high voltage, a hot arc would be formed between the broken ends. A hot arc in the middle of a lot of solid methane! Intense cold versus intense heat! The methane would turn back into gas instantly. Sudden pressure would be built up, and there would be an explosion—

Or would something go wrong, after he had planned so carefully? Viborg experienced a moment of fearful doubt. It made him cringe,

mocking all reason. Uranus was a dreadful place after all. A dreadful place to die, and already the cold was nibbling at him.

Then he heard the explosion he had been waiting for. It was sharp and loud and re-echoing, almost brittle, even through the screaming chaos of oxygenless atmosphere.

Viborg did not look up for several seconds. It was better to keep low, to avoid possible flying fragments. But his masked face in the snow wore a grim smile. They were dying now. Irvin Farmer and all the others. A wide hole had surely been torn in their shelter wall, and the blizzard was sweeping instantly through the gap. There would be no chance to get into spacesuits. No chance to do anything! Fingers and lungs would freeze before nerves could direct more than a reflex movement.

Viborg's thoughts seethed with black triumph. The track was clear, now, for himself. His lust for glory would be satisfied. He would go back to the spaceship, which had been sealed up and unused for weeks. He could live there, while he was repairing the shelter. He could gather and compile the data on Uranus, alone. It would mean terrific effort, of course, lasting for many months, but it would be worth it, when he flew back at last, with the *Argonaut*. The name of Jan Viborg would be remembered on Earth as long as civilization endured. For he would be the lone man who had carried on for science, after his companions had perished—in an accident. Yes, an accident—for there would be no one who knew the real truth except himself. The conqueror of Uranus! Viborg's mind thrilled with glory. Irvin Farmer was dead, now, and could never overshadow him again.

Viborg lifted his masked face from the snow. Brushing his goggles he looked around, searching for the blur of the beacon light, that would guide him back to the shelter and the spaceship. But he saw nothing but inky, impenetrable blackness, alive with the din of the tempest. Mortal terror seized him, and he stumbled automatically to his feet, mumbling. Promptly the gale knocked him flat; but he scrambled to his knees again.

What had happened? Why had the beacon light gone out? There had been an explosion, yes; but it could never have been powerful enough to wreck the mechanism of the generators, or of the windmill that drove them. As for the electric cable that had snapped with contraction of cold to produce the blast—that could have nothing to do with the present circumstance, for the beacon light worked on a different circuit.

Jan Viborg could find no answer to the question. He was whimpering like a child, for in this hideous, impenetrable blackness, he could not tell one direction from another, and the cold was biting more forcefully through the joints of his armor, numbing his arms and legs and fingers, and making him feel sick and faint.

He fought for control. After all, the instrument tripod was only seventy-five feet away—a mere nothing, ordinarily—and the shelter was along the guide rail from there, the same insignificant distance beyond. Jan took out his small flashlight, and bending close to the snow, searched for marks he had made coming here. But he knew beforehand that those marks would already be obliterated by the driving,

drifting white. As for the flashlight, that was useless to reveal anything in the streaking tempest, beyond a few inches distance.

Viborg gave a terrified sob. Wildly he looked above, for stars to guide him. There were none—of course. Being composed largely of hydrogen, a light gas, the pressure of the Uranian atmosphere was no greater than that of Earth. But it was deep and blurred. Starlight could never have penetrated it. Certainly not now.

He tried to rely, then, on his sense of direction; but that was impossible, too, in the dense, all-pervading gloom; and his fall, when the wind had knocked him down, had confused him completely. But he had to make an attempt of some kind. He crawled in one direction for what he believed was the distance to the instrument tripod. But he found nothing but frozen methane. He crept back, then, trying to reach his original position, but he sank and clawed in the powdery white, and was thus further confused, so that he did not know whether he was moving in a straight line or not. He listened for some sound—any sound—that would give him a clue. But no human shout or cry, had there been such, could have penetrated the muffled scream of the gale, vibrating through his helmet.

He thought of circling—of spiraling round and round in an ever widening radius—according to the well-known scheme of relocating lost objects. He began to do so, creeping and clawing through the snow. Sometimes it gave way under him, half burying his body, and he had to struggle to the surface again, making the problem of following a planned spiral more and more difficult. The Stygian darkness was against him and all his efforts. Wind howled and seemed to laugh, ready to knock him down instantly, if he rose to his feet. His mind was getting vague with cold. But the panic in him kept him fighting. Minutes seemed ages. He did not know how much time passed, except to realize that even in an insulated spacesuit, a man could not retain consciousness for much more than half an hour, here.

But with his waning strength, came the grim certainty that he was doomed. Heat was slowly leaking from his body through the insulation of his armor. His arms and legs were stiff and numb. His lips drooled and panted. Saliva froze against the inner surface of his mask. He lost sight of the glory he craved, as terror bored into his

heart. Seventy-five feet was all the distance he'd been from the instrument tripod. Only a hundred and fifty feet from the shelter, itself. But here, mere shortness of distance was mockery. The blackness of a sealed tomb. And the fuddling chaos of a caldron—not hot, but fearsomely cold. And still Jan Viborg battled on, trying to spiral.

URANUS—almost two billion miles from the Sun. Besides it was—winter. Yes, as Viborg well knew, there were seasons on this great lifeless planet. There were fantastically exaggerated seasons, for the axis of Uranus was tilted far more toward the plane of its orbit than was the axis of Earth. And besides those seasons were long indeed, for the Uranian year was equal to eighty-four terrestrial years. Because of the great axial tilting, the Arctic and Antarctic regions covered most of the planet. Polar nights and days thus became decades long. And in the night, as now, the snows of frozen methane fell, until it was scores of miles deep. In the summer—the day—the temperature would shift upward a little from its three-quarters approach to absolute zero. The Sun would shine dimly through the clouds, and some of the snow would melt. But that time was still Earth years away, here—

Thinking, Jan Viborg began to chuckle madly. How had his plan of murder and glory miscarried? Why had the beacon light, atop the shelter, gone out—robbing him of guidance? He couldn't imagine. He was just about done. His movements were feeble, reflexive clutchings. And terror drove him to one last resort.

With his teeth, he closed a little switch, inside his mask. His radio communicator. "Help!" he groaned. "Chief! Schmidt! Haelbeck! Harnett! It's me—Jan! I'm lost—dying. Come and find me—"

Thus Viborg called to the men whom it had been his intention to murder—whom he believed dead, now. He just took the despairing chance that they still lived, and might be able to help him. But no response came through his phones. The powdery snow swallowed him again. Blackness seemed to grow blacker. The howl of the gale was nothing to him any more. Scientific glory was nothing. Failure—the oversight he'd made somewhere—was nothing. Life was nothing—

IT WAS maybe three minutes later. In the shelter house of the Uranus Expedition, Irvin Farmer and his five remaining men still lived. But only the quickest action on their part had enabled them to take advantage of the good fortune that had been theirs.

The explosion within the walls of the shelter had come with utter, unexpected suddenness. Thick aluminum had bellied toward them. From holes rent in it, cold gas had blasted, throwing them to the floor. But they did not know that Jan Viborg had caused all this. For a reason that Viborg had overlooked, the effect of the explosion had not been as great, here in the interior of the metal habitation, as he had anticipated.

The rents in the inner shell of the house had all been small. There was no great gap, through which the wind of Uranus could rush, in a sudden, killing gust of super cold. There had been a few seconds in which to think and to act.

Guessing the nature of the blast itself, and its connection with the electrical system of the refuge, Car-

son the engineer, had bounded to the control board, pulling a lever to disconnect the clutch of the generators just under the floor, and the drive-shaft which led down from the windmill on the roof above. And so, with the end of electrical power in all circiuts, the beacon had gone out—

But Carson had been thinking partly of fire, too. The electric arc in the wall had, of course, been instantly destroyed by the explosion it had produced—the broken cable ends being torn too wide apart for the electricity to cross. Still, if there was a spark now, Uranian hydrogen and inflammable methane would burn away all the Earthly oxygen in the room.

The men had grabbed flashlights. Choked and frostbitten by alien atmosphere mixing with the Earthly air around them, they had worked like mad, stuffing things into the rents—rags, clothing, canvas—anything to check for an instant, the entry of that deathly wind. Then they'd gone ahead, rigging metal rods to brace the bulging wall. With the aid of a viscous, adhesive cement, they'd fitted metal patches over the holes. All this had taken time, nerve, and stamina—stamina to ward off the unconsciousness caused by lungs and bodies burnt with cold. Klariday passed out, and had to be gotten into space armor at once.

When the little battery-powered radiophone, hooked to a rib of the shelter, whispered a wild plea for help, nobody noticed for shouts and noise drowned the faint words, and attention was grimly elsewhere.

But at last the emergency repair work was finished. The men stood back, panting. All had spacesuits on, now.

"What could have caused it—the blast, I mean?" Haelbeck, the

kid, stammered through the breath exhaust of his mask.

Farmer shrugged his gaunt, rangy shoulders. "Rivet must have pulled loose—contraction of the outer plates of the wall of our shelter," he said. "Cold can contract things plenty, you know. Methane snow got in through a little gap. There's a power cable there in the packing. Presently the cold of the snow made it break too. Result—a hot electric arc—right in that frozen gas. Then —*wham!*"

There was silence for a moment among the little knot of weary men.

"I can tell you what really saved us," Carson said finally. "An explosion like that should have ripped us wide open, except for one thing—something easy for a fellow to miss. Simple though. Know what it is, any of you guys?"

Masked men looked at Carson through the gloom, where only a couple of flashlights burned. But no one answered the engineer's question.

"O. K., I'll spill it," he said after several seconds. "The effect of cold and heat again. The outer shell of our house wall should be just as strong, ordinarily, as the inner shell. Same thickness, same metal. Only the inner shell is warm—while the outer shell is cold. When metal gets cold it gets brittle—it breaks easily. And the exploding methane snow in the packing between the two shells, naturally followed the line of least resistance. It released most of its energy smashing the brittle outer shell, exposed to the low temperature of Uranus. The inner shell, being warm, remained tough and pliable. It only bulged, and tore in spots. So we're still alive."

Carson's audience gulped, seeing what a little detail of physics it was, that had saved them.

"Good Heaven!" Haelbeck grated suddenly. "In the excitement we've forgotten all about—Jan! What has happened to him? He hasn't come back, and it's almost eight forty-five! The beacon—that's it—it's out! Jan got lost! And now—it's probably too late!"

Farmer gave swift orders in an unsteady voice. The generators were put in motion again. The entire company snapped on the phones in their helmets, and listened, and called frantically: "Jan! Jan Viborg!" Again and again the call was repeated—without response.

Not being able to see into his heart, they had all rather liked Viborg, the quiet meteorologist. Now they would never see him again, they were sure. They prepared, without hope, for a cautious sally. They were weak. They couldn't take many chances. And by now Viborg would be buried in methane snow, beyond discovery.

FINAL BLACKOUT

By L. Ron Hubbard

A grim and powerful novel of the end of the current war—an end that comes when in all Europe are so few men they can scarcely find each other!

Part II.

Synopsis:

Three hundred million civilians and thirty million fighting men are dead; their corpses rotting in the shattered cities and fortresses, their homes and factories and planes and tanks so much rusty rubble merging with the mud.

The Thirty-second European War is

done. It has consumed two generations and a civilization. All Europe has been a battleground and is now a shell-pocked graveyard.

Governments have changed time after time, but each collapsing only to be attacked anew. And so the war has gone on. Through many revolts, Russia has once again become an imperial czarist state and England is a communism. Germany, Italy, Spain, France—each has run the gamut of political philosophy. And then, at last, the inevitable, simultaneous collapse of several together has ended the war, not with a fanfare and a cheer, but quietly, as a candle burns down and, having nothing left to burn, sputters out, leaving darkness.

Fuel shortage had early restricted mechanical warfare, but substitutes, each time, had been found. But the continual bombing of factories and transport had at last exhausted all mechanical stores. A thousand planes had been amalgamated into fifty, then into ten, then none. Artillery had suffered the same fate. All big guns had been worn out or ruined in the face of capture. The problem of shells was the problem of manufacture and transport and, at last, could no longer be solved. A few scattered field pieces with limited ammunition reloaded on the field sporadically appeared, each time less and of smaller caliber.

With soldiers no longer cheap and ammunition dear, the whole system of tactics has changed to one of infantry strategy. There is left only the bayonet unit.

Plant insects have been spread over enemy land to the end of starvation. And wide starvation has taken as much toll as bullet and bombs. Stalking close on the bony heels of hunger came soldier's sickness, a malady which found the medical corps of all nations too disorganized to combat it. And soldier's sickness has wiped a final, clammy hand across the slate of Europe.

Scattered from Egypt to Archangel, the British survivors of the B. E. F. number less than ten thousand. Not one in two hundred have lived. Very few officers are left. So careless has the English government become of their field troops that no advances in commissioned ranks have been listed for years. At first the officers themselves had attempted reorganization, but repeated battle and sickness losses soon skeletonized these forces again.

England has long ago quarantined her troops in France in a wild attempt to stop soldier's sickness. Though this had not succeeded, the quarantine remains. America's strict quarantine has been in force so long that she is nearly forgotten by all Europe.

The only survivors of a once great army are the unkillables, soldiers with such high immunity from bombs, bullets and bugs that they are almost impossible to kill. They know only one art, that of war. Europe is ravaged by wandering soldiery of all nations.

In command of a brigade is the lieutenant. He was born, early in the war, in an air raid shelter, lost his father at Kiel, his uncle at Hamburg, and his mother died of starvation and grief in London. He was an officer at sixteen and now, at twenty-three, he has five years of service behind him on the front in addition to the years he spent manning the home defenses in England. Like all other highborn English lads, he knows all there is to know about war, nothing about civilization.

The lieutenant's nature is a strange one. Losses are repulsive to him and yet he does not hesitate to execute out of hand anyone he considers the slightest menace to his command. He is more than God to his brigade, for he feeds and clothes and guides them very soundly. And they have but one allegiance—having found all creeds false—and that is to the lieutenant. He takes all things mildly, smiling. He seems to have a streak of impudence in his soul which prompts him to execute all battles with more humor than death. A strategist extraordinary, it is strange that he will now allow himself to be walked into a trap at the British G. H. Q. in France where General Victor will naturally take away his command.

The brigade now numbers but one hundred and sixty-eight, plus five ranking noncoms and the lieutenant. Once it numbered six thousand and has had ninety-three thousand replacements. It is made up of other nationalities than British, soldiers who have wandered into the command as a result of the lieutenant's reputation.

