ASTOUNDING

SCIENCE-FICTION

A STREET & SMITH PUBLICATION

20¢

JAN. 1940

NEUTRAL VESSEL, by Harl Vincent

Better start gargling with Listerine, Mister!

WHEN you've got the sniffles, a chill, and your throat feels irritated, it's a sign that germs are probably at work in mouth and throat.

Sometimes they can be killed in sufficient numbers or kept under control so that Nature can halt the infection . . . throw off the cold.

If you have any symptoms of trouble, start gargling with full strength Listerine Antiseptic and keep it up. Countless people say it's a wonderful first aid and 8 years of scientific research back them up. Tests during this period actually showed fewer and milder colds for Listerine Antiseptic users . . . fewer sore throats, too.

Listerine Antiseptic reaches way back on throat surfaces to kill millions of the secondary invaders—germs that many authorities say help to complicate a cold and make it so troublesome.

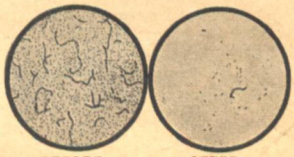
Actual tests showed germ reductions on mouth and throat surfaces ranging to 96.7% even 15 minutes after the Listerine Antiseptic gargle. Up to 80% one hour later.

In view of this evidence, don't you think it is a wise precaution to use Listerine Antiseptic systematically during fall, winter, and spring months when colds are a constant menace to the health of the entire family?

Lambert Pharmacal Co., *St. Louis, Mo.*

FOR COLDS AND SORE THROAT

NOTE HOW LISTERINE GARGLE REDUCED GERMS!



The two drawings at left illustrate height of range in germ reductions on mouth and throat surfaces in test cases before and after gargling Listerine Antiseptic. Fifteen minutes after gargling, germ reductions up to 96.7% were noted; and even one hour after, germs were still reduced as much as 80%.

152/EKB

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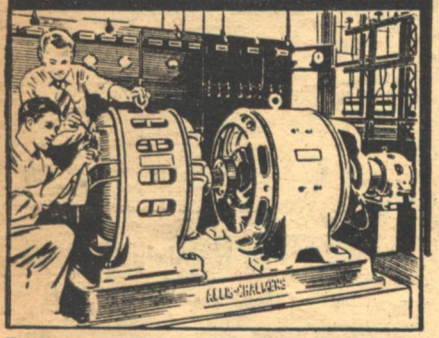
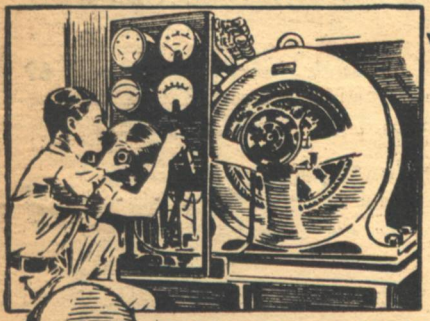


First you are told and shown what to do and how to do it. Then you do it yourself.



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AST—1

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CONTENTS JANUARY, 1940 VOL. XXIV NO. 5

Illustrations by M. Isip, R. Isip, Koll and Schneeman

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16

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INCONSEQUENTIAL DETAIL

Science-fiction deals with invention and progress, and loud is the call for great and sweeping ideas. But it is, in the land of present reality, remarkably difficult to distinguish between a "great invention" and an "improvement in inconsequential detail." The immediate reaction to that statement is probably a vociferous disbelief. Does sound slightly screwy, doesn't it? It's a painful fact, however—painful for those fellows who make a minor improvement, just a slight change in detail, that turns a one-percent efficient and wholly uneconomic "great idea" into a ninety-percent efficient and useful device. Sometimes the man who makes it work gets the credit; generally he doesn't. Edison was lucky, in this respect, and Nernst correspondingly unlucky. Nernst produced an incandescent electric light that was considerably more efficient than Edison's carbon-filament bulb.

Unfortunately, Nernst lamps required a rather delicate thermo-relay and a platinum pre-heater coil, and ran at a temperature that slowly but surely evaporated away the platinum. (Incidentally, if they'd persisted to modern times, broadcast radio wouldn't have come into existence. Each little incandescent rod would have been the source of a wonderful howl of static.)

Still this subtle art of differentiating between a minor change of design, intended to squeeze an infringing patent through the Patent Office, and a major, revolutionary development would not, on the surface, seem to require much insight into the intricacies of science. If Inventor A patents a cooling tube with disk-shaped fins for dissipating heat, and Inventor B tries to patent a cooling tube with disk-shaped fins for dissipating heat, the latter fins differing somewhat in shape and number, Inventor B is, obviously, a bare-faced chiseler.

Only, it happens, he isn't. Inventor B has, in fact, made a vital and revolutionary invention. In this case, it applies to the cylinder of an air-cooled airplane engine, and that small change in shape and placement of air-cooling fins is one of the year's major inventions. It boosted the power of the largest engines from twenty-four hundred horsepower to thirty-six hundred horsepower—made possible an entirely new understanding and system of design for aircraft engines.

The NACA, at the same time it announced that new engine, announced a new type of aircraft wing. It differs minutely in the exact curve employed, the cross-section has a slightly different shape. The combination, they stated, would make possible ships of five hundred miles per hour and better.

Two more inconsequential details. A slight increase in speed—from about four hundred seventy to, say, five hundred ten miles per hour—and the difference in wing-curve imperceptible to the untrained eye. The trick is hidden therein: the properties of air change abruptly and violently at about five hundred miles per hour. The normal "streamline" forms signally and abruptly fail to give smooth airflow above that critical speed, the usual wing refuses to lift, and instead of slipping through the air starts trying to blast a path.

The announcement that planes of speed greater than five hundred miles per hour are now possible, because of a slightly different wing-shape, means that a second major and revolutionary discovery has been perfected.

Yet each of these two first-order inventions differs so slightly in appearance from its predecessors as to be almost indistinguishable to the unspecialized eye. They represent not mere improvements; they are the practical application of newly discovered fundamental principles.

This situation is an invitation—and has been for years—for patent-law trouble, this seemingly minor physical difference between two things that involve, actually, radically different principles. Great ideas hidden behind a mask of inconsequential difference make it nearly impossible for a court to determine where, in refusing a patent to one seemingly slight improvement, and granting one on another slight physical difference, they are to draw the line.

But, perhaps, it might equally be an invitation for stories. Great ideas make stories—but great ideas aren't always vastly different in appearance and seeming than their minor predecessors.

One final inconsequential detail we should like to point out. Arthur McCann's filler, on page 154, is an obvious and evident invitation for stories. As he rightly says, science-fiction proposes, time and again, the discovery of some miraculous new metal on a strange planet, the synthesis of super-normal metal atoms, and similar expedients to attain the super-metal. From present science knowledge, it appears that what we want is not a "great discovery," but another "minor invention." We need a new way of heat-treating or tempering metals we already have, for that atom-to-atom strength lies in copper and aluminum as well as in steel.

Many small steps that way have already been taken. The recently discovered austempering process which makes possible a steel so hard it cuts glass that is yet so tough a file made of it can be bent double without cracking, is an instance.

It isn't alone new ideas we need; we need, too, to make the ones we have work better.

THE EDITOR.

I Trained These Men

Chief Operator Broadcasting Station

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator."
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Radio broadcasting stations employ engineers, operators, technicians. Radio manufacturers employ testers, inspectors, foremen, servicemen in good-pay jobs. Radio jobbers, dealers, employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make $30, $40, $50 a week. Others hold their regular jobs and make $5 to $10 a week fixing Radios in spare time. Automobile, police, aviation, Commercial Radio; loudspeaker systems, electronic devices are other fields offering opportunities for which N.R.I. gives the required knowledge of Radio. Television promises to open good jobs soon.

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The day you enroll, I start sending you Extra Money Job Sheets which start showing you how to do Radio repair jobs. Throughout your Course I send plans and directions which have helped many make $200 to $500 a year in spare time while learning. I send special Radio equipment to conduct experiments and build circuits. This 50-50 training method makes learning at home interesting, fascinating, practical. I ALSO GIVE YOU A MODERN, PROFESSIONAL, ALL-WAVE, ALL-PURPOSE SET SERVICING INSTRUMENT to help you make money fixing Radios while learning and equip you for full time work after you graduate.

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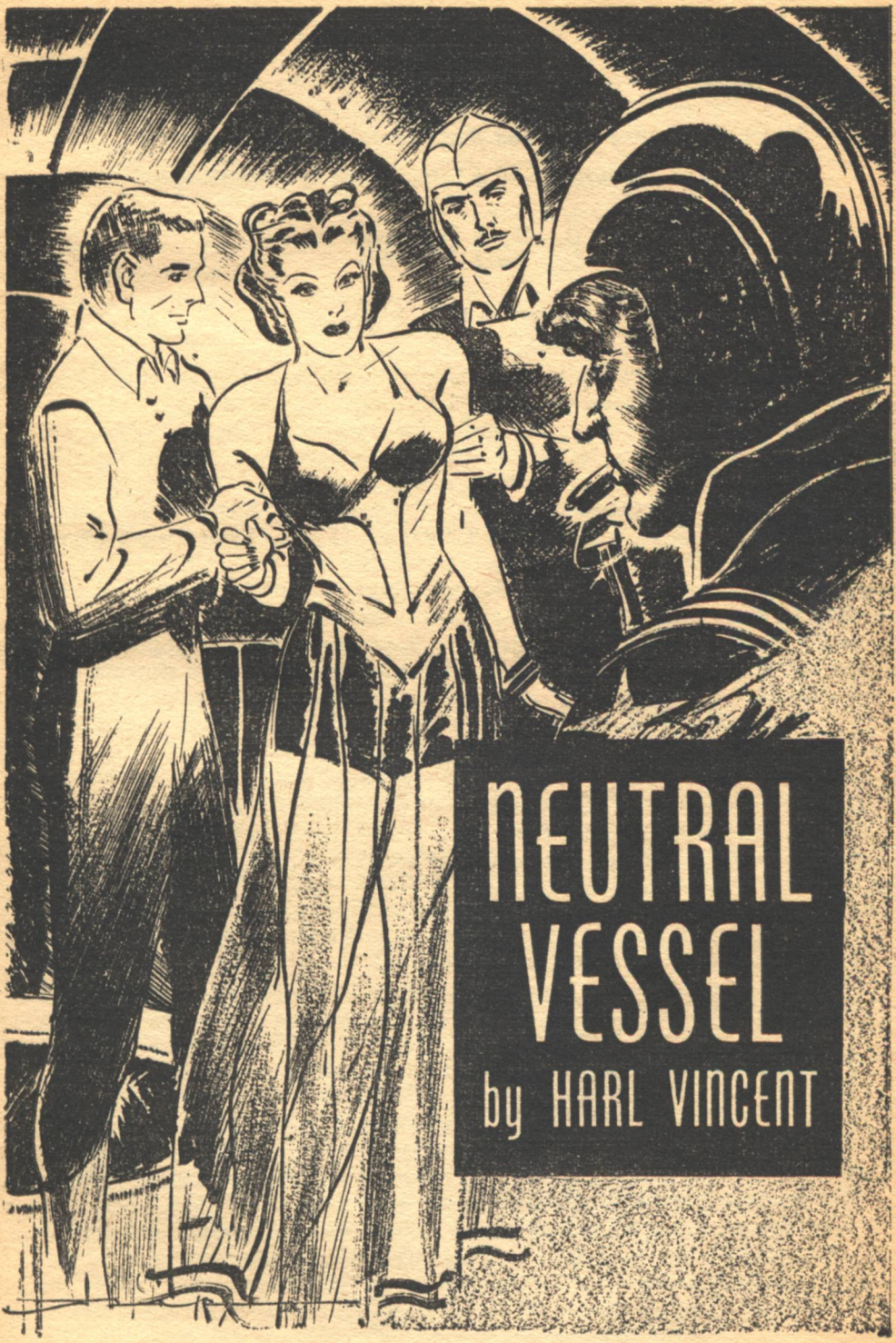


NEUTRAL VESSEL

by HARL VINCENT

NEUTRAL VESSEL

In interplanetary war, you don't merely attack a neutral vessel—you can turn it into a helpless but terrible weapon!

By Harl Vincent

Illustrated by R. Isip

In the captive military observation sphere a hundred miles above the outer cloud layer of Venus, Tommy Blake idly punched a location spot on the calculating board. He was not greatly impressed by the alarm indication of this body's approach. Seven million miles it was off, at the limit of the sensitive magnetic pickup system. From its direction, it could hardly be a Martian battle fleet and, even if it were, they would be several days getting here. Plenty of time.

His next check on the object gave him pause. It was an hour later when he glanced casually at the distance-indicator spot which marked it. It read 5,200,000 miles! An impossible figure. Nothing in the Solar System could travel nearly two million miles in an hour.

"Hey, Masters," he called across the room. "Come over here and tell me if I'm screwy."

"I don't have to come over to tell you that," his pal grinned. But he crossed to the instrument board.

"Look here," Blake said excitedly. "See this approach-warning dot? I get an incredible reading on its velocity. Check me, will you?"

"Did you put the spectroscope on it?"

"Sure, but it's too small and too far off No lines. Now, be a good guy and hold the stop watch while I punch the calculator. Give me ten-second intervals." Blake squinted purposefully into the vernier, his fingers on the keyboard.

Barney Masters laughed. "Man, you won't need intervals that close for *anything* that moves."

"Never mind." Blake was frowningly serious. "I will if this thing's traveling as fast as I think. I'm setting the calculator for serial subtraction, so yelp out the times."

A pause; Masters eying his stop watch. Then, "Now!" he sang out.

The calculator chuckled and clunked. And at each "now" for two solid minutes the machine did likewise.

"Enough," announced Blake, tearing out the printed tape.

Together they gazed at the figures; in unison they whistled their wonderment. 5,090,005 — 5,084,355 — 5,078,705 — 5,073,054—and so ran the series down to an end figure of 5,022,181 in miles distant.

Masters' eyes goggled. Blake grabbed his slide rule and pencil. "67,824 miles in two minutes!" he gasped. "565 miles a second average. See for yourself."

Masters saw for himself. He was checking it by long division. "565.2," he corrected. "And the differences are progressively slightly greater. Wonder what that means?"

Blake stared, checking back rapidly in his mind to the average of 500 miles a second for the first hour. "Why," he husked, "it means the thing's *accelerating*. The slide and indicator of his rule

moved swiftly. "At about 160 feet per second. Five Earth gravities."

"Meteors don't accelerate," Masters remarked thoughtfully. "Nor comets, nor anything—"

"Excepting spaceships," Blake finished for him. "And neither comet nor spaceship ever went this fast."

"Whatever it is, it's coming this way," Masters said gloomily.

"Approximately, anyway. But there isn't a chance in a million of it hitting us. Not ten million." Blake was struck with a sudden new thought. "Sa-ay!" he snorted. "We're fools to believe this —it just isn't possible. I'll bet our base line, for the automatic triangulator, is haywire. The other sphere may be down or out of whack. We'll check up with headquarters. Have to report, anyway."

Staring at one another with a mixture of hope, awe and incredulity on their lean young faces, the two Terrestro-Venusian military observers made for the radio room. They couldn't possibly know that some five hours previously, out in space—

CAPTAIN JEFFERY BRAND had an uneasy feeling.

It wasn't as if the *Spirit of Terra* had anything to fear in the Earth-Venus space lane. The mightiest liner of the skies, though nearly new, she was tried and proven by her nine previous jaunts across the void. She was unarmed and carried no contraband. Her repulsor screens were of ample capacity to ward off any stray mines of either combatant she might encounter. She carried proudly the insignia of Earth, which planet had been steadfastly neutral through the two years of bitter warfare between Mars and Venus. Under the terms of treaties never yet dishonored, she was guaranteed freedom from search or attack in space, and safe entry at the designated unblockaded ports. Still the captain was uneasy.

Brand was not superstitious. He had no fear of anything in an atmosphere or in the far-flung reaches of the heavens. Perhaps his dinner hadn't agreed with him. Maybe he had never gotten quite used to these ultramodern liners in which every major mechanism was automatic, bridge-controlled. He'd come up through the ranks. He'd been a yard mechanic, rocket man, conditioning engineer, chartman, control operator, and skipper of a slow lunar freight. First taking orders, later giving them. Accustomed for more than twelve years to a full-crew ship, he'd rather bark his orders at a man than at a machine—even though the machine was likely to be more reliable. You began to feel like a damn machine yourself.

His eyes swept the thirty-foot curve of the bridge control board. Four men, spaced along its length, their fingers twinkling over a maze of controls, their eyes alert to the flickering on and off of varicolored lights before them, were all that were required for the operation of every mechanical detail of the thousand-foot, eighty-thousand-ton ship! Of course, there was the maintenance crew. The purser and his staff. Cargo wranglers and an army of deckhands. Hundreds in galleys, dining saloons, cabin service—all coming under the head steward. But of old-time, hard-bitten spacemen like himself, there were none. Even his first officer, Gary Carlin, had never seen service on a full-crew ship.

Brand paced the bridge, along the desk rim of the control board, a thing he rarely did. The men's eyes never left their instruments and lights, nor their fingers the buttons and jacks and levers, as he passed; but he knew his disquietude was affecting them. Fortunately, he'd soon be relieved by Carlin.

He paused at the position-indicating panel. They were just under ten million miles from Venus and approaching it at the normal coasting rate of 27.6 miles per second. A little over four

days yet remained of their journey. And Brand would be glad when it was completed.

He was glad now when Carlin came in. The mate was always wearing a grin, a cheerfully boyish sort of smile. He wore it now.

"Fellow to see you, sir," he told the captain. "Waiting in your lounge. One of the passengers."

Brand arched black brows. "Complaint?"

"He didn't say. Looks harmless enough, though. Venusian, I'd say, or Venuso-Terrestrian." Young Carlin looked up at the chronometer. "Ready to give over, sir?" he asked.

Brand's eyes roved enviously over the younger man's trim, sinewy form as set off by his perfectly fitted uniform. His own square bulk, he was painfully aware, was better suited to the rigors and scanty garb of a foundry than to the gold-braided scarlet and a drawing room.

"Yes," he sighed, "I'm ready, Mr. Carlin. And, as usual, there are no instructions." He waved a knotty hand toward the control board. "It's all done for us automatically. Done in wriggling red and blue and green lines that ink themselves on the charts."

Gary Carlin had better sense than to expand his grin. "Yes, sir," he said respectfully.

THE APPEARANCE of Brand's visitor justified Carlin's estimate. A scrawny little man with washed-out eyes and parchment skin drawn tight over high cheekbones. His greeting was mildly apologetic.

"What can I do for you?" the captain boomed genially.

His caller bowed in almost servile manner. "I am greatly honored, captain, that you receive me. I am Leander Phillips of London. And I have some information I believe will interest you."

Surprised, Brand offered the man a cigar, bit the end off his own. "Name's Phillips?" he said. "I should have thought you were Venusian."

"Only on the maternal side, captain. Father was pure Terrestrain. But that is neither here nor there, sir. Excepting that my sympathies are naturally with Venus in, shall I say, the present unpleasantness?"

Brand repressed a chuckle at the little man's seriousness and verbiage. "That's not surprising, Mr. Phillips," he conceded. "Many Earthmen are sympathizers on one side or the other. I try to be strictly neutral. But I repeat, sir: what can I do for you?"

The Venusian sympathizer looked around nervously. "There are Martian spies aboard," he said with owlish solemnity.

The captain laughed reassuringly. "I shouldn't be surprised. Probably Venusian spies as well. We can't help that. Why worry about it? This is neutral territory, just the same as London."

"I know that, sir." Leander Phillips was tensely serious. "In general, I believe this causes you no concern. In this case, however, I'm convinced it should be of grave concern to you."

The man's earnestness impressed Brand. "Let's not beat about the bush," he suggested. "Just what have you to tell me?"

Phillips furtively withdrew a paper from his pocket, passing it to the captain as if it were red-hot to his touch. "First off, sir," he whispered, "I beg of you to look this over and conceal it at once."

Brand's skin crawled as he saw the meticulously drawn sketch on the paper. It was an accurate circuit diagram of the *Spirit of Terra!* Hastily he pocketed it. "Where'd you get this?" he asked soberly.

"They were discussing it, sir, at my table. One dropped it later. And I'm quite a bit frightened, sir, for my daughter's sake. She is with me, you know. That is one favor I came to ask: would

it be possible to have our table changed for the remainder of the voyage—Zona's and mine?"

Brand frowned, thinking of his previous uneasiness. "Can you point out the ones you think are spies?" he demanded in his abrupt way.

Leander Phillips jumped a foot, then smiled sheepishly. "I can, sir, and will, of course," he quavered.

The captain jabbed at a button and bawled into the audio frame on his desk: "Tell Mr. Worthman two more passengers at my table, starting with supper this period. Leander Phillips and his daughter, Zona. That's all."

Every passenger knew that Worthman was head steward. The little Venuso-Terrestrian bowed himself out, smiling relievedly, leaving the captain to sit scowling perplexedly in a haze of cigar smoke.

WITHOUT knowing why, Brand stirred himself in a few minutes and went into his private quarters, where he instructed his cabin boy to lay out his most impressive finery. He knew why, a moment later, when he returned to his lounge and beheld the vision. If ever he wished he were twenty years younger, it was then. A girl-vision, it was, tall and slim and auburn-haired, with features and a figure that would have made the greatest artist forget his art. The girl's lips were tremulous and her eyes wide.

"I'm Zona Phillips," she said breathlessly. "Has . . . has my father been here?"

"Why, yes, my dear," said Brand, blissfully unconscious of what was an intrusion. "He left only a few minutes ago."

The girl wrung her tapered fingers. "Oh, Captain Brand!" she wailed. "I'm afraid. I . . . I just know something's happened."

"Now, now—" the captain started to soothe her. But he forgot what words of comfort had been on his lips in a sudden sensation that comes only to an old-time spaceman. A rush of emptiness inside him.

The *Spirit of Terra* had leaped into sudden acceleration! To the girl, to any passenger aboard the giant liner, this would be unnoticeable—the internal gravity compensators took care of that instantly. But you couldn't fool an old-timer like Brand.

Zona Phillips was becoming frantic when the audio frame on his desk bellowed in Carlin's familiar accents: "All stern motors and steering jets blasting full, captain. Controls not functioning. Your instructions, sir."

Brand sputtered. This was an unheard-of eventuality. But just like these newfangled contraptions to let you down at exactly the wrong time. "Coming!" he barked at the frame. "Be right with you."

"I . . . I'm sorry, captain." The girl's eyes were starry with tears about to come. "I . . . I didn't mean to interrupt. "But, my father—"

The reason for her presence had slipped Brand's mind. "Yes, yes," he said hastily. "Come along, Miss Zona, and tell me about it on the way. I have to be on the bridge immediately."

Trotting at his side, she said: "I can wait till you've finished with that, captain." But her voice sounded dead, hopeless.

And well it might. Rounding a corner of the corridor, they almost fell over the body of Leander Phillips, which was slumping grotesquely to the floor. The acrid smell of burned flesh was in the air. His head was almost blasted from his shoulders. The girl screamed and flopped at his side just as Brand leaped after the big figure he saw scuttling off. Her scream had warned the fugitive and he turned like an animal at bay, whipping up a stubby flame thrower. A fleeting instant showed Brand bloodshot eyes, twisted mouth,

the most malignant face he'd ever seen. Then, as white flame crackled past his ear, singeing his hair odorously, he launched his big bulk into a flying tackle.

His arms enwrapped struggling legs; his square battering-ram of a shoulder hit just right. The fellow went down like a toppling chimney, smacking into a floor grating with a crunch of finality. But Brand made sure with the butt of the fellow's own weapon. Kicking him over, he saw that he was a Terrestro-Martian. Phillips' suspicions had been well founded but his visit too late.

Returning, Brand found that the girl Zona had fainted over her father's body. He picked her up bodily and strode onto the bridge with her slim form draped over one arm.

There would be no supper at the captain's table today for them.

II.

CARLIN at once seemed more solicitous of the girl than of the difficulties on the bridge and below.

"She's only fainted," Brand told him gruffly after one look at the control panels. He had never seen so many red lights flashing at one time in all his experience.

He glared at the mate, who scurried back to the controls. Then Brand howled into an audio frame for the infirmary. He told them about Phillips and about the daughter and to be damn quick doing something. He got the results he demanded. A nurse was with the girl almost before he had finished bellowing.

Then he glared at the indicating panel. Their speed had increased from the normal 27.6 to 45.8 miles per second in ten minutes. None of the operators spoke a word. Brand moved to the motor panels and saw that all five driving jets were on full blast, as were the four steering jets. He flicked a control key himself. Nothing happened. The jets continued to blast. They were accelerating with full power—at five gravities. Nothing serious in that—for a while. There was plenty of time to decelerate. But how long would the tubes stand the heat? And what was the trouble? The flashing lights showed everything in the ship wrong all at once.

"I've notified maintenance," Carlin told him.

"What started it all?" Brand asked.

"Regular hourly test procedure, sir. The operators plugged in on their ground indicators and everything started. Every relay clicked furiously and the jets were on. As you can see, they refuse to cut off. That's all we know."

Brand thought of the circuit diagram and of Phillips, a frown creasing his brow. "Funny," he muttered.

Carlin jumped. "What's that, sir?"

"Nothing." The audio blared and Brand jumped.

The four operators straightened tensely. Something was in the air.

"Wilson, maintenance," squawked the audio. "Numbers one, two and three drive chambers inspected. All circuit breakers closed and fused solid. Can't be repaired without complete shutdown."

"We can't shut down. What's wrong with the hand disconnects?" returned the captain.

"Fused solid, sir."