Mawkey, whose eyes can see a pin at a mile, is a hunchback, the Lieutenant's orderly and batman. Weasel is an expert scout with a remarkable pair of ears. Bulger is a cook with the soul of a bandit, who seems to sense the presence of food at any range up to five miles in any cover. Pollard is the mustached sergeant major, the lieutenant's adjutant, a very serious fellow. The First Regiment is commanded by an old man, Chipper, the Second Regiment by a gleeful French cutthroat named

Tou-tou, the Third Regiment by Hanley, a shaggy and huge Scot.

The Fourth Brigade has been sought out by Captain Malcolm of the staff, who brings orders from G. H. Q.'s General Victor that the lieutenant is requested to return with his force. There is a feud between staff and field officers for the former are appointees of a shaky government of communists and the latter have fought the war. Malcolm wants this command for himself, knowing that Victor will be happy to remove the lieutenant and abandon him to an unkind Europe.

The lieutenant tricks the admission from Malcolm that England has now completely abandoned her B. E. F. in France. Malcolm having been made to tell that Victor seeks to set himself up as a duke in southern France, cannot understand why the lieutenant should return to G. H. Q.

Provisioning his troops by capturing the last of the White Russian Imperial army—which he releases courteously with all arms, keeping only the horses for food and some small field pieces—the lieutenant starts back to G. H. Q. En route they capture a subterranean peasant village by the expedient of closing their chimneys and thus smoking them out. The packs of the brigade begin to be heavy with supplies, food conjured up out of a vacant land by the lieutenant. Malcolm, knowing that the lieutenant suspects what awaits him at G. H. Q., is worried as to why the lieutenant returns at all.

IV.

THROUGH the morning, the brigade mounted ridge after ridge, keeping to no definite course but working toward a certain objective by arcs and angles. It was hot work and, to Malcolm, senseless, for they only succeeded in exposing themselves to several random shots by hopeful snipers in high rocks who vanished like their powder smoke upon approach—wanderers who coveted a knapsack or two, could they drop it into a ravine and beyond the immediate concern of the troops.

It had taken Malcolm only twenty-four hours of fast traveling to get from the G. H. Q. to the Fourth Brigade, and it was taking the lieutenant four days of circuitous march to make the return. Malcolm had followed the high ground with a relief map. It would be very different when *he* had this command, he thought.

Malcolm's crossness was not lost upon the lieutenant, but it did not wear upon him until they halted wearily at noon on a hill which commanded all approaches.

"What's the matter?" said the lieutenant.

Malcolm looked at him innocently. "Nothing."

"Come on, have it out."

"Well— I think you should have had that village leader shot. Dixon was our friend."

The lieutenant knew that this was a dodge, but he answered. "We had no evidence that those people killed Dixon. Jolly Bill was entirely too good an officer to be rolled down by peasants."

"I never knew you needed evidence to execute a man."

"To put you straight on the matter, I did execute him. Now, are you satisfied?"

"How's this? Why, I saw him with my own eyes bidding us good-by."

"And you saw Tou-tou issuing their rifles to the thirty-one Pollard dug out of the ground. Tell me, Malcolm, why should I thicken up the atmosphere of that hut any further and so annoy myself when the task was clearly finished at the release of the prisoners? Peasants do strange things. While we were there, there might have been an incident of some sort if the leader had been killed. It is done, anyway."

"You mean those soldiers—"

"Of course."

Malcolm was not mollified in the

least. He gazed very uneasily at the lieutenant, suddenly unsure in the presence of such cold thoroughness. In fact, he began to feel sorry for the leader, forgetting completely that he had trapped soldiers and enslaved them.

"Sometimes I don't understand you," said Malcolm. "Maybe it is because I have been less long at the front than you. Maybe I'm just a staff officer and always will be. But— Well, you're not consistent. You were courteous to the Russian commander and yet you treated that village leader like a cur."

The lieutenant had not thought about it. Mawkey came up and spread lunch out on a rock and the two officers ate silently for some time. The lieutenant finished and sat back, looking down across the autumn-colored valley without really seeing it.

At last, he spoke. "I suppose it was because I felt that way. Maybe there are so few of the officers' corps left that we have a feeling we ought to preserve ourselves. Maybe it's because all officers have been taught the necessity of exalting their rank and being as above that of the soldier. The Russian was a fellow craftsman. But the leader of that village commune— Bah! A stupid blunderer, raised up from filth by guile, a peasant without polish or courage— The thought revolts me." He was silent for a while, staring out at the painted slopes. And then: "There are so few of us left."

Malcolm, a little awed now by the quiet sadness he had drawn forth, could not venture to carry it forward. He had been dwelling, in the main, upon this circuitous marching and had not quite the courage to speak boldly in criticism of a commander in the field.

All that afternoon they stole wraithlike through the wilderness, beating up only rabbits and birds. But by night they had come into a one-time industrial area which scarred the earth for a mile around with the fragments of buildings and machinery.

Although this city had been splattered into atoms at the very beginning of the war, it had been rebuilt, in lessening degree, in each lull which followed in order to utilize the coal here found. But after each retreating army had damaged the mines time and again, at last they were wholly unworkable.

Water tanks leaned crazily—great blobs of rust against the sky. Buildings were heaps of rubble, overgrown with creeping vines and brown weeds. Within a few years the place would be swallowed except for the few battered walls which made ragged patterns against the hazy dusk. Fused glass crunched under foot and twisted chunks of metal attested the violence of thermite bombs and shells.

The brigade filtered through the tangle, alert and silent. Gian's men sweated the light guns over the unevenness, cursing both guns and the laborious works of man.

The lieutenant caught sight of the Weasel's runner signaling him ahead from the side of an overturned railroad car. He quickened his pace and followed the fellow up to the vanguard.

Weasel, his small self very still, pointed mutely to a crazily suspended railroad rail which jutted out from a wall like a gibbet. And it was a gibbet.

Four soldiers, their necks drawn out to twice their length, were rotting in their uniforms, swaying to and fro in the gentle wind. Below

them was a painted scrawl upon the stone:

SOLDIERS! MOVE ON!

"British," whispered Pollard, coming up.

The lieutenant looked around. Ahead he could see the mine entrances and piles of waste which bore lines like trails. He gave the place a careful scout and returned to his men.

"I hear people down there," said Weasel, ear to earth.

A bullet smashed into the truck of a car and went yowling away like a broken banjo string.

"I think," said the lieutenant, "that this is a very good place to spend the night. *Gian! Guns front into action!*"

All the following day and the day after, Malcolm was increasingly morose. He had encountered a problem which he could not solve and it was giving him nerves. He had known the lieutenant very casually at Sandhurst when they were sixteen and cadets. But he did not remember such a man as this, rather, a somewhat quiet, cheerful lad with only a hint of the devil in his eyes. But the blank had been filled by seven battlesome years, two for the lieutenant in England, five for Malcolm. And the five which the lieutenant had spent on the Continent seemed to have forged a steel blade which might stab anywhere.

It was all so irrational! Malcolm had counted on his order and the habit of obedience to the source to bring the lieutenant back. That and tales about what Victor wished to do for the lieutenant. But the lieutenant's mind was not one to run in grooves or to be duped, and here he was, walking back to a loss of command! And Malcolm was fairly certain now that the lieutenant *knew* what was waiting for him. Hadn't the lieutenant failed to take any cognizance of the general orders to reorganize on the outline of the B. C. P? Hadn't he been all too successful in his campaigning—too successful to be safe? Certainly such a man, asserting such independence, could not be left with a body of troops while the general staff was so weak.

And Malcolm was suffering from jealousy. He was used to a close understanding between an officer and his troops, yes, but these fellows actually seemed to wriggle when the lieutenant saw fit to look at them. It was rather disgusting. Well, that would be changed. They'd recognize their rights, these fellows, and know that the new order of things was best. A clever officer was better off under a committee than he was by himself, for he could always manipulate the membership of that committee with benefit to himself and could always blame all failure upon it. Soldiers were such stupid brutes.

Malcolm could understand that the lieutenant was not anxious to check in at G. H. Q., in the light of what he must know. But why, then, didn't he just quietly put a bullet in Malcolm and head south, forgetting that any organization such as G. H. Q. ever existed?

This devious traveling was an annoyance to a man who feels he is constantly being put off from control of his command. And Malcolm had thought about it so often and so long that he was now under the impression that he was truly commanding here and so every order from the lieutenant came as a definite affront.

Then, damn it, those people in

that first village had instinctively turned to the lieutenant! And the people there at the mines, even though they had been terribly knocked about in the short fight, had calmed into quiet obedience as soon as the lieutenant confronted them with his orders.

And last night, when they had raided that old fort, the noncom in charge had almost licked the lieutenant's boots!

Captain Malcolm saluted smartly. "The Fourth Brigade, sir, reporting in."

This brigade was all wrong. Their haversacks were stuffed. Forty impressed carriers were lugging the guns and the carts of provisions. It was glutting itself from the best in the countryside, poor as that best was, but it was also marching and fighting like people possessed. What was the sense of that when a short, direct march would lead them to G. H. Q? What use did the lieutenant have for all this loot?

That night, secure in a cave-pocked hill which had been taken by assault with the loss of only one man and that a carrier, Malcolm brooded long. He felt he had a very definite quarrel with the lieutenant and, the way Malcolm stood with Victor, a quarrel which would very soon be settled.

The G. H. Q. of the B. E. F. in France was the only thing of permanence which had survived the last mass bombardments. It had been constructed under the direct supervision of the general staff some fifteen years before and was, therefore, probably the only safe refuge in this, now borderless, country. Every artifice discovered for camouflaging and armor-plating a fortress had gone into its making, until neither shell nor gas could make the slightest impression upon it. Sickness and bacteria only took toll of men.

Spreading some fifty thousand square yards under the earth, it occupied the better part of a rocky hill. No chamber in it was less shallow than eighty feet and all chambers were designed to withstand, at a blow, the combined fire of a hundred howitzers. The appointing had overlooked nothing by way of safety and so the G. H. Q. had remained stationary, quite some distance from the wreck of Paris and still far enough from the sea to prohibit attack from that quarter. The thirty-nine generals who had, in turn, commanded here, had only lacked provision for the prevention of casualty through politics.

Every ventilator was a fortress in itself, guarded by an intricate maze of filters which took all impurity from the air. In addition to this, each chamber contained oxygen tanks sufficient for a hundred men for one month. Water was plentiful, for the place was served by half a dozen artesian wells, two of which operated on their own pressure. The lighting was alcohol driven with a helio-mirror system as auxiliary. The communications alone had been neglected, for provision had been made for telephones and radio only, whereas the lines of the former had long gone dangling for want of copper and the latter had been useless when storage batteries for field receivers had gradually become exhausted, never to be replaced. Radio communication was occasionally established even yet with England, but the occasion for this had now vanished.

Outwardly the place was just a hill, the countryside about rather torn up by constant shelling and gassing and the approach too open to be attempted. There were a dozen such rises in the neighborhood and many an enemy pilot had mistaken one for the other until the whole terrain was similarly marked. The rusty wrecks of charred tanks and crumpled planes gradually merged with the mud.

In short, the place was an ideal G. H. Q. The generals, in perfect safety, could send the army out to die.

When the lieutenant had last seen it, it had been summer. But the effect of gas upon undergrowth was enough to make little difference be-

tween summer and late autumn.

A drizzle of rain was turning the flats into bogs and obscuring the horizon and the brigade marched with helmet visors down and collars up, more because it was habit than because their thin clothing could keep out the wet. They had only had a morning of this but still they were all of a color, and that was of mud.

But there were no complaints to be heard, for the rains had held off much longer than usual this fall, and because an outfit whose bellies are full would not feel right unless something bad came along with the good.

At one time, out this far, there had been photoelectric sentries and land mines, but as these had worn out and had been exploded by occasional attacks, they had not been replaced. In fact, the brigade was almost upon the hill itself before they were decried.

"Soldiers," sniffed Weasel to Bulger in derision. "We could have walked in and stole their socks if we'd been trying."

"They get that way," said Bulger. "That was always the trouble with forts. Eight years ago I said it always happened. They feel so safe they don't even bother to watch. You give a soldier a full belly and some sandbags to dig into and he goes to sleep."

"Naw, he don't," said Weasel. "He sits around and thinks, and pretty soon he's got it figured out that he's a Communist or a Socialist or a Individualist, and the next thing you know he shoots the officers and changes the government. I says we'd still have a king in England if they hadn't had fortresses to bore the soldiers to death. It ain't fightin' that ruins governments. It's eatin'."

"There ain't nothin' wrong with eatin'," said Bulger, defensively.

"Not when there's fightin'. All eat and no fight makes Tommy a politician."

"They ain't doin' much eatin' around here," said Bulger, having come within surveyal distance of the first sentry.

Indeed, the man was very gaunt. His buckle was fastened around his spine and his cheeks showed the outline of his teeth. There was a dreary hopelessness about him, and when he was supposed to port his arms he lifted the rifle up an inch or two to show that he knew he should and let the lieutenant through without so much as whispering to turn out the guard.

The Fourth Brigade went down the incline into the earth, gun wheels rumbling up the echoes. They paused in the first chamber until an officer came out of the guardroom.

"Fourth Brigade?"

"Right," said the lieutenant.

"I am Major Sterling. Oh! Hello, Malcolm. By George, old chap, we wondered what on earth had happened to you."

"We took a personally conducted tour of Europe," said Malcolm, for the first time feeling at ease when in the lieutenant's presence, and therefore giving vent to what he really thought.

"Well, now. We waited. Couldn't see what had happened. But you're here, and that's what matters. Malcolm, if I were you, I'd quarter my men in the north section. We've got sixteen hundred here, all told, and you make almost eighteen hundred. Most everyone is quartered in the north section in those old thousand-man barracks. It's quite light and roomy now and it's better that everybody is together."

The lieutenant was not particularly surprised that the major should

call them Malcolm's troops; he was only annoyed by the actual fact. They were not Malcolm's yet.

"Sergeant major Pollard," said the lieutenant. "You will quarter the brigade in the north section. I shall be in to make an inspection as soon as I have paid my respects to General Victor."

"Yessir," said Pollard. "And the carriers, sir?"

"Retain them until further orders. I daresay they're happy enough."

"Yessir." He hesitated, and then saluted and turned away. He had not quite dared wish the lieutenant luck, no matter how much he wanted to do so.