"Very well. Stand by until the others report."

"Aye, sir."

Brand turned to the mate. "Now, what in the devil could have done that?" he demanded.

Carlin shook his head. Just then the audio started talking again. Numbers four and five drive chambers were reported in the same condition as the first three. So were the steering-jet chambers. Brand grimaced.

"Get Jarvis up here," he told Carlin. "And Tony Rosso. You and I are going below."

The mate called and the second and third officers responded quickly. Zona Phillips had gone out with the nurse, Brand noticed. Jarvis and Rosso were here, reporting in. Brand pointed wordlessly to the panels and told them to stand by.

"We're going armed," he told Carlin, as they left.

"Armed?" The mate looked surprised.

Brand explained and, stopping at the mate's cabin for flame throwers, they started below. They went directly to Brinkerhof, the head maintenance engineer, finding him scratching his head as he looked over his file of circuit drawings.

"I can't figure it out," he told Brand. "It looks as if someone had tampered with the switches all around. It doesn't seem possible."

"No," agreed Brand. "But it—"

The door to the maintenance office crashed open and an electrician collapsed inside. Blood gushed from his throat in jerky spurts. He bubbled horribly: "Machine shop. They're—"

That was all. The man died while they stood rooted with horror. His jugular had been ripped wide open.

"A mutiny!" babbled Brinkerhof.

"Mutiny, hell!" Brand snorted. "This is war. On a neutral ship, too. Come on!"

THE CAPTAIN'S burly form nearly filled the passageway as the three made toward the machine shop. They plunged through the central core forward of number three drive chamber and Brand glanced up at the huge disconnecting switch. Sure enough, its massive copper bars had been hand-brazed fast in their fingers. How could anyone have gotten away with this? They couldn't on a full-crew ship, that was a cinch.

This business of placing the drive motors as complete assemblies with their individual fuel supply in separate insulated cells was all right, he reflected, provided you never had trouble with more than one or two at a time. With all of them out of commission and the disconnects inoperative, what were you going to do?

Those disconnects were in the 13,800-bolt bus from the main generator. To cut them out of a live circuit like that was something. The relays and main breakers, too, were inside the cell with the igniter tube, jet breech and fuel hopper. So were the step-up transformers, the phanotron rectifiers and the 400,000-volt D. C. for ignition. And the heat of a continuous blast. You couldn't even get in there to shut off the fuel supply. And you dared not shut down the main generators because the gravity compensators ran off the 13,800-volt A. C. And who could live to tell of sudden exposure to five gravities?

Also, and worse, the main generators supplied the current for the exciters that maintained the atomic blast which, in turn, supplied energy to turn that generator. Cut the generator, and the blast would die. With that out, the generator couldn't be restarted till the blast was restarted from a jury-rig exciter circuit. Generators weren't supposed to be cut out in transit; the exciter current for starting was supplied normally from special lines run in from dock before take-off. Rigging jury-exciter circuits would take hours, and in the meantime nothing but low-voltage storage-battery power would be available.

It looked as if they'd just have to keep on accelerating for a while. Until they could figure a way out. Meanwhile—

His reflections ceased abruptly when he saw a bent figure skulking out of the machine shop. Not in ship's uniform, this figure. Brand splashed a lance of white flame at his feet and saw a floor grating glow instant red. The man yelped and ducked into a passage leading forward.

"You're under arrest," snapped the captain—and in the same instant the Martian went for his gun, and his head vanished.

"I'll get him," grunted Carlin and sprinted down the corridor.

Poking the snout of his flame thrower around the door jamb ahead of himself, Brand followed it cautiously into the machine shop, Brinkerhof at his heels. The place was a shambles. Not a man of the shop force was alive. They hung draped over lathe, drill press and milling machine, heads battered in or jugulars slashed. Obviously they had been taken by surprise and by a superior force. Altogether, there were nine dead. One was not in ship's uniform. Brand turned the fellow over and thought he might be a Martian drylander. You could never be sure, though, with more than five generations of intermarriage between various races of the three planets. Brinkerhof groaned as if in pain.

"Lord, captain, what's it all about?" he asked helplessly.

Carlin dashed in, panting. "Lost him," he reported ruefully. "He gave me the slip."

Brand rose from the prostrate outlander corpse. He hadn't found a single identifying mark. "Whatever it's all about, it's serious," he said grimly. "And we have to get to the bottom of it. Carlin, you'll return to the bridge. Brinkerhof, you get busy and find a way of cutting these stern jets out of commission. I'm going to the infirmary and question that girl."

"The girl?" asked the mate, blankly.

"Yes, the girl." Brand grinned. There hadn't been a "mister" or a "sir" tossed around lately. It reminded Brand of the old full-crew days.

He found Zona Phillips recovered, though pale and obviously much shaken. Her father's body was lying in the mortuary, pending instructions for disposal. So was that of his murderer.

Brand patted her shoulder sympathetically. "Sorry to bother you in the circumstances, Miss Zona," he said. "But I'm afraid I'll have to ask you a few questions."

"If I can be of any help," she said tremulously, "I'll be glad to."

"You know, of course, why your dad was—put out of the way?"

The girl nodded mutely, her big eyes filling anew with the tears she was struggling to hold back.

"He thought certain parties at your table were spies. Did you?"

Zona Phillips became articulate. "I'm sure of it," she said.

"Can you identify them?" Brand asked gently.

"I . . . I could. But—" The blue eyes widened farther and a look of fear glazed over the sorrow.

"I'll protect you," the captain assured her hastily.

"It isn't that. I'm not really afraid for myself. It's something else I can't—" Her hand went swiftly to her mouth as if to shut off words she shouldn't be saying.

Brand was nonplused. Was this girl willfully hiding anything? "Miss Zona," he said soberly, "this ship is in grave danger of some sort. I don't know even yet how serious it may be in extent. If you can help us to identify the miscreants at the bottom of it, you will be rendering a great service. It may be the means of saving other lives."

"Oh, I will! I will. I'll do anything."

"Do you know the names of the ones your father suspected?"

The girl looked fearfully around the infirmary waiting room. "I think so. If I can see the passenger list—"

Brand knew then that she was in utmost terror. "Now, you can just stop worrying," he told her. "Come along with me, young lady, and I'll see that nothing happens to you. We've a duplicate list in the bridge office. You won't even need to cross a passenger deck."

Zona Phillips brightened perceptibly, though there still remained a look about her eyes that might have been furtive. Brand laid it to her fears. Or tried to. He still wondered vaguely.

THEY found the bridge in somewhat of a turmoil, the usual discipline having relaxed. The operators were fidgety at the control board. And Carlin was in a huddle with the second and third officers. They pulled apart when they saw the captain coming. All eyes were on Zona Phillips. Caressingly, almost, those eyes. For some reason, Brand bristled inside.

"Anything new?" he asked Carlin.

"Only that the radio room has been wrecked and the radio transmitter ruined. And Brinkerhof reports every cutting torch in his stores either smashed or missing entirely."

You could have heard a pin drop on the bridge after that. Brand's eyes

strayed to the indicating panel. The speed was 105 miles a second. Faster than any of them had ever expected to travel. And still the *Spirit of Terra* was accelerating at five gravities!

"Tell Brinkerhof to rig up an electric-arc burning outfit and cut out those disconnects as fast as he can," Brand ordered. "You, Jarvis, get after the radio and have it fixed. Rosso, get below and organize the steward's department. But make sure the passengers don't get wise that anything's up."

He moved toward the office with the girl.

"We're still in the Venus-Terra beam," Carlin reminded him in a sort of hushed voice.

"I know it," snapped Brand. He didn't want to think about that now, and he didn't want the girl to be alarmed further.

In the office, looking over the passenger list, she seemed more at ease. Brand was surprised when she identified five unpronounceable names.

"Those weren't all at your table?" he exclaimed.

"No, only two. But I saw those two talking confidentially with all three of the others at different times."

Brand noted the cabin numbers of the five and immediately audioed the chief steward to round up their occupants. He had no sooner left the frame when it crackled back at him in Rosso's voice:

"Deckhand says he saw several passengers fooling with the lock of number twenty-one lifeboat. I'm going down there."

"So am I," Brand shot back. Then, to the girl: "You stay in my lounge, Miss Zona. You'll be safe there. Tell the cabin boy I said it'd be all right."

He picked up Carlin as he rushed across the bridge and they sped to join Rosso. It looked as if whoever had made such a thorough job of putting the ship out of commission was trying for a getaway.

III.

THINGS like this just couldn't be happening on the greatest passenger ship in the skylanes. A neutral ship, at that. But they were happening. Brand caught himself wishing they hadn't been quite so damn strictly neutral. His mind worked swiftly as he and the mate thudded along the corridor toward number twenty-one lifeboat lock.

"Got any theories?" he asked Carlin.

"No. Except someone's trying to get Earth into the war. It'll mean a declaration, sure as shooting."

"But why should Martians be trying to get us in on the other side? This'd mean war against Mars, not Venus."

Carlin grunted. "If we keep accelerating—"

What he had been about to say was jarred out of him by a catapulting body that struck him amidships from out a side passage. The mate went down in a heap, thrashing wildly to get a grip on his assailant. Brand's weapon described a wide arc and crunched down on the fellow's head. Carlin rose groggily.

"Thanks," he said.

Brand searched the dead man's clothes without result. "Damn!" he muttered. "Shouldn't have killed him. Might have made him talk." On an impulse, he ripped open the fellow's shirt.

On his chest was tattooed the red orb of Mars and its two moons.

Sounds of a conflict were wafted toward them from ahead. They leaped toward the mêlée. The inner seal of number twenty-one life lock was open. And inside the narrow space surrounding the small craft it housed, a battle was raging. Tony Rosso and two stewards were finding their hands very full with some six or seven huskies who were trying to pulverize them. There were no searing pencils of white flame. No one seemed to be armed. Brand couldn't understand, anyway, how the one who'd

killed Phillips had managed to get a flame thrower on board. He flung himself upon the one who was throttling Rosso's eyes out onto his cheeks and dragged him off with his big hands. Savagely he bent him back over his knee and bore down until his spine cracked. The fellow went limp.

Carlin's weapon spat luridly twice. His first blast splashed a hideously grinning Martian face into bubbling incandescence that drove back into an emptied skull. His second seared arm and shoulder from the one who had just slashed a steward's throat. Rosso scooped up the falling knife and killed a third with an upcurving slash that disemboweled him. The others remaining of the battling Martians tried to crowd into the small port of the lifeboat and Brand smeared them into blazing, frying blobs that stuck to the glowing spot his flames had painted on the hull. The lock was thick with choking smoke which stank sickeningly of red-hot death. The survivers piled out into the corridor.

"That's that," said Brand grimly when they were in the fresher air outside. "And that isn't all of them, I'll gamble. Listen, Rosso: I want you to go to Worthman and have him put a patrol in every blessed lifeboat corridor. Take this steward with you and tell him to arm his men from the stores. This is no picnic; it's an emergency and we have the right to small arms. Carlin, you and I are going forward and have a council of war. We can't be everywhere at once."

BY THE TIME they reached the bridge, the *Spirit of Terra* was ripping through the void at nearly 200 miles a second. About an hour and a half had passed since they started this mad acceleration.

Brand frowned. "I'm surprised the tubes haven't melted down," he observed.

"Guess the tungstoloy linings are better than the designers thought," said Carlin. "Looks like they'd stand maximum blast indefinitely."

"Yes." Brand shook his head reflectively. "How much time do we have?" he asked Carlin.

"Remembering we're in the Venus lane?"

Brand nodded. How could he forget? He moved to the audio frame as Carlin busied himself with his slide rule. Jarvis answered from the radio room.

"It's a mess, captain," he reported. "We have spare tubes to replace the broken ones and can repair the condensers and coils. But they shorted both generators. Armatures burned out. They'll have to be rewound."

"How long'll that take?" Brand bit the end from a fresh cigar.

"About eight—ten hours. We only need one."

"All right. Have 'em rewound." Brand turned from the frame to Carlin with inquiring eyes.

"We're still adding five gravities," he stated. "At the end of two hours from when this started, we'll be doing 247 miles a second, at three hours 356—"

"Never mind that. How long do we have?" Brand saw that the operators were cocking their ears at the board.

Carlin glanced at the chronometer and the velocity indicator. He lowered his voice. "A little over five hours to Venus," he whispered. "And the velocity then will be close to 800."

Brand turned again to the audio and called Brinkerhof.

"How you making out with those disconnects?" he asked him.

"Just tried to burn one off with a 13,800-volt arc. Killed one of my men and blew up the rig we'd made. I'm going to try it with a 440-volt outfit. Have to make up a transformer rig."

"How long'll that take?"

"Two or three hours."

"All right. Go to it. What's the temperature in the drive cells?"

"Last I saw, captain, it was over boiling. Nobody can go in those."

"That's what I thought." Brand turned to Carlin, who looked grave. "I'm going to talk to the Phillips girl again," he told him.

"The girl?" Carlin wrinkled his forehead.

"Yes. I've a hunch." Brand strode off toward his own quarters, knowing the mate's puzzled eyes were following him.

He didn't know why he wanted to talk with her himself. Certainly not because she was so attractive. He was too old for that and, anyway, the situation was too desperate. There was some sort of a hunch. If only the radio were operative, they'd not have so much to worry about. They could have the Venus-Terra beam lane cut off for an instant and, at this speed, they'd be out of the curve of its magnetic guiding forces in nothing flat. But the radio couldn't be fixed in time; they'd simply have to get a steering jet cut out within the five hours. Just one of them would do the trick; the opposing jet would swing them out of the lane and give them time to complete repairs. In a full-crew ship, now, this never could happen.

Brand almost ran headlong into Zona Phillips as she came out from his lounge on the arm of a tall male passenger with a decidedly Martian cast of countenance. The girl blushed furiously, avoiding the captain's accusing eyes.

"What are you doing here?" Brand demanded of the man. "Passengers aren't allowed here; you know that."

"Miss Phillips is a passenger," the Martian sneered.

"That's different." With a quick motion of his huge paw, Brand snatched open the front of the fellow's shirt. There was the brand of the red planet and its satellites!

Quick as a flash a flame-thrower snout appeared in the fellow's fist. Another one! "Raise your hands!" the thin-lipped mouth over the ugly snout of the weapon snapped. "And be quick about it."

Brand's hands came up slowly. "Miss Zona," he said calmly, "you had better return to the lounge. You're not safe with this man."

They were backing away together, the man and the girl. No wonder he'd had a hunch about her, Brand thought sourly. She was in with the conspirators! And her old man, too, before he'd died, like as not. Or else she'd been double-crossing her own father. To look at the beauty and sweetness of her, you'd never think it. Brand was watching for the slightest sign of relaxing vigilance on the Martian's part. It didn't come.

Suddenly the girl's eyes widened with terror and, simultaneously, the Martian's thrower belched white flame. Brand dropped flat as its pencil of death fanned his cheek with blistering heat. There crackled another blast from behind and the Martian, because no man can stand up after his head has been blown away, toppled and lay still.

"Thanks," Brand said soberly, rising and gripping the mate's hand.

"That makes us even," grinned Carlin.

The girl started into a panicky run down the corridor.

"Oh, no, you don't, my pretty," he said, catching her and drawing her arms behind her. "You'll come right along with me and do some tall explaining."

Despite her kicks and struggles and pleading, he returned her to his lounge and tossed her on a divan. "Come in," he told Carlin, "and close the door."

"Now, young lady," he demanded, "what's this all about?"

Zona Phillips tossed her head and clamped her lips to a thin line. Her eyes flashed fire. She was more beautiful than ever; Brand heard Carlin draw in a quick breath.

"Are you going to tell me?" Brand shouted.

"There's nothing to tell," the girl insisted stubbornly. Then she began crying. Hysterically, Brand thought.

The captain couldn't bear to see a woman cry. Neither could the mate. Consulting in undertones while the girl regarded them fearfully, they decided it was best to leave her here under guard. Brand locked her in and went to audio Worthman for stewards to stay and see that she didn't get away or into any trouble. He'd deal with her later.

IT WAS ghastly having to wait for results below. Brand left the mate on the bridge, where there was still nothing that could be done, and walked out to cool off. Out in the great central well of the ship where all the passenger decks circled like balconies, everything seemed exactly as usual. He moved along the spanning catwalk and was glad to observe that nothing seemed to be worrying the passengers at all. They had not the least inkling that anything was wrong. Dancing, cards, deck games, were proceeding as always at this time of day.

Of course, though the *Spirit of Terra* had accelerated to terrific speed and was still accelerating, there was no sensation observable aboard. Not any more than when traveling at normal speed, not any more than you would notice the 18.5 miles a second orbital velocity on Earth or the 21.7 on Venus. With gravity compensation functioning here as it did, you just didn't notice anything at all different from what it would be at home. But Brand knew, and he was getting impatient and more than ever concerned. They had accelerated for nearly three hours now and were doing about 350. And still those atomic jets astern stood up under the punishment. How to cut them off or, temporarily, even that one steering jet?

Rosso had reported everything quiet in the lifeboat corridors and Worthman's men hadn't been able to locate any of those Zona Phillips had originally reported. Brand could not help wondering about the girl, and he was beginning to think that all of the conspirators had been accounted for. He decided to check up Brinkerhof's gang.

He found them working at number two steering jet, in the approach tunnel, rigging up an insulated platform under the disconnect overhead. Ordinarily these disconnects were pulled open by hand with a hook on the end of a long insulating handle. Now the blades were brazed fast. *And* each was carrying some 10,000 amperes at main voltage.

"Nearly ready?" Brand asked Brinkerhof, who was fluttering about his sweating men.

Through the cell bulkhead you could hear the thrum of the igniter tube under its 400,000 volts and the rhythmic tapping of the tiny fuel-admission valve. The nearly continuous atomic blast of the jet was evident only by a faint tremor that was in floorplates, the air, everything—and the heat, which was almost intolerable even here in the tunnel.

"Nearly ready," said Brinkerhof. "We couldn't find a single one of the cutting torches. One of those would be the trick."

"Couldn't we make one quicker than this?" Brand jerked a thumb toward the 440-volt cables that looped along the floor to the resistance of the arc rig that was still missing its transformer.

"No, I had Wilson check up. Machining nozzles and valves and all would take four or five hours."

Brand examined his flame thrower, then experimentally lashed its full blast up at a blade of the disconnect. The men ducked and the copper glowed red, then white. But it refused to melt down; the flame spread over too great an area. These things were made to kill men, not to cut through metals. The charge was exhausted; the weapon valueless without reloading.

"Wonder if we couldn't make a cutting torch out of one of these," said Brand, handing it to the maintenance man. "Nozzle it down."

"The nozzle's tungstoloy," muttered Brinkerhof. "Another four- or five-hour-machining job. And no assurance it'd work."

The men were bringing in the new transformer and swiftly connecting it in the arc circuit. Mopping his brow, Brand turned away.

"Wait, sir," suggested the maintenance man. "They'll be ready to cut in a moment." He handed Brand dark goggles.

The captain waited. He needn't have been so concerned, he thought. Cutting out this one jet would hurl them out of the Venusward course. Then cutting off number four steering jet would set their course straight in space again and give them plenty of time to get the drive motors out and start permanent repairs. Their terrific velocity could then be decelerated with the forward braking jets, which you didn't dare use now for fear of buckling the hull plates. Brand cheered up.

"Move back, sir," Brinkerhof warned as the men swung the hinged rod of the cutting arc up toward the disconnect. "There'll be fireworks."

Controlled from thirty feet away by handwheels behind an asbestos shield, the contact points snapped viciously, and there was a lurid green flare of a copper arc. The quartz tube that sheathed the heavy conductor and insulated careless workmen from the low—in the necessarily cramped power room of the spaceship—13,800-volt bus bar shattered and tinkled on the floor. The contacts moved forward again, one planted firmly on the heavy copper bus. Then the other touched it, moved slowly away, drawing out the hissing, luridly green flare of the 440-volt arc. The metal sputtered a dazzling shower of sparks and started fusing away. In two minutes a slash opened down through the six-inch thickness of copper—and the 13,800-volt arc let loose with a roar and a blast of flame that enveloped the entire apparatus and drove everyone far back into the corridor. By a miracle, all of them men escaped death. The heat, even here, was brutal.

The high-tension arc continued, melting down the heavy bar as if it were tallow. In this narrow space the sixty-cycle note of released power was ear-shattering. Metal dripped over the apparatus and—the transformer burned out with a deep groan and a billow of thick oil smoke!

The shield above the disconnect was dripping molten metal. There was an abrupt cessation of sound and the huge arc whipped out of existence. A glowing, white-hot blob of metal had bridged the gap and reclosed the circuit to the jet cell. Nothing had been accomplished.

And the cutting apparatus was wrecked again. All to do over.

Brand cursed luridly, mopping perspiration and looking at his watch. Then he took his headache away from there and went bridgeward.

IV.

FOUR HOURS—466 miles a second. Five hours—575. And only a little more than four and a half million miles to Venus! They'd be there in an hour and three quarters. And they'd hit with—

Brand stared solemnly at the mate as they stood by the indicating panel. Brinkerhof would be ready with a new cutting apparatus in half an hour. He thought it was all perfectly constructed and shielded now. But Brand had his doubts. It was all right to say the conspirators had been able to braze those switches shut and we ought to be able to cut them open. That was all right, but there hadn't been 10,000 amperes of 13,800-volt juice flowing through the

buses when the Martians did that. And, besides, the circuits were closed when they operated. There wasn't any opening of a 185,000-horsepower blast of energy to consider. They had casually brazed the switches tight with torches whose flames couldn't ground them. Then they'd gone in the cells and loaded the jet breakers with fusible material that would lock them closed at the next automatic momentary closing for routine test. They were well out of the danger zone when that happened. And the switches were all closed to stay!

"Couldn't we slow down the main generators gradually?" asked Carlin. "So the effect of changing gravity would not be severe?"

"Carlin, if it were the passengers alone now, I'd say yes. Mars isn't trying to get Earth in on this war; she's trying to end the whole thing. The *Spirit of Terra's* the heaviest thing in the skyways—heavier than any warship. Moving at the speed she'll have when she reaches Venus, if we can't stop her—Carlin, there won't *be* any Venus city! A meteor moves only about 100 miles a second; we have, ton for ton, sixty-four times as much energy of impact. And we're the largest meteor ever recorded!

"This ship has to be stopped—and not for the sake of the passengers alone!"

Carlin shuddered. He simply could not visualize the terrific eventuality of smashing into Venus at close to 800 miles a second. With the *Spirit of Terra's* 80,000 tons a molten mass from atmospheric friction and the energy of impact proportioned to that mass multiplied by the *square* of the velocity! It would damn well destroy the planet, and that was just what the Martian conspirators had figured on. *They* hadn't been worried about Terra going in on the side of Venus. There wouldn't be any Venus. Not any more.

"The lifeboats are worthless, too," Brand told Carlin. "At this speed they'd be helpless. Going out with the same residual velocity as ours, they'd never be able to decelerate with their weak jets and small supply of atomic fuel. Otherwise I'd have had them loaded an hour ago. Now it's way too late, even if it hadn't been then."

The audio frame blared in Rosso's voice. "Just caught a couple more at thirty-six lifeboat," was his amazing news. "Trying to get away. And a girl with them."

"A girl!" roared Brand. "Redhead?"

"Yes, and she won't talk. What'll we do with her? We blasted the two men."

"Do with her? Send her back to my lounge with three—no, five stewards to guard her. She got away from two and I'm going to find out how." Brand turned a foolishly beaten gaze on the mate. "What do you know about that?" he demanded.

Then he lurched toward the lounge, the mate following.

TOMMY BLAKE sat white-faced at his calculating board on the observation sphere above the clouds of Venus. He had finally caught the mysterious speeding object in the spectroscope. The shifting of the lines had checked its velocity of approach with the calculating board. Its speed now was over 600 miles a second. It would be here in little more than an hour. And would meet up with the planet at 780 miles per second, he figured.

"The thing's in the Venus-Terra magnetic lane," he told Masters. "It's bound to hit us."

"Doesn't seem like the right direction at all," the other objected.

"I've tried to tell you," Blake explained patiently, "that the beam is constantly shifting its curvature in space, due to the motions of the two planets in their orbits. This thing's in the lane, all right."

"But *what* is it? Accelerating like this."

"I'm just taking a determination of its mass," replied Blake, his lean young features drawn into grim lines.

The calculator before him was clacking and chuckling merrily. At last it stopped with a decisive *clunk* and Blake tore off the tape.

"163,705,040 pounds," he read off. His voice dropped to a whisper of despair. "The *Spirit of Terra,*" he said hopelessly. "That would be just about her weight with passenger and freight load. And Zona is on board!"

Masters eyed him sympathetically. He knew how much his friend had been looking forward to the coming of the only girl—to their marriage, which had all been arranged on the q. t. "Maybe they can pull out of it, Tommy," he said without much conviction.

"Pull out of it, hell! Something's jammed her stern jets full on. She's a runaway. Even if they could get them off now, they'd never be able to decelerate in time."

"Well, if they do hit us, we'll never know it," commented Masters.

"No, we won't." Blake was trying to figure the momentum of this hurtling mass at the square of its inconceivable velocity. He jumped up and paced the floor like a madman. "We've got to stop it from hitting, and I'm going to do something about it even if I'm court-martialed."

Young Blake strode into the radio room and spun the transmitter dials away from the military wave. He called Venus Spaceport, a most flagrant violation of regulations.

"Spaceport?" he asked, when a sleepy operator replied. "What report have you on the *Spirit of Terra?*"

"No report. She's still four days out and hasn't radioed at all."

"Oh, yeah? Four days out. She'll be here in an hour—only you won't know it."

"Who in hell is this? What're you talking about?"