The lieutenant looked at Sterling. He did not like the fellow. General Victor had brought rabble with him instead of a staff. Every bootlicker that had skulked throughout the war in the shelters of London had been ousted by the last reversal of government. Sending a man to France since the quarantine was placed was tantamount to exiling him for life. None of these fellows had seen real war. They had dodged bombs and fawned upon superiors. In the latter they had become very adept.

Long ago, the last competent officer had taken the field. And now, where were they? Adrift somewhere in Europe or deposed and languishing here without command.

Major Sterling was not quite able to bear the censure which was leveled upon him by the lieutenant's eyes, nor did he like the slight smile which lingered about the mouth. There were around eighty-seven field officers still unreported and it was apparent now that they would never report; why, then, should a man with a record as brilliant as the lieutenant's come back? Only twenty-one fragments of organizations had come in, and these because of starvation. But the Fourth Brigade, quite obviously, was not starving. However, it was a strange thing, this habit of duty.

"This orderly will show you your quarters," said Major Sterling. "You will please prepare a written report and send it, by him, to the adjutant colonel."

Dismissed, the lieutenant looked for a moment at Malcolm who, very obviously, was on his way right now to see General Victor. Malcolm, too, was unable to support the directness of those eyes. The lieutenant followed the orderly and Mawkey followed the lieutenant.

They went deeper into the labyrinth, along dank corridors which long had gone unswept and unlit. Here and there the concrete had faulted and drips of water were outlined by a pattern of moss. Row upon row of officers' apartments were musty with disuse, their doors, untouched for two years and more, sagging out from their weary hinges. The lieutenant remembered this place from its yesterdays. Five years before, when England had sent her last flood of men to the Continent and when the army here was still great and proud, these corridors had resounded with cheerful voices and hurrying boots; sergeant majors had bustled along to receive or to obey orders; subalterns' dog-robbers worried themselves frantic as they raced about with hot water and laundry; canteen runners had flashed along with their trays of drinks; and officers would have popped forth as the word raced along to give him greeting and beg for news.

It was all quiet now. Not even a rat scuttled in the dead gloom. These voices which should have called out a welcome were forever stilled, these

faces were decomposed in some common grave out in the endless leagues of mud. Only the ghosts were here, crying a little, naked and cold and forgotten—or was it just the wind?

The runner tiredly indicated a door and slumped down on the bench outside as though the effort had been too much. Mawkey entered and finally found the trap which opened the helio-mirror.

The apartment was littered with scraps of baggage, Gladstones and locker trunks and valises. It had been a long while since they had been ransacked for valuables and the mold was thick and clammy upon them. Useless knicks, dear only to their dead owners, were thrown carelessly about. A large picture of a girl lay in the center of the room. A careless foot had broken the glass and the dampness had seeped in to almost blot the face with dirt. A sheaf of letters lay about, crumpled and smudged; one on the table was decipherable only as far as "My dearest Tim. I know this will find you safe and—" A pair of boots, too well-tailored to be comfortable, stuck out from the lid of a locker. But the rats had eaten the leather nearly to the soles.

The lieutenant leaned against the table while Mawkey tried to straighten the place by heaving everything into a trunk. The lieutenant's eyes wandered up and fastened upon a stenciled box, the last piece of baggage upon the rack, where all of it had been placed so carefully so long ago.

Forsythe, A. J.,
Col. Cmmdg. 4th Brigade, 2nd Div.
10th Army Corps.
B. E. F.

For an instant there flashed across the lieutenant's memory the picture of a straight-backed, gray-mustached soldier, trying hard not to show the agony of his wound as he looked levelly at the lieutenant.

"They're gone, son. They're gone and I'm gone. It's up to you, now."

SUDDENLY the lieutenant was filled with a great restlessness. Angrily, he swept the litter from the table and began to pace back and forth from wall to wall. Mawkey was startled, for he had never seen his lieutenant give way to any emotion before which even slightly resembled nerves. Hastily the hunchback finished cramming the refuse into the trunk and got the baggage out of the way. He set the lieutenant's effects upon a bunk and got out the razor and some clean clothing and started away to see if he could find any hot water.

"I'm not changing," said the lieutenant.

Mawkey looked at the mud-caked cape and the crusted boots and then turned back to put away the clean clothes.

"Get me some paper."

Mawkey found some in the refuse and smoothed it out upon the table. He put a pencil down and pulled up a chair.

The lieutenant sat and wrote.

Report 4th Brigade May to Nov. 1
To General Commanding B. E. F.
From Lieutenant Commanding 4th Brigade.
Via Adjutant Colonel, official channels.

1. The 4th Brigade patrolled region north of Amiens.
2. The 4th Brigade met and defeated several commands of enemy troops.
3. The 4th Brigade provisioned itself on the country.
4. The 4th Brigade now numbers 168 men, 5 senior noncoms, 1 officer.
5. The 4th Brigade, on receiving orders, reported to G. H. Q.

Commanding Officer
4th Brigade.

Mawkey gave the report to the runner, who slouched off with it trailing limply from his fingers.

"Beg pardon, sir," said Mawkey.

"Well?"

"I don't like this, sir."

The lieutenant looked at him.

"That Captain Malcolm, sir. He is thought pretty well of here, I think. He is a staff officer."

"Well?"

"I am pretty sure that everybody is getting ready to leave this place. The men looked starved and there ain't anything in the country around here. I think that is why we were called back. Beggin' the lieutenant's pardon."

"And what of that?"

"I think Captain Malcolm is going to be given command of the brigade, sir. He acted like that and he ain't any field officer. He's weak and he's soft and all he knows how to do—"

"You are speaking of an officer, Mawkey."

"Beg pardon, sir. But I'm speakin' of one of them staff things that come over a couple years ago. And the B. C. P. was always so rotten that whatever they wanted to get rid of must've been pretty—"

"Mawkey!"

"Yessir."

Mawkey withdrew and began to fuss with the forgotten baggage, seeing if there was anything there that his lieutenant could use. Now and then he bent a glance at his officer. Plainly he was worried.

In two hours the runner dragged himself up to the door to announce that the lieutenant was ordered to report to the adjutant colonel and the officer followed him.

As they passed the batman by the door, Mawkey whispered: "Be careful, sir."

They went down, down, down into the earth until it seemed that the staff of G. H. Q. wanted to be as close as possible to the devil. The lieutenant noted the emptiness and filth of the fortress in general and was inclined to agree with Mawkey that the place would soon be abandoned.

They came at last to the office of the adjutant colonel, a place wholly encased in armor-plate so that voices repeated themselves hollowly and endlessly. This room did not bear the same stamp as the rest of the fortress. The five juniors who sat at desks in the outer chamber did not appear to be starved. Their uniforms were strictly regulation and, if a little old, were not much worn; they had had, after all, the whole fortress to pick from. There was something unhealthy about these fellows which the lieutenant could not immediately recognize. He was used to men tanned by wind and sun and darkened with dirt, men who had hard faces and wasted few words or actions. These faces were like women's, and not very reputable women at that. They seemed to be somewhat amused by the lieutenant's appearance and, as soon as he had passed, went back to their ceaseless chattering.

The adjutant colonel's name was Graves and certainly he resembled nothing more than an undertaker. He sat at his desk as though it was a coffin and he was melancholy about the dear, dead deceased. He was a dark, small, greasy man and his eyes were not honestly evil like Mawkey's; they were masked and hypocritical.

Graves showed scant attention to the lieutenant, but required him to stand for some minutes before the desk before he saw fit to glance up. Then he did not speak, but sent a

junior in to find if the lieutenant could be seen.

The junior came back and Graves stood up. Graves went down the hall and stepped into a larger office encased in even thicker armor-plate.

"Officer commanding the Fourth Brigade, Second Division, Tenth Army Corps," said Graves. He beckoned the lieutenant to follow him in. Another junior announced them in the inner chamber and then the lieutenant was beckoned into a large room.

A table occupied most of the space and about the table sat men much like those in the adjutant's outer office. They were all shaven and brushed and anointed and wore their insignia conspicuously. They wanted no mistake made about their rank, which was high, or their staff position, which they thought was high.

The lieutenant was sensible of their regard and knew they were staring somewhat dismayed at the mud which caked the battle cloak and the boots and the dirt which stained the unshaven face. It did not come to them immediately that the lieutenant's hands were covered by the cape and that the cape was bullet proof. It was very unseemly that he should come so armed, and censure was directed at the adjutant, all in silence.

General Victor, a very small and dehydrated man with too large a head and too small a mouth, sat at the head of the table. He glanced once at the lieutenant and then, finding that the eyes had a shocking power, hastily returned to a perusal of reports. He did not much like these field officers. They came in smelling of battle and full of comment upon their orders and generally made a man feel unsure of himself.

THE LIEUTENANT thought to himself that this looked more like a court-martial than a conference. He

caught sight of Malcolm, now beautifully groomed, standing against the wall, looking carefully disinterested.

A colonel named Smythe, on Victor's right, glanced to Victor for permission and then, receiving it, turned to the lieutenant. In Smythe's hand was the lieutenant's report.

"This is very little to submit," said Smythe.

"It is complete enough," said the lieutenant.

"But you give no detail of casualties or desertions or troops fought."

"I knew you wouldn't be interested," said the lieutenant.

New interest came into the eyes about the table, for the lieutenant's tone was not in the least tempered with courtesy.

"Come now," said Smythe, "give us an account. We must know what troops there are out there which might impede our movements."

"There are about a thousand Russians heading south to Italy. They are the last of the Imperial White Russian army. You might possibly contact there, but I doubt it."

"That's better," said Smythe, with a toothy smile which made him look very much like a rabbit. "Now, we have had reports about roving bands of soldiers, without officers, who have been laying waste the countryside. You met some of these?"

"Why should I?"

"Why should you? My dear fellow, it is the duty—"

"I was ordered to return here. I think the countryside will take care of those who still remain of the enemy—and of our own troops, too."

"We did not request an opinion," said Smythe.

"But you have it," said the lieutenant. He had been taking accurate stock of the room and had found that four enlisted men were posted at the board and that two others stood behind Victor.

"What are those fellows doing here?" said the lieutenant, with a motion in their general direction.

"The Soldiers' Council representatives," said Smythe. And then, with sarcasm: "Of course, if you object—" The titter about the board pleased him.

The representatives were witless-looking fellows, rather better fed than their compatriots of the barracks. They did not instantly perceive that they had been affronted, and when they did it was too late.

"We have a report here," said Smythe, "that you failed to organize, at any time, or permit the organization of a soldiers' council in your brigade. Is that true?"

"Yes."

"And I believe, according to the record here, that we sent out a man named Farquarson, a private, to help organize such a council in your brigade. He does not seem to be with you now and we can get no word of him from your troops."

"He was killed," said the lieutenant.

"What's this?"

"If you'd sent a soldier he might have lived a while. But as it was, the first time we were under fire he was shot."

"You infer that you—"

"I infer nothing, gentlemen. It was not necessary to shoot the trouble maker myself. It takes a man to live these days." And he looked around the board, plainly not finding any.

Smythe and the general put their heads together and whispered, glancing at the lieutenant the while. Then Victor whispered something to the officer on his left, who whispered to the next, and so on about the

board. At last Smythe had it back again and whispered to the two soldiers back of the general, who both nodded stupidly.

Squaring himself about, Smythe addressed the lieutenant. "We have come to the conclusion that you are incompetent in the direction of your command, sir. We have decided that you shall be removed from that office. Because you have not sufficient rank to be attached to the staff, you will consider yourself as a supernumerary to the garrison without duties and, consequently, on half rations."

"And my command?" said the lieutenant.

"Will be provided for carefully. I believe Captain Malcolm here is better fitted for the duty. The Fourth Brigade will be assimilated as a company by the First Brigade of the First Division of the First Army Corps and will be stricken from the Army List. You will please turn over to Captain Malcolm your records and standards."

"Gentlemen," said the lieutenant, "your wishes are law. May I ask one question?"

"Certainly," said Smythe, somewhat mollified by this statement, which he took to be complete acquiescence.

"You intend to leave this place. I can perhaps give you some data upon the conditions in the surrounding countryside, where you can get provisions and so on."

"I am afraid we do not need your advice," said Smythe. "But there is no reason not to tell you that we intend to take a certain area far to the south which is reported to be fertile. And, by the way, lieutenant, I do not believe there is any occasion for you to revisit your own troops. The guard will be informed to include your name on the list of those barred from communicating with the men. There are several of your field officers here, and we can't have any trouble, you know."

"I am barred—"

"Certainly. It is necessity. Colonel Graves, will you please make certain that even his batman is sent to the barrack before the lieutenant returns to his quarters."

"This, then," said the lieutenant, "is arrest!"

Smythe shrugged. "That is a hard name. You do not seem to share our political views and as such your opinions must, of course, be isolated. Your room probably should be changed as well."

"Does it come to you that you gentlemen may regret this?"

"Come, come," said Smythe, amused. "No threats, now. You are excused, lieutenant."

Captain Malcolm could not help smiling over his complete victory.

V.

THE LIEUTENANT discovered himself moved to the south passages, at the greatest possible distance from his troops. Of Mawkey there was no sign, only the pack on the table showed that he had been there.

When the orderly had shuffled away, the lieutenant unfastened his cloak from about his shoulders and dropped it to the table. He put his helmet upon it but he did not remove his side arms. It had rather amused him that nobody had quite dared ask for his weapons, but now even that faded. Dispiritedly he sat down on a stool and began to clean the mud from his boots with a splinter from the table.

That he was preoccupied completely showed when it became apparent that he was not alone in the room. The oversight, when he noted

it, alarmed him for it indicated how the grip on himself had slipped. This would never do. An officer with nerves was a dead officer.

A large, hopeless-looking youth swung his legs down from an upper bunk. He seemed to have lost all pride in both self and appearance

for his blond hair was matted and snarled and his greasy tunic was buttoned awry where it was buttoned at all. He dull insignia showed that he was a subaltern. He looked disinterestedly at the lieutenant.

From the bunk opposite another pair of legs showed and the lieutenant glanced in that direction. This second officer was a major, probably in his thirties, though his hair was already gray. He, too, was a big man, bearing that stamp of hopelessness which characterized the first. A black patch covered the place where his left eye had been and his left sleeve was tucked into his belt. But he still took care of his person, for his mustache was carefuly trimmed and his jowl blue with the razor. His right eye brightened.

"May I introduce myself?" he said. "I am Major Swinburne and that lad there is Mr. Carstair, an Australian."

"Pleased," said the lieutenant, going back to work on his boots.

"What organization?" asked Major Swinburne.

"Fourth Brigade, Second Division, Tenth Army Corps, commanding."