"Listen, fellow," Blake mouthed frantically into the microphone. "I can't tell you who I am, but I'm above the clouds in an observation sphere. And I tell you the *Spirit of Terra's* a runaway. She's doing 600 miles a second right now and still in the lane. Get that beam cut off, for God's sake!"

The operator laughed raucously. "I'll say you're up in the clouds. Six hundred—why, you're nuts—" His carrier cut off abruptly.

Blake groaned. "There you go. Nobody'll believe us, Masters."

He dialed down and started calling G. H. Q., watching the chronometer anxiously. Another sleepy operator answered. "Get me the major p. d. q.," Blake shouted. "Military emergency."

"The major's asleep. What do you mean, emergency?"

"I tell you it's real," cried Blake. "You've gotta believe me, or we'll all be dead in another hour. Get me the major."

Evidently Blake's panic got through to the G. H. Q. operator. "All right," he said with sudden decision. "I'll get him."

"If only they'll cut out the usual red tape and *do* something, we may get somewhere," Blake groaned, eying the time. "But you know how it is in the service."

"Yeah." Masters looked dubious. He had not yet become really afraid. He would in a few minutes.

The G. H. Q. operator was back on the air. "Major threw a shoe at me and told me to get to hell out," he told Blake.

"Listen, fellow." Blake's voice was wheedling, frantically insistent. "We've got to put this across. Listen, do this for me, will you—"

The youngster in the black-and-white uniform of Venus was begging for Zona, for himself, for another billion and more lives. He put all of his fears and hopes into his quivering voice. G. H. Q. would

"That figures out five hundred miles a second! That ship's out of control—and she's headed right for Venus!"

have to listen. They'd have to get that beam cut off—something—

CAPTAIN BRAND found his cabin boy and two stewards locked in his serving pantry. He raged when he let them out.

"She asked for a cocktail, sir," one of the stewards explained.

"And it took three of you to make it for her!" Brand wheeled from them as three other stewards came in with Zona Phillips.

The girl was holding her head high, a spot of color burning on either cheek.

"So now," the captain bellowed. "Now, young lady, you're up to something again. And you're going to talk this time."

"I'll talk," she said simply. "Send these others out." Her sweeping gesture embraced the goggling cabin boy and five goggling stewards.

Brand shooed them out and, as a precaution, locked the outer door to the

lounge and pocketed the key. "Well?" he said, trying to keep his voice stern. Somehow, you couldn't stay angry with Zona Phillips.

"I was only trying to get away," she said breathlessly, "because I'm planning to get married on Venus."

"Married?" said Brand blankly.

"Yes, to a boy in the Venus forces —Tommy Blake. It's forbidden, you know, and my passport's no good except for a visit. The Martians promised to land me secretly. That's all. I haven't done anything really wrong, have I?"

"Well, I'll be d-doggoned." Captain Brand looked his amazement. Then he spoke to the girl seriously: "Wrong, no, but foolish, my dear. Do you realize how fast we're going?"

"N-no." The girl's eyes widened to their full blinding blue.

Brand told her. He told her what would have happened if she had succeeded in getting away from those Martians; that the little lifeboat would use up all its fuel trying to decelerate and then would go drifting forever in a solar orbit, a frozen, airless tomb at last. That even now the *Spirit of Terra* was headed for a disaster that would likely destroy the planet Venus along with themselves. "And you make trouble for me," he concluded glumly.

"I'm sorry." The girl's voice was truly contrite. She stared at the captain as the full purport of his words sank in. "Then we'll all die, anyway?" she asked. "And—Tommy'll be killed, too?"

Brand nodded. "Unless maintenance wins out with their new cutting rig," he admitted.

The girl pursed her luscious lips and frowned prettily. "It seems," she said, "that *something* might be done with the lifeboats."

That was all, but it set Brand thinking. Suddenly he was a madly whirling tornado. He hugged Zona Phillips in his enthusiasm and she didn't seem to mind.

"Girl, you've got it!" he exulted. "With the lifeboats we'll do it." He began bawling into the audio frame.

"But you said—" began the girl.

"Never mind what I said." Brand's broad face was alight. "We'll do it with the lifeboats. Watch!"

He talked swiftly in clipped words to the frame when Rosso came in.

V.

"Rosso!" he chirped. "And you, too, Worthman"—two voices having come in by now—"listen closely. Man lifeboats eleven to twenty and fifty-one to sixty. And don't ask any questions till I'm finished. That's ten above and ten below on the port side astern. Plug in an audio connection to each. Close all inner seals when manned. Seal boats themselves. Open outer seals of air locks. At my orders, we'll blast forward rockets."

"Of the lifeboats?" inquired Worthman incredulously.

"Certainly. They've weak jets, to be sure. But with twenty of them blasting, we may be able to get out of the lane."

"Will the air-lock seals hold?"

"We'll chance that. Put a watch on each. I'll stand by the audio.

"Now," he said to Carlin when they reached the bridge controls, "this is going to work like a full-crew ship. Give me visuals down stern lifeboat corridors on the port side. We're going to pull out of the magnetic lane."

"You mean—"

"With the lifeboats."

A slow red suffused the mate's cheeks as he watched the smile that wreathed Zona Phillips' lips. He'd be willing to bet she had something to do with this. And he hadn't thought of it himself. Of course the lifeboats would do it—if—

Signs of activity showed in the corridors as soon as the viewplates lighted. Lock hatches were being opened one by one. One by one the individual audio connections plugged in.

"Blast forward jets gently," Brand told them, watching the cross lines of the course indicator. They blasted gently. "Inner seals holding all right?" he asked. The boats had driven back solidly by now.

One by one the men in the corridor reported them O. K.

"Increase blasts slowly," Brand ordered. The glowing, rapidly enlarging orb of Venus had not budged from the cross-line centering.

Carefully, as he would have done on a full-crew ship, Brand had them increase the power of their jets until the inner lock seals had all he thought they could stand of the reaction of the small lifeboats pushing to get through them and inside the ship. Then he added boat after boat to the number until all twenty he had designated were blasting, shoving mightily against the inner seals. There were no automatic relays to take care of things; Brand was jockeying to get a balance of energies the way you would jockey a horse. And he loved it.

But Venus still swooped in toward them. They hadn't budged the tiniest fraction of an inch from the magnetic course. Traveling 720 miles a second and only about half a million miles to go. Brand dripped perspiration.

"Quick, Rosso," he called. "Same thing on boats twenty-one to thirty and sixty-one to seventy forward, starboard." He'd twist the *Spirit of Terra* off this lane if it was his last act. And trying would be his last act if he didn't.

The men responded swiftly. All knew the importance of speed. In another minute two lifeboats were blasting on the opposite side of the liner, up near the nose, trying desperately to turn her vast bulk like a pinwheel. But only a fraction of an inch from her present line, just the slightest angularity would do. In fact, more than this would be as disastrous as the collision toward which they were heading. But only for themselves.

Twenty-two, twenty-three, twenty-four, sixty-two, sixty-three and sixty-four lifeboats blasting. Still Venus came in ever larger, rushing madly. Still centered precisely on the crosshairs. Twenty-five and sixty-five boats reported blasting. No one moved on the bridge. No one seemed to breathe. Brand choked on the remains of his cigar and threw it away. Twenty-six and sixty-five in. Twenty-seven, twenty-eight. The crosshairs began a slow march eastward across Venus.

"Hold it there!" Brand yelped. "No more." The crosshairs kept on in their slow march. Venus was out of line. "Enough," called the captain. "Cut everything off." He slumped back weakly in his chair.

Brand didn't even hear the thunderous explosion as Brinkerhof finally cut the mad flow of current to the jets—quite safely and easily when he, almost simultaneously with Brand's inspiration, saw the answer. From spares, he got a series of the heavy emergency fuses, rigged a short by-pass line around a section of the main bus bars to a steering jet, and inserted the fuses in the by-pass. Then a hand power saw readily sliced out a two-foot section of the by-passed, and hence unloaded, bus bar. One of the heavy fuses paralleled in the by-pass circut was then pulled out of the socket with the insulated pole, and the other promptly blew from the overload, with a roar of triumph interrupting and killing the jet circuit! Nor did Brand hear Jarvis reporting that one of the generators was again in commission and the radio operative. Ahead of time.

G. H. Q. was even more stubborn than Tommy Blake had anticipated. He finally did manage to get Major Varejo

excited, though, and he promised to take it up with the colonel. The colonel would go to the general.

Blake groaned. In his radioscope screen the *Spirit of Terra* now was visible as a tiny speeding dot with a ten-mile trail of incandescent gases astern. He thought he saw faint illumination off to one side.

"See that, Masters?" he demanded. "Doesn't it look as if they were blasting a steering jet or something?"

"It does, Tommy, it does! But, Lord, they're only four hundred thousand miles off. And 730 miles a second. It's too late."

Blake tore into the radio room as a call came in. It was General Fulsen. He had to tell his story all over again. He was nearly sobbing as he finished. "Can't you see, sir?" he pleaded. "The major checked with the other sphere. He knows it's the truth. We've only a few minutes and it won't make any difference to any of us!"

"I'll see what I can do with the space line, young man." The G. H. Q. carrier was off and Tommy Blake tore his hair.

"He'll see what he can do!" he raved at nobody at all. "See what he can do. Masters, if we live to tell the tale, I'm getting out of this damn service."

Masters grinned in spite of the impending catastrophe. Two closely cropped heads came together before the radioscope screen.

"They are!" exulted Blake. "They are blasting off the side. And say! Masters! They're off the line. They'll miss us. To hell with G. H. Q. and their song of 'see what I can do.'"

The two OBS. men did a war dance of their own as a trail of penciled flame swept across the viewplate and off into space. Venus was safe and so was the *Spirit of Terra.*

In Captain Brand's lounge there was great rejoicing. A few minutes ago they had passed Venus with a thousand miles to spare, scarcely even feeling her gravity pull as they swept by at 800 miles per second and left her far astern.

Everyone was talking all at once in the captain's lounge. The ship's entire staff of officers was here. And an auburn-haired girl.

Captain Brand had shooed off all her other admirers and had her sitting beside him on one of the comfortable divans. She looked brightly up at the big man over the rim of her glass.

"You," he was telling her, "will see your Tommy boy. And you'll be able to marry him, if I have anything to say about it. That is, if I think he's good enough for you when I look him over."

The girl laughed throatily, happily. "How can you arrange that?" she demanded.

"How would you like to be my daughter, Miss Zona?" The captain looked down at his big red hands and blushed as if this were a proposal of marriage.

The girl's eyes misted. "Why?" she asked softly.

"Because," Brand told her solemnly, "that way you could have your Tommy Blake. Look: I'm the law and everything else on this ship. I can marry people or divorce them. I'm the judge and the jury and the preacher, if necessary. I can adopt you, have the papers attested and all, right here. Then, with my permission as your father, you can marry anybody you please on Venus. Passport be d-darned. Besides"—Brand searched the girl's wondrous and wondering eyes—"I like you, Miss Zona. I sort of think I'd like to have you for a daughter."

Brand looked away. The chatter of the crowded lounge was a meaningless background for his leaping thoughts.

"Why, you old dear," a soft voice was saying. "I've lost a father and found a new one. I . . . I think I'd like what you propose, D-daddy Brand. I'm sure I would."

IN TIMES TO COME

One difficulty sometimes encountered in running one of Smith's novels is that the serial following it, while, perhaps, a good, workmanlike job in itself, tends to seem rather pale. That difficulty has been settled, I think—or, rather, pushed off into the future by five months. The next serial will be "If This Goes On—" by Robert A. Heinlein. It is one of the strongest novels I have seen in science-fiction, one of the most beautifully and carefully detailed pieces of science-fiction. It's a two-part novel, utterly different from Smith's "Gray Lensman," yet as strong a piece of work in an equally tense field.

"If This Goes On—" is the first of two novels we have lined up. It gives a deadly keen picture of the future of a thing that is today an art, but will, tomorrow, be a science, a more fateful and important science, insofar as Man's future is concerned, than the science of medicine. It is the future of propaganda, and its follower, dictatorship. Propaganda and dictatorship developed to their ultimate, the goal toward which they tend today—a false cult, hiding behind the mask of a new religion!

It's fiction—and it's prophecy. And it is so thoroughly different in strength and presentation from any predecessor that it wins Astounding's rare *Nova* designation.

That is a two-part serial. We have already chosen its successor, "Blackout." I announce them both now, because they form, really, an almost inter-connecting pair, though "Blackout" is in no sense a sequel, is, in fact, by a different author—L. Ron Hubbard. But as "If This Goes On—" is the future of propaganda and dictatorship, "Blackout" is the future of their spawn—creeds and war. We have heard for months that "another European war will mean the end of European civilization." Well, what would that mean?

"Blackout" is a grim and final answer—the night that comes when "Europe's lights are going out, one by one"—and are not lit again.

It is not a simple publicity boast, but an honest opinion of a long-time science-fiction reader when I say that these two complementary novels, "If This Goes On—" and "Blackout," are two of the most powerful and truly meaningful stories science-fiction has produced. If you have a friend you want to introduce to science-fiction, these are the stories for him to begin on.

Due to the short while the November issue has been on the stands at the time this issue was made up, this month, Analytical Laboratory contains insufficient data and will be postponed, giving a double Laboratory next month.

THE EDITOR.

MOON OF DELIRIUM

There were deadly parasites there, horribly efficient parasites—but they forgot, in their fear of them, one characteristic of truly efficient parasites—

By D. L. James

Illustrated by W. A. Koll

THERE was an interval of tense silence in the control room of the *Pegasus*. Then a bell clanged sharply. Immediately thereafter came a dull thump as the ship made contact with the surface of Dione, and for a second low-pitched vibrations raced to swift death up and down that drum-tight, molybdic alloy hull.

"We're here!"

Captain Egard's usually hearty voice was edged with more than a trace of strain.

"Hall, take an atmosphere test immediately. And be sure you don't let any of that stuff loose here inside the ship! Griffin, what's the temperature outside?"

"Still subzero, captain; but the meter's slowly rising."

"Norm—if you can pull your head out of that port—run down to the rocket room and tell McDill and Perrin I want 'em up here just as soon as they can leave things. Get Rives and Talbot, too."

Eric Norm, junior member of the crew, tore himself away from the port through which he had been staring. That scene of alien grotesqueness had held a peculiar fascination for him. Black rocks jutting up between fernlike mounds of frozen vapor; ice crystals sparkling and throwing back the light of the tiny, but still brilliant sun in delicate tints of purple, rose and golden green.

He entered the cartridgelike car, which shuttled through a tube from stem to stern, and a second later emerged into the rocket room. McDill and his mate, Perrin, appeared to be in exultant moods—as well they might.

"Hey there, Norm," grinned the solidly-built, chief, welcoming Norm with a hearty slap on the back. "We made it, son!"

"Cap wants you and Perrin in the control rooms," said Norm.

"Why didn't he phone?" asked Perrin, tossing aside a handful of waste.

Norm shook his head as he turned back to re-enter the lift. He didn't like to mention Captain Egard's unprecedented display of jitteriness.

On the deck above the rocket room he found Rives and Talbot staring from a port. They had evidently just finished giving their oxygen suits a last careful inspection.

Talbot was speaking: "—a green mote! I saw it drift past the port."

"You're seeing things," scoffed Rives.

Five minutes later, the entire crew of the *Pegasus*—nine men including the ship's surgeon, Dr. Frontain—were congregated in the not-too-spacious control room. That is, all except Hall, who was still busy with his atmosphere analysis.

Burdened, hampered by the suit, he stumbled over the rocks, dodging frantically—

"Men, here we are on Dione—fourth moon of the ringed planet," said Captain Egard, his shrewd, bushy-thatched eyes stabbing around to rest for an instant on those of every man present. "You've all done your duty. I'm proud of you—so proud I want to take you all back with me."

"Cap," spoke up the irrepressible McDill, giving Norm a sly nudge in the ribs, "none of us figure to desert ship."

Grins and a tense laugh or two followed, but they quieted immediately. Nerves were keyed to a high pitch, as must always be when men face the unknown.

"You all know our purpose here," continued Egard. "We've sworn to collect thought-nuggets, and take them back to Earth—or die trying! But what some of you don't know is the exact hazard we're up against. You were all warned of the danger attending this voyage—but not in detail. Until now I've withheld just a little of the slight information I possess, so that our morale might be maintained—not that you're men inclined to flinch, but anticipating dangers too far ahead is bad. So far as I'm aware, no man ever set foot here on Dione and lived to tell about it."

Navigator Griffin cleared his throat. "But, captain, that can't be right." Bronzed, square-jawed, he was leaning against the chart table, his light-blue eyes regarding the older man steadily. "What about Morgran, the explorer, who brought back the first thought-nugget—ten years ago?"

Captain Egard answered slowly: "Explorer Morgran used a radio-controlled mobile robot to do the actual ground work. His ship touched here only for a few hours; the air lock was never unsealed."

Griffin nodded. "Right, captain—pardon the interruption."

"Unfortunately, Morgran died before his ship reached Earth," continued Egard. "We had only his notes to go by—and the thought-nugget. Here," he added—fishing a small object from his pocket—"this is an imitation, made to closely resemble the original, so we'll know what we're looking for. Pass it around. Milk-white, the size of a peanut. The original was of crystalline structure, but whether an organic prouct or a mineral is something we don't know.

"You are all aware of what happened when that thing was turned over to scientists. They soon discovered that it was thought-sensitive—capable of receiving and amplifying telepathic impressions—an element long sought by physicists.

"Enthusiasm waxed feverish over this astounding discovery. And during the years that followed, ship after ship left Earth for this remote moon, to collect more of the treasured nodules. But not one of them ever came back—"

"Captain Egard," interrupted Hall at this moment, elbowing his way into the crowded control room. Tall and lanky, he was able to stretch an arm over Norm's shoulder. "Here's the atmosphere formula."

EGARD grasped the slip of paper, his eyes sliding quickly over the penciled symbols.

"Hm-m-m. Quite an envelope for a body only twelve hundred miles through—mostly inert gases, nothing poisonous—and no oxygen, either."

A mutter of voices had started up among the crew.

"The old boy don't sound any too cheerful," husked McDill in Norm's ear. "Don't take it too serious, though. He'd cut his throat before he'd lose a man here on this confounded chunk of rock. I know him!"

Norm nodded, in full agreement. "But I wonder what else he's got up his sleeve."

Egard raised his hand for silence.

"One or two things more, and then

we'll get busy. Ill fate was met with by our predecessors. From Morgran's report we know there is life here on Dione. We know that this life is parasitic and uses a symbiosis—a damned queer life-form—deadly to anything else that's alive, and even to itself—"

"I don't get that," broke in Rives, eying first Egard and then Talbot, his inseparable companion, but with whom he maintained a serialized argument about everything within and without the cosmos. "About that symbiosis—"

"I can't do better," said Captain Egard, turning to fumble in the files under the chart table, "than to read you Morgran's own notes. Then you'll know just as much as I know. Here they are, as published in a monthly report of the Academy of Science, dated May, 2371—or roughly ten years ago: 'Green Animals of Dione: There is no such thing as a distinct plant life on Satellite IV. The primary substance composing Dione's green-animal life is somewhat comparable to the protoplasmic base of all earthly life, in so far as the fluid entering its composition is, in both instances, water; but in the case of Dione, an unidentified chemical reagent renders this solvent free from crystallization into ice at low temperatures.

" 'This living animal-matter is perfectly transparent to allow the passage of sunlight to the millions of chlorophyll-bearing vegetable cells within its substance, hence its green color. Here we observe what might be called an instance of perfect symboisis between animal and plant; the animal cells supplying carbon anhydride and nitrogenous matter to the vegetable cells, and they in turn supplying oxygen and starch to the animal cells.

" 'Thus we have organisms maintained almost entirely by sunlight. But growth and regeneration can take place only by the absorption of fresh protein from another living body—hence the evolution of parasitism. Constant, insidious warfare must necessarily be carried on against each other by Dione's individual life-units.' "

There was a moment's silence after Egard finished reading.

"Parasitic life—hell," muttered Rives. But his exact meaning, if any, was not clear.

"There you have it, men," concluded the captain. "Now we'll get busy. I know there's not one of you but would volunteer to be the first to go outside the ship. But that would be side-stepping good judgment on my part. Rives, you and Talbot jump into your oxygen suits. But just because you're supposed to be good at outside space work, don't try anything fancy. Take every precaution. You'll be in constant communication with Norm here, by microwave. Stick close to the ship, until we find out where we stand."

THE CONFERENCE broke up quietly. Rives and Talbot were hustled into their oxygen suits. Back-slapping and rough joking followed—such as men sometimes indulge in when their nerves are on edge—then the bubblelike hoods of transparent glassoplast were clamped down, and the two men prepared to leave ship.

Norm watched these activities with mingled feelings. Although naturally of a rather unobstrusive disposition, he had often wondered if his job as communications-technicist wasn't robbing him of certain adventurous thrills, such as Talbot and Rives must now be experiencing.

"Norm, get to your post," ordered the captain. "They'll be outside in a couple of minutes."

Seated at the microwave panel in the control room, directly in front of an observation port, Norm clamped earphones on his head, adjusted various switches. A moment later the shuttling car brought Captain Egard.

"They're outside," he growled,

snatching up an auxiliary headset.

"Talbot! Rives!" Norm spoke into the transmitter.

"Sure, son," came Talbot's matter-of-fact voice.

"Keep your shirt on," advised Rives. "There's nothing to it, kid."

Almost at once the two figures, bulky in their oxygen suits, appeared outside and below the port. They were walking slowly away from the ship, on the brittle frost-crystals that covered the rocks.

"Is everything right?" queried the captain, sharply, speaking into the transmitter attached to his own headset.

"O. K.," reported Talbot.

"Same here, cap," came Rives' voice.

There was an interval of silence while the two men drew farther away.

"Any sign of life?" asked Egard, his tone easier.

Talbot answered: "Something floating in the air—green motes."

"Not motes, you blockhead," Rives' voice cut in. "Nor spores, either. Too large, some of 'em. More like burrs—"

"Yea, that's it—burrs," conceded Talbot, grudgingly. "Like green chestnut burrs."

"Do they try to attack you?" asked Egard, quickly.

"Well—not exactly," said Talbot, after a momentary pause. "But they kind of swarm around. Hear that tapping? That's them, hitting against my hood."

By peering intently, Norm himself could now catch a vague glimpse of these green dots in the air.

"But you're safe in the oxygen suit?" persisted Captain Egard.

"Sure, cap. Now we'll start looking for thought-nuggets."

WITH A GUSTY sigh of relief, Egard removed his earphones. He turned to Griffin, the navigator, who had entered quietly and was watching from another port.

"There's our answer," he declared. "A man in an oxygen suit is safe. The real danger lies in the chance that some of those burrs may get inside the ship. In the construction of the *Pegasus'* air locks, this was all foreseen. With the ordinary lock, a pocket of outside air follows a man in through the neutralizing chamber when he enters the ship. That was undoubtedly the fate met by our predecessors. Dione's atmosphere is contaminated with parasitic life. Some of those burrs got inside their ship. But with our locks, the neutralizing chamber is automatically cleared by a blast of sterile air before the inner slide opens."

Griffin nodded. "Then there's no reason why the rest of us shouldn't go out and give a hand with the search."

After some hesitation Egard agreed. "You and Hall can go. But don't get separated. What I'd like to do, if possible, is to collect a few of the nuggets, and leave before darkness sets in. The sunlight period here on Dione lasts for thirty-three hours, which may give us time enough. I think I'll let McDill and Perrin loose, also. That will make three searching parties, leaving Dr. Frontain, Norm and myself to take care of the ship. I don't think that this is being incautious. I'm of the opinion that these burrs are the only life on Dione. The ship itself will hardly require any defending, and the more men we have outside, the better chance of helping each other in case of accident."

Norm cursed softly under his breath at this arrangement. He wanted to go out and join in the search. Meanwhile, Rives and Talbot had moved out of sight from the port, but he could still hear them chafing each other in their half-serious fashion.

"This stuff isn't 'snow', as you call it," Rives was saying. "It's too cold to snow here on this lousy moon."

"Oh, yeah? Well notice that haze floating a few feet above the ground," came back Talbot. "That's due to the

sun's action on patches of bare rock. And see how those mounds are building up all around. Miniature snowstorms in action, I call 'em."

"Shucks! Norm—ask Cap where's the best place to look for those nuggets."

"Cap isn't here right now," Norm spoke into the transmitter. "Besides, you've already been told all that. Look where the rocks are bare; in chinks—you know."

Hall and Griffin, clad in oxygen suits, were soon leaving the ship. A few minutes later, McDill and his mate Perrin also joined in the search. Each was promptly surrounded by a convoy of floating, green burrs.

Time passed. Presently a rousing report came from Rives.

The first thought-nugget had been found!

Captain Egard received the word with elation.

"We only need a few," he explained to Norm and Dr. Frontain. "Then, with information as to where and how more can be obtained, we'll have accomplished our purpose here. Norm, tell Rives to bring the thing in; I want to make sure it's genuine."

Rives arrived a few minutes later.

"There's nothing to it!" said he, hood tipped back from his alert-eyed countenance. "Those burrs can't hurt you—'cause they can't get at you to touch your flesh. Here—"

He dropped a milk-white nodule into Egard's hand.

"It's real!" breathed the captain, after a close scrutiny. "Rives—you'll be a blasted hero when we get back to Earth!"

AGAIN the search went on. Rives departed to rejoin Talbot. And during the next hour, with six men outside the ship to be kept track of, Norm's attention was so thoroughly occupied that few spare moments remained in which to bewail his own enforced nonparticipation.

Meanwhile, no more nuggets had been found. But as time passed, Norm began to form a kind of vicarious familiarity with the immediate locale. The *Pegasus* was resting in a wide, saucerlike depression. Fantastic mountain-chains, serrated and ice-spangled, rimmed this depression. But the moon, even close to the ship, was very rough, being crossed by innumerable chasms and littered with fragments of rock and other mineral detritus.

The search gradually widened as the men began wandering farther and farther from the ship. Still no more nuggets were found. It was perhaps two hours later when the first untoward incident occurred.

Then, without giving notice of anything amiss, McDill, the rocket-engineer, returned to the ship, bearing on his broad shoulders the body of his mate Perrin—no great muscular feat, however, in the weak gravity of Dione.

"The clumsy son took a fall in the rocks," he explained to the three men waiting in the ship.

"Why didn't you send in word?" demanded Captain Egard, scowling darkly as Dr. Frontain stripped the oxygen suit off Perrin.

"Didn't want to tie things up," McDill confessed, grinning broadly. "He isn't hurt bad."

"Broken leg," reported Dr. Frontain, after a short examination.

"You big sap!" McDill said to the injured Perrin, unfeelingly. "You could have done that by falling downstairs at home."

Perrin groaned.

"So long. I'm going out again," said McDill.

"You join up with Griffin and Hall," ordered the captain. "And don't try anything smart. We'll need you, now that Perrin is laid up."

"I'll have him on his feet in three

days," promised Dr. Frontain. "A shot of B-X-44, in the fracture, will do the trick."

For a time thereafter, Norm was alone in the control room while Captain Egard and Frontain were making the injured man comfortable in his bunk amidship.

McDill was again outside. Presently his voice sounded in Norm's phone: "Kid—you don't know what you're missing."

"Where you going?" asked Norm, for the direction-finder certainly did not indicate that the engineer was following Egard's orders.

"Back where Perrin took that fall," said McDill. "I got a hunch that it's a likely place to look."

"Griffin and Hall aren't over there."

"I know, but they're finding no nuggets. Why should I tag along with them? We've got to spread out."

The other searchers seemed to be of this opinion also. They were now rather widely dispersed over the rugged area surrounding the *Pegasus;* Rives and Talbot were perhaps two miles from the ship, Hall and Griffin nearly as far away. But the impetuous McDill was choosing a course which lay on the opposite side of the ship, far from any of the others.

Norm stretched his cramped legs under the microwave panel. He longed to take a more active part in things. Presently he threw the switch over to Griffin and Hall. They had nothing to report; neither had Rives and Talbot. The latter two were still disagreeing monotonously about the surrounding scenery in whole and in part, occasionally reverting to the former dispute concerning frost-mounds and to the exact meaning of the word "snow."

Twenty minutes passed.

"McDill, how are you making out?" asked Norm for the tenth time.

"Stop worrying about me!" bawled McDill desperately. Then in a milder tone he confided, "Listen, kid—just between you and me—I think I'm finding something."

At this moment Captain Egard returned to the control room. The general enthusiasm following the discovery of that first

nugget had by this time cooled. Egard's face looked tired and drawn as he received Norm's report.

"Did McDill join up with Griffin and Hall?" he demanded astutely.

"Well . . . er . . . no," confessed Norm. "He's over there where Perrin met with his accident."

Egard snatched up the auxiliary headset.

"McDill, you crazy fool!" he roared into the transmitted. "McDill— McDill—"

There was no reply.

"Norm, why don't he answer?" demanded Egard, sharply.

Norm shook his head. "He was on only a moment ago."

Egard's hand flipped over the control switches. "Rives, Talbot! And you, Griffin and Hall—start back on the jump! McDill's silent; something may be wrong. You're too far away to help immediately, so I'm sending Norm—"

Norm snatched off his own headset. At last he was to engage in a little action —personally!

"Use Perrin's oxygen suit," directed Captain Egard. "You know where to go—or I hope you do! I'll take your place here. Now get a move on, my lad—but watch yourself!"

So Eric Norm went into action. With Dr. Frontain's help he thrust his lean body into Perrin's oxygen suit—which was the only one quickly available —clamped the glassoplast hood down over his head and adjusted the flow of oxygen.

The *Pegasus'* air locks were almost automatic in action. Less than five minutes after the initial alarm Norm was outside the ship, surrounded by the life-infested atmosphere of Dione.

With long strides he started out across that rough basin in the direction he knew McDill had taken. Over him the tiny, brilliant disk of the sun gleamed coldly down, its slow advance across the blue-black sky almost imperceptible.

A green burr circled close to Norm in the thin air. Then another, and another. Some were large. Talbot's simile, suggesting their resemblance to chestnut burrs, seemed very apt. Parasitic life, evolved through some strange symbiosis of plant and animal to resist the rigor of existence on this inhospitable moon. Was the captain right in thinking these burrs were its only manifestation?

And what was now happening to McDill? His sudden silence—though ominous—might have a simple explanation. Microwaves were very beamlike in action. If he had entered some pocket or cavern surrounded by metallic rocks—

Norm raced down a declivity, leaped a rod-wide fissure. Then, for the first time, he noticed that his own communication-unit was not functioning. Perrin's fall, in this same suit, had evidently broken or displaced some essential part of the instrument!

Well, thought Norm, perhaps it wouldn't make any difference. He could still go on, though his silence would probably add to the captain's worries. No telling what McDill had gotten into, and a few minutes delay might spell the difference between life and death.

As he climbed the opposite slope, a thin, bitterly cold wind whispered around him—quite audible through the direct-sound diaphragm in his hood. But the oxygen suit was especially designed to maintain an even temperature. He could still see the *Pegasus,* although it was now a good half-mile distant. From this particular side of Dione, the ringed-planet, Saturn, was never visible. For as Dione raced swiftly around the mother planet in an orbital period of only sixty-six hours, she kept always this desolate, mountain-rimmed depression facing outward toward the depths of space.

And now, with that almost black sky

staring down at him, Norm experienced a sudden foreboding. This was new work, in which he had comparatively little practice. He paused for an instant to glance around. He must now be nearing the point from which McDill had last spoken. The sight was not reassuring. For behind him now trailed a swarm of green burrs.

The oxygen suit, inflated with a pressure considerably above that of Dione's shallow atmosphere, kept these harbingers of death safely away from him; but now, during this brief pause, he could hear the tiny tapping sounds of them against his hood.

Eyes straining sharply ahead for a first glimpse of the unruly, but well-intentioned engineer, Norm raced on again. The ground here was very broken and rocky, with large spaces clear of frost-mounds. He began shouting—although fully aware that a voice could not travel far from the diaphragm, through this thin atmosphere.

He had reached a point where, according to his best judgment, he should find McDill, when catastrophe overtook him. It came unexpectedly. There was a sudden, soft *s-s-swooshing* sound, followed by the immediate collapse of his oxygen suit!

With stunning clearness, Norm realized the cause. Perrin's accidental fall in this same suit had done more than damage the communication unit. Some sharp point of rock must have scraped along the tough fabric, straining it almost to the point of rupture. For the suit had now split open in a foot-long gash across the shoulders.

Immediately succeeding that loss of pressure, Norm's lungs began to work overtime in labored gasps as the unfamiliar scent of Dione's thin, bitterly-cold atmosphere entered his nostrils.

And tending to add a note of panic to this truly grim situation, that swarm of green burrs awoke into sudden, vicious activity. Here and there they darted around him, like angry hornets. The sound as they struck his hood grew continuous—*tap . . . tap . . . tap*—

Despair entered Norm's heart. Nothing in his experience indicated what should be done in a crisis of this sort, but his alert mind groped for some saving expedient.

An answer came in the very nick of time. He jerked the valve of his oxygen tank wide open.

Again he could breathe—after a fashion. For even Dione's shallow atmosphere offered a certain pressure, enough to inflate his lungs and keep the oxygen from dissipating immediately.

He stood there for a moment, trembling, exhausted.

HOPE SPRANG up again as his lungs absorbed oxygen. His breathing became freer. He might possibly last long enough to return to the ship!

But what about McDill?

Norm groaned regretfully. Even Rives or Talbot would not be expected to carry on in the face of such disaster. He cast a last look around for the engineer. No human shape was visible. McDill would have to take his chances.

Gathering his feet together, Norm set off in a long leap for the *Pegasus*. Immediately, a stinging pain in the back of his neck diverted his attention, brought him tumbling in a heap against a mound of brittle ice crystals.

Dione, moon of delirium, was only just starting with him!

He endeavored to clap a hand to the source of the pain, swearing in a breathless mumble, "Damn green burr—got in through that hole."

But encumbered as he was by the deflated suit, a moment passed while he struggled to reach the thing and tear it away.

Meanwhile, a purely local numbness, like that produced by the injection of cocaine, had succeeded that first agonizing twinge; and by the time Norm

finally managed to touch the area in question, a lump, the size of a walnut, had puffed up there—a lump, and nothing more. The burr had drilled in, imbedding itself in the flesh almost at the base of the brain.

And, unknown to Norm, a tiny, filamentlike rootlet had penetrated even deeper, contacting nerves of the spinal cord.

Norm struggled to his feet. Even slight exertion made him pant and gasp for more oxygen. Then he noticed that all those other greenish burrs had departed from him, as if—well, as if his fate had been squabbled over, decided, sealed.

And suddenly he noticed something else, an utterly strange, incomprehensible thing—he possessed a new sense!

A sixth sense—a sense in addition to sight and hearing and the normal five senses; an alien, unfamiliar sense, and with it he could now sense—life!

Life all around him—an awareness of life as a form of radiant energy. Life that he couldn't see or hear—

"Lord," he muttered, "it's got me. I'm all—"

He was going to say "crazy," but he didn't actually feel crazy, merely unfamiliar with himself. He could sense life here and there around him, but more particularly he could sense something off to his right, something—a monstrous organism—that had its lair in a deep cleft in the rocks; something that was calling.

He realized that he was not himself mentally. No longer could he go on; no longer could he struggle to reach the *Pegasus* and thereby prolong his own life. His mind seemed to be divided against itself. Yet, with every atom of his reason—his former self—he tried to fight against that compeling, insidious call.

"Food . . . food . . . food," boomed that soundless voice from the rock-cleft. "Food . . . come nearer . . . nearer."

A strange rapture seized Eric Norm.

Food—that meant him! He was food And this realization filled him with an elation that was pure madness. For suddenly it seemed that the entire purpose of his existence lay in the fulfillment of a certain obligation to that hidden monstrosity now calling him.

And yet, his reasoning powers were apparently unimpaired. He realized that he had been trapped by one of the strange parasitic life-forms of Dione. The thing on his neck was a decoy—sent out by that dreadful organism hiding in the rock-cleft to beguile and delude him.

But he didn't mind this delusion. No! Above all things he longed to answer that call.

Breathless, panting, he turned aside. How long would his oxygen hold out? He had only the vaguest idea. But long enough now, in all likelihood, for him to accomplish his new purpose.

The rock-cleft lay only a short distance to his right. He staggered down a talus of frost-bound rocks, into the opening. Before him he could now see that it formed one of numerous entrances into a wide gully or ravine.

Suddenly his new sense told him that McDill was down there somewhere, although it didn't seem to matter greatly. Directed against his reasoning self, he entered this ravine.

"Food . . . food . . . food!" With rising clearness radiated that thought-voice ahead of him, almost shrieking now its eager commands. "Nearer . . . nearer . . . nearer!"

This was the end, thought Eric Norm vaguely. The *Pegasus* would return to Earth without him. Perhaps no one would ever learn exactly what had happened to him, here on this frightful moon of Saturn.

But all this was misty and unimportant.

PRESENTLY, as he staggered around a jagged block of rock which rose from the floor of the ravine, he saw his fate—A vividly green, star-shaped monstrosity! Twenty feet from tip to tip, its body bulged upward in the center to form a hideous mamelon of glaucous, glistening flesh on which emerald eye-spots pulsed with rhythmic dilation and shrinkage. The thing was advancing slowly up the ravine on its hundreds of short, pseudopodial legs.

"Food . . . food . . . food!" it was shrieking with that extra-sensory voice. "Food . . . come nearer—nearer!"

Again that strange rapture seized Eric Norm—intensified now into an exquisite ecstasy of longing, a yearning to be consumed, absorbed, combined!

And as he reeled onward, his mind half numbed with horror, half frenzied with this nameless delirium, he noticed dully a strange thing on the rocks under his stumbling feet.

The floor of the ravine was strewn with milk-white nodules.

Hundreds of them lay there. And in a flash of odd vision he realized the answer. Thought-nuggets and green burrs were the same thing! This frightful organism sent out the green burrs in a sporelike fashion, to snare and lure. When they failed to contact a living creature, they returned to this ravine where the monster had its lair, and here metamorphosed into thought-nuggets—retaining for some obscure reason the quality of being telepathically sensitive.

A pertinent discovery, thought Norm. But now nothing seemed to matter except the quick relinquishment of his ego as a separate being. So, blindly and deliriously, he reeled forward.

Now he was almost within the monster's reach—so close, indeed, that one of the triangular extremities of its star-shaped body had lifted to draw him close in its frightful embrace—when a thin, distant voice bawled out behind him.

"Norm! What the hell? Norm—come back!"

It was a real voice this time, a voice edged with fear and astonishment, a voice that he knew—McDill's voice.

McDill was trying to call him back from death. But the mystery of the engineer's voice, of his presence here, seemed of slight importance. Not worth troubling over.

Moreover, to Norm, with his new sense, there was nothing strange about it anyway. He seemed instinctively to know McDill's recent line of experience, just as well as his own. McDill had wandered into this ravine from a different angle. Enthusiastic over his discovery of myriad thought-nuggets, he was not even aware that his microwave connection with the ship had been occulted by these black, metallic rocks; and only this very instant had he

glimpsed the Dionian monster.

All this was very clear to Norm—although unimportant. And yet, McDill's shout, fraught with urgency, did cause him to raise his eyes for a last look around before taking that final step.

"Food . . . food!" boomed that soundless voice. With a slowly flowing motion the monster's multitudinous feet bore it closer.

McDill, corpulent in his oxygen suit, hip-pouches overflowing with milk-white nodules, was bounding across the rock-strewn floor of the ravine, shouting as he came, "Norm—for God's sake—beat it!"

The fact that McDill was not himself in any danger, pleased Norm distinctly. But not so pleasing came knowledge of the loyal-hearted engineer's determination to take an active hand in these proceedings.

Something touched Norm's shoulder. He glanced around. The monster had heaved itself half upright over him. The undersurface thus exposed was a writhing mass of pseudopodial legs and absorptive disks, pulsing with a dreadful eagerness.

"Food . . . food . . . food!" the thing seemed to gurgle.

A gloved hand suddenly clamped itself around Norm's arm, tried to yank him back. But like a lunatic poised on the brink of a cliff, he resisted rescue, struggled to twist his arm free.

That grasp, however, was not to be broken, for McDill was solidly boned and muscled.

"Norm!" he was half shouting, half gasping. "You dope! Don't you know me? Stop fighting! Come away!"

The affrighted and desperate appeal in McDill's voice penetrated only dimly through the delirium drowning Norm's reason. He continued to struggle.

Suddenly, McDill's hard fist swung up in a crushing blow that pliable glassoplast could not divert. Norm's hood bulged in against his jaw. His head snapped back, and forthwith all that scene of madness evaporated into mist.

With returning consciousness came the impression that a rather long interval had elapsed. Again Norm could breathe without gasping; there was plenty of oxygen. And even before he opened his eyes he knew where he was—back aboard the *Pegasus*, in his own bunk!

He opened his eyes. In the soft glow cast by the nimbus tube on the metal ceiling, he blinked at the group of worried faces around him—Captain Egard, Griffin, Talbot, all the crew, in fact, except Perrin.

"He's coming around," said the voice of Dr. Frontain. "Take it easy, Norm—just relax. Are you in any pain?"

For a moment Norm didn't answer. He was trying to figure things out—with strangely good success! All that former obsession, the sacrifice of his body to the monster in the ravine, had vanished. He felt, if not perfectly normal, very fit indeed—and in a certain odd way, even *more* than normal.

McDill shouldered his way forward. Despite Frontain's remonstrances, the impulsive chief grasped Norm's hand. "Kid, you got into this on my account. I'm sorry I had to crack you."

Norm sat up in the bunk. "That's all right. You saved my life. Thanks for packing me back here to the ship."

Frontain pushed McDill aside. "Better lie down," he urged Norm, soothingly.

But Norm had no desire to lie down. Instead, he raised a hand to the back of his neck. The swelling was not nearly so noticeable, and a piece of tape was plastered over the place where the burr had entered.

"You tried to operate," he said, looking at the troubled Dr. Frontain. Norm's words were more in the form of a statement than question.

The ship's surgeon nodded unwillingly. "Just lie down and relax," he

said. "You'll come through all right."

"Why not tell the truth?" asked Norm gently. "You tried to remove the burr, and found that most of it had already been absorbed. Moreover, the small vestige still remaining was so thoroughly incorporated with the spinal cord that to attempt its removal would cause my death."

Frontain's jaw dropped. "How did you know that?" he gulped.

"Because," said Norm quietly, "I can read your thoughts."

Blank amazement fell across that circle of faces.

They watched Norm rise from the bunk.

Then Captain Egard stepped forward. Worry had deepened the lines on his face. "Lad," he said gruffly, "I'll never forgive myself for ordering one of my men out in a bad oxygen suit."

"Forget it, Cap," said Norm. "I'm O. K."

And this seemed to be the truth. Eric Norm had never felt better in his life. Formerly he had been of a rather quiet, retiring disposition; but now, with the possession of this new sense, a certain ease and sureness of himself had descended on him—for his mind seemed to reach out and encompass that of every man present.

Nevertheless, he was mystified. What had become of that obsession, that delirium he had labored under? Of course, McDill's interference, which had prevented him from immediately uniting with the Dionian monster, might be the solution. For the telepathic control exerted by the monster over its burrs might conceivably be expected to grow weaker with the passage of time when anything prevented their natural functioning.

But what about the burr itself? Why had it not killed him? Would it eventually kill him?

Rives and Talbot were staring at him with odd, slightly abashed expressions. And for once Rives was speechless.

Norm grinned. It seemed almost as if they were all expecting him to take charge of things.

"I think," he observed with quiet assurance, "that Dr. Frontain has figured out a possible explanation as to why that burr hasn't killed me. Won't you tell us about it, doc?"

"This is the most astounding thing that ever happened to mankind!" gasped Dr. Frontain. "Yes, it is true! I do have a theory. These burrs, as we know, belong to a symbiotic life-form. It is quite apparent that when they attack man, the burrs are not in themselves deadly. The man attacked immediately acquires a new sense. And if he is prevented from sacrificing himself to the parent organism during the subsequent brief delirium, he may even be permanently benefited. This life-form, since it works on a symbiosis, does not kill him, but merely attempts to continue its symbiosis. It is mutually profitable both to the life-form and the man, but more profitable to the man because he has at last acquired a long-desired faculty.

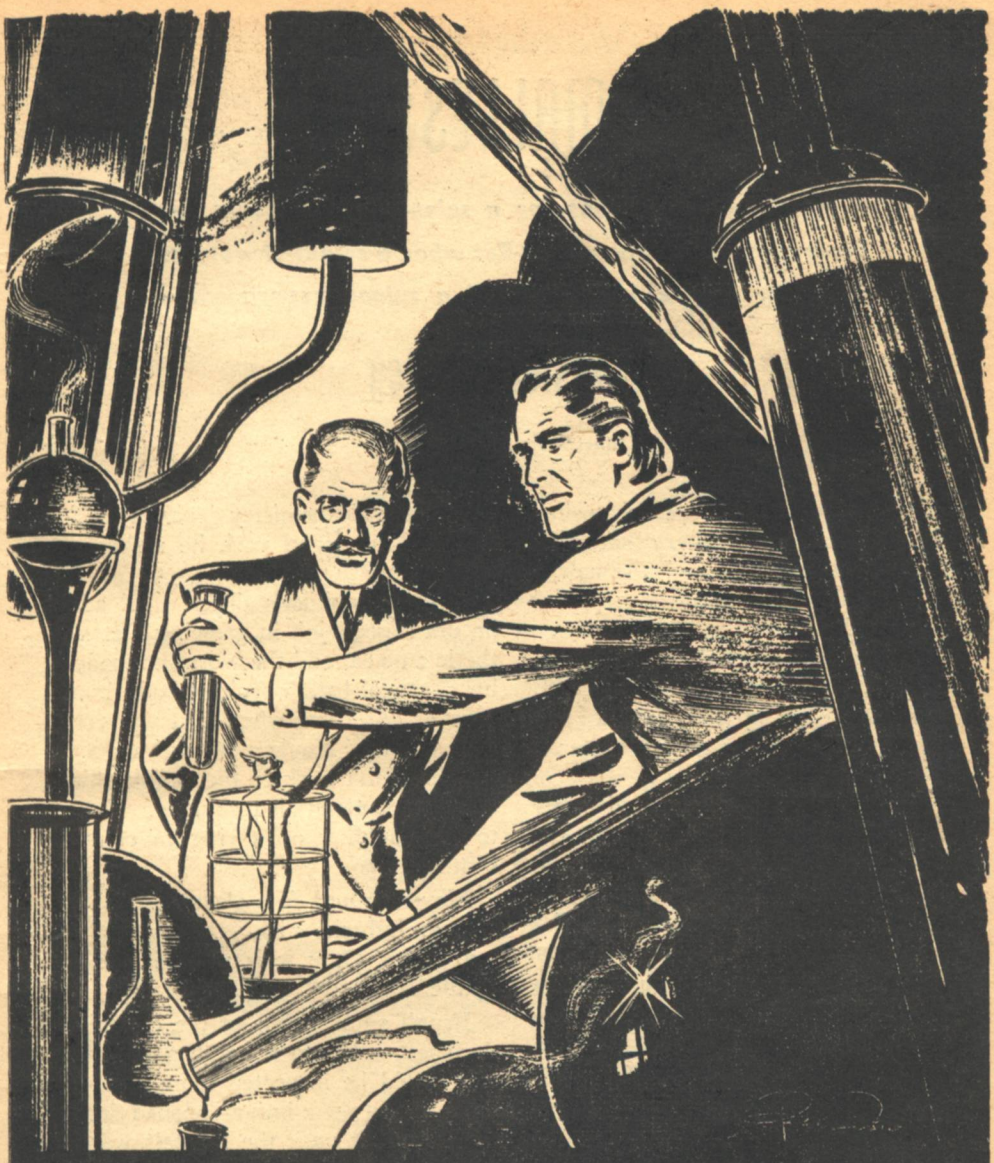
"Moreover, this new sense will undoubtedly be transmitted from generation to generation, as are certain earthly forms of symbiosis with which we are already familiar.

"This, gentleman, is my theory!"

As Dr. Frontain ceased speaking, Captain Egard stepped to Norman's side.

"Men," he announced gravely, yet in a deep tone of triumph, "we shall leave Dione immediately. We have more than accomplished our mission. Not only shall we return to Earth with a plethora of thought-nuggets, but with something much more auspicious.

"Behold the superman!" he rumbled, placing his hand on Norm's shoulder. "The possible progenitor of a new race of humans—the first man with a complete telepathic sense!"



THE SMALLEST GOD

By LESTER DEL REY

THE SMALLEST GOD

A most unusual subject for a science-fiction yarn: the biography of a rubber doll! But when a scientist weights a rubber doll with the goo of a ruined experiment—

By Lester del Rey

Illustrated by R. Isip

DR. ARLINGTON BRUGH led his visitor around a jumble of machinery that made sense only to himself, and through a maze of tables and junk that occupied most of his laboratory.

"It's a little disordered just now," he apologized, glad that his assistant had been able to clear up the worst of the mess. "Sort of gets that way after a long experiment."

Herr Dr. Ernst Meyer nodded heavy agreement. "Ja, so. Und mit all dis matchinery, no vunder. It gives yet no goot place v'ere I can mit comfort vork, also in mine own laboradory. Und v'at haff ve here?"

"That's Hermes—my mascot." Brugh picked up the little, hollow rubber figure of the god Hermes; Mercury, the Romans called him. "The day I bought him for my daughter, the funds for my cyclotron were voted on favorably, so I've kept him in here. Just a little superstition."

Meyer shook his head. "Nein. I mean here." He tapped a heavy lead chest bearing a large "Keep Out" label. "Is maybe v'at you make?"

"That's right." The physical chemist pulled up the heavy cover and displayed a few dirty crystals in a small compartment and a thick, tarry goo that filled a half-liter beaker. "Those are my latest success and my first failure. By the way, have you seen Dr. Hodges over in the biochemistry department?"

"Ja. Vunderful vork he makes yet, nicht wahr?"

"Um-m—opinions differ. I'll admit he did a good job in growing that synthetic amœba, and the worm he made in his chemical bath wasn't so bad, though I never did know whether it was really alive or not. Maybe you read about it? But he didn't stick to the simple things until he mastered his technique. He had to go rambling off trying to create a synthetic man."

Meyer's rough face gleamed. "Ja, so. Dot is hübsch—nice. Mit veins und muschles. Only it is not mit der life upfilled."

Brugh sifted a few of the crystals in the chest out onto a watch glass where they could be inspected more carefully. Then he put them into an opened drawer and closed it until the crystals were in a much dimmer light. In the semidarkness, a faint gleam was visible, hovering over the watch glass.

"Radioactive," he explained. "There is the reason Hodges' man isn't filled with life. If there had been some of this in his chemical bath when he was growing Anthropos—that's what he calls the thing—it would be walking around today. But you can't expect a biochemist to know that, of course. They don't keep up with the latest developments the way the physical chemists do. Most of them

aren't aware of the fact that the atom can be cracked up into a different kind of atom by using Bertha."