"Well, well! You still have your organization, then. My regiment has been stricken from the Army List and Mr. Carstair's company as well. I say, old boy, if you don't mind my being curious, just how did you manage to keep your command away from those ghouls?"

"Until I am notified in writing and until my color bearer gives up our standard, the Fourth Brigade still exists and I am still in command."

A monotonous kind of laughter issued for several seconds from the subaltern's throat and then, while he still went through the expression, ceased to make any sound.

"Quite amusing, no doubt," said the lieutenant.

"Don't be hard on the lad," said the major. "He came out four years ago and he's seen every officer of his regiment killed. He brought in his company nearly a year ago and he has not been out of this fortress since, nor has he had duty."

"And you?"

"I've only been here a month," said Swinburne, "but it is pretty clear to me now that all field officers are being eliminated from their commands and that General Victor and that crackpot Smythe are thinking of setting up some sort of dukedom or some such thing. I came in just before all communication was cut off with London and so I got caught."

"I understood," said the lieutenant, "that twenty-one commands have reported in. Am I to presume that the rest of the officers are being similarly treated."

"They were," said Swinburne.

"And where are they?"

"There are still thirty or forty organizations out so far as I know. All but Carstair and myself have managed to get out of here and join them, one way or another."

"And you are telling me that field officers deserted their outfits here?"

"Not exactly. There were desertions of noncoms and a few men as well."

"Then the place has nothing but staff officers and very few field noncoms."

"Yes."

The lieutenant smiled.

"I fail," said Major Swinburne, "to see anything funny in that."

"The confidence of these Tommy-come-afters astounds me," said the lieutenant. "That is all."

"They have little to fear," said Major Swinburne. "Before they left

England they were vaccinated against soldier's sickness."

"What's this? There is a vaccine?"

"It was produced in very small quantities by culturing human blood. I understand that only the governmental heads and the staffs have been given it."

"Our natural immunity to it is low enough, Heaven knows," said the lieutenant. "Well! So they can thumb their tails at soldier's sickness. No wonder they're still alive." And again he laughed quietly.

"You seem to be easily amused," said Carstair resentfully.

"I was thinking of those poor little weaklings walking through the mud out there, not getting their tea on time and being knocked off left and right by every sniper that comes along. The joke of it is, they've been moles so long they think war and disease cleaned the country. Why, a subaltern with twenty men could outmaneuver them and annihilate them before breakfast."

"Not so easily. Some of them have been on field service in central Germany," said Major Swinburne. "Do not underrate them. As I see it, they intend to take over this entire district, only going south to get into a region where there is food. Most of the still-extent organizations, you see, have headed for the Balkans and the Near East. I'm told we've quite a force in Africa. Some two thousand men. Nobody knows, of course."

"You're saying they'll meet no opposition, then?" said the lieutenant. "Why, any village leader could cope with these half-starved soldiers and fizz-brain staff rabble."

"The soldiers will carry it through," said Swinburne. "The thousand which have been on constant garrison duty here are also immune to soldier's sickness by the process of natural selection."

"They'll have eighteen hundred men," said the lieutenant.

"And we'll have nothing but a lingering death from boredom," said Carstair.

"Why didn't you chaps go with the other officers?" asked the lieutenant.

Swinburne looked uneasily across at Carstair and then shrugged. "We sound hopeless. We really aren't. My men, the whole hundred, depended upon me to stick by them. His men, about twenty, have done the same. We occasionally get a message through from our sergeant majors."

"And so you stick in the faint hope that you'll be given back your commands?"

"Yes," said Swinburne.

"They'll never be *given* back," said the lieutenant.

"What do you mean?" said both men sharply, with uneasy glances at the door. Hope had suddenly blazed in their faces.

The lieutenant went on about the task of cleaning his muddy boots.

THE BARRACKS had originally been intended to accommodate a thousand men and so there was ample room for two hundred and eight. But for all that the place was damp and gloomy and, to soldiers who had begun to depend upon mobility rather than barricade for protection, it was too near from wall to wall and, compared with the sky, too close from ceiling to floor.

A silence fell upon the Fourth Brigade as they went about preparing their abiding place. For the first few minutes they feverishly got things in order and then, that accomplished, they touched up themselves. But more and more, as the hours passed, they glanced inquiringly toward the door. Two or three

times false word came that the lieutenant had arrived and there was a scurry of activity to make certain everything was all right. They supposed, naturally, that General Victor would accompany the lieutenant upon this inspection and, above all things, they did not want to disgrace their officer.

Bulger put dinner off and off until everyone was fairly starving, for he did not want to have the place messed up with food and smoke. Finally Pollard gave the word and Bulger's two scarecrows broke up some desks and benches to build a fire under the air outlet. There was another burst of activity to get supper through and cleared away before the inspection should come. And then, once more, they relapsed into waiting.

Little by little the tension died from them. They felt empty and neglected. They did not even know the time, for they no longer had the sky. A mild attack of claustrophobia was creeping over each of them.

In short, their morale was slipping. As long as they could remember, they had had the lieutenant in sight or alarm distance, and now that they did not know where he was, they felt nervous. What if something should happen? Of course they knew nothing could happen, but still—

"An enemy command over that ridge, sir. About three hundred and fifty and machine guns."

"Weasel! Scout the position. Pollard, make sure we can march in ten minutes. Bulger, apportion those supplies. Carstone, are your guns in condition? Good. Stand by."

"Sir, there's damn near a regiment in that town."

"Pollard! Stand ready to feint a front attack. Hanley! Prepare to take cover on the right. Tou-tou! Your outfit take cover on the left. Carstone! Make ready an ambush. When Pollard sucks them out, roll up their flanks, cut their retreat and give Carstone his chance."

Yes, what if something should happen?

What if something *had* happened?

Gian went over his artillery again and wiped away some mythical dust and gave his men seven brands of Hades if they slipped up again.

"What you think, Gian?" said Tou-tou.

"How can I know what to think? These staff officers!"

"The sun's down. At least, those helios aren't working."

"He said he'd be back," said Gian.

"But he hasn't come back," said Tou-tou.

They wandered away from each other.

"Maybe he got sick all of a sudden," said Weasel. "Maybe he got sick and we weren't there!"

"Maybe they fed him some poison," said Bulger. "They know nothin' about food in a rat burrow like this!"

"Was he all right when you saw him last, Mawkey?" said Weasel for the thirty-second time.

"Yes," said Mawkey. "He'll be along. He hasn't seen those other officers for a long, long time and maybe he's sick of talking to stupid rabbits like us."

"Sure, that's it," said Bulger.

But nobody believed it.

THERE WAS another false alarm, and everybody eased down as soon as the noncom was clearly seen in the door. Nobody knew him, but as he was a sergeant major, Pollard received his greeting.

"I hear this is the Fourth Brigade," said the newcomer. "I'm Thomas O'Thomas of the Tenth Regiment, Second Brigade, Third

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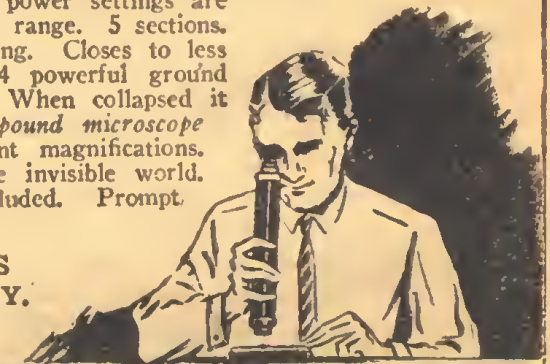

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Division, Tenth Army Corps." But when he said it he looked over his shoulder to see if anyone was listening. "That's the old outfit, of course," he added. "Major Swinburne commanding."

"Orace Pollard, at your service. Second in command of the Fourth Brigade. Come in and have something."

"I *thought* that was food I smelled."

"Right you are," said Pollard, leading his guest back to the square on the floor which was Pollard's office.

Thomas O'Thomas didn't miss anything as he came down the barrack. He saw haversack after haversack bulging with food and loot, belt after belt full of ammunition. This outfit was wealthy!"

"And Heaven blind me!" said O'Thomas. "Artillery!"

"Yes-s-s, indeed," said Gian.

"There are some guns around here but they're shot out until a crew won't touch them. And these here weapons look like new."

Gian beamed happily and was greatly taken with Thomas O'Thomas.

Pollard seated his guest at the table and signaled to Bulger to have a man bring some barley soup and bark tea and real flour bread. O'Thomas could hardly believe his eyes and nose and, without apology, fell to with voracity.

"Some more?" said Pollard. "There's plenty."

"Plenty?" said Thomas O'Thomas. "A bigger dish, Bulger."

Thomas O'Thomas slurped avidly through that and a third and then, scoffing off the tea with its liberal portion of beet sugar, felt that the age of miracles had returned.

"How do you manage it?" said Thomas O'Thomas.

"It's the leftenant," said Pollard. "He thinks of rations and bullets and the brigade, and nothin' else."

"Blind me! What an officer!"

"We picked this up in four days," said Pollard.

"Four— Aw, now, there ain't that much food in this whole bleeding country, chum."

"There is. That's the kind of commanding officer we got."

"We bloody well starved in the Tenth Regiment. That's why we came back here. But there ain't a thing to eat in this hole, let me tell you. And since they relieved Major Swinburne of his command, we never get nothing."

"They . . . they *what?*" cried Pollard, half on his feet.

"Why, certainly. Every time a field officer comes back to this rabbit warren, the staff takes away his troops and hands them over to some simpering mamma's boy that'd run forty miles if he ever heard a rifle cocked. And let me tell you, when you get your new officer you'll find out all about etiquette—saluting and playing nurse—" He found, suddenly, that he was surrounded by a group of tense faces belonging to all the noncoms of the organization. "Oh, I say, you chaps. You seem to be worked up!"

"What happened to your command officer?" said Pollard.

"Well, he was just relieved, that's all. We hated to lose him, because he was a fine man. A wonderful field officer and we all liked him. But what can we do? We haven't even been able to find out what happened to him."

"You haven't— See here!" said Tou-tou. "You actually let them take him away from you and never made a move to find him?"

"When we got it through our heads," said Thomas O'Thomas, "we

were already broken up into other outfits. Just like you'll be. Wait and see. They'll spread you thin. That way there ain't no way you can give trouble." He felt uneasy, as though they didn't approve of him quite. "If you don't mind, now, I'll be going. I slid past the guard. Nobody is supposed to come here yet, you know."

"You mean we're isolated?" said Pollard.

"Well, call it that. They don't want anybody to start any trouble, you know." And so, bidding them farewell, Thomas O'Thomas left.

O'Thomas' going was the signal for the whole room to begin talking at once. Even the carriers, beasts of burden though they had been made by him, became anxious for the safety of the lieutenant lest they thereby receive a worse fate than having to eat well and work hard.

Before they had even started to get this talked out, two more high-ranking noncoms filtered in, on the alert for food. They were fed and they were pumped thoroughly.

"Look, you chaps," said one. "There's no use getting worked up. When the mutinies commenced they equipped all these barracks with regurgitant gas. Calm down or you'll have it dumped on your heads."

Several more noncoms got through the guard and these added further confirmation.

"Your command officer?" said one. "Why, if he was a field officer, it's pretty plain what's happened to him. I'm from old Tin Can Jack's Hellfire Highlanders and I know. Tin Can Jack couldn't get us back three weeks ago and so he sloped."

"He ran away?" said the brigade, incredulous.

"And left you?" said Bulger.

"The whole blooming eighty-nine of us. He had to save his life, didn't he?"

"His life—" in horror.

"You ain't got any idea of these new staff officers," said the noncom from the Hellfire Highlanders. "You see, when they killed the last dictator in England and set up the B. C. P. it was General Victor what turned his coat and handed over the London Garrison to the commies. Him and all his officers. And when that was done, the B. C. P. had to do something for him and they was scared of him, because a traitor once may be a traitor twice and so they just shipped him over here with all his blinking officers to remove General Bealfeather. So they aren't nothing, these staff officers, but a lot of whipped cream and gold braid and they're scared of the field officers—"

And so it went throughout the night. The stores of the Fourth Brigade went rapidly down and their alarm went rapidly up. They paid good food for information, despite the repeated warning, sotto voce, that they wouldn't get such fare here in the garrison. They were too desperate to care.

And when morning came, finding them without sleep, they were at last quiet. At least, Malcolm found them so.

"Atten*shun!*" barked a noncom they hadn't seen before.

Captain Malcolm came in. He was freshly shaved and laundered and he carried a crop under his arm and wore gloves. He scowled when he saw that very few had come to their feet. He turned and beckoned in a picked squad of garrison soldiers. Sullenly, the Fourth Brigade stood up.

Malcolm looked them over, not very complimentary to their condi-

tion, or deportment, or weapons. Pollard followed him around more to keep him from doing anything than to aid his inspection.

At last Captain Malcolm came to the center of the room. He felt that he should make a speech.

"Soldiers," said Malcolm, "you are, of course, in very sorry shape." From what the Fourth had seen of the garrison, they did not believe it. "And your discipline, it is plain to see, has been very slack." There was a mutter and Malcolm glanced around to see if the garrison guard was handy and alert. "However, as soon as you are split up into your new organizations and your ranks filled from theirs, we shall go about improving you. As your commanding officer, I—"

"Beg pardon?" said Pollard.

Malcolm glanced back and was reassured by the garrison guard. "Sergeant major, if you wish to see the orders"—gently sarcastic—"I shall be glad to show them to you."

"The only orders we recognize," said the stolid Pollard, "are those that comes from the leftenant's mouth."

"Oh, now, see here, old man, I—"

"I said it and I'll stick by it. Call this mutiny or anything you like, but you ain't going to do anything to our leftenant!"

Malcolm backed a pace and then stiffened with anger. "I care to call it mutiny! Sergeant of the guard, arrest this man!"

"Touch him," said Tou-tou. "Just go ahead and touch him."

"And this man," said Malcolm, pointing to the burly Tou-tou.

"Sergeant of the guard," said Malcolm, "touch that alarm."

The clamor went screaming through the fortress.

"In a moment," said Malcolm, "we'll have adequate force here. You will be relieved of your food and given strict confinement. Sergeant of the guard, take this brigade sergeant major in custody as well as his thick-skulled friend."

The sergeant hesitated a moment. But he heard troops coming on the run and it looked like a cheap way to make face for himself. He advanced and laid a hand on Pollard.

A revolver cracked and smoke writhed from Hanley's fist. The sergeant caught at his guts and began to scream. The guard tried to get through the door and away but pinned themselves there by their very anxiety. Malcolm, white-faced, sought to claw through them.