"Bert'a? Maybe she is die daughter?"

Brugh grinned. "Bertha's the cyclotron over there. The boys started calling her Big Bertha, and then we just named her Bertha for short." He swung around to indicate the great mass of metal that filled one end of the room. "That's a lot of material to make so few crystals of radioactive potassium chloride, though."

"Ach, so. Den it is der radioagdivated salt dot vould give life to der synt'etic man, eh?"

"Right. We're beginning to believe that life is a combination of electricity and radioactivity, and the basis of the last seems to be this active potassium we've produced by bombarding the ordinary form with neutrons. Put that in Anthropos and he'd be bouncing around for his meals in a week."

Meyer succeeded in guessing the meaning of the last and cocked up a bushy eyebrow. "Den v'y not der salt to der man give?"

"And have Hodges hog all the glory again? Not a chance." He banged his hand on the chest for emphasis, and the six-inch figure of Hermes bounced from its precarious perch and took off for the watch glass. Brugh grabbed frantically and caught it just before it hit. "Some day I'll stuff this thing with something heavy enough to hold it down."

THE GERMAN looked at the statue with faint interest, then pointed to the gummy mess in the beaker. "Und dis?"

"That's a failure. Some day I might analyze a little of it, but it's too hard to get the stuff out of that tar, and probably not worth a quarter of the energy. Seems to be a little of everything in it, including potassium, and it's fairly radioactive. but all it's good for is—well, to stuff Hermes so he can't go bouncing around."

Brugh propped the little white figure against a ring stand and drew out the beaker, gouging out a chunk of the varicolored tar. He plopped it into a container and poured methyl alcohol over it, working with a glass rod until it was reasonably plastic. "Darned stuff gets soft, but it won't dissolve," he grumbled.

Meyer stood back looking on, shaking his head gently. Americans were naturally crazy, but he hadn't expected such foolishness from so distinguished a research man as Dr. Brugh. In his own laboratory, he'd have spent the next two years, if necessary, in finding out what the tar was, instead of wasting it to stuff a cheap rubber cast of a statue.

"Dis Herr Dr. Hodges, you don't like him, I t'ink. Warum?"

Brugh was spooning the dough into his statue, forcing it into the tiny mouth, and packing it in loosely. "Hodges wanted a new tank for his life-culture experiments when I was trying to get the cyclotron and the cloud chamber. I had to dig up the old antivivisection howl among the students' parents to keep him from getting it, and he thought that was a dirty trick. Maybe it was. Anyway, he's been trying ever since to get me kicked out, and switch the appropriations over to his department. By the way, I'd hate to have word of this get around."

"Aber—andivifisegtion!" Meyer was faintly horrified at such an unscientific thing.

Brugh nodded. "I know. But I wanted that cyclotron, and I got it; I'd do worse. There, Hermes won't go flying around again. Anything else I can show you, Dr. Meyer?"

"T'ank you, no. Der clock is late now, and I must cadge my train by der hour. It has a bleasure been, Dr. Brugh."

"Not at all." Brugh set the statue on a table and went out with the German,

leaving Hermes in sole possession of the laboratory, except for the cat.

II.

THE CLOCK in the laboratory said four o'clock in the morning. Its hum and the gentle breathing of the cat, that exercised its special privileges by sleeping on the cyclotron, were the only noises to be heard. Up on the table Hermes stood quietly, just as Dr. Brugh had left him, a little white rubber figure outlined in the light that shown through from the outside. A very ordinary little statue he looked.

But inside, where the tar had been placed, something was stirring gently. Faintly and low at first, life began to quiver. Consciousness began to come slowly, and then a dim and hazy feeling of individuality. He was different in being a unit not directly connected in consciousness with the dim outlines of the laboratory.

What, where, when, who, why, and how? Hermes knew none of the answers, and the questions were only vague and hazy in his mind, but the desire to know and to understand was growing. He took in the laboratory slowly through the hole that formed his partly open mouth and let the light stream in against the resinous matter inside. At first, only a blur was visible, but as his "eyes" grew more proficient from experience, he made out separate shapes. He had no names for them, but he recognized the difference between a round tube and a square table top.

The motion of the second hand caught his attention, and he studied the clock carefully, but could make no sense to it. Apparently some things moved and others didn't. What little he could see of himself didn't, even when he made a clumsy attempt at forcing motion into his outthrust arm. It took longer to notice the faint breathing of the cat; then he noticed it not only moved, but did so in an irregular fashion. He strained toward it, and something clicked in his mind.

Tabby was dreaming, but Hermes couldn't know that, nor understand from whence came the pictures that seemed to flash across his gummy brain; Tabby didn't understand dreams, either. But the little god could see some tiny creature that went scurrying rapidly across the floor, and a much-distorted picture of Tabby was following it. Tabby had a definitely exaggerated idea of herself. Now the little running figure began to grow until it was twice the size of the cat, and its appearance altered. It made harsh explosive noises and beat a thick tail stiffly. Tabby's picture made a noise and fled, but the other followed quickly and a wide mouth opened. Tabby woke up, and the pictures disappeared. Hermes could make no sense of them, though it was plain in Tabby's mind that such things often happened when her head turned black inside.

But the cat awake was even more interesting than she was sleeping. There were the largest groups of loosely classified odor, sights, and sensations to be absorbed, the nicest memories of moving about and exploring the laboratory. Through Tabby's eyes he saw the part of the laboratory that was concealed from him, and much of the outside in the near neighborhood. He also drew a hazy picture of himself being filled, but it made no sense to him, though he gathered from the cat's mind that the huge monster holding him was both to be despised and respected, and was, all in all, a very powerful person.

By now his intelligence was great enough to recognize that the world seen through the cat's eyes was in many ways wrong. For one thing, everything was in shades of white and black, with medial grays, while he had already seen that there were several colors. Hermes decided that he needed another point of view, though the cat had served ad-

mirably to start his mind on the way to some understanding of the world about him.

A LOW howling sound came from outside the laboratory, and Hermes recoiled mentally, drawing a picture of a huge and ferocious beast from his secondhand cat's memory. Then curiosity urged him to explore. If the cat's color sense was faulty, perhaps her ideas on the subject of dogs were also wrong. He thrust his mind out toward the source of the sound, and again there was the little click that indicated a bridge between two minds.

He liked the dog much better than the cat. There was more to be learned here, and the animal had some faint understanding of a great many mysteries which had never interested Tabby. Hermes also found that hard, selfish emotions were not the only kind. On the whole, the mind of Shep seemed warm and glowing after the frigid self-interest of Tabby.

First in the dog's mind, as in all others, was the thought of self, but close behind was mistress and master, the same person whom the cat's mind had pictured filling the god. And there were the two little missies. Something about the dog's mental image of one of them aroused an odd sensation in the little god, but it was too confused to be of any definite interest.

But the dog retained hazy ideas of words as a means of thought, and Hermes seized on them gratefully. He gathered that men used them as a medium of thought conveyance, and filed the sixty partly understood words of Shep's vocabulary carefully away. There were others with tantalizing possibilities, but they were vague.

Shep's world was much wider than that of Tabby, and his general impression of color—for dogs do see colors—was much better. The world became a fascinating place as he pictured it, and Hermes longed for the mysterious power of mobility that made wide explorations possible. He tried to glean the secret, but all that Shep knew on the subject was that movement followed desire, and sometimes came without any wish.

The god came to the conclusion that in all the world the only animals that could satisfy his curiosity were men. His mind was still too young to be bothered with such trifles as modesty, and he was quite sure there could be no animal with a better intelligence than he had. The dog couldn't even read thoughts, and Hermes had doubts about man's ability to do the same; otherwise, why should the master have punished Shep for fighting, when the other dog had clearly started it?

And if he hadn't, Shep would have been home, instead of skulking around this place, where he sometimes came to meet the master after work.

Hermes tried to locate a man's mind, but there was none near. He caught a vague eddy of jumbled thought waves from someone who was evidently located there to guard the building, but there was a definite limit to the space that thought could span.

The cat's brain had gone black inside again, with only fitful images flickering on and off, and the dog was drifting into a similar state. Hermes studied the action with keen interest and decided that sleep might be a very fine way of passing the time until a man came back to the laboratory, as he gathered they did every time some big light shone from somewhere high up above.

But as he concentrated on the matter of turning off his mind, he wondered again what he was. Certainly neither a dog nor a cat, he had no real belief that he was a man; the dog didn't know about him, but the cat regarded him as a stone. Maybe he was one, if stones ever came to life. Anyway, he'd find out in the morning when the master

came in. Until then he forced thoughts from his mind and succeeded in simulating sleep.

III.

A STRANGE noise wakened Hermes in the morning. From what he had seen in Shep's mind, he knew it was the sound of human speech, and listened intently. The people were talking at a point behind him, but he was sure it was the master and one of the little missies. He tuned his mind in on that of the master and began soaking up impressions.

"I wish you'd stay away from young Thomas," Dr. Brugh was saying. "I think he's the nephew of Hodges, though he won't admit it. Your mother doesn't like him, either, Tanya."

Tanya laughed softly at her father's suspicions, and Hermes felt a glow all over. It was a lovely sound. "You never like my boy friends," she said. "I think you want me to grow up into an old-maid schoolmarm. Johnny's a nice boy. To hear you talk, a person would think Hodges and his whole family were ogres."

"Maybe they are." But Brugh knew better than to argue with his older daughter; she always won, just as her mother always did. "Hodges tried to swindle me out of my appropriations again at the meeting last night. He'd like to see me ruined."

"And you swindled him out of his tanks. Suppose I proved to the president who sent those anonymous vivisection letters to all the parents?"

Brugh looked around hastily, but there was no one listening. "Are you trying to blackmail me, Tanya?"

She laughed again at his attempt at anger. "You know I won't tell a soul. 'By, dad. I'm going swimming with Johnny." Hermes felt a light kiss through Brugh's senses, and saw her start around the table to pass in front of him. He snapped the connection with the master's mind and prepared his own eyes for confirmation of what he had seen by telepathy.

Tanya was a vision of life and loveliness. In the fleeting second it took her to cross the little god's range of sight, he took in the soft, waving brown hair, the dark, sparkling eyes, and the dimple that lurked in the corner of her mouth, and something happened to Hermes. As yet he had no word for it, but it was pure sensation that sped through every atom of his synthetic soul. He began to appreciate that life was something more than the satisfaction of curiosity.

A sound from Brugh, who was puttering around with a cloudy precipitate, snapped him back to reality. The questions in his mind still needed answering, and the physicist was the logical one to answer them. Again he made contact with the other's mind.

This was infinitely richer than the dog's and cat's combined. For one thing, there was a seemingly inexhaustible supply of word thoughts to be gleaned. As he absorbed them, thinking became easier, and the words provided a framework for abstractions, something utterly beyond the bounds of the animal minds. For half an hour he studied them, and absorbed the details of human life gradually.

Then he set about finding the reasons for his own life; that necessitated learning the whole field of physical chemistry, which occupied another half-hour, and when he had finished, he began putting the knowledge he had gleaned together, until it made sense.

ALL LIFE, he had found, was probably electricity and radioactivity, the latter supplied by means of a tiny amount of potassium in the human body. But life was really more than that. There were actions and interactions between the two things that had thus far baffled all students. Some of them baffled the rubber

god, but he puzzled the general picture out to his own satisfaction.

When the experiment had gone wrong and created the tarry lump that formed the real life of Hermes, there had been a myriad of compounds and odd arrangements of atoms formed in it, and the tarry gum around them had acted as a medium for their operations. Then, when they were slightly softened by the addition of alcohol, they had begun to work, arranging and rearranging themselves into an interacting pattern that was roughly parallel to human life and thought.

But there were differences. For one thing, he could read thoughts accurately, and for another he had a sense of perception which could analyze matter directly from its vibrations. For another, what he called sight and sound were merely other vibrations, acting directly on his life substance instead of by means of local sensory organs. He realized suddenly that he could see with his mouth instead of his eyes, and hear all over. Only the rubber casing prevented him from a full three-hundred-and-sixty-degree vision. But, because of the minds he had tapped, he had learned to interpret those vibrations in a more or less conventional pattern.

Hermes analyzed the amount of radioactive potassium in Brugh's body carefully and compared it with his own. There was a great difference, which probably accounted for his more fully developed powers. Something ached vaguely inside him, and he felt giddy. He turned away from his carefully ordered thoughts to inspect this new sensation.

The alcohol inside him was drying out—almost gone, in fact, and his tarry interior was growing thicker. He'd have to do something about it.

"Dr. Brugh," he thought, fixing his attention on the other, "could I have some alcohol, please? My thoughts will be slowed even below human level if I can't have some soon."

Arlington Brugh shook his head to clear it of a sudden buzz, but he had not understood. Hermes tried again, using all the remaining thought power he could muster.

"This is Hermes, Dr. Brugh. You brought me to life, and I want some alcohol, please!"

Brugh heard this time, and swung suspiciously toward the end of the room, where his assistant was working. But the young man was engaged in his work, and showed no sign of having spoken or heard. Hermes repeated his request, squeezing out his fast failing energy, and the master jerked quickly, turning his eyes slowly around the room. Again Hermes tried, and the other twitched.

Brugh grabbed for his hat and addressed the assistant. "Bill, I'm going for a little walk to clear my head. That session last night seems to have put funny ideas in it." He paused. "Oh, better toss that little rubber statue into the can for the junkman. It's beginning to get on my nerves."

He turned sharply and walked out of the room. Hermes felt the rough hands of the assistant, and felt himself falling. But his senses were leaving him, drained by the loss of alcohol and the strain of forcing his mind on the master. He sank heavily into the trash can and his mind grew blank.

IV.

A SPLATTER of wetness against Hermes' mouth brought him back to consciousness, and he saw a few drops fall near him from a broken bottle that was tipped sidewise. Occasionally one found its way through his mouth, and he soaked it up greedily. Little as he got, the alcohol still had been enough to start his dormant life into renewed activity.

There was a pitch and sway to the

rubbish on which he lay, and a rumbling noise came from in front of him. Out of the corner of his "eye" he saw a line of poles running by, and knew he was on something that moved. Momentarily he tapped the mind of the driver and found he was on a truck bound for the city dump, where all garbage was disposed of. But he felt no desire to use the little energy he had in mind reading, so he fell back to studying the small supply of liquid left in the bottle.

There was an irregular trickle now, running down only a few inches from him. He studied the situation carefully, noting that the bottle was well anchored to its spot, while he was poised precariously on a little mound of rubbish. One of Newton's laws of momentum flashed through his mind from the mass of information he had learned through Brugh; if the truck were to speed up, he would be thrown backward, directly under the stream trickling down from the bottle—and with luck he might land face up.

Hermes summoned his energy and directed a wordless desire for speed toward the driver. The man's foot came down slowly on the accelerator, but too slowly. Hermes tried again, and suddenly felt himself pitched backward—to land face down! Then a squeal of brakes reached his ears, as the driver counteracted his sudden speed, and the smallest god found himself rolling over, directly under the stream.

There were only a few teaspoons left, splashing out irregularly as the bouncing of the truck threw the liquid back and forth in the fragment of glass, but most of them reached his mouth. The truck braked to a halt and began reversing, and the last drops fell against his lips. It was highly impure alcohol, filled with raw chemicals from the laboratory, but Hermes had no complaints. He could feel the tar inside him soften, and he lay quietly enjoying the sensation until new outside stimuli caught his attention.

The truck had ceased backing and was parked on a slope leading down toward the rear. There was a rattle of chains and the gate dropped down to let the load go spinning out down the bank into the rubbish-filled gulley. Hermes bounced from a heavy can and went caroming off sidewise, then struck against a rock with force enough to send white sparks of pain running through him.

But the rock had changed his course and thrown him clear of the other trash. When he finally stopped, his entire head and one arm were clear, and the rest was buried under only a loose litter of papers and dirt. No permanent damage had been done; his tarry core was readjusting itself to the normal shape of the rubber coating, and he was in no immediate danger.

But being left here was the equivalent of a death sentence. His only hope was to contact some human mind and establish friendly communications, and the dump heap was the last place to find men. Added to that, the need for further alcohol was a serious complication. Again he wished for the mysterious power of motion.

He concentrated his mental energy on moving the free arm, but there was no change; the arm stayed at the same awkward angle. With little hope he tried again, watching for the slightest movement. This time a finger bent slightly! Feverishly he tried to move the others, and they twisted slowly until his whole hand lay stretched out flat. Then his arm began to move sluggishly. He was learning.

It was growing dark when he finally drew himself completely free of the trash and lay back to rest, exulting over his newfound ability. The alcohol was responsible, of course; it had softened the tar slightly more than it had been when he made his first efforts in the labora-

tory, and permitted motion of a sort through a change of surface tension. The answer to further motion was more alcohol.

There were bottles of all kinds strewn about, and he stared at those within his range of vision, testing their vibrations in the hope of finding a few more drops. The nearer ones were empty, except for a few that contained brackish rain water. But below him, a few feet away, was a small-sized one whose label indicated that it had contained hair tonic. The cork was in tightly, and it was still half full of a liquid. That liquid was largely ethyl alcohol.

HERMES forced himself forward on his stomach, drawing along inch by inch. Without the help of gravity, he could never have made it, but the distance shortened. He gave a final labored hitch, clutched the bottle in his tiny hands, and tried to force the cork out. It was wedged in too firmly!

Despair clutched at him, but he threw it off. There must be some way. Glass was brittle, could be broken easily, and there were stones and rocks about with which to strike it. The little god propped the neck of the bottle up against one and drew himself up to a sitting position, one of the stones in his hands. He could not strike rapidly enough to break the glass, but had to rely on raising the rock and letting it fall.

Fortunately for his purpose, the bottle had been cracked by its fall, and the fourth stone shattered the neck. Hermes forced it up on a broken box and tipped it gingerly toward his mouth. The smell of it was sickening, but he had no time to be choosy about his drinks! There was room inside him to hold a dozen teaspoonfuls, and he meant to fill those spaces.

The warm sensation of softening tar went through him gratefully as the liquid was absorbed. According to what he had read in Brugh's mind, he should have been drunk, but it didn't feel that way. It more nearly approximated the sensation of a man who had eaten more than he should and hadn't time to be sorry yet.

Hermes wriggled his toes comfortably and nodded his approval at the ease with which they worked. Another idea came to him, and he put it to the test. Where his ear channels were, the rubber was almost paper-thin; he put out a pseudopod of tar from the lumps inside his head and wriggled it against the membrane; a squeaky sound was produced like a radio speaker gone bad. He varied the speed of the feeler, alternating it until he discovered the variation of tones and overtones necessary, and tried a human word.

"Tanya!" It wasn't perfect, but there could be no question as to what it was. Now he could talk with men directly, even with Tanya Brugh if fate was particularly kind. He conjured up an ecstatic vision of her face and attempted a conventional sighing sound. Men in love evidently were supposed to sigh, and Hermes was in love!

But if he wanted to see her, he'd have to leave the dump. It was dark now, but ultraviolet and infrared light were as useful to him as the so-called visible beams, and the amount of light needed to set off his sight was less than that for a cat. With soiled hands he began pulling his way up the bank, burrowing through the surface rubbish. Then he reached the top and spied the main path leading away.

His little feet twinkled brightly in the starlight, and the evening dew washed the stains from his body. A weasel, prowling for food, spied him and debated attack, but decided to flee when the little god pictured himself as a dog. Animals accepted such startling apparent changes without doubting their sanity. He chuckled at the tricks he

could play on Tabby when he got back, and sped down the lane at a good two miles an hour.

V.

BRUGH worked late in the laboratory, making up for the time he had taken off to clear his head. All thoughts of his trouble with Hermes had vanished. He cleared up the worst of the day's litter of dirty apparatus, arranged things for the night, and locked up.

Dixon, head of the organic-chemistry department, was coming down the hall as the physicist left. He stopped, his pudgy face beaming, and greeted the other. "Hi, there, Brugh. Working late again, eh?"

"A little. How's the specific for tuberculosis going?"

Dixon patted his paunch amiably. "Not bad. We're able to get the metal poison into the dye, and the dye into the bug. We still can't get much of the poison out of the dye after that to kill our friend, the bacillus, but we've been able to weaken him a little. By the way, I saw your daughter today, out with Hodges' nephew, and she told me—"

"You mean Johnny Thomas?" Brugh's eyebrows furrowed tightly and met at the corners. "So Hodges is his uncle! Hm-m-m."

"Still fighting the biochemistry department?" By a miracle of tact and good nature, Dixon had managed to keep on friendly terms with both men. "I wish you two would get together; Hodges is really a pretty decent sort. . . . Well, I didn't think so; you're both too stubborn for your own good. That nephew of his isn't so good, though. Came up here to pump money out of his uncle and get away from some scandal in New York. His reputation isn't any too savory. Wouldn't want my daughter going with him."

"Don't worry; Tanya won't be going with Hodges' nephew any longer. Thanks for the tip." They reached the main door, and Brugh halted suddenly. "Darn!"

"What is it?"

"I left my auto keys on the worktable upstairs. Don't bother waiting for me, Dixon. I'll see you in the morning."

Dixon smiled. "Absent-minded professor, eh? All right, good night." He went out and down the steps while Brugh climbed back to his laboratory, where he found the keys without further trouble. Fortunately he carried a spare door key to the lab in his pocket; it wasn't the first time he'd done this fool trick.

As he passed down the hall again, a faint sound of movement caught his ear and he turned toward Hodges' laboratory. There was no one there, and the door was locked, the lights all out. Brugh started for the stairs, then turned back.

"Might as well take advantage of an opportunity when I get it," he muttered. "I'd like to see that creation of Hodges, as long as he won't know about it." He slipped quietly to the door, unlocked it, and pulled it shut after him. The one key unlocked every door in the building and the main entrance; he had too much trouble losing keys to carry more than needed with him.

There was no mistaking the heavy tank on the low table, and Brugh moved quietly to it, lifted the cover, and stared inside. There was a light in the tank that went on automatically when the cover was raised, and the details of the body inside were clearly defined. Brugh was disappointed; he had been hoping for physical defects, but the figure was that of a young man, almost too classically perfect in body, and with an intelligent, handsome face. There was even a healthy pink glow to the skin.

But there was no real life, no faintest spark of animation or breathing. Anthropos lay in his nutritive bath, eyes

open, staring blankly at the ceiling and seeing nothing. "No properly radioactive potassium," Brugh gloated. "In a way, it's a pity, too. I'd like to work on you."

He put the cover down and crept out again, making sure that the night watchman was not around. The man seldom left the first floor, anyway; who'd steal laboratory equipment? Brugh reached for his keys and fumbled with them, trying to find the proper one. It wasn't on the key ring. "Damn!" he said softly. "I suppose it fell off back on the table."

But he still had the spare, and the other could stay on the table. With the duplicate, he opened and relocked the door, then slipped down the hall to leave the building. Again a faint sound reached him, but he decided it was the cat or a rat moving around. He had other worries. Mrs. Brugh would give him what-for for being late again, he supposed. And Tanya probably wouldn't be home yet from the beach. That was another thing to be attended to; there'd be no more running with that young Thomas!

IN THE LATTER supposition he was wrong; Tanya was there, fooling with her hair and gushing to her mother about a date she had that night with Will Young. She usually had seven dates a week with at least four different men serving as escorts. Brugh thoroughly approved of Young, however, since he was completing his Ph.D. work and acting as lab assistant. Mrs. Brugh approved of him because the young man came from a good family and had independent means, without the need of the long grind up to a full professorship. Tanya was chiefly interested in his six-foot-two, his football reputation, and a new Dodge he owned.

Margaret Brugh spied her husband coming through the door, and began her usual worried harangue about his health and overwork. He muttered something about a lost key, and Tanya changed the subject for him. Brugh threw her a grateful smile and went in to wash up. He decided to postpone the lecture on Thomas until after supper; then she was in too much of a hurry to be bothered, and he put it off until morning.

The old Morris chair was soothing after a full meal—so soothing that the paper fell from his lap and scattered itself over the floor unnoticed, until the jangling of the telephone brought him back with a jerk. "It's for you," his wife announced.

The voice was that of Hodges, his nasal Vermont twang unmistakable. "Brugh? Your latest brainstorm backfired on you! I've got evidence against you this time, so you'd better bring it back." The pitch of the voice indicated fury that was only partly controlled.

The back hairs on Brugh's neck bristled up hotly, and his voice snapped back harshly: "You're drunk or crazy, like all biochemists! I haven't done anything to you. Anyway, what is it you want back?"

"You wouldn't know? How touching, such innocence! I want Anthropos, my synthetic man. I suppose you weren't in the laboratory this evening?"

Brugh gulped, remembering the faint noises he had heard. So it had been a trap! "I never—"

"Of course. But we had trouble before—someone trying to force their way in—and we set up a photoelectric eye and camera with film for u. v. light. Didn't expect to catch you, but there's a nice picture of your face on it, and your key is in the lock—the number show it's yours. I didn't think even you would stoop to stealing!"

Brugh made strangling sounds. "I didn't steal your phony man; wouldn't touch the thing! Furthermore, I didn't leave a key. Go sleep your insanity off!"

"Are you going to return Anthropos?"

"I don't have him." Brugh slammed the receiver down in disgust, snorting. If Hodges thought that he could put such a trick over, he'd find out better. With all the trumped-up evidence in the world, they'd still have to prove a few things. He'd see the president in the morning before Hodges could get to him.

But he wasn't prepared for the doorbell a half-hour later, nor for the blue-coated figures that stood outside. They wasted no time.

"Dr. Arlington Brugh? We have a warrant for your arrest, charge being larceny. If you'll just come along quietly—"

They were purposeful individuals, and words did no good. Brugh went along—but not quietly.