A rifle blazed and the back of Malcolm's head came off, splattering the others in the door. Malcolm's arms kept on beating and then froze out straight.

Carstone's pneumatics began to pop like champagne corks and the blood began to flow. The door, in thirty seconds, was barricaded by the bodies of the garrison men.

Beyond, an officer leaped into view, not having heard the pneumatics in the roar of sound. He jerked and his hands flew to his chest and were full of holes.

Above them a powder began to flow out from automatic trips. The regurgitant.

"Clear away!" howled Gian. And the doorway was clear of the Fourth Brigade as far back as the artillery.

Three guns crashed as one, and half the wall went out, fragments spattering through the corridor to knock back the garrison troops.

Hastily snatching their packs and trying not to breathe, the Fourth leaped into the corridor. Gian whiplashed the carriers into moving guns and caissons. Men were already beginning to gag and vomit.

POLLARD'S bellow brought eyes to him. He sorely missed his lieutenant, but it was up to him and he had to act. He pointed up the least defended incline and they sped along it. Behind them Carstone's pneumatics were covering their retreat by hammering back the mob of garrison soldiers.

When the last of Gian's artillery rumbled by, Carstone began to have his machine guns shifted at intervals. By picking up the first of the string in rotation and making it the last he was able to keep the corridor behind them sprayed and still retreat.

A clang sounded up again and Pollard began to howl for Gian. The artillery came up, the brigade hastily making room for it. A great steel door had dropped into place across the corridor and powder was again beginning to sift from above it.

"Stand back!" screamed Gian. "Ready guns three and four. Fire!"

The center of the door bulged out.

"Guns three and four reload! Fire!"

The bulge increased. The Brigade was retching. Behind them the pneumatics sputtered and hissed, interspersed at intervals with the coughing clatter of the Belgian alcohol gun.

"Guns three and four! *Fire!*" bawled Gian.

The door collapsed. The half-deafened troops sped through it, some of them hastily binding wounds received from the richocheting splinters of steel and stone.

Soon Pollard faltered in dismay. Quite evidently the corridor he had chosen had only gone up long enough to avoid a particularly hard seam of rock and had then been built downward. They were on their way

into the depths of the fortress!

Wildly he glared about for another passage and found none. He had to go forward now. All the way through the place. Thank Heaven the regurgitant effect had been slight and was wearing away. Oh, if the leftenant were only here to tell them!

He sensed rather than heard or felt the machine gun which had hastily been thrown on a barricade to bar their way. Before he came to the turn he halted and piled up the men behind him. They were glad to stop and breathe better air.

"There's a machine gun up there, Gian."

"Right. Gun one, forward. Load solid. Make way, will you, Pollard?"

Gian laid the gun himself with the care of an artist. He yanked the lanyard and the roar was too great for them to hear the shot bounce off the far end of the turn. There was a scream of agony from the barricade around the curve.

"Weasel, mop up!" said Pollard.

Weasel and four men snaked forward. Twice their rifles crashed and then there wasn't any more sound at the barricade. The Fourth Brigade went forward.

The central offices were quite deserted save for one orderly who had risked all to rummage among the general's effects for any possible food cache. Pollard hurried into the offices and glanced about, hoping to find a map of the place. But the grenade they had tossed into the place first had ripped up the wall chart beyond recognition. The remaining orderly, who had taken cover behind a desk, was hauled forth. He clearly expected to have his throat cut.

"Soldier," said Bulger, sticking his bayonet into the orderly's ribs and tickling him up a bit, "if you want to live, you'll lead us straight as a bullet to our leftenant."

"Y-y-you are the Fourth Brigade?"

"Right."

"J-j-j-just f-f-f-follow m-m-m-me!"

They followed him. Evidently the garrison had had a full belly for they were not again obstructed. They drew up and tried to straighten their uniforms when they came to the indicated door.

Pollard knocked with his pistol butt.

The lieutenant opened it.

Pollard gave one of his very rare salutes, though he forgot to take the gun out of his hand first. "Sergeant major Pollard, sir. Fourth Brigade all present and accounted for. Will . . . will you please take command?"

It was very hard, just then, for the lieutenant to remember to keep full control of his nerves.

BURROWED like a rat with a phobia against hawks, General Victor and his staff received fragments of news and acted accordingly. Their first effort was to order out the garrison, en masse, to engulf and put to death the leaders of the mutineers. Very confidently, then, they huddled in the darkness, awaiting report of results. A full hour passed before any orderly came down to them.

It seemed that the loyal garrison was perfectly willing but that the field soldiers, while only half their number, were opposed.

General Victor frothed and spluttered and sent out orders again, even sending a staff major along with them. Half an hour went by before the staff major came back.

It seems that he had somehow blundered into the north barrack which had housed the Fourth and there had found the corpse of Captain Malcolm.

"Mutiny and murder!" howled Victor. "Get back up there and sweep them into cells!"

"That is the point, sir," said the staff major. "The garrison soldiers state they would be only too glad to do it but it seems, howchow, that their rifles are missing."

"What's this? What's this? Missing! Incredible!"

"It would seem so, sir, but you must not forget that the field troops are quartered with the garrison troops now."

And so, bit by little, the staff pieced together the lieutenant's "fiendish" plan and their own defeat.

General Victor, once he understood, no longer raved. He just sat and stared at his boots in dumb dismay.

Smythe grew bitter, blaming everyone around him. "You should have understood! Why, I myself heard Captain Malcolm state his annoyance at the brigade's slow progress back. They attacked every possible source of food supply. It's plain now. He's the devil incarnate!"

An orderly came down, the same that had found the lieutenant for Pollard. He was happy to be momentarily free. "Sir, the compliments of the lieutenant and would the general come up under a flag of truce to discuss the terms?"

"Terms?" cried the officers. "For what?"

"Surrender, he says, sirs," apologized the orderly.

"Surrender! By all that ever *was* holy!" said Smythe. "Tell him no!"

"He says he'd hate to have to come down and get you, gentlemen. Begging your pardons."

"Come down— How perfectly ghastly!" Smythe grabbed the orderly by the coat and shook him. "Does he think he can take his own general headquarters? Does he?"

General Victor stood up wearily. "It appears that he has. I shall go speak with him."

They protested, but Victor did not hear them. Unwillingly they filed after him up through the fortress to the higher levels. It was with great surprise that they found the troops all out of the ground.

THE RAIN had ceased for the time and small shafts of sunlight were cutting along the slopes, flicking over the remains of many an attack and sparkling in the water which clung to the bottoms of shell holes. Nearly eighteen hundred men were out here, variously disposed upon the flat expanse between the hills.

Victor's very large head turned this way and that, taking it all in. He saw that a machine-gun company was stationed in such a way as to command the expense and that riflemen were posted so as not to interfere with the machine guns. It appeared very much as if the garrison was about to be executed to a man.

The staff's eyes were burned by the light, to which they were not accustomed. And their courage also burned very low, for they bethought themselves of the possibilities of firing squads. Their consciences, where field officers were concerned, were very, very bad.

Victor located the lieutenant seated upon a rock, surrounded by several noncoms and two other officers. With misgivings he approached.

The lieutenant stood up and bowed, smiling.

"See here," said Smythe, beginning without preamble. "This is mutiny, murder and desertion; a hellish plot!"

"A plot?" inquired the lieutenant innocently.

"You know very well what it is!" said Smythe. "You cannot deny it. You stocked your men up with food and brought them here. You *knew* what effect that would have upon this garrison. You *knew* that when you ordered your men to revolt there would be no hand to oppose them. This is a vile trick!"

"Perhaps, Colonel Smythe, perhaps. But you are wrong in saying that I ordered my men to revolt. That was not necessary, you know."

"Ah!" cried Smythe. "You admit it! You admit you came here on purpose to avenge your friends."

"Vengeance," smiled the lieutenant, "was not part of my plan. However, I might include it."

"How else," howled Smythe, could it be?"

"We have very poor rifles, gentlemen. We had no rain cloaks, no sound boots. We had no baggage carts, no new-style helmets. We were short on good ammunition and only long on strategy. As soon as we have what we want we shall leave you to your regrets."

General Victor thrust Smythe aside. "According to international law, sir, you are a brigand."

"If we must have law," said the lieutenant courteously, "then let it be military law, by which you are a fool. Now please stand aside while we get on with this business."

Swinburne, Carstair, Pollard, Tou-tou and Thomas O'Thomas all looked wonderingly at the lieutenant. They had had no inkling of this as a deliberate scheme, but now they saw it clearly. They saw it in terms of numbers and guns, and gasped at the realization that the lieutenant had captured the only existing fortress in this countryside, garrisoned by sixteen hundred men, with not the loss of one in all his own command. Their faces softened into gentle worship as they gazed upon their officer.

It took half the day to complete the business. What with every garrison soldier clamoring to be included in the lieutenant's ranks and therefore turning out every possible hiding place for the hoarded stores, the detail became enormous.

The lieutenant worked on. He took no soldier who had not had at least three years in the lines with a combat division. He took no soldier who thought there should be anything even faintly resembling a soldiers' council. And he did not even take all the field troops, for many of these were not fit for active service and would only have proved a burden.

AT DAWN of the following day, the organizations were made up. Five hundred and fifty troops were assigned to two sections, with the cream of the Fourth Brigade marshaled into a body of scouts under the direct control of the lieutenant. By order, the whole was to remain the Fourth Brigade, with two regiments and one artillery unit.

Drawn up on the expanse before the hill, the soldiers stood rigidly under the lieutenant's inspection, only a fortress guard under Pollard being absent from the ranks. The Union Jack was absent and in its place was the standard of the Fourth Brigade.

The lieutenant was very thorough. Each man had a good pair of boots, a rainproof cape, a visored helmet, a semiautomatic rifle, a breastplate, three bandoleers of ammunition, a canteen, a bayonet, a sharp-sided spade, six grenades, a good overcoat, two uniforms of regulation British slate-blue, and an adequate haverhack. The baggage carts were brimming with spare ammunition and condensed food. The artillery unit now had eight pieces and sixty noncombatants to draw them.

The lieutenant finished his inspection.

"Major Swinburne, is the First Regiment ready to march.

"Yes, sir."

"Ensign Carstair, is the Second Regiment ready?"

"Yes, sir."

"Orderly, recall Pollard and inform him he is to bring up the rear guarded. Weasel, lead off with the vanguard. *Brigade! By squads, left! March!*"

In the ranks of the Hellfire Highlanders a bagpipe began to scream and wail, accompanied by three drums. Englishman, Scotsman, Irishman, Australian, Canadian, Frenchman, Finn, Pole, Belgian, Italian, Dane, Spaniard, Moor and Turk, stepped out to the barbaric strain, the standard of the Fourth Brigade streaming out in the fore.

General Victor stood downcast upon the lip of the fortress, watching the command snake over a ridge and out of sight until the bagpipes, finally, had vanished into the distance.

"I was wrong," said General Victor. "There's reason, then, why a field officer should be treated well. Smythe, I would to Heaven we had kept him under our command."

"There's no use talking about it now," said Smythe bitterly. "That outfit is headed for England!"

"You . . . you think so?" said the startled Victor.

"I'm certain. Come, we owe it to London to tell them of this revolt and of the man that led it. This debt will yet be paid."

TO BE CONCLUDED.

BRASS TACKS

Heinlein's story may give you that feeling—but if it had been longer, it would have been dry. As for after the revolt—Heinlein's got a sequel, "Coventry," coming.

Dear Mr. Campbell:

Possibly there have been better issues than the March '40 Astounding; probably there have, but at the moment I can't recall any, though, of course, some have approached it closely. Perhaps there is no one definite reason for this; I can't point to any one quality of the magazine and say, "This is the cause"; but there is a certain atmosphere, a certain impression that I get when I read it, composed of several elements; an impression that Astounding is a unique magazine and occupies a position alone in the realm of science-fiction or elsewhere. I think that the impression is the realization that a subtle process of advancement started when the magazine came under its new editorship has now reached a point where culmination is in sight. There has been a gradual evolution of the old into the new; and although it is impossible to say just when the new arrived, the awareness has come that it is here. Shall I try to explain what I think are the distinctive qualities of the new Astounding?

First of all there is a realism which, except for scattered examples, was heretofore unknown to science-fiction. Characters and individuals in the stories are acting more and more under given conditions as actual people would act under those same conditions. We have men whose actions and thoughts are vivid and real; we have stories which we can enjoy and experience vicariously—without the feeling that what we are reading is absorbing but dreamlike and unreal and without vital significance. Not only do the people act in accordance with the principles of psychology, but increasingly often their environments and the varied civilizations are pictured convincingly and constructed logically; consistent extrapolation from present conditions of human nature and social systems is becoming more prevalent. There is, of course, much imperfection and room for extensive development; but a new order apparently has arrived.

Furthermore, the magazine has come of age. There is an air of maturity and a lack of sensationalism in its pages, a concern with subjects a little deeper and more vital, and an absence of ballyhoo and thrills—the meaningless sort—which set it apart from similar publications. Not that such characteristics eliminate the entertainment it gives—by no means. For pure enjoyment—with, of course, a few flaws—it is most satisfactory.

Intimately connected with this is the fact that the stories are well written: the diction, style, and construction are polished and possess literary merit. They are meant for adult reading, most of them.

And they are original. They give one new material to ponder and present new situations, and surprisingly enough, they don't have to step out of the bounds of accurate scientific beliefs of the present to do it—or if they do, they have excellent excuses.

Not only the stories but the illustrations have improved. The trend has been away from the old wooden, uncouth men and marvelously intricate and meaningless machinery (stage props, as it were) toward an emphasis on humans who are more or less anatomically exact and naturally posed. I sometimes think that this has been rather overdone; some of the symbolical drawing of Dold, with its massiveness, was powerful in spite of his gaunt, hollow-eyed living robots. On the whole, however, the illustrations are better balanced, saner, and of a higher artistic quality, although they have not yet reached the level of the stories. They are probably the weakest point of the magazine.