"Thanks," said Brugh unhappily, "but you're a little small to be useful, aren't you?"

VI.

HERMES spied the public highway below him, and began puzzling about which direction to take back to town. Brugh had never been out this way, and he had failed to absorb the necessary information from the garbage man, so he had no idea of the location of Corton. But there was a man leaning against a signpost, and he might know.

The little god approached him confidently, now that he could both move and talk. He wanted to try his new power instead of telepathy, and did not trouble with the man's thoughts, though a faint impression indicated they were highly disordered.

"Good evening, sir," he said pleasantly, with only a faint blur to the words. "Can you direct me to Corton University?"

The man clutched the signpost and gazed down solemnly, blinking his eyes. "Got 'em again," he said dispassionately. "And after cutting down on the stuff, too. 'Sfunny, they never talked before. Wonder if the snakes'll talk, too, when I begin seeing them?"

It made no sense to Hermes, but he nodded wisely and repeated his question. From the vibrations, the man was not unacquainted with the virtues of alcohol.

The drunk pursed his lips and examined the little figure calmly. "Never had one like you before. What are you?"

"I suppose I'm a god," Hermes answered. "Can you direct me to Corton, please."

"So it's gods this time, eh? That's what I get for changing brands. Go away and let me drink in peace." He thought it over slowly as he drew out the bottle. "Want a drink?"

"Thank you, yes." The little god stretched up and succeeded in reaching the bottle. This time he filled himself to capacity before handing it back. It was worse than the hair tonic, but there was no question of its tar-softening properties. "Could you—"

"I know. Corton. To your right and follow the road." The man paused and made gurgling noises. "Whyn't you stick around? I like you; snakes never would drink with me."

Hermes made it quite clear he couldn't stay, and the drunk nodded gravely. "Always women. I know about that; it's a woman that drove me to this—seeing you. 'Stoo bad. Well, so long!"

Filled with the last drink, the god stepped his speed up to almost five miles an hour. There was no danger of fatigue, since the radioactive energy within him poured out as rapidly as he could use it, and there were no waste products to poison his system. His tiny legs flickered along the road, and the little feet made faint tapping sounds on the smooth asphalt surface.

He came over a hill and spied the yellow lights of Corton, still an hour's trot away. It might have been worse. The swishing of the water inside him bothered him, and he decided that he'd stick to straight alcohol hereafter; whiskey contained too many useless impurities. Hermes flopped over beside the road, and let the water and some of the oil from the hair tonic trickle out; the alcohol was already well inside his gummy interior where there was no danger of losing it. For some reason, it seemed to be drying out more slowly than the first had, and that was all to the good.

The few cars on the road aroused a faint desire for some easier means of locomotion, but otherwise they caused him no trouble. He clipped off the miles at a steady gait, keeping on the edge of the paving, until the outskirts of the town had been reached. Then he took to the sidewalk.

A BLUE-COATED figure, ornamented with brass buttons, was pacing down the street toward him, and Hermes wel-

comes the presence of the policeman. One of the duties of an officer was directing people, he had gathered, and a little direction would be handy. The smallest god stopped and waited for the other to reach him.

"Could you direct me to the home of Dr. Arlington Brugh, please?"

The cop looked about carefully for the speaker. Hermes raised his voice again. "I'm here, sir."

Officer O'Callahan dropped his eyes slowly, expecting a drunk, and spied the god. He let out a startled bellow. "So it's tricks, is it now? Confound that Bergen, after drivin' the brats wild about ventriloquence. Come out o' there, you spalpeen. Tryin' your tricks on an honest police, like as if I didn't have worries o' me own."

Hermes watched the officer hunting around in the doorways for what he believed must be the source of the voice, and decided that there was no use lingering. He put one foot in front of the other and left the cop.

"Pssst!" The sound came from an alley a couple of houses below, and Hermes paused. In the shadows, he made out a dirty old woman, her frowsy hair blowing about her face, her finger crooked enticingly. Evidently she wanted something, and he turned in hesitantly.

"That dumb Irish mick," she grunted, and from her breath Hermes recognized another kindred spirit; apparently humans were much easier to get along with when thoroughly steeped in alcohol, as he was himself. "Sure, now, a body might think it's never a word he'd heard o' the Little Folks, and you speaking politely, too. Ventriloquence, indeed! Was you wanting to know what I might be telling you?"

Hermes stretched his rubber face into a passable smile. "Do you know where Dr. Arlington Brugh lives? He's a research director at Corton University."

She shook her head, blinking bleary eyes. "That I don't, but maybe you'd take the university? It's well I knew where that may be."

Dr. Brugh lived but a short distance from the campus, he knew, and once on the university grounds, Hermes would have no trouble in finding the house. He nodded eagerly. She reached down a filthy hand and caught him up, wrapping a fold of her tattered dress about him.

"Come along, then. I'll be taking you there myself." She paused to let the few last drops trickle from a bottle into her wide mouth, and stuck her head out cautiously; the policeman had gone. With a grunt of satisfaction, she struck across the street to a streetcar stop. " 'Tis the last dime I have, but a sorry day it'll be when Molly McCann can't do a favor for a Little Folk."

She propped herself against the car-stop post and waited patiently, while Hermes pondered the mellowing effects of alcohol again. When the noisy car stopped, she climbed on, clutching him firmly, and he heard only the bumping of a flat wheel and her heavy breathing. But she managed to keep half awake, and carried him off the car at the proper place.

She set him down as gently as unsteady nerves would permit and pointed a wavering finger at the buildings on the campus. "There you be, and it's the best of luck I'm wishing you. Maybe, now that I've helped a Little Man, good luck'll be coming to me. A very good night to you."

Hermes bowed gravely as he guessed she expected. "My thanks, Molly McCann, for your kindness, and a very good night to you." He watched her totter away, and turned toward the laboratory building, where he could secure a few more drops of straight alcohol. After that, he could attend to his other business.

VII.

TANYA BRUGH was completely unaware of the smallest god's presence as he stood on a chair looking across at her. A stray beam of moonlight struck her face caressingly, and made her seem a creature of velvet and silver, withdrawn in sleep from all that was mundane. Hermes probed her mind gently, a little fearfully.

Across her mind, a flickering pageant of tall men, strong men, lithe and athletic men, ran in disordered array, and none of them were less than six feet tall. Hermes gazed at his own small body, barely six inches high; it would never do. Now the face of John Thomas fitted itself on one of the men, and Tanya held the image for a few seconds. The god growled muttered oaths; he had no love for the Thomas image. Then it flickered into the face of Will Young, Brugh's assistant.

Hermes had probed her thoughts to confirm his own ideas of the wonderful delight that Tanya must be, and he was faintly disappointed. In her mind were innocence and emptiness—except for men of tall stature. He sighed softly, and reverted to purely human rationalization until he had convinced himself of the rightness of her thoughts.

But the question of height bothered him. Children, he knew, grew up, but he was no child, though his age was measured in hours. Some way, he must gain a new body, or grow taller, and that meant that Dr. Brugh would be needed for advice on the riddle of height increase.

He dropped quietly from the chair and trotted toward the master's bedroom, pushing against the door in the hope that it might be open. It wasn't, but he made a leap for the doorknob and caught it, throwing his slight weight into the job of twisting it. Finally the knob turned, and he kicked out against the door jamb with one foot until the door began to swing. Then he dropped down and pushed until he could slide through the opening. For his size, he carried a goodly portion of strength in his gum-and-rubber body.

But the master was not in the bed, and the mistress was making slow strangling sounds that indicated emotional upset. From Brugh's mind, Hermes had picked up a hatred of the sound of a woman crying, and he swung hastily out, wondering what the fuss was about. There was only one person left, and he headed toward the little Missie Katherine's room.

She was asleep when he entered, but he called softly: "Miss Kitty." Her head popped up suddenly from the pillow and she groped for the light. For an eight-year-old child, she was lovely with the sleep still in her eyes. She gazed at the little white figure in faint astonishment.

Hermes shinnied up the leg of a chair and made a leap over onto the bed where he could watch her. "What happened to your father?" he asked.

She blinked at him with round eyes. "It talks—a little doll that talks! How cute!"

"I'm not a doll, Kitty; I'm Hermes."

"Not a doll? Oh, goody, you're an elf then?"

"Maybe." It was no time to bicker about a question that had no satisfactory answer. But his heart warmed toward the girl. She wasn't drunk, yet she could still believe in his existence. "I don't know just what I am, but I think I'm the smallest of the gods. Where's your father?"

Memory overwhelmed Kitty in a rush, and her brown eyes brimmed with tears. "He's in jail!" she answered through a puckered mouth. "A nasty man came and took him away, and mamma feels awful. Just 'cause Mr. Hodges hates him."

"Where's jail? Never mind, I'll find out." It would save time by taking the

information directly from her head, since she knew where it was. "Now go back to sleep and I'll go find your father."

"And bring him home to mamma?"

"And bring him home to mamma." Hermes knew practically nothing of jails, but the feeling of power was surging hotly through him. So far, everything he had attempted had been accomplished. Kitty smiled uncertainly at him and dropped her head back on the pillow. Then the little god's sense of vibration perception led him toward the cellar in search of certain vital bottles.

A child's toy truck, overburdened with a large bottle and a small god, drew up in front of the dirty white building that served as jail. Hermes had discovered the toy in the yard and used it as a boy does a wagon to facilitate travel. Now he stepped off, lifted the bottle, and parked the truck in a small shrub where he could find it again. Then he began the laborious job of hitching himself up the steps and into the building.

It was in the early morning hours, and there were few men about, but he stayed carefully in the shadow and moved only when their backs were turned. From his observation, men saw only what they expected, and the unusual attracted attention only when accompanied by some sudden sound or movement. Hermes searched one of the men's minds for the location of Brugh, then headed toward the cell, dragging the half-pint bottle behind him as noiselessly as he could.

DR. BRUGH sat on the hard iron cot with his head in his hands, somewhat after the fashion of Rodin's "Thinker"; but his face bore rather less of calm reflection. An occasional muttered invective reached the little god, who grinned. Arlington Brugh was a man of wide attainments, and he had not neglected the development of his vocabulary.

Hermes waited patiently until the guard was out of sight and slipped rapidly toward the cell, mounting over the bottom brace and through the bars. The scientist did not see him as he trotted under the bunk and found a convenient hiding place near the man's legs. At the moment, Brugh was considering the pleasant prospect of attaching all police to Bertha and bombarding them with neutrons until their flesh turned to anything but protoplasm.

Hermes tapped a relatively huge leg and spoke softly. "Dr. Brugh, if you'll look down here, please—" He held up the bottle, the cap already unscrewed.

Brugh lowered his eyes and blinked; from the angle of his sight, only a half-pint bottle of whiskey, raising itself from the floor, could be seen. But he was in a mood to accept miracles without question, and he reached instinctively. Ordinarily he wasn't a drinking man, but the person who won't drink on occasion has a special place reserved for him in heaven—well removed from all other saints.

As the bottle was lowered again, Hermes reached for it and drained the few remaining drops, while Brugh stared at him. "Well?" the god asked finally.

The alcohol was leaving the scientist's stomach rapidly, as it does when no food interferes, and making for his head; the mellowing effect Hermes had hoped for was beginning. "That's my voice you're using," Brugh observed mildly.

"It should be; I learned the language from you. You made me, you know." He waited for a second. "Well, do you believe in me now?"

Brugh grunted. "Hermes, eh? So I wasn't imagining things back in the lab. What happened to you?" A suspicious look crossed his face. "Has Hodges been tinkering again?"

As briefly as he could, the little god summarized events and explained himself, climbing up on the cot as he did so, and squatting down against the physicist's side, out of sight from the door.

The other chuckled sourly as he finished.

"So while Hodges was fooling around with amœbas and flesh, I made superlife, only I didn't know it, eh?" There was no longer doubt in his mind, but that might have been due to the whiskey. The reason for more than one conversion to a new religious belief lies hidden in the mysterious soothing effect of ethanol in the form of whiskey and rum. "Well, glad to know you. What happens now?"

"I promised your daughter I'd take you home to the mistress." But now that he was here, he wasn't so sure. There were more men around than he liked. "We'll have to make plans."

Brugh reflected thoughtfully. "That might not be so good. They'd come after me again, and I'd have less chance to prove my innocence."

Hermes was surprised. "You're innocent? I thought you'd murdered Hodges." After all, it was a reasonable supposition, based on the state of the physicist's mind the day before. "What happened?"

"No, I haven't murdered him—yet." Brugh's smile promised unpleasant things at the first chance. "It's still a nice idea, after this trick, though. It all started with the key."

"Maybe I better take it from your head," Hermes decided. "That way I'll be less apt to miss things, and more sure to get things straight."

Brugh nodded and relaxed, thinking back over the last few hours. He lifted the bottle and tried to extract another drop, but the only dampness in it was such as condensed from his breath. Hermes followed the mental pictures and memory until the story was complete in his head.

"So that's the way it was," he grunted, finished. "Some of it doesn't make sense."

"None of it does. All I know is that I'm here and Hodges has enough trumped-up evidence to convict me. He wanted to make the charge kidnaping, but they suggested corpse stealing, and compromised on larceny—grand larceny, I guess."

"I still might be able to swipe the guard's keys, and attract their attention—"

Brugh gathered his somewhat pickled senses. "No. Your biggest value to me is in your ability to get in places where a man couldn't, and find out things without anyone knowing it. If I get out, I can do no more than I can here—I'm not a detective when it comes to human reactions; just physical or chemical puzzles."

There was something in that, Hermes had to concede. "Then I'm to work outside?"

"If you want to. You're a free agent, not bound to me. Slaves have gone out of fashion, and you're hardly a robot." The physicist shook his head. "Why should you help me, come to think of it?"

"Because I want to grow up, and you might help me; and because in a sense we both have the same memories and thought actions—I started out with a mixture of dog, cat and you." He climbed off the bunk and scuttled across the floor. "I'll give Hodges your love if I see him."

Brugh grinned crookedly. "Do."

VIII.

Professor Hiram Hodges stirred and turned over in his bed, a sense of something that wasn't as it should be troubling his mind. He grunted softly and tried to sleep again, but the premonition still bothered him. And then he realized that there was a rustling sound going on in his study and that it was still too early for his housekeeper.

He kicked off the sheet and rummaged under the bed for his slippers, drawing on the tattered old robe he'd

worn for the last six years. As quietly as he could, he slipped across to the study door, threw it open, and snapped on the light switch, just as the rustling sound stopped. Probably his nephew up to some trick—

But the room contained neither a nephew nor any other man. Hodges blinked, adjusting his eyes to the light, and stared at his desk. It had been closed when he went to bed, he was sure of that. Now it was open, and a litter of papers was strewn across it in haphazard fashion. Someone must have been there and disappeared in the split second it took to snap on the lights.

Hodges moved over to the desk, stopping to pick up a few scraps of paper that had fallen on the floor, then reached up to close the roll top. As he did so, something small and white made a sudden frantic lunge from among the papers and hit the floor to go scuttling across the room. With startlingly quick reactions for his age, the professor spun his lank frame and scooped up the scurrying object.

Apparently it was an animated rubber doll that lay twisting in his grasp. Words came spilling out, though the tiny mouth did not move. "All right, you've caught me. Do you have to squeeze me to death?"

Some men, when faced with the impossible, go insane; others refuse to believe. But Hodges' life had been spent in proving the impossible to be possible, and he faced the situation calmly. A robot wouldn't have spoken that way, and obviously this wasn't flesh and blood; equally obviously, it was some form of life. He lifted the figure onto the desk and clamped the wire wastebasket down over it.

"Now," he said, "what are you, where from, and what do you want?"

Hermes devoted full energy to picturing himself as a charging lion, but the professor was not impressed.

"It's a nice illusion," he granted, smiling. "Come to think of it, maybe your other shape isn't real. Which is it—my nephew or Brugh?"

Hermes gave up and went over the story of his creation again, point by point, while dawn crept up over the roofs of the adjacent houses and urged him to hurry. Hodges' first incredulity turned to doubt, and doubt gave place to half belief.

"So that's the way it is? All right, I'll believe you, provided you can explain how you see without the aid of a lens to direct the light against your sensory surface."

Hermes had overlooked that detail, and took time off to investigate himself. "Apparently the surface is sensitive only to light that strikes it at a certain angle," he decided. "And my mouth opening acts as a very rough lens—something on the order of the old pinhole camera. The tar below is curved, and if I want clearer vision, I can put out a thin bubble of fairly transparent surface material to rectify the light more fully, as a lens would. I don't need an iris."

"Um-m-m. So Brugh decided he'd made life and wanted to make a fool of me by bringing my man to consciousness, eh? Is that why he kidnaped Anthropos?"

Hermes grunted sourly. His mind was incapable of the sudden rages and dull hates that seemed to fill men's thoughts, but it was colored by the dislike Brugh cultivated for the biochemist. "It's a nice way of lying, professor, but I know Dr. Brugh had nothing to do with your creation."

The other grinned skeptically. "How do you know?"

"I read his mind, where he had to reveal the truth." In proof, the little god transferred part of the picture he had drawn from Brugh's mind to that of Hodges.

"Hm-m-m." The biochemist lifted the wastebasket off and picked up the

little figure. "That would account for the exposed film. Suppose you come with me while I get dressed and try reading my mind. You might be surprised."

HERMES was surprised, definitely. In the professor's mind there had been complete conviction of Brugh's guilt, shaken somewhat now by the story transferred by Hermes. Instead of being a cooked-up scheme to ruin his rival, the theft of the synthetic man was unquestionably genuine. The god fixed on one detail, trying to solve the riddle.

A note received the night before had first apprised the biochemist of the disappearance of his pet creation and sent him to the laboratory to investigate. "What happened to that ransom note?" Hermes asked.

Hodges was struggling with man's symbol of slavery to the law of fashion, his necktie. "It's still in my pocket—here." He flipped it across the room, where the other could study the crude scrawl. The words were crude and direct:

> Perffeser, we got yur artifishul man itll cost you 1000$ to get him back leave the dough in a papre sak in the garbaj can bak of yur hows noon tomorer an dont cawl the bulls.

"Obviously the work of a well-educated man," Hodges grunted, succeeding finally with the tie. "They always try to appear too illiterate when writing those notes. That's why I thought Dr. Brugh wrote it to throw me off the trail."

"Hatred had nothing to do with it, I suppose?"

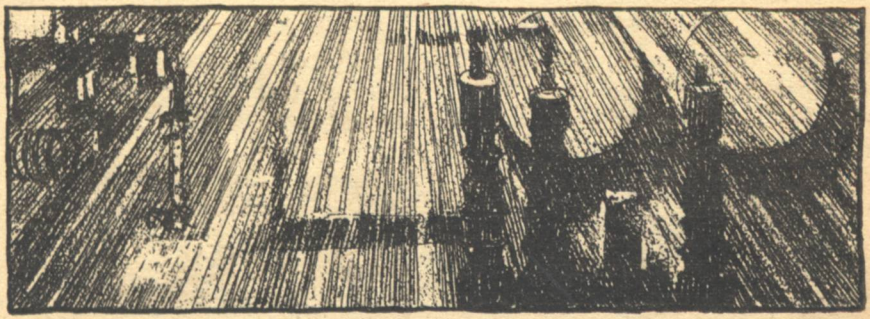
"I don't hate Brugh, and if his conscience didn't bother him, he wouldn't hate me. We used to be fairly good friends. We could still be if we weren't so darned stubborn." The professor grinned as he picked up the small figure and moved toward the kitchen. "You don't eat, do you? Well, I do. Brugh played a dirty trick on me, but I've put over a few of them myself to get money for my department. At Corton, it's always been dog eat dog when appropriations were under debate."

"But did you think he'd leave his key lying around for evidence?"

"People do funny things, and only the department heads are permitted master keys. It had his number." Hodges swallowed the last of a bun and washed it down with milk. "It is funny, though. Let's see, now. Brugh left the keys on the table, and sometime yesterday he lost one of them. Tanya was in the laboratory in the morning, just before a date with that confounded nephew of mine. Hm-m-m."

"But Tanya wouldn't—" Hermes felt duty bound to protect Tanya's reputation.

Hodges cut in on his protest. "It's plain you don't know Tanya Brugh. For herself, she wouldn't take it. But give her a fairly handsome young man with a smooth line, and she'd sell her own father down the river. That ran-



som note might be some of Johnny's pleasant work."

"Then you think it's your nephew?"

"I don't think anything, but it might be. He's the type. Tell you what I'll do; you try to get some of that potassium salt—oh, yes, I knew about it long ago—from your patron, and I'll help you investigate Johnny."

"If you'll help increase my size." That question was still a major one in the god's mind. "How'll we find out whether Thomas has the thing?"

"That's your worry, son. I'll carry you there, but from then on it's in your hands." Hodges pocketed Hermes and turned out of the kitchen.

IX.

JOHNNY THOMAS looked reasonably pleasant as he stuck his head out of the door, though the circles under his eyes were a little too prominent in the early morning hours. He grinned with evident self-satisfaction.

"Ah, my dear maternal uncle. Do come in." He kicked aside a newspaper that was scattered across the floor and flipped the cigarette ashes off the one comfortable chair in the room, seating himself on the bed. "What can I do for you this morning?"

Hodges coughed to cover the noise of Hermes slipping across the room to a dark place under the table. With that attended to, he faced his nephew. "You know Anthropos—that synthetic man I grew in a culture bath? Somebody stole him last night, tank and all, and slipped a note under my door demanding a thousand dollars for his return."

"Too bad. But surely, uncle, you don't think I had anything to do with it?"

"Of course not; how could you get into the laboratory? But I thought you might help me contact the men and make arrangements to pay. Of course, I'd be willing to let you have a few dollars for your work."

Thomas smiled, and looked across the room while apparently making up his mind. As he looked, a cat came out from where no cat should be, gravely lifted a bottle of whiskey and drank deeply. "Excellent, my dear Thomas," the cat remarked. "I suppose when you collect that grand from your uncle, we'll have ever better drinks. Smart trick, stealing that thing."

The cat licked its chops, sprouted wings and turned into a fairy. "Naughty, naughty," said the fairy. "Little boys shouldn't steal." It fluttered over to Thomas' shoulder and perched there, tinkling reproachfully.

The young man swatted at it, felt his hand pass through it, and jumped for the chair. Now the room was empty, though his eyes darted into every corner. His uncle coughed again. "If you're done playing, John—" he suggested.

"Didn't you see it?"

"See what? Oh, you mean that fly? Yes, it was a big one. But about this business I have—"

"I think he'd make a nice meal," said a grizzly bear, materializing suddenly. "So young and succulent."

A shining halo of light quivered violently. "You'd poison your system, Bruin. Go back home." The bear obediently trotted to the window and passed through the glass; the halo of light struck a commanding note, and a face of wrath appeared in it. "Young man, repent of your ways and learn that your sins have found you out. Time is but short on this mortal sphere, and the bad that we do must follow us through all eternity. Repent, for the hour has come!"

Thomas quivered down onto the bed again, wiping his forehead. The idea of getting nervous at a time like this! The things couldn't be real. He turned back to Hodges, who was waiting patiently.

"Just a little nervous this morning; not used to getting up so early. Now, as we were saying—"

Click! The sound was in the young man's head, and a soft purring voice followed it. "I know a secret, I know a secret, and I'm going to tell! Johnny, old kid, tell the old fossil what a smart guy you are, putting over a trick like that on him. Go ahead and tell!" There was a hot flicker of pain that stabbed up the backbone, then ran around the ribs and began doing something on the order of a toe dance in Thomas' stomach.

He gritted his teeth and groaned. Hodges became all solicitation. "Something you ate?" asked the professor. "Just lie down on the bed and relax."

There was a whole den of rattlesnakes curled up on the bed, making clicking sounds that seemed to say: "Come ahead, young fellow, it's breakfast time and we're hungry!" Thomas had no desire to relax among even imaginary snakes.

"Gulp—ugh!" he said, and an angel unscrewed its head from the light socket and dropped near him. *"Gulp—ouch!"* The angel sprouted horns and tail, and carried a red-hot fork that felt most unpleasant when rubbed tenderly along his shins.

Click! Again the voice was in his head. "Remember that girl at Casey's? Well, when she committed suicide, it wasn't so nice. But that was gas, and she didn't feel any pains. When you commit suicide—"

"I won't commit suicide!" The bellow was involuntary, forced out just as the little devil decided his fork would feel worse in the stomach. "Take 'em away!"

Hodges clucked sympathetically. "Dear, dear! Do you have a dizzy feeling, Johnny?"

Johnny did, just as the words were out. His head gave an unpleasant twang and leaped from his body, then went whirling around the room. A gnome picked it up, whittled the neck quickly to a point, and drew a whip. "Hi, fellows!" called the gnome. "Come, see the top I made." He drew the whip smartly across Thomas' head and sent it spinning as a horde of other little hobgoblins jumped out of odd places to watch. That was a little too much for Johnny, with the addition of two worms that were eating his eyes.

Hodges chuckled. "All right, Hermes, let him alone. The boy's fainted. It's a pity I couldn't see the things you were forcing on his mind. Must have been right interesting."

Hermes came out of the corner, smiling. "They were very nice. I think he'll talk when he comes to. He persuaded Tanya to get him the key by pretending an interest in cyclotrons—said he was writing a story. She wouldn't have done it, except that the key was lying so temptingly within reach. He worked on her innocence."

"O. K., Hermes," Hodges grunted. "She's washed whiter than snow, if you want it that way. Better get back in my pocket; Johnny's coming around again."

IT WAS noon when Hodges came to the cell where Brugh sat. The biochemist dropped the little god on the floor and grinned. "You're free now, Arlington," he informed the other. "Sorry I got you in here, but I've tried to make up for that."