To get down to particulars, however, Heinlein's story deserves comment. My compliments to him for a thorough and painstaking job, carefully constructed, happily conceived, well written, and of great present interest. His system was beautifully worked out. But I can't escape the feeling that someone performed a major operation and amputation on the last part of the story; it was bowling along in great style, giving promise of many things yet to come—when suddenly it staggered, slumped, and fell with a thud. The possibilities were by no means realized; the plot was too restricted; the last part of the revolution—the very last part—was inadequately treated; some loose ends were left dangling, or ineffectually gathered up

in the last few paragraphs. The significance of the change the revolution brought about was not sufficiently impressed upon the reader. The private story of the main character needed extension. I got the impression that the author was driving toward some goal which I was eagerly anticipating: the author then indicated that the goal had been reached, in a vague sort of way, but I did not feel that he had taken me along with him, although I had accompanied him up to that point. I admit that the ending was an improvement over that of the unfortunate "Galactic Patrol" (I've often wondered what those few omitted words were), but, nevertheless, it was unsatisfactory. Who was responsible, please; author, editor, or printer? That would have made a fine three- or four-installment serial. In spite of all this, it merited most of what you, Mr. Campbell, said of it; Heinlein should have the satisfaction of having contributed one of '40's best stories.

The rest of the yarns in the issue were competent pieces of workmanship for the most part, especially "Chapter From the Beginning" and "Gold." I liked especially the former because of the graphic way in which it was written. The reactions of the men in the latter were somewhat unconvincing; they were too convenient to the plot and too perfectly responsive to the stimuli—as if they were turned on and off by the pressing of buttons. Aside from that, though, it was a good story.—Ralph C. Hamilton, 920 College Avenue, Wooster, Ohio.

Our De Camp's the same man—but he graduated in 1930, not 1928. And in Smith's yarn, he specifically pointed out one man who'd researched a lifetime on that problem, and added all the experience of the planet brought over from the Second Galaxy.

Dear Mr. Campbell:

This should have been written two months ago, but here it comes, better late than never. I'm about to commit sacrilege! I've got a squawk about "Gray Lensman." (Horrors!) The beef is with Canto Four—Smith went too super-super and the overdose left me feeling somewhat sick. It's a common Smith trait; it happened in "Skylark of Valeron" and it'll probably happen in every sequel the man ever writes. He can't help it. The first one is super (maybe we should say supercolossal) and it is impossible to top it. But the master does, and the result leaves me a little flat. We hate "The marines have landed in the nick of time" twists, and when Smith grows arms and legs by the dozens just when he needs Kim a whole man for dear little Mac (We could go for her!) it's straining the imagination a little too much. We didn't even like the idea the first time we read about it (way back there sometime in a story about a new hand for a violinist), and when Smith pulls it out of nowhere—no previous research, no nothing—we refuse to believe. We go into a Smith sequel with high hopes and we're always sadly disillusioned. Ah, well, try again; maybe it's us. (Where did I lapse into that editorial "we"?)

I still think your best author is L. Sprague de Camp. (And by the way, is it the same L. S. de C. that graduated from this institution in 1928?) We've got a little rooting sec-

tion out here who cheer long and loudly for L. Sprague. Let's have more of him.

Good for Wellman. An author with an idea. Stick with it. Nuff sed.

Hi-ho for the slipsticker. Let's organize, membership cards 'n' everything. Send in a puzzle, or an answer with a top from an old slide rule, and you're in. Esky's "Sound and Fury" plays enough with insolvable puzzles for ten mags, but that still isn't enough for us. I'll add my bit in favor of, but as yet I haven't figured out the answer to Tarrant's catch question. Maybe some day— By the by, somebody once wanted to know the center of mass of a cone. Assuming a right circular cone from the info given, the answer is one third the altitude from the base on the axis. There is no easy way that I know of except by the use of the calculus. Tsk, tsk, Mr. C., you should have known that one, and rumor has it that you're an old M. I. T. man.

My bid for the slipstickers' corner before I forget it. The fast streamliner, averaging seventy m.p.h., leaves Chicago for New York. At the same instant, the local leaves New York for Chicago, averaging a mean forty m.p.h. The question: which one is closer to New York when they meet? Or if this stumps you, which one is farther from Chicago? You'll burn when you finally get this. Ninety-nine out of the usual hundred around here missed the boat on it, and then went out to catch another sucker. With that warning, I leave you to cogitate on the matter.—Murray Lesser.

Street & Smith were the American publishers of much of Kipling's work. There's a good chance we couldn't buy those rights simply because we already own them. But we still don't use reprints of fiction.

Dear Mr. Campbell:

This marks my first (and probably last) letter to any magazine. My SF addiction dates back to a copy of Grimm's fairy tales given me on my sixth birthday. Then Gulliver, Alice, Jules Verne. The early SF stories in the old "Electrical Experimenter"; Burroughs' Martian novels; and the old Argosy-All Story which did a lot to preserve the faith. Maybe you remember that early attempt at a SF magazine called "Thrill Book"—that's where I first met Murray Leinster. That mag was a promising sprout, but was cut off in its youth by a printers' strike, or the War, or something. I never did finish a serial running in it.

Escape literature seems best to describe SF; and to my mind a good job must of necessity let the reader completely escape. Pet hates: the author who introduces the "premonition of evil"; the author with pious leanings; the Frankenstein plot; and Ray Cummings' double-jointed adjectives.

Dr. Smith, of course, is tops; your own long novels were his only serious rivals; I want more of them. Of course, if you say you cannot be both editor and author, we'll keep you as editor if you please. Leinster, Weinbaum, Taine are old favorites; new talent such as Sprague de Camp and Heinlein—"If This Goes On" was very, very satisfying and should be required reading in all schools because of the meaty epilogue.

Many well-known writers have done SF. Good SF. Of course, H. G. Wells is known to every SF fan. But I never see mention of Shaw, T. S. Stribling (one of my favorites—he, like Shaw, has that most proper spirit of irreverence that made Sam Clemens beloved—incidentally, his "Connecticut Yankee" would rate as A1 fare in AS; Talbot Mundy—a very good workman; Tiffany Thayer (with more irreverence than imagination, but good quality both); and the greatest of all: the late Rudyard Kipling. Why, oh, why, have I never seen his "As Easy as A B C" mentioned in SF letters? To my mind, that is the perfect SF story: plot, characterization, imagination—and all told as sim-

ply as any report in yesterday's newspaper. You can read it and believe it.

Read Kipling's "With the Night Mail" (with excerpts from the magazine in which it appeared). There is an idea for a "Mutant" issue that would go to town! (Yes, I know you don't print reprints, but you probably couldn't buy the thing, anyhow), but just imagine: a complete magazine published as of, say, SOL 15th, 2040. Each story, article, advertisement, editorial, news item, illustration, et cetera, to tie in. And put an Astounding cover over it. Peculiar things have become best sellers, and among SF fans such a synthetic bit of vicarious time travel would be a sensation. Why not a special issue—call it an annual.

As to your *Unknown*, of course every issue has been a disappointment after "Sinister Barrier." But still it is second only to Astounding. —Powell Ross, Jr., Washington, Missouri.

According to statistical analysis, you'd need 500 votes to get a true picture of reader opinion.

Dear Mr. Campbell:

My private poll of Astounding's 1939 contribution to science-fiction was a dismal disappointment. Not only that, but it was a financial loss to me of exactly five cents. I'll tell you the story. When my letter appeared in the February issue, I showed it to my girl friend (a rank aeophyte whose pretty little head spins dizzily upon encountering "all those gyroscopes and atoms and things," as she puts it). She, of course, showed her pretty teeth in a magnificent horse laugh. "Votes!" she derided. "You'll be lucky if you get one!" I knew better than that; so when the first vote came January 29th from Don Thompson I made a bet with her that by the end of February there would be over twenty votes. Poor, innocent creature, I thought, as we agreed to the five-cent bet; little does she know how many votes will really come. Came the end of the month, and now all I can say is: "Little did *I* know how many votes would come." Counting my own vote, I cannot stretch the figure higher than a total of eleven votes. I want to thank each of the ten for shaking off their psychic inertia and wasting a penny post card. I want to thank Robert Lowndes for inserting an announcement of my poll in his *Science Fiction Weekly*.

The results can be briefly summarized. If we count Smith's "Gray Lensman" as a '39 offering, we shall have to admit its right for first place. If we do not count it—since it ended in 1940—Moore's "Greater Than Gods" takes first place, followed immediately by "Black Destroyer." "Blue Men of Yrano" captured last place easily, and other prominent *worst* stories were "Ultimatum from Mars" and "General Swamp, C. I. C." Three articles were tied for first with two votes apiece: "Tools for Brains," "The Other Side of Astronomy," and "Pandora's Icebox." Only three covers were mentioned, and of these the April astronomical cover took first place easily. The other two covers which secured votes were the November and October ones. An interesting point or two: "General Swamp" was mentioned as a best and a worst, and so was "Hermit of Mars"; "Black Destroyer" also received a vote as a worst story; "Shawn's Sword" received special mention as the best short story of the year from one voter; one reader judged that your April issue was your best one and your January the worst. That finishes that; I guess one little paragraph in a letter to Brass Tacks is not enough for a thing of this kind. Perhaps next year you will hold a special poll as a supplement to the Analytical Laboratory.—Dean Brazier, B. S., 3031 North Thirty-sixth Street, Milwaukee, Wisconsin.

SCIENCE DISCUSSIONS

Ross Rocklynne goes for a friendly ride—

Dear Sir:

I was afraid it would happen sooner or later, and here it is; that fellow Ross Rocklynne has finally made so many errors in one story that something must be done about it, even if that something is only a letter destined for the editorial wastebasket.

But before going into the long and dreary catalogue of his crimes, Mr. Rocklynne deserves no little praise for being the first writer in the SF field, to my knowledge, to correctly state that the interior of a hollow sphere (perfectly symmetrical, of course) has no gravitation of any sort. Led by Edgar Rice Borroughs, a whole army of characters have walked on the inner surface of a hollow sphere "because of the greater attraction of the material underfoot, as compared with that across the diameter of the hollow." This *sounds* plausible, but it's wrong, as a mathematical analysis will reveal.

But, sad to relate, this is about the only scientific statement in the story that is not outrageously wrong.

Take the speed with which a man can jump into gravitationless space from a solid object, a matter of general interest, by the way, as this is a common exercise in SF. Mr. Rocklynne figures that a speed of 34 to 36 feet per second can be attained by a man "who is not an athlete." He submits in evidence that a high jumper on Earth can jump 6 feet, and stays up about a second. In the first place, these two facts of time and distance are unnecessary, as either one alone will yield the other by calculation. In the second place, the two figures given are contradictory. On the way up, $s=\frac{1}{2}gt^2$ (familiar formula of high-school physics) applies. If s is 6 ft., g is 32 ft./sec./sec., we have $t=\frac{3}{8}$ sec. The same time is taken on the way down, and the total time in the air is $1\frac{1}{4}$ sec. A further error is the tacit assumption that a high jumper clearing a bar at 6 ft. has *jumped* 6 ft., that is, raised his center of gravity by 6 ft. The jumper twists his body to go over the bar practically horizontally, and if he is 6 ft. tall, this contortion, quite unrelated to actual upward motion, gains

him 3 ft. Thus, a good jumper, without the contortions only jumps 3 ft. I suggest that the reader choose something 3 ft. beyond the reach of his upstretched hand, and then jump up and see how close he can get to it. This more correct view brings our time for the jump down to about 0.8 sec. Still further error is found in the cockeyed reasoning which apparently adds 32 to the height you can jump to give the resulting velocity. It is, of course, true that a man can jump away from the ground faster when he does not have to raise his weight against gravity during the driving part of the jump. Suppose we do this problem now, correctly. The jumper crouches down as far as he can get, then springs upward as hard as he can. A good strong man can raise himself from a deep knee bend when carrying another man of the same weight on his shoulders. The faster the motion, the less the force available ("quick strength" and weight-lifting strength are different, as everybody knows), but let's forget that, and credit our jumper with a driving force of 2 gravities through a distance of three feet. The formula tells us that $v^2=2as$ or 2x3x64, and V=20 ft./sec. approximately. The jumper could improve this a little by starting crouched forward, with his shoulders close to the ground, and first pushing with his arms to get his upper body in motion, and then driving with his legs. But while allowing a gain from this technique, don't forget the weight and the binding effect of the spacesuit worn by the jumper. I am inclined to set a velocity of 20 ft./sec. as near the maximum for a human being. Note that a superman who could not only rise from a deep knee bend with two heavy men hanging on his neck, but who could equal this in quick strength, would only get to 34 ft./sec. If Mr. Kinnison, the well-known lensman, were to try it, he would probably do about that. (I wonder if Mr. Smith could arrange for an actual test to check this? After all, this is more important than the fate of a couple of gaiaxies.) But Mr. Rocklynne is expecting all this from a bunch of dissipated and traditionally hog-fat "profiteers."

Jumping brings us naturally to other means of developing velocity. The plot of Mr. Rocklynne's story depends on the use of the recoil of "an old-fashioned six-shooter" to achieve velocities far greater than those of a jump. Looking up "Pistols" in the encyclopedia, I find that a representative six-shooter uses 16 grains of powder to shoot a 150-grain bullet at 798 ft./sec. The recoil of the gases generated is small, so that the momentum imparted to the gun is about that of the bullet, which calculation shows to be approximately 15 lbs./ft./sec. A 150-lb. man would find the recoil of such a shot good for the tremendous velocity of 1/10 ft./sec.! A full clip of six bullets would build up about 0.6 ft./sec.! Our hero could do better by hurling the two-pound gun away. He could throw it about 80 ft./sec. and give himself a full foot per second velocity, nearly twice as much as all the bullets would!

So much for velocities. How are they to be applied? The profiteers suppose at first that jumping directly up will carry them along a diameter of the hollow, but later find that the ground has rotated (the hollow asteroid has a period of 25 hours). Mr. Rocklynne has remembered the rotation in one matter, but forgotten it in another. The equatorial motion of the ground works out to be 22 ft./sec., just about that of our (champion!) jumper. Hence, jumping directly upward, the jumper is carried by the very motion of the ground at an equal speed tangentially, and so does not jump along a diameter at all, but at a speed of about 30 ft./sec. in a direction at 45° to the diameter. Thus, he will cross diagonally across 90° of the equatorial circumference, taking about 4 hours. Meanwhile, his starting point has followed him by about 50°, so that he has gained only 40° all told, which falls well short of the 60° required to reach even the *nearest* man. Incidentally, the jumper would land at 20 ft./sec., vertically with respect to the ground. As the ground rotates just a little faster than our jumper can travel, he can never quite neutralize the tangential motion, and so cannot jump along a diameter. And the gun won't help him much, even if he empties it first, and then throws it!

Another point: the six characters are scattered along 374 miles of circumference, or 62 miles apart. Yet they never fail to jump to within a few feet of each other's positions!

Now I would like to suggest another way of getting about that would avoid such difficulties. Even with magnetic shoes, a man ought to be able to run about as fast as on Earth, considering weightlessness. This is about 30 ft./sec., faster than he can jump. He need only take a few running steps along the equator, and then take off the magnetism. He will continue to move along, scraping ever so gently on the concave surface, with negligible friction. He will make better speed than by any other way of travel available, for his speed is not only higher, but is not subject to loss by ground motion. He also gets to see a lot of the country, and has a chance to correct himself if he wants to by just giving his shoes some juice.

Another matter is the light. In the story, the ground is supposed to be lit by a glow, but after a jumper leaves the surface, the light fades. This is wrong, as the apparent surface brightness of an object does not change with distance, and the light measured at any point changes only if the total area subtended by the bright object changes. Everywhere inside a sphere, an observer is 100% surrounded by the spherical surface, so that the light is exactly the same at any point in the hollow.

Next, we come to the question of food and water. All the killings take place for food and water. Water, perhaps, but in a well-designed suit water need be no problem, for reasons too long to go into here. Food, no. Thirty days is no enormous time to go without food. See records of shipwrecks and hunger strikes. But what about oxygen? That should have been the really important motive. The need for oxygen is well known to SF. addicts, as well as a realization of the relatively enormous quantities of the gas required over a thirty-day period.

So much for the science. But Mr. Rocklynne's psychology is also bad. (Psychology is a science only by courtesy, of which we have little at the moment.) He describes poor Hagerstown as a man without a single virtue. But this same Hagerstown, when his actions are separated from the author's constant anti-Hagerstown propaganda, turns out to have more imagination, enterprise and courage than any of the others. The final survivor, Lemley, was just lucky, and took no risks that were not thrust upon him. Hagerstown got busy right away and went for his men. What if he did stab them in the back? This is mere prudence and tactic well recognized in war. What is a surprise attack but sneaking and back-stabbing? George Washington won the independence of our country largely through a surprise attack on the Hessians on Christmas night, and that was surely a noble victory!

As for the moral guilt of the murders, it should interest readers to know that it is a question whether killing under the impulse of necessity is a crime at all, and it is generally recognized in law that if it is, technically, the convicted prisoner should be given an automatic pardon.

In the famous English case, Regina v. Dudley and Stephens, some shipwrecked men in an open boat killed and ate one of their number. They were rescued soon after, and one, an "honorable man," with moral scruples against cannibalism, informed against the others. They were all (including the "honorable man") convicted of murder, after much discussion and against the beliefs of many famous authorities, but were soon pardoned by the king. As for the "voice," it is certain that he is legally as well as morally responsible for all of the murders, and not only that, he has more than a little of the fiend in him.

This covers the more outstanding errors in

the story. But there is one thing I can't explain so easily, and that is why a story so shot full of errors should have been the most interesting story in a pretty good issue!—Floyd Armstrong, 37 R Street, N. W., Washington, D. C.

—and so does A. M. Phillips!

Dear Mr. Campbell:

By chance I happened to read a copy of Astounding for March, 1940, and, while I am not an addict to this type of fiction, yet it proved a welcome change from the usual fare.

Perhaps I enjoyed "A Chapter from the Beginning" by A. M. Phillps more than any of the rest of the contents, although it bristled with errors that even an amateur should have avoided. They did not prevent my enjoying the yarn as a yarn, but Mr. Phillips could greatly have added to my enjoyment by adding to its accuracy.

The scene of the story must have been laid in North America between the Uinta Eocene and the end of the Miocene. Mr. Phillips gives an excellent word picture of Moropus, a strictly North American form of the Chalicotheres not known to have existed outside the present boundaries of North America, and which could not have been in existence earlier than the lower stages of the Miocene and which is not known to have persisted into the Pliocene. Fragmentary fossils from the lower Pliocene should, perhaps, be assigned to the immigrant genus Macrotherium.

This would seem to fix the date as sometime during the Miocene, and necessarily in North America, but what of the Eiotheres? The latest survival in North America of the Entelodonts was Dinohyus, which has not been found after the lower Miocene, so the time limit cannot be extended after the lower Miocene.

A little earlier in the story Mr. Phillips introduced a representative of the Titanotheres, which are not known to have existed in North America after the Uinta substage of the Oligocene, and while Entelodonts co-existed with the later forms of the Titanotheres, it is certain that Moropus, in the stage of development depicted by Mr. Phillips, had not yet evolved. Ancestral forms were in existence, although they are the rarest of fossils from the Oligocene. No Oligocene horse exceeded a sheep in size. The genus contemporary with the Titanotheres did not exceed a hound in size and was strictly a forest dweller.

The Mastodon, appearing early in the story, can have been only due to author's license, as the earliest known form of mastodon, I believe, is Miomastodon from the Miocene and known only from teeth.

Saber-tooth cats are known from the Oligocene, but to be contemporary with the Titanotheres, they must have been the earliest form of Hoplophoneus, perhaps Dinictis, but certainly no possible form of middle Oligocene saber-tooth could have had teeth nine inches long. Mr. Phillips has confused the early American saber-tooths with the Pleistocene Smilodon, which cannot have been a descendant of the indigenous saber-tooths, which to all appearances died out early in the Miocene.

The most obvious error was the presence of monkeys. No form of monkey has existed since the Eocene in North America, and it is equally certain, as far as the present state of our knowledge extends, that man, as man, did not evolve in the Western Hemisphere.

With one exception, all traces of Pleistocene man in North America and South America show unmistakable affinities to the present Indian stock. He is very late Pleistocene in date.

The one exception that I know of is the Punin skull from the South American Andes, which bears a striking resemblance to Australian native female skulls, so much so that it is difficult to believe that it could be an exceptional individual of another race. The skull belonged to an individual contemporary with the peculiar Andean form of the Pleistocene South American horses, Hyperhippidium.

When the many forms of Tertiary South American marsupials are weighed in evidence, the very intimate resemblance between the Tertiary South American predaceous marsupials and their modern equivalents in Australasia, more than a prima-facie case is made out that the earliest form of man in the Americas will prove to be an early form of Australian aborigine, and Sir Arthur Keith expressed a suspicion that the actual ancestry of the Australian aborigine would prove to be a form not unlike Pithecanthropus.

I believe that a Miocene humanoid form is not an impossibility, but his legs are likely to show greater evolutionary changes at this stage than his brain. The scene of such a possible discovery most probably would be South America, when deposits containing fossils of a forest fauna contemporary with the Miocene plains fauna of the Santa Cruz stages may be discovered.

Another point raising my hackles was the statement that early man walked with bowed knees, using the knuckles of his hands to balance himself. There is no evidence so far recovered that gives ground for such a statement. The earliest form of man, of which the lower limb bones have been found, is Pithecanthropus. He walked as uprightly as you or I. Neanderthal man has been libeled by many an author. He did not, as Manly Wade Wellman asserted, walk on the side of his foot and with bent knees or hips. His posture was as upright as modern man and his lower limbs must have moved in the same way as our own. On an average he had as much, if not more, weight of brain as we have.

The evidence so far existing points to the fact that the upright posture was developed faster than the human brain. Pithecanthropus and his very near relative Sinanthropus were not mental giants, in fact they had the bare minimum of brain to entitle them to be considered human, but in the case of Pithecanthropus he walked as we do. Mr. Phillips' arboreal hero is against nature and I cannot credit him. If he thought, as Mr. Phillips implied he could, to a rational degree, he would not have been able to travel through the trees with speed. His legs and *his arms* would have been too much like our own; cruder, perhaps, but built on the same general lines.

Another point of issue with Mr. Phillips is his statement that early forms of man must have been so antagonistic that two species coexistent in the same area would have beat all their efforts to mutual extermination. Observed and implied trends do not bear him out. Early man must have been too sparsely distributed and too hard put to wrest a bare existence from nature to have wasted any effort in unnecessary combat. Factors, the actual working of which we do not know or comprehend, usually referred to as indirect competition of species, would tend to eliminate the less-advanced types. As an example you have the extinction of the predaceous marsupials of Tertiary South America in the face of the competition of the more efficient and advanced carnivores, immigrant from North America during the late Pliocene and early Pleistocene.

Among human types, you have the diminution in numbers of the Australian aborigine, certainly not caused by physical combat with the whites, and the replacement of the bushman and hottentots of South Africa by the Bantu. In its early stage perhaps by physical force, but certainly during the past thirty years physical force had little if anything to do with the continual loss of ground of these two races.

Human races cross with the slightest pretext. Miscegenation is an artificial creation of education and propaganda. There can be no innate objection in nature against crossing different races of man, or there would be no crosses, to mention extreme cases, between Australian aborigines or Central African pygmies and whites. If there were that innate objection of nature, then the races would not be fertile when crossed.

When two races are crossed, no one can state what characteristic of each parent will be continued through the offspring and its descendants. If Cro-Magnon man crossed with Nean-

derthal man, can we state that Neanderthal genes were dominant and that descendants of such a cross would necessarily retain Neanderthal characteristics? It is my hunch that Neanderthal characteristics would be rapidly bred out of the hybrid descendants. Long heads were at one time predominant through Central Europe. As far as the record goes a small injection of broad (round) headed genes sufficed to eliminate long-headedness as a characteristic of the population of Central Europe.

The proportion of individuals preserved as fossils to the population as a whole is microscopical. Determinable crosses between early species of man must have been proportionately as rare to the total number of both species that existed during the span of existence of the species. It would be a miracle, but what a happy miracle, if the fossil of a hybrid between, for example, Neanderthal and Homo Sapiens had been preserved for posterity.

Taking another family. Dogs will cross, unless physical differences in size prove to make a cross impossible. Does Mr. Phillips believe that the physical differences between early contemporary species of man were greater than present differences between the various breeds of dogs? I doubt it.

Many of my statements will be vigorously denied and disputed. If any of your readers care to cross swords with me, I shall be most delighted to join battle with them. Win or lose, I would greatly enjoy a duel and no doubt I would receive knowledge that I now badly lack.

In spite of my implied criticisms of Mr. Phillips' work, I thoroughly enjoyed his story and I hope to see many more from his pen, even if I am compelled to have at him.—C. J. Gregg, Guatemala City, Guatemala, C. A.

SLIPSTICKERS' DEPARTMENT

Hm-m-m—think they'd get over using gold in a mere century?

Dear Mr. Campbell:

Congratulate Mr. Tarrant for me; I love the "slipsticker" idea, if I don't love his headacher. However, herewith my suggested solution for poor Tobias McDoodle's quandary, plus an additional slipsticker based on Tarrant's problem.

The solution: Tobias McDoodle goes down to the dime store, buying lots and lots of the local brand of silverware, and runs it through his machine. (Tarrant set up his problem with the suggestion that McDoodle had already run a plaster statue through, turning it to gold, thus suggesting that the machine has the improbable power of altering atoms without altering their mutual configurations—transmutation en masse, so we'll use that.) From the dime-store ware he produces solid silver service. This he puts in a burlap bag with a lot of sand (to scratch it up) and some sulphur (to tarnish it) and shakes it vigorously for a while.

Obtaining from the sale of this "old family silver" a sufficient supply of cash, he buys a car and trailer, and proceeds, with his machine, to Colorado, to the well-known uranium ore beds. Here, with the aid of his young lawyer friend —who is quite willing to forgo his bar examinations on the basis of better prospects in the less crowded occupation of transmutation engineer—he sets up his plant.

McDoodle, you understand, has made a very important discovery. He has a way of extracting radium from uranium ore by a new and much simpler process, recovering, in fact, the theoretical maximum from the ore supply. It's remarkably efficient, of course, a process that interests the Belgian government with their tight-fisted radium ex-monopoly, and the Canadian mining syndicate that chiseled the ex into the Belgian monopoly. But there's a well-established rule that a man has a right to a secret industrial process, so, though they may try a little gentle spying, and perhaps a bit of bribery, they aren't very much worked up. After all, there's a limit to the amount of radium McDoodle Radium Processing, Inc., can produce from their hand-worked ore.

It isn't till about a year later, when, possessed of a fortune of about two million dollars, McDoodle puts through his patent, that the price of metallic radium, one hundred percent pure, drops to five dollars a ton, F. O. B. Denver.

Of course he might accumulate a bit more "old family silver" and move down to South America, and go into the business of refining platinum metals. The nuggets found always consist of a most horribly intractable mixture that won't dissolve in any acid going—including aqua regia—and make separation a difficult and laborious process. The McDoodle Platinum-separation Process would be highly profitable.

Now as to my own pet slipsticker: I think Tarrant's suggestion that a transmuter will turn out solid hunks of transmuted elements—transmuting a plaster statuette to a solid gold statuette, for instance—highly improbable. Any process so supernally violent as to shatter atoms and put them back together in a different form is going to destroy any physical molding.

Suppose that the McDoodle Transmuter has been on the market for about one hundred years. (That's so people will have had time to get over the passion for solid-gold bedsteads and solid-platinum, two-ton radio cabinets.) Further, the transmuters actually produce from any substance, any desired element, one hundred percent pure, in its natural physical state at room temperature with the condition that, if it's a solid, it's in the form of a coarse dust, about like fine beach sand in physical texture.

Now, under these conditions, when any element whatsoever, due to the fact that it can be made from any local material whatever, the price of all elements will be about the same per ton, and that would be, let's say somewhat arbitrarily, about five dollars a ton—about a third the present price of iron, about twice the price of coal. (After all, the machines and technicians to run them will cost something.) Hydrogen, oxygen, et cetera, will be somewhat more expensive save at the converter-mouth, due to difficulties of storage and handling. Fluorine will be quite expensive, because of its dangerous properties and difficult handling. Fluorine, in fact, has the nasty habit of chemically attacking the converters themselves.

But all metals have the same price, in the form of the raw but pure element.

Now, what will the following common items be made of:

A frying pan.
A monkey wrench.
A bridge lamp standard.
An ordinary desk lamp.
A filing cabinet.
An airplane fuselage.
A table knife, fork and spoon.
A kitchen stirring spoon.
A saucepan.

The frying pan will not be made out of platinum. It would weigh about thirty pounds if it were, and women don't appreciate thirty-pound kitchen utensils. Platinum has a density of about twenty-one against iron's six. The monkey wrench would not be made out of hard, strong, tough tungsten. Try working a metal that melts at 3600°C. (We'll have to assume, purely arbitrarily, that the science of metallurgy has, quite impossibly, stood completely still. If we don't, however, we can't talk at all. But I'd bet that tungsten still wouldn't be popular!)

The bridge lamp wouldn't be made of gold, because pure gold is so soft it would slump under its own weight, like a trick rubber lamp. It might be an alloy of gold. But it wouldn't be silver, because that tarnishes.