Brugh looked up at the professor's voice, and his face wasn't pretty. *"Arrughh!"* he said.

The smile on Hodges' face remained unchanged. "I expected that. But Hermes here can tell you I honestly thought you'd stolen Anthropos. We just finished putting him back where he belongs, and seeing that young nephew of mine leave town. If you'll avoid committing homicide on me, the warden will unlock the door."

"What about my reputation?"

"Quite untouched," Hermes assured him. "Professor Hodges succeeded in keeping everything hushed up, and it's Sunday, so your absence from the university won't mean anything."

The physicist came out of the cell, and his shoulders lifted with the touch of freedom. The scowl on his face was gone, but uncertainty still remained in the look he gave Hodges.

The biochemist put out a hand. "I've been thinking you might help me on Anthropos," he said. "You know, Arlington, we might make something out of that yet if we worked together."

Brugh grinned suddenly. "We might at that, Hiram. Come on home to lunch, and we'll talk it over while Hermes tells me what happened."

Hermes squirmed as a hand lifted him back into the pocket. "How about helping me grow up?"

But the two men were busy discussing other things. The height increase would have to wait.

X.

HERMES sat on the edge of Anthropos' tank, kicking his small legs against it and thinking of the last two days. To live in the same house, breathe the same air as Tanya Brugh! He dug up another sigh of ecstasy and followed it with one of despair.

For Tanya regarded him as some new form of bug, to be tolerated since he was useful, but not to be liked—an attitude shared by her mother. Dr. Brugh had the greatest respect for the little god, and Kitty was fond of him. Of them all, Kitty treated him best, and Tanya worst.

Of course, that was due to his height. John Thomas was gone, but there were still Will Young and her other escorts, none less than six feet in height. And Hermes was far from being tall. The consultation held with Brugh and Hodges had resulted in nothing: when all was said and done, there was no hope for him.

He sighed again, and Dixon, who was helping Hodges and Brugh with Anthropos, noticed him. "What's the matter, son?" he asked good-naturedly. "Alcohol drying out again? Why not try carbon tetrachloride this time?"

Hermes shook his head. "I don't need anything. The alcohol seems to have permanently combined with the tar, something like water with a crystal to form a hydrate. I'm softened thoroughly for all time."

Hodges looked up and then turned back to the tank where the synthetic man lay, and Hermes turned his attention to it. As far as outward appearance went, Anthropos was nearly perfect, and a tinge of envy filled the little god's thoughts.

Dixon wiped his forehead. "I give up. When three separate divisions of chemistry can't bring life to him, there's no hope. Hodges, your man is doomed to failure."

"He's breathing, though," the biochemist muttered. "Ever since we injected the potassium into him and put it in his nutritive bath, he's been living, but not conscious. See, his heartbeat is as regular as clockwork." He indicated the meter that flickered regularly on the tank.

Brugh refused to look. "To anyone but a biochemist," he informed the room, "the answer would be obvious. Hiram's created life, yes; but he can't give it a good brain. That's too complex for his electric cell formation determiner. What Anthropos needs is a new brain."

"I suppose you'd like to stick his head full of that gummy tar of yours?" Old habit made the words tart, though good fellowship had been restored between them.

"Why not?" It was Hermes' voice this time. Inspiration had flashed suddenly through his small mind, opening a mighty vista of marvels to his imagi-

Gradually he learned to work the ponderous mechanism of this new body, to move its muscles, to use it—

nation. "Why wouldn't that solve it?"

"I'll bite. Why?" Dixon grinned, sweat rolling from his chubby face. "That's the best suggestion we've had today."

"But he wouldn't be real life then, not organic life. Besides, we can't be sure that another batch of the tar would live—it might be an accident that Hermes contained just the right ingredients.

The rest of the tar probably isn't the same."

Hermes wriggled in his excitement. "Organic life is merely a chemicoelectrical reaction, with radioactivity thrown in; and I'm all of that. What difference does it make?" He stretched out a small leg. "Dr. Brugh, will you examine my feet?"

With a puzzled frown, Brugh complied. "They're wearing out," he said. "The rubber is almost paper-thin. You'll need a new body soon, Hermes."

"Precisely. That's what I'm talking about. Why couldn't I be put in Anthropos' brainpan?"

Hodges let out a startled wail that died out and left his mouth hanging open. Finally he remembered to close it. "I wonder—" he muttered. "Would it work?"

Dixon demurred. "It'd be a delicate operation, removing the useless higher part of the brain and leaving the essential vital areas that control the heart and organs. Besides, could Hermes control the nerves?"

"Why not? He can control your nerves at a distance if he tries hard enough. But the operation would need a doctor's skill."

Hermes had that all figured out by now, and he voiced his plan while the others listened carefully. Hodges finally nodded. "It might work, son, and Anthropos isn't much good as is. I promised to help you grow up, and if you can use this body, it's yours. The university doesn't seem to value it much."

THE BORROWED dissecting equipment from the zoölogy department was in readiness and the men stood looking on as Hermes prepared for his work. He paused at the brink of the tank. "You know what you're to do?"

"We do. After you open it, we'll lower your temperature until you harden up to unconsciousness, remove your casing, pack you in the brainpan, so there's no danger of nerve pressure, and cover the opening with the removed section of the skull."

"Right. In that nutrient fluid, it should heal completely in a few hours." Hermes dropped into the tank and was immersed by the liquid; his ability to work in any medium facilitated the operation.

And his sense of perception made him capable of performing the work with almost uncanny skill. As the others watched, he cut briskly around the skull, removed a section, and went into the brain, analyzing it almost cell by cell and suturing, cutting, and scraping away the useless tissue.

Blood oozed out slowly, but the liquid's restorative power began functioning, healing the soft nerve tissue almost as rapidly as it was cut. Hermes nodded approval and continued until only the vital centers that functioned properly were left. Then he indicated that he was finished and Hodges pulled him out.

The dry ice was numbing as they packed it around him, and his thoughts began moving more sluggishly. But as consciousness left him, a heady exultation was singing its song through every atom of his being. He would be tall and handsome, and Tanya would love him.

Consciousness faded as Hodges began the relatively simple job of removing his casing and inserting him into the vacancy in Anthropos' head.

XI.

DARKNESS. That was the first thought Hermes felt on regaining consciousness. He was in a cave with no entrance, and light could not stream through. Around him was a warm shell that held him away from direct contact with the world. He started to struggle against it, and the uneasy sense of closeness increased.

Then he remembered he was in the

head of the synthetic man. He must open his eyes and look out. But his eyes refused to open. Again he concentrated, and nothing seemed to happen.

Brugh's voice, muffled as from a great distance, reached him. "Well, he's awake. His big toe twitched then." There was another sensation, the feeling of a faint current pouring in from one of the nerve endings, and Hermes realized that must be his ears sending their message to his brain.

This time he tried to talk, and Hodges spoke. "That was his leg moving. I wonder if he can control his body." Hermes was learning; the sound and nerve messages co-ordinated this time. Learning to use Anthropos' auditory system would not be too difficult.

But he was having trouble. He had tried to open his eyes, and a toe had twitched; an effort to use his tongue resulted in a leg moving. There was only one thing to do, and that was to try everything until the desired result was obtained.

It was several minutes later when Dixon's voice registered on his nerves: "See, his eyes are open. Can you see, Hermes—or Anthropos?"

Hermes couldn't. There was a wild chaos of sensation pouring in through the optic nerve, which must be the effect of light, but it made little sense to him. He concentrated on one part that seemed to register less strongly, and succeeded in making out the distorted figure of a man. It was enough to begin with, but learning to use his eyes took more time than the ears had.

He gave up trying to speak and sent his thought out directly to Brugh. "Lift me out and move me around so I can study which sensations are related to my various parts."

Brugh obeyed promptly with the help of the others, enthusiasm running high. Hermes had the entire job of learning to make his body behave before him, but he brought a highly developed mind to bear on the problem. Bit by bit, the sensation sent up by the nerves registered on his brain, were catalogued and analyzed, and became familiar things to him. He tried touching a table with his finger, and made it in two attempts.

"You'll be better than any man when we're done with you," Hodges gloated. "If I'd brought consciousness into Anthropos, I'd still have had to educate him as a child is taught. You can learn by yourself."

Hermes was learning to talk again, in the clumsy system of breathing, throat contraction, and oral adaptation that produces human words. He tried it now. "Let me walk alone."

Another half-hour saw a stalwart young figure striding about the laboratory, examining this and that, trying out implements, using his body in every way that he could. It answered his commands with a smooth co-ordination that pleased them all.

Brugh was elated. "With a brain like that, Hermes, and the body you have now, we could make the world's greatest physical chemist out of you. A little wire pulling and a few tricks, examinations, and things, and you'd have your degrees in no time. I could use you here."

"He'd be a wonderful biochemist," Hodges cut in. "Think of what that sense of perception would mean to us in trying to determine the effect of drugs on an organism."

Dixon added his opinion. "As an organic chemist, think what it would mean in analyzing and synthesizing new compounds. But why not all three? What we really need is someone to co-ordinate the various fields, and Hermes is ideal." He held out an old pair of trousers, acid stained, but whole, and Hermes began climbing into them. That was a complication he hadn't thought of, and one which was not entirely pleasant. He saw no reason to conceal the new body of which he was so proud.

Brugh had accepted Dixon's idea. "How about getting yourself added to our staff in a few years? It would mean a lot to science, and the board of directors couldn't refuse the appointment if you'd force a little thought into their empty heads."

Hermes had been considering it, and the prospect appealed to him. But Tanya wouldn't like it, probably. He'd have to see her before he could make any decision. Of course, now that he was a real man instead of a rubber statue, she couldn't refuse him.

THERE WAS an interruption from the door, a small child's voice. "Daddy, daddy, are you there?" The door swung open and Kitty Brugh came tripping in.

"Kitty, you don't belong here." Brugh faced her with a scowl of annoyance. "I'm busy."

"But mamma sent me." Her voice was plaintive. "She gave me this telegram to bring you."

Brugh took it and read it through, his face lighting up. "Great luck," he told Hermes, handing it over. "I never thought Tanya would chose so well."

The telegram was as simple as most telegrams are:

HAVE MARRIED WILL YOUNG AND ON HONEYMOON IN MILLSBURG STOP EVER SO HAPPY STOP LOVE TANYA

And with it, the newly created man's hopes went flying out into nothingness.

But somehow he felt much better than he should. He handed it back to Brugh, and the sigh he achieved was half-hearted. Kitty's eyes noticed him for the first time.

She squeaked delightedly. "Oh, what a pretty man! What's your name?"

Hermes' heart went out to her. He stooped and picked her up in his strong young arms, stroking her hair. "I'm the little god, Kitty. I'm your Hermes in a new body. Do you iike it?"

She snuggled up. "Um-hmm. It's nice." There was no surprise for her in anything Hermes might do. He turned back to the three men then.

"Dr. Brugh, I've decided to accept your offer. I'd like nothing better than working with all of you here at Corton."

"Splendid, my boy. Splendid. Eh, Hiram?"

They crowded around him, shaking his hand, and he thoroughly enjoyed the flattery of their respect. But most of his thoughts were centered on Kitty. After all, she was the only woman—or girl—who had treated him with any consideration, and her little mind was open and honest. She'd make a wonderful woman in ten more years.

Ten more years; and he wasn't so very old himself. There might be hope there yet.

TRANSMUTATION, 1939

By JACK HATCHER

The modern scientist has long known the alchemist pursued a hopeless dream. But, strangely, that modern scientist is hotter on the trail of that not-so-hopeless dream than ever was the alchemist of old!

"TODAY I made some cadmium!" If Phillipus Aerolus Paracelsus Theophrastus Eremhite von Hohenheim had been able to write that in his diary! But to us it was only a routine lecture experiment for the freshmen, that took ten minutes. For demonstration purposes we used a very pretty paraffin sphere as the philosopher's stone, but Paracelsus might well have used a common bucket of water. The recipe is simple enough:

℞: 1 small pinch powdered boron.
1 small bubble radon, or small pinch radium. Mix well, and seal in a capsule.
1 piece silver.
Place the silver and the capsule in the center of the bucket of water, and the silver will be transmuted to cadmium.

Perhaps Paracelsus wouldn't have liked the last ingredient—after all, why take silver at 50¢ an ounce, and turn it into cadmium, worth about 50¢ a pound? Paracelsus wanted gold, not cadmium—not even the rare isotope of cadmium we made. Well, the same recipe would suffice for making gold if platinum is used in place of silver, but that would hardly be much help, either; how about the old trick of gold from mercury? We can do that, too, nowadays; in fact, we can make almost anything out of anything else! But let us go back to the beginning of things.

In 500 B. C., Democratus had a rough idea of atoms and molecules as indivisible units of matter, but by Paracelsus' time most of the Greek knowledge was lost, and one substance, be it element, compound, or mixture, was as good as another—with the possible exception of a slight bias in favor of the more malodorous compounds. When Boyle finally defined an "element," and Dalton and Avagadro in the early nineteenth century laid the foundations for a precise formulation of the atomic theory, it was implicit in their work that an "atom" was not only the smallest, but an *indivisible* unit of matter. And so it was, until Faraday, Maxwell, and the rest developed the practice and theories of electricity which provided the energy to pull an atom apart.

Cavendish, Rutherford, J. J. Thom-

son, and the group at Cambridge did more than make the first "neon" signs; they clearly demonstrated that the atom was composed of two entities—a large

cently, even to the "fundamentals," and, in fact, the date is some weeks ago—more recent foreign journals have not reached the West yet.

Fundamental Particles, June 2, 1939

Date	Particle	Symbol	Charge (e.s.u.)	Relative Mass	Mass Energy (millions of electron volts)
1895	electron	$_{-1}e^{-}$	-4.774×10^{-10}	.00055	0.551
1932	positron	$_{1}e^{+}$	$+4.774 \times 10^{-10}$	.00055	0.551
	proton	$_{1}H^{1}$	$+4.774 \times 10^{-10}$	1.0081	940.000
1932	neutron	$_{0}n^{1}$	0	1.009	941.000
	mesatron	?	-4.774×10^{-10}	0.1 ?	?
	neutrino	?	0	$\pm$0.0000+ ?	?
1932	deuteron	$_{1}H^{2}$	$+9.554 \times 10^{-10}$	2.0147	1876.000
	alpha	$_{2}He^{4}$	$+9.554 \times 10^{-10}$	4.004	3761.000

positively charged, heavy part called the "nucleus," and lighter, smaller, negatively charged particles, the "electrons." But their atom splitting was only the transient removal of the outer electrons, the "ionization" of gases; the potentials available then were far too low, for one thing. And when the applied potential was removed, they had just what they started with, no more, and no less. The Bohr theory indicated that the riddle of the constitution of matter was to be sought in the heavy nucleus; the chemical behavior was apparently a characteristic of the outer electrons.

But before we proceed we had best summarize what is known of the structural building blocks of matter and define a few particles; things move too rapidly now for any simple historical approach. In the table above are the fundamental particles as we know them today; the table is dated, because things have been happening pretty fast re-

THE FIRST four and the last two are the important particles in nuclear phenomena; we don't know much about the other two—yet. The electron, known since Rutherford's time, and the positron, discovered by Anderson, are familiar quantities and need no further introduction, for the proton is simply a hydrogen atom without its electron—in other words, the nucleus. The neutron, discovered by Chadwick, is something different again; with no charge, it has a mass slightly greater than the proton, and we shall discover some exciting things about its properties later. The mesatron is a heavy electron, weighing about two hundred and fifty times as much as an electron, but with the same charge. We haven't been able to produce these, yet, and their sole right to inclusion in the table lies in their observation on Wilson cloud chamber photographs of cosmic-ray tracks by Anderson and others.

The neutrino is even more of an enigma. Unobserved at the date of the table, it is only an extra term in theoretical calculations*; the mass is noted as plus or minus, because you can take your choice, depending on who's doing the calculating—negative mass, of course, would be stuff that came at you harder the more you pushed it away, like high-pressure salesmen. The mass energy column in this table is a simple result of Einstein's work; this is the amount of energy that appears if the mass of the particle in question should disappear. Thus if a positron and an electron should collide—and they love it!—energy to the extent of some 1.102 m.e.v. would appear as gamma radiation. Atomic energy? Sure—but—

The last two items in the table are deuterium and helium nuclei, respectively, and we might here explain the notation used in these cases. We can represent any atomic nucleus by the symbol ${}_zX^w$, where z is the number of electrons that surround the nucleus in the neutral atom, or the positive electron charge of the nucleus itself, since they must be equal.

X is the symbol of the element, and corresponds, of course, to the number z, since the properties of the element concerned are mainly a function of the number of outer electrons; no other differences result in appreciable differentiation, except, perhaps, in the case of the very light elements like hydrogen and deuterium, where the physical properties such as density are altered to some extent. But note that *chemical* behavior is *solely* a function of z.

w represents the approximate weight of the nucleus in whole numbers; thus ${}_3Li^6$ represent lithium, atomic number 3, atomic weight 6, and we have a complete designation of the stuff at hand; ${}_3Li^7$ is the other natural isotope of lithium, with mass 7.

And it might be well to indicate here exactly what the atom is, so far as we know now. It consists of a heavy, positively charged nucleus, surrounded by a number of light negative electrons, as many as there are positive charges. The nucleus is composed solely of protons and neutrons—when later we shall speak of electrons and positrons being emitted by nuclei, it must be borne in mind that these are born, *de novo*, at the instant of emission. It can be calculated that the life of an electron or positron existing in the nucleus is extremely short; of the other of billionths of billionths of a second.

Now we pick up the story of transmutation again. In spite of man's slow progress in this direction, it was found with the discovery of natural radioactivity by Becquerel in 1896 that nature had been doing it all along. We could write one of the reactions thus:

$$ {}_{88}Ra^{226} = {}_{86}Rn^{222} + {}_2He^4 $$

and it simply means that an atom of radium breaks up, giving off two entirely different nuclei, both of gaseous atoms; one is the familiar helium, and the other radon, the radium emanation or niton so commonly used in radium therapy. There are, of course, a vast number of other reactions concerned in natural radioactivity, but they are of no importance here; the essential fact that came from the discovery was the general size of the process.

Rutherford found, for example, that the energies liberated in these transmutations was of the order of millions of electron volts,* and he properly thought that it would require energies of this magnitude to effect artificial disintegra-

*The energy spectrum of the beta particles of a beta-active substance is continuous, and not discrete; the neutrino is postulated to preserve the laws of conservation of angular momentum and energy in these cases. Thus it has angular momentum, but whether it has mass is another problem.

*One electron volt is the energy associated with an electron falling through a potential of one volt, and it equals 3.81×10^{-20} calories. A mol of such electrons would give 23,055 calories; about enough energy to run a hundred-watt light for fifteen minutes.

tions. Actually he succeeded in doing just that in 1919; working on a very small scale, he did get protons from nitrogen nuclei bombarded with alpha particles. Unfortunately he didn't recognize what he was doing; his attention was focused on the protons which were emitted, and he did not attempt any examination of the nitrogen itself. He might have found—but wait.

It was not until 1934 that the first artificial transmutation was identified as such, and it is intimately associated with the discovery of artificial radioactivity. In that year Curie and Joliot—the married daughter of Madame Curie—were working in the Curie laboratory in Paris investigating the emission of positrons from boron, using a simple arrangement like this: Po ● I B. The Po was some O D polonium, which emitted alpha particles, which, on striking the boron target B liberated positrons which were detected by a suitable device D—such as an electroscope or Geiger counter. One day they removed the polonium, and left the detector running—astonishingly enough, positrons continued to come out of the boron plate! And there were several facts disclosed by further experimentation which at once proved this phenomena was the actual production of artificial radioactivity in the boron:

(1) The decay, or diminution of number of particles from the boron followed an exponential curve, with a half life of several minutes—the half life is the time required for activity to decrease to one half its initial value—similar to the case of natural radioactive disintegrations;

(2) The growth of the emission of particles similarly followed an exponential curve, with the same transformation constant;

(3) The intensity of the emitted radiation from the boron was dependent upon the intensity of the alpha particles used; but

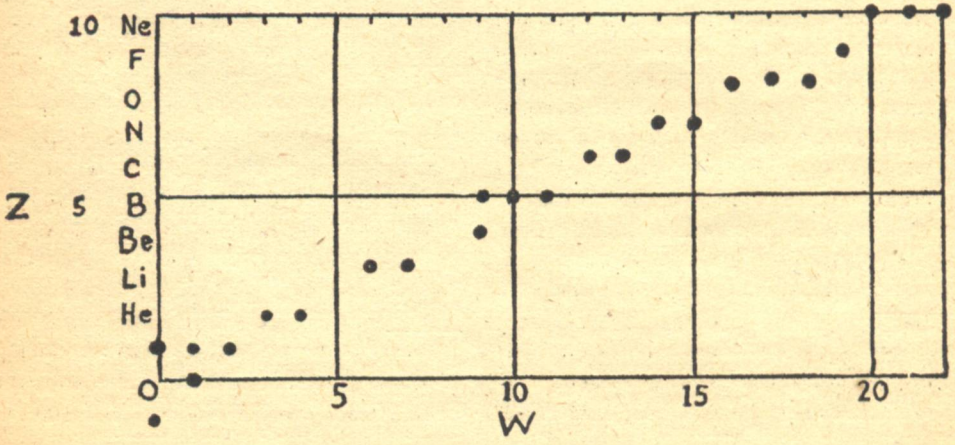
(4) the half life of decay was independent of the intensity of the bombarding particles.

In their first paper Curie and Joliot suggested, as was later proved to be exactly the case, that this artificial radioactivity was the result of the formation of a new nitrogen isotope, unknown in nature, by the reaction:

$$_5B^{10} + {}_2He^4 = {}_7N^{13} + {}_0n^1$$

a neutron being emitted in the process.

Now, it had long been noted that the naturally occurring isotopes of the various elements do not have any random weights, but that instead they follow a particular pattern, especially notable if we plot z, the atomic number, against w, the atomic weight, as in the figure below.



THUS no natural isotopes of lithium beyond those with weights 6 and 7 seem to exist; nitrogen ($z = 7$) has only the isotopes of mass 14 and 15. It can hardly be regarded that this narrow distribution of isotopic weights is mere coincidence, but instead it may be inferred that the narrow region thus defined by the known isotopes represent stable possibilities, and any other isotopes would be unstable. And so Curie and Joliot suggested that the $_7N^{13}$ which was formed on the impact of the alpha particle with the boron nucleus was unstable, and would decompose according to the reaction

$$_7N^{13} = {}_6C^{13} + {}_1e^+,$$

the $_7N^{13}$ thus being converted into the stable, naturally occurring carbon isotope of mass 13, with the emission of the positrons which they observed. The $_7N^{13}$ is a radioactive element, with a half life of some 10.5 minutes, and they also predicted that it would also be formed by the bombardment of carbon with deutons. This latter prediction was fulfilled in the same year, when Crane, Lauritson, and Harper, working in the high voltage laboratory at the California Institute of Technology did actually produce it with deutons that had been accelerated with a potential of a million volts. The reaction may be written

$$_6C^{12} + {}_1H^2 = {}_7N^{13} + {}_0n^1$$

and it represents the first *completely* artificial transmutation. Curie and Joliot had certainly made carbon out of boron, but they had used a natural source of energy, polonium alpha particles, whereas the later production of carbon isotope 13 from the isotope 12 was brought about solely by artificial electrical energy.

But considering the voltages required for accelerating protons or deutons—about 3 m.e.v.—and the natural energy of alpha particles available from naturally radioactive sources—about 8.8 m.e.v.—transmutations of these sorts could only be expected in the lighter elements; in both cases a charged particle must strike a nucleus, and the natural repulsion of the two positive particles varies, of course, with the product of their charges. Thus in the case of the boron reaction described, the repulsion is proportional to $5 \times 2 = 10$; in the case of the carbon reaction, $6 \times 1 = 6$. But the repulsion for a transmutation of, say, platinum would be —using alpha particles—$78 \times 2 = 156$!

Now, there should be no repulsion of neutral particles by the nucleus, and acting on this idea in 1934, Fermi, the brilliant Italian physicist, tried the effect of neutrons in producing artificial radioactivity. At once the process was a success, and it was the process we used in our little lecture demonstration. The capsule of boron and radon is simply a source of neutrons, produced by the first reaction of Curie and Joliot:

$$_5B^{10} + {}_2He^4 = {}_7N^{13} + {}_0n^1,$$

and it is these neutrons, striking the silver, which bring about the reaction:

$$_{47}Ag^{107} + {}_0n^1 = {}_{47}Ag^{108} + h\nu$$

—the $h\nu$ represents gamma radiation of the appropriate energy to satisfy conservation of energy, in the relativistic sense—but since the 108 isotope of silver is unstable—it is not known in nature—it is decomposed by the reaction:

$$_{47}Ag^{108} = {}_{48}Cd^{108} + {}_{-1}e^-$$

with the production of the stable cadmium isotope 108 and an electron, and, lo, we have transmuted silver to cadmium! In our experiment, then, the neutrons from the boron-radon capsule strike the silver nucleus, transmute it to an unstable silver isotope, which decomposes—with a half life of twenty-three seconds—and becomes cadmium.

We demonstrated this in the lecture by simply putting the piece of silver in front of a Geiger counter, showing no increase in the number of counts, placing the silver in the paraffin sphere with the capsule for twenty seconds, and remov-

ing it again and immediately putting it near the counter, which broke out into a terrific clatter of activity from all the electrons emitted by nuclei undergoing this last reaction. No really conclusive proof that the element was cadmium, but there's hardly time for that in a lecture. And anyway, we have already done that experiment, and know that it's cadmium, and the freshmen were willing to trust us.