Remembering tarnishability, eye-appeal, workability, brittleness, hardness, toughness, density and anything else you can think of— Slipstickers, slip away!—Arthur McCann, 761 Scotland Road, Orange, N. J.

HOT FILAMENT

By Arthur McCann

A discussion of immense interest to science-fiction; recent analysis of the theories of the formation of planets shows that none so far proposed satisfies all necessary conditions. Therefore astronomers can give no estimate whatever of the possible number of planets in our galaxy!

The astronomers are gazing sadly at the latest collection of ruins. Their bitterness is, this time, somewhat greater than it has been before, perhaps, because this collection of ruins is both larger and more intricately fashioned—and smashed—but into the bargain, it has not been destroyed as were the previous heaps of ruins on this particular junk pile. (Labeled *On the Origin of the Planets.*) About a dozen previous layers of ruins were contributed by the new structures that replaced them. This one was simply scrapped without replacement.

Astronomers are, in consequence, looking for a new theory rather bewilderedly, because they don't have any idea at all where to start. It happened this way:

On the bottom of the junk heap is a thin layer of dust consisting of the remnants of various gods and goddesses, who for many, many years satisfied all Man's insatiable curiosity very nicely. They originally bore the inscriptions "Mercury," "Venus," "Mars," et cetera.

Immediately above them is a layer of badly broken and rusted Nebular Hypothesis wreckage. Laplace made it; angular momentum smashed it. Laplace assumed that, once, the Sun had been an immense, immensely tenuous ball of gas large enough to fill the orbit of Neptune. Gradually, this vast globe of gas contracted, and, as it contracted, spun more and more rapidly on its axis—which is characteristic of a shrinking, rotating globe. The more rapid rotation gradually, he believed, threw off material from the equatorial zone as centrifugal force overcame gravity. This material was gradually swept up upon itself to form Neptune. Again the Sun shrank, rotated more rapidly. A new crisis of instability led to throwing off another ring of matter, later to form a new planet—Uranus. In turn, Saturn, Jupiter, and the other planets were formed—

Angular momentum smashed it, because the planets, combined, represent less than one percent of the matter of the Solar System—but have ninety-eight percent of the rotational momentum of the whole system! It is utterly impossible for such a terrific concentration of rotational momentum to build up in such a system as Laplace suggested. (After Angular Momentum killed it, Distribution of Mass buried it. The rings of ejected matter required by this successive sloughing of the equatorial zone would remain rings—rings of asteroids, and not planets. They wouldn't collect into lumps. Witness Saturn's rings.)

The next major casualty was the Collision Hypothesis. This assumed that our Sun was struck, or very nearly struck, by an invading star, a wild wanderer that passed very close, drawing out a vast filament of matter from the Sun as it retreated again. The immense gravitational strain of the close passing, swinging stars stirred up vast tidal strains, tore loose immense masses of flaming gas, and strung them out across space between the stars in a twisted strand of incandescent gas. As the invader finally retreated into the depths of space, the filament broke up into beads—planets—and settled into rotation about the Sun.

The invading Sun here contributed the momentum, and accounted for the immensely greater concentration of momentum in the planets.

The same fault licked the theory, however; *angular* momentum. The invader had momentum and to spare to contribute to the filament of gas, and hence to the planets—but it was all, or very nearly all in a straight line away from the Sun. The planets don't move straight away from the Sun—they move parallel to its surface, and hence circle in stable orbits. An invader nearly colliding with the Sun could make plenty of comets, with their immensely long, looping orbits, but could not make a planetary orbit.

The straight collision theory was wrecked, and replaced by the Lyttleton Binary Collision theory. Evidently there was a tremendous amount of matter—at least enough to make all the planets—in rotation about the Sun, out of which the planets were made. This suggests a binary star—that, originally, the Sun was one partner of a double star, and that the planets were *not* formed of matter torn from the Sun, but of matter from the other, now vanished companion. Matter ejected from that other star would be al-

ready in rotation about the Sun. All that would then be needed would be some force capable of breaking the stupendous mutual grip of two suns on each other. The magnitude of that binding gravitational grip suggests at once the only thing in space capable of the feat—another, perhaps more massive star.

If a binary system were invaded by a wandering, very massive star, and the wanderer passed within a million miles of one of the pair, the stupendous strains of those vast gravities would certainly tear out a vast filament of matter, splatter searingly incandescent gas for billions of miles. The invader and the one star of the binary system would —if angles, velocities, densities and masses were right—retreat from the second member of the binary system, straining at each other savagely, probably separating from each other in the end. Behind, they'd leave the wreckage still rotating about the deserted partner.

Now: An invading star could have the necessary grip to yank loose one member of a binary system. It could strew wreckage behind it, wreckage possessing the angular momentum to form planetary orbits about the surviving member of the binary system. It could have momentum enough—straight-line momentum now—to pull itself and the second member of the binary system out of the way forever.

But the conditions are critical. Not just any invader, from any angle, will do. And the passage must be very close to the one star. The binary system itself must be a close binary, not one of those systems where two stars hundreds of billions of miles apart rotate very, very slowly about each other.

Still, however stringent the conditions, however improbable the happenings, so long as it's possible, it's

acceptable because, fundamentally, we *do* exist, there *is* a planetary system here. Thirteen spades is an unusual sort of bridge hand, but it does happen.

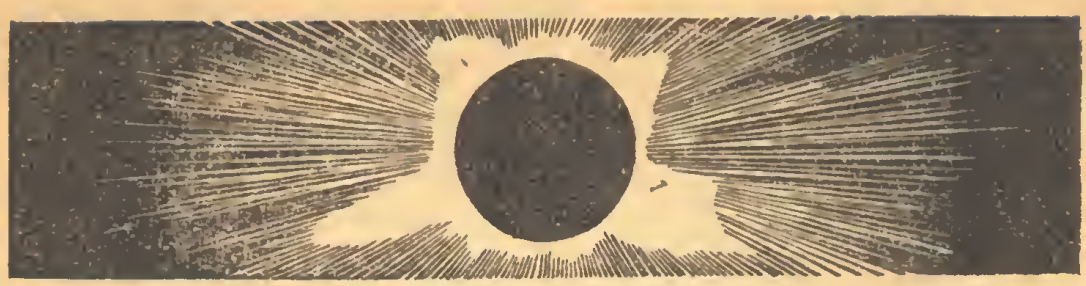
And that theory satisfied every dynamical consideration, both of total angular momentum, distribution of angular momentum, angular momentum per ton, and distribution of planetary mass.

And that is the one the astronomer's are mourning about at present. It's fairly apparent that, the nearer you approach to accuracy, the more mathematical analysis can be applied to the problem. The binary system collision hypothesis withstood dynamical analysis—the first to do so.

Astronomers then advanced to the next point for analysis; the thermal and radiation effects.

The planets did not come from the upper layers of the stars involved. They couldn't, because the upper layers of a Sun are too tenuous a gas. If Jupiter's mass were placed on the Sun, and evenly distributed over its surface, that one planet's matter would form a layer so deep that the pressure at the bottom would amount to around eight hundred thousand atmospheres. The average pressure to which the matter would be subjected would be about half of that. Adding in Saturn, Uranus, Neptune, and the Earth, plus Jupiter's moons, would make the pressure even more terrific.

Definitely, while the planets didn't come from the heart of a star, they didn't come from the surface, exactly, either. At the levels they must have come from, the temperature is high. At the surface of the Sun—the photosphere layer that supplies the light and heat we receive—the temperature is high enough to make solid tungsten ex-



plode into gas as violently as ice thrown into molten iron.

The exact temperature to be expected at the depths from which the planets must have come depends on the opacity of gaseous matter at those temperatures. The conditions cannot be approximated in terrestrial laboratories for obvious reasons. Mathematical work can make guesses at the results, however, based on knowledge of atomic structure and the studies of radioactive particles (which act like particles of matter at enormously high temperatures). The results will vary as the assumptions made by the mathematician vary.

THERE IS unanimity on one aspect, however; that matter is *hot*. It is hot beyond the meaning of heat. The atoms composing it are not merely agitated; they're stripped by the frightful battering to their inner shells of electrons. The center of an electric arc is, of course, cold. The violence of exploding TNT is so gentle as to be a vacuous nothing into which such matter would collapse. An atmosphere of constant, continuous, all-over lightning bolts of maximum intensity would perhaps represent the outer, cold layers of the Sun.

Obviously, since we haven't any approach to physical understanding of those conditions, we can only handle them mathematically. The gas is hot, down there, and, because the atoms have been crushed out of their shells of electrons, and the electrons are flying about free, but avidly seeking union with one of those atomic nuclei, the gas is also rather opaque. Radiation can't penetrate it far or easily.

Since withdrawal of some of the heat means a slight easing of the frightful battering the atoms are subjected to, it means an easing that permits some of the electrons that have been knocked free to take hold of an atomic nucleus again. In doing so, they release energy, which helps to maintain the temperature.

Of such is the matter the collision theory of planetary origin—simple, or binary collision theory—requires. That stuff must be torn loose and exposed to space to make planets.

Driven by the frightful pressures, plus those temperatures for which our scale of thought is not designed, the matter so torn out would expand. The filament of matter that would stretch from the invader to the star it had collided with, or nearly collided with, would be in an impossible, unstable condition. It would tend to expand for relief of pressure, cooling in consequence. There will be a mad race between two factors: that expansion against the gravitational attraction of the filament's own mass—remember that that mass is to be more than enough to make the planets—and the cooling to solidify or liquefy the constituents of the filament.

The space about the Sun is clear.

It isn't hazed by a vast gas cloud, such as might result from evaporated parts of that filament that escaped and formed a five-billion-mile deep haze about the Sun. If a mass of matter equal to that of the planets had been evaporated into space about the Sun, the hazing would be extremely brilliant—as brilliant as our own Earth sky.

Therefore, if that filament even existed, it must have been solidified before more than a small fraction of its mass evaporated away.

No matter how conservative you make your mathematics for radiation opacity of that filament, or how extreme you make the grip it would have on its gaseous, expanding substance, the calculations show that within three months of its formation, the filament would have vanished in expanding, hopelessly swift-moving gas that could never be pulled back by its own gravity. Radiation cooling would require at least a year.

The expansion and dissipation of the gas filament would win the race hands down.

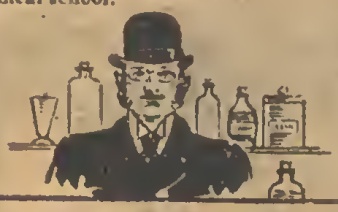
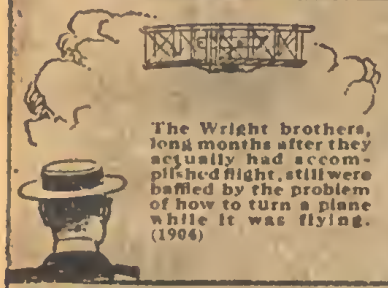
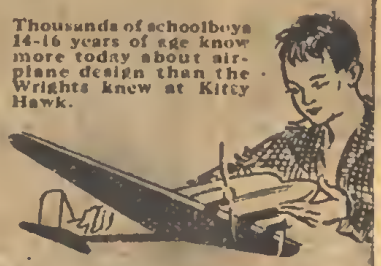
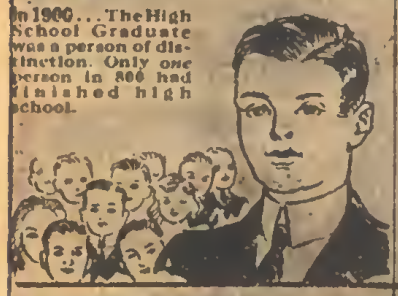
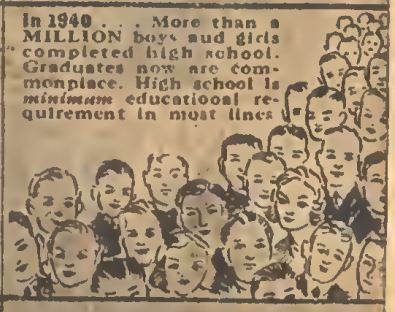
Dynamically, the binary collision hypothesis satisfies all necessary requirements.

Thermal considerations just as important rule it out hopelessly.

And worse is the fact that it equally rules out practically all suggested modifications of the collision theory.

Promotion Begins at Home

If you are an average grade school graduate, the average man with High School training earns $16.30 a week MORE than you.

YESTERDAY—	TODAY—
In 1900 . . . Many doctors then practicing were not even high school graduates. High School had not been required at the time they entered medical school. 	 In 1940 . . Schools of nursing require high school graduation because most of them are conducted at *college* level. Progress has made modern nurses' training equal or superior to that available to many old time doctors.
 The Wright brothers, long months after they actually had accomplished flight, still were baffled by the problem of how to turn a plane while it was flying. (1904)	Thousands of schoolboys 14-16 years of age know more today about airplane design than the Wrights knew at Kitty Hawk. 
In 1900 . . . The High School Graduate was a person of distinction. Only *one* person in 800 had finished high school. 	In 1940 . . . More than a MILLION boys and girls completed high school. Graduates now are commonplace. High school is *minimum* educational requirement in most lines 
In 1900 . . . Very few even thought of going to college, unless to enter one of "the learned professions." The number of college graduates in business and industry was so few that they formed practically NO COMPETITION in the average job. 	In 1940 . . Almost exactly as many are being graduated from college, today, as from high school 40 years ago. Everywhere—in everything you do—in commerce, industry, personal affairs, you are up against the competition of COLLEGE GRADUATES. 
In 1900 . . . The "little red schoolhouse" did a pretty fair job of equipping men and women to make their way in the world. 	

To Get Ahead Today You MUST Finish High School

Alice in Wonderland learned: *"You must run as fast as you can in order to stay where you are. To get anywhere, you must run TWICE that fast."*

Your own life, today, is like that. During the day, you must try as hard as you can—as well as you can—in order to be sure of holding what you already have. To get anywhere in commerce, industry or socially—to win a better job—bigger pay—greater success in your social activities—you must make EXTRA effort in your SPARE time to meet the competition of better educated people.

Do you want

→ **.. to go to College?**

→ **.. or to enter a Profession?**

(Such as Accounting, Architecture, Nursing, Dentistry, Teaching, Social Work, Osteopathy, Beauty Culture, Optometry, Embalming, Chiropody, Law, Medicine, etc.)

→ **.. or get an Office Position?**

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- ☐ Accounting and Auditing
- ☐ Architecture and Building
- ☐ Automotive Engineering
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