I called the bucket of water in my recipe a "philosopher's stone"; it was discovered in October, 1934, by Fermi. Up to that time the neutron source and silver had merely been brought close together; Fermi observed that a tremendous increase in the activation of silver took place when the neutron source and silver were surrounded by quantities of water or paraffin. This effect is brought about simply by the slowing of the neutrons from collisions with the hydrogen nuclei of the water or paraffin, either wax or oil.

As any billiard player knows, on the impact of two equally heavy balls the first is slowed down, imparting some of its momentum to the second unless the collision is exactly head-on, which is a rare occurrence in nucleur phenomena, too. And you can't put "english" on a neutron. Thus within the bucket of water or paraffin the neutrons are slowed down, and their probability of capture by a silver nucleus is correspondingly increased, just as it is easier—for me, at least—to catch a slow grounder than a hot line drive.

So FAR we have discussed some three possible transmutation reactions; the example of the second happened to produce an isotope of the original element as the end product, but the same reaction holds good for other elements where the next higher isotope—the unstable one in the carbon-bombarded-with-deutons case—is actually stable, and this reaction also leads to the production of a new element. There are in all some eight general reactions which have been fairly well investigated that lead to the production of radioactive products and different elements, and it would be verbose to discuss each in detail. Instead, we may summarize them all by giving the reactions in implicit notation, as follows:

Alpha Particle Bombardment

(1) ${}_{z}X^{w} + {}_{2}He^{4} = {}_{0}n^{1} + {}_{z+2}Z^{w+3}$

$${}_{z+2}Z^{w+3} \longrightarrow {}_{z+1}Z^{w+3} + {}_{1}e^{+}$$

(2) ${}_{z}X^{w} + {}_{2}He^{4} = {}_{1}H^{1} + {}_{z+1}Y^{w+3}$

$${}_{z+1}Y^{w+3} \longrightarrow {}_{z+2}Y^{w+3} + {}_{-1}e^{-}$$

Deuton Bombardment

(3) ${}_{z}X^{w} + {}_{1}H^{2} = {}_{0}n^{1} + {}_{z+1}Y^{w+1}$

$${}_{z+1}Y^{w+1} \longrightarrow {}_{z}X^{w+1} + {}_{1}e^{+}$$

(4) ${}_zX^w + {}_1H^2 = {}_1H^1 + {}_zX^{w+1} \longrightarrow {}_{z+1}Y^{w+1} + {}_{-1}e^-$

Proton Bombardment

(5) ${}_zX^w + {}_1H^1 = h\nu + {}_{z+1}Y^{w+1} \longrightarrow {}_zX^{w+1} + {}_1e^+$

Neutron Bombardment

(6) ${}_zX^w + {}_0n^1 = {}_2He^4 + {}_{z-2}V^{w-3} \longrightarrow {}_{z-1}W^{w-3} + {}_{-1}e^-$

(7) ${}_zX^w + {}_0n^1 = {}_1H^1 + {}_{z-1}W^w \longrightarrow {}_zX^w + {}_{-1}e^-$

(8) ${}_zX^w + {}_0n^1 = h\nu + {}_zX^{w+1} \longrightarrow {}_{z+1}Y^{w+1} + {}_{-1}e^-$

In all cases we are starting with the element X, and it might be noted that in some of the processes we end up with a new isotope of the same element, other times a new element. And in all cases the process may continue further than the given two reactions, if by chance the final product happens to be an unstable isotope. If on the other hand the first product formed is a stable isotope, the reaction may stop at once. Thus, on applying reaction (8) to cadmium, which has the stable isotopes 106, 108, 110, 111, 112, 113, 114, 115, and 116, if the neutron hit any particular atom except the first two or the last one—and all three of these are rare in nature—the process stops at once with the emission of radiation as indicated in the equation. If, on the other hand, the neutron hit, say the 116 isotope, the unstable 117 isotope would be produced, decompose, and we would have ${}_{49}In^{117}$, according to the reaction. But this particular isotope is unstable, too, and it would also decompose, probably to give us ${}_{50}Sn^{117}$, which is a stable, known isotope.

How much do we make by these methods? Very little. As yet, no one has produced weighable quantities of a transmuted element, but it is possible that production of radioactive sodium from magnesium with the cyclatron at Berkeley will make enough to make it possible to actually measure by physical means the amount of neon produced on its disintegration. Our little lecture experiment required about $150 worth of radon, and in the two twenty-second exposures to the neutron source we made about 6,000,000 cadmium atoms. That is 0.00000000000000112 grams of cadmium—not much for $150!

These low yields are simply a matter of geometry and marksmanship; thus if a proton or deuton is being used to

produce the transmutation, the attractive and repulsive forces of the outer electrons and nucleus of the target atom makes minor deflections a certainty, even if we could aim a beam of the particles properly—and only direct hits count! Since the average distance between the target nuclei will be of the order of 10^{-8} centimeters, and the nuclear diameter of the order of 10^{-12} cm., there's a lot of room for misses—the problem is essentially that of trying to make direct hits on .22 rifle bullets 100 yards apart with a .22 rifle in a high wind—though to make an accurate analogy we ought to suspend the target bullets on two-foot pieces of string and let them sway in the breeze, too!

Alpha particles are even worse, because they will come out of radium, or whatever is being used as a source, in completely random directions—same as our other analogy, only the fellow with the rifle has gone and got quite drunk. We can't, of course, just increase the thickness of whatever we're bombarding, to make sure of getting all the alpha particles caught by a nucleus sooner or later, because the particles have to be going darn fast to do any good, and after they've done any slowing down they just gather in any convenient electrons and become common, ordinary atoms of hydrogen, deuterium, or helium, and then what good are they?

The capture of slow neutrons, on the other hand, is a much better business, even though we can't aim them at all; theoretically, at least, all we have to do to use up all of them is to increase our absorbing target so that, no matter how they wander about, nearly all will get a chance to drop into a nucleus of the desired substance before wandering out of the room—what matter if the chunk of material we're transmuting has to be several feet thick? All we need is a little source of neutrons in the center.

And that's the catch! How do we make neutrons? So far the only known ways are to make 'em from reactions (1) or (3) on our list—and both of these involve that marksmanship business again!

CONSIDERING the low yields available from these various sources, one very properly inquires just how does one identify the transmuted elements, and what use are they? Let us take these in order—first the identification. No chemical analyst ever dreamed of being able to get a test for a mere 6,000,000 atoms—the smallest amount of material one can manipulate under a microscope in present-day micro methods is of the order of billions of times this quantity—so we have to make a lot more than we did in our lecture experiment to get a chemical test. On the other hand,

we can do right well with far less material with either of the fundamental gadgets of the nuclear chemist; an electroscope or a Geiger counter.

The electroscope is simply a very light charged fiber—usually metallized quartz—repelled from its support. As radiation falls near the fiber it ionizes the surrounding air and permits the charge to leak away, and the activity of the sample analyzed is measured simply as the rate at which the electroscope discharges. A Geiger counter may be made in a variety of shapes and designs; essentially, however, a high direct-current potential is maintained between a wire insulated from a metallic cylindrical shell surrounding it. This potential is so balanced against a vacuum tube that the passage of an ionized particle inside the cylinder ionizes the gas sufficiently to trip the vacuum tube, and the resulting potential is amplified and recorded.

Needless to say, this is a very sensitive instrument—theoretically every single particle emitted from a particular sample could thus be counted, but actually cosmic rays are too difficult to screen out, and one is content to work against a constant "background." However, it has been found practicable to measure accurately the amount of radioactive material present when only *one* nuclei is exploding every *twenty* seconds or so; roughly, then, we'd only have to have some 10,000 or so radioactive atoms to be able to find them without trouble.

Fine, so far; now we can tell that some radioactive material is present. But what element is it? We can tell that, too, very simply; let us take the case of the Curie and Joliot reaction and follow the process through. Here we suspect a radioactive isotope of nitrogen being formed, and even though we can't possibly handle the small amount of it that is present, we can detect it, and so we simply add some ordinary nitrogen gas—and to be on the safe side a handful of other miscellaneous elements that might be the radioactive one—to our reaction mixture, and then separate out the nitrogen again.

Usually we put the element through one or two characteristic reactions or separations—in this case making calcium nitride, decomposing it to ammonia, et cetera—but, in any event, each and every time we do something to the nitrogen and the other substances we examine them for radioactivity. If a radioactive isotope of nitrogen was initially present, it would mix with, and behave exactly like, the added nitrogen, so that if every time we test for it the radioactivity is still associated with our nitrogen fraction, then it must be coming from a nitrogen isotope.

To be perfectly exact, of course, this method would involve adding each and every one of the ninety-two elements to a particular mixture and separating each and every one of them out again—a pretty difficult business when you remember a large number of these isotopes have a very short half life. Take cadmium, for example. We made 6,000,000 radioactive silver atoms, with a half life of twenty-three seconds. In twenty-three seconds, then, there are but 3,000,000 atoms; in forty-six seconds 1,500,000, and in ten minutes not even one! So, one takes all the suspected elements he can and does what he can.

Now we know that the *radioactive* element in the Curie and Joliot reaction was nitrogen. But how do we know it became carbon after it blew up? That's not so easy; to a considerable extent we get this sort of information from analogy with other reactions, and the fact that the mass-energy equation balances only if it is carbon—remember we can measure the energy, charge, et cetera, of the emitted particles quite readily.

As a last resort we might have to set out and make enough of the particular element to get some chemical test for it;

in some cases this is quite simple, as in the production of $_{15}P^{32}$ by reaction (7), where one simply irradiates carbon disulphide with fast neutrons. On the impact of the neutron with the nucleus, or as recoil from the proton emission as a result of the formation, the sulphur atom is knocked out of chemical combination with the carbon, and a faint precipitate of the newly born phosphorus slowly appears in the carbon disulphide; on evaporation the residue is pure radioactive phosphorus!

TRANSMUTATION as a source of rare and expensive elements is pretty impractical—remember the drunk with the .22? Of course, if we could sober him up, so he *never* missed— But we haven't quite done that yet. In the meantime, the tremendous value of these reactions we have been discussing is not that they give us any valuable, stable, elements, but that they give us *unstable* even more valuable elements.

Why? The detection of the emitted radiations from these elements was a fairly simple matter, we saw, and it gave us a test billions of times more sensitive than any chemical analysis. And in addition that radioactive determination is independent of just how the particular element is combined, or where it is—a factor making the artificial radioelements of tremendous use in biological work.

You want to know if some substance A is the precursor of substance B in the intact animal? Feed your animal A which has been synthesized with some radioelement in it, isolate your B and see if it has any radioactivity.

Want to know if a particular substance is stored in the animal as such, and for how long? Feed your animal the substance with a radioelement in it, and analyze the excrement.

Want to know how fast the sap flows upwards in a plant? Dump some radioactive phosphorus in the water around the roots—and this experiment has been done recently, too—put a Geiger counter near an upper leaf, and wait. When your recorder begins to clatter, the phosphorus has arrived.

The story of the ultimate in transmutations is the most recent, and we're only at Chapter V, so far, but things are moving rapidly—too rapidly for discussion here. Briefly, though, we do know for sure a few things. When uranium is bombarded with neutrons, several radioactive elements, with half lives that do not correspond to any of the known elements *near* uranium, are formed. These were first identified as elements 93, 94, and 95, but we know now that some of them are isotopes of barium, tellurium, iodine, and antimony, and there seems to be more *smaller* pieces of one sort or another. What's going on is something like this:

$$_{92}U^{238} + {}_{0}n^{1} = {}_{56}Ba^{138} + {}_{36}Kr^{36} + ??$$

with both of the two major products breaking down into smaller fragments. Energy? I'll say—plenty of it! But from the standpoint of transmutations, this is none of the little one and two element jump business, but splitting the atom smack in half—and then some.

But more understanding of, and more data on, this transformation is accumulating so rapidly that this discussion of the uranium reaction is already out of date. Under such circumstances, the best we can do is to join the radio announcers in saying: "For further details see your local papers!"

BOOK REVIEW

ANIMALS WITHOUT BACKBONES, by Ralph Buchsbaum, Department of Zoology, University of Chicago, Chicago: University of Chicago Press, 1938, 371 pp., $5.00.

To fix a meal up so that it looks attractive adds nothing to its nutritive value, but you enjoy it more. Much the same applies to books. Hence the handsome getup of this book, while it may not add to the information imparted, puts you in a receptive frame of mind before you start. Similarly, seasoning adds not a calorie to your food, but makes it easier to eat; a lively writing style neither adds nor detracts from the accuracy of a work, but makes it easier to read. So by the time you've read Buchsbaum's first sentence: "Anyone can tell the difference between a tree and a cow," you're reasonably sure that you are in for a good time. Nor will you be disappointed.

The book is a description of what our scientific forebears used to call "Invertebrates." They used to think that the animal kingdom was divided into vertebrates and invertebrates. Now we know that animals are divided into a large number of large groups called phyla, of which the vertebrates are only one—and by no means the most numerous or the most various. Being vertebrates ourselves, we are naturally more familiar with this phylum than any other. But the author shows that, if we study the vertebrates only, we hardly know anything about the animal kingdom at all.

For instance, of the protozoa alone, Buchsbaum points out that "there are many more individual protozoa alone than individuals of all other animals combined." They show an amazing diversity of form and habit, live in places and put up with conditions that no other animal will stand, and have life cycles of fantastic complexity. Some of them live in us, without our minding them in the least. When others set up housekeeping in our bodies, we get fevers, or break out in spots or lumps, or begin cutting out paper dolls, or die. When the last happens, other gangs of protozoa move in and begin wrecking operations.

The author goes on to tell about sponges, and hydras, and polyps, and planarian worms—the cross-eyed crawlers—and flatworms, and roundworms, and hairworms. These last four are all very different, despite being all called worms. But all these phyla have members parasitic on vertebrates, many of them with the most ingenious and complicated methods of supporting themselves and carrying on their species.

Other invertebrates are the mollusks—including such different creatures as oysters and squids—the segmented worms, the buzzing, scuttling, biting, stinging, pinching, and often highly edible arthropods, and the many-sided echinoderms—starfishes, sea urchins, et cetera. There is a section on several obscure invertebrates that seem to be on the verge of becoming vertebrates. At least they were once; maybe they got discouraged.

The book is not only entertainingly written, but magnificently illustrated with bold black-and-white drawings and photographs. If biological matters interest you at all, it is a "must." It's the kind of book that you will put in the most conspicuous place on your shelves after you've read it.

L. Sprague de Camp.

REQUIEM

It was a matter of business and investments—but it wouldn't stay that way, for a man who'd dreamed, and financed those dreams.

By Robert A. Heinlein

Illustrated by M. Isip

On a high hill in Samoa there is a grave. Inscribed on the marker are these words:

"Under the wide and starry sky
Dig my grave and let me lie.
Glad did I live and gladly die
And I lay me down with a will!

"This be the verse you grave for me:
Here he lies where he longed to be,
Home is the sailor, home from the sea,
And the hunter home from the hill."

These lines appear another place—scrawled on a shipping tag torn from a compressed-air container, and pinned to the ground with a knife.

IT was not much of a fair, as fairs go. The trotting races didn't promise much excitement, even though several entries claimed the blood of the immortal Dan Patch. The tents and concession booths barely covered the circus grounds, and the pitchmen seemed discouraged.

D. D. Harriman's chauffeur could not see any reason for stopping. They were due in Kansas City for a directors' meeting; that is to say, Harriman was. The chauffeur had private reasons for promptness, reasons involving darktown society on Eighteenth Street. But the boss not only stopped; he hung around. He didn't seem much interested in the racetrack or sideshows, though.

Bunting and a canvas arch made the entrance to a large inclosure beyond the racetrack. Red and gold letters announced:

This way to the
MOON ROCKET! ! ! !
See it in actual flight!
Public Demonstration Flights
TWICE DAILY
This is the ACTUAL TYPE used by the
First Men to Reach the *MOON! !*
YOU can ride in it! !—$25

A boy, nine or ten years old, hung around the entrance and stared at the posters.

"Want to see the ship, son?"

The kid's eyes shone. "Gee, mister, I sure would."

"So would I. Come on."

Harriman paid out fifty cents for two pink tickets which entitled him and the boy to enter the inclosure and examine the rocketship. The kid ran on ahead with the single-minded preoccupation of boyhood. Harriman looked over the stubby curved lines of the ovoid body. He noted with a professional eye that she was a single-jet type with fractional controls around her midriff. He squinted through his glasses at the name painted in gold on the carnival red of the body, *Carefree*. He paid another quarter to enter the control cabin.

WHEN his eyes had adjusted to the gloom caused by the strong ray filters of the ports, he let them rest lovingly on the keys of the console and the semicircle of dials above. Each beloved gad-

get was in its proper place. He knew them—graven in his heart.

While he mused over the instrument board, with the warm liquid of content soaking through his body, the pilot entered and touched his arm.

"Sorry, sir. We've got to cast loose for the flight."

"Eh?" Harriman started, then looked at the speaker. Handsome devil, with a good skull and strong shoulders—reckless eyes and a self-indulgent mouth, but a firm chin. "Oh, excuse me, captain."

"Quite all right."

"Oh, I say, captain . . . er . . . uh—"

"McIntyre."

"Captain McIntyre, could you take a passenger this trip?" The old man leaned eagerly toward him.

"Why, yes, if you wish. Come along with me." He ushered Harriman into a shed marked "Office" which stood near the gate. "Passenger for a check-over, doc."

Harriman permitted the medico to run a stethoscope over his thin chest and to strap a rubber bandage around his arm. Presently the doctor unstrapped

it, glanced at McIntyre, and shook his head.

"No go, doc?"

"That's right, captain."

Harriman looked from face to face, his disappointment plain to see. "You won't take me?"

The doctor shrugged his shoulders. "I couldn't even guarantee that you would live through the take-off. You see, sir," he continued, not unkindly, "it's not only that your heart condition makes heavy acceleration dangerous, but at your age bones are brittle, highly calcified, and easily broken in the shock of take-off. Rocketry is a young man's game."

McIntyre added: "Sorry, sir. I'd like to, but the Bates County Fair Association pays the doctor here to see to it that I don't take up anyone who might be hurt by the acceleration."

The old man's shoulders drooped miserably. "I rather expected it."

"Sorry, sir." McIntyre turned to go, but Harriman followed him out.

"Excuse me, captain—"

"Yes?"

"Could you and your . . . uh . . . engineer have dinner with me after your flight?"

The pilot looked at him quizzically. "I don't see why not. Thanks."

"CAPTAIN MCINTYRE, it is difficult for me to see why anyone would quit the Earth-Moon run," said Harriman a few hours later. Fried chicken and hot biscuits in a private dining room of the best hotel the little town of Butler afforded, three-star Hennessey, and Corona Coronas had produced a friendly atmosphere in which three men could talk freely.

"Well, I didn't like it."

"Aw, don't give him that, Mac—you know damn well it was Rule G that got you." McIntyre's mechanic poured himself another brandy as he spoke.

McIntyre looked sullen. "Well, what if I did take a couple o' drinks? Anyhow, I could have squared that—it was the damn persnickety regulations that got me fed up. Who are you to talk? Smuggler!"

"Sure, I smuggled! Who wouldn't—with all those beautiful rocks just aching to be taken back to Earth? I had a diamond once as big as— But if I hadn't been caught I'd be in Luna City tonight. And so would you, you drunken blaster—with the boys buying us drinks and the girls smiling and making suggestions—" He put his face down and began to weep quietly.

McIntyre shook him. "He's drunk."

"Never mind." Harriman interposed a hand. "Tell me, are you really satisfied not to be on the run any more?"

McIntyre chewed his lip. "No—he's right, of course. This barnstorming isn't what it's all cracked up to be. We've been hopping junk at every pumpkin doin's up and down the Mississippi Valley—sleeping in tourist camps, and eating at greaseburners. Half the time the sheriff has an attachment on the ship, the other half the Society for the Prevention of Something or Other gets an injunction to keep us on the ground. It's no sort of a life for a rocket man."

"Would it help any for you to get to the Moon?"

"Well—yes. I couldn't get back on the Earth-Moon run, but if I was in Luna City, I could get a job hopping ore for the company—they're always short of rocket pilots for that, and they wouldn't mind my record. If I kept my nose clean, they might even put me back on the run, in time."

Harriman fiddled with a spoon, then looked up. "Would you young gentlemen be open to a business proposition?"

"Perhaps. What is it?"

"You own the *Carefree?*"

"Yeah. That is, Charlie and I do—barring a couple of liens against her. What about it?"

"I want to charter her—for you and Charlie to take me to the Moon!"

Charlie sat up with a jerk. "D'joo hear what he said, Mac? He wants us to fly that old heap to the Moon!"

McIntyre shook his head. "Can't do it, Mr. Harriman. The old boat's worn out. We don't even use standard juice in her—just gasoline and liquid air. Charlie spends all of his time tinkering with her at that. She's going to blow up some day."

"SAY, Mr. Harriman," put in Charlie, "what's the matter with getting an excursion permit and going in a company ship?"

"No, son," the old man replied, "I can't do that. You know the conditions under which Congress granted the company a monopoly on lunar exploitation —no one to enter space who was not physically qualified to stand up under it. Company to take full responsibility for the safety and health of all citizens beyond the stratosphere. The official reason for granting the franchise was to stop the enormous loss of life that occurred during the first few years of rocket travel."

"And you can't pass the physical exam?"

Harriman shook his head.

"Well, what the hell—if you can afford to hire us, why don't you just bribe yourself a brace of company docs? It's been done before."

Harriman smiled ruefully. "I know it has, Charlie, but it won't work for me. You see, I'm a little too prominent. My full name is Delos D. Harriman."

"What? *You* are old D. D.? But, hell's bells, you own a big slice of the company yourself; you ought to be able to do anything you like, rules or no rules."

"That is not an unusual opinion, son, but it is incorrect. Rich men aren't more free than other men; they are less free—a good deal less free. I tried to do what you suggest, but the other directors would not permit me. They are afraid of losing their franchise. It costs them a good deal in—uh—political contact expenses to retain it, as it is."

"Well, I'll be a— Can you tie that, Mac? A guy with lots of dough, and he can't spend it the way he wants to."

McIntyre did not answer, but waited for Harriman to continue.

"Captain McIntyre, if you had a ship, would you take me?"

McIntyre rubbed his chin. "It's against the law."

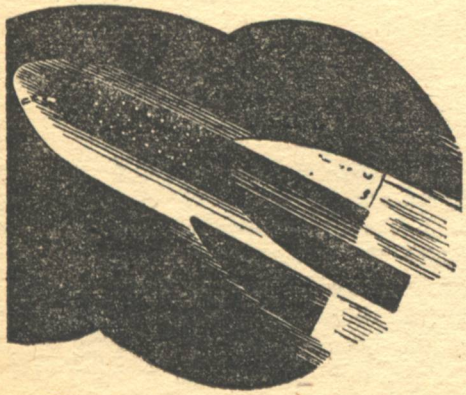
"I'd make it worth your while."

"Sure, he would, Mr. Harriman. Of course you would, Mac. Luna City! Oh, baby!"

"Why do you want to go to the Moon so badly, Mr. Harriman?"

"Captain, it's the one thing I've really wanted to do all my life—ever since I was a boy. I don't know whether I can explain it to you or not. You young fellows have grown up to rocket travel the way I grew up to aviation. I'm a great deal older than you are; maybe fifty years older. When I was a kid practically nobody believed that men would ever reach the Moon. You've seen rockets all your lives, and the first to reach the Moon got there before you were old enough to vote. When I was a boy they laughed at the idea.

"But I believed—I believed. I read



Verne and Wells and Smith, and I believed that we could do it—that we *would* do it. I set my heart on being one of the men to walk the surface of the Moon, to see her other side, and to look back on the face of the Earth, hanging in the sky.

"I used to go without my lunches to pay my dues in the American Rocket Society, because I wanted to believe that I was helping to bring the day nearer when we would reach the Moon. I was already an old man when that day arrived. I've lived longer than I should, but I would not let myself die—I will not!—until I have set foot on the Moon."

McIntyre stood up and put out his hand. "You find a ship, Mr. Harriman. I'll drive 'er."

"Atta boy, Mac! I told you he would, Mr. Harriman."

HARRIMAN mused and dozed during the hour's run to the north into Kansas City, dozed in the light, troubled sleep of old age. Incidents out of a long life ran through his mind in vagrant dreams. There was that time—oh, yes, 1910—a little boy on a warm spring night. "What's that, daddy?"

"That's Halley's comet, sonny."

"Where did it come from?"

"I don't know, son. From way out in the sky somewhere."

"It's *beyooootiful,* daddy. I want to touch it."

" 'Fraid not, son."

"Delos, do you mean to stand there and tell me you put the money we had saved for the house into that crazy rocket company?"

"Now, Charlotte, please! It's not crazy; it's a sound business investment. Some day soon rockets will fill the sky. Ships and trains will be obsolete. Look what happened to the men that had the foresight to invest in Henry Ford."

"We've been all over this before."

"Charlotte, the day will come when men will rise up off the Earth and visit the Moon, even the planets. This is the beginning."

"Must you shout?"

"I'm sorry, but you—"

"I feel a headache coming on. Please try to be a little quiet when you come to bed."

He hadn't gone to bed. He had sat out on the veranda all night long, watching the full Moon move across the sky. There would be the devil to pay in the morning, the devil and a thin-lipped silence. But he'd stick by his guns. He'd given in on most things, but not on this. The night was his. Tonight he'd be alone with his old friend. He searched her face. Where was Mare Crisium? Funny, he couldn't make it out. He used to be able to see it plainly when he was a boy. Probably needed new glasses—this constant office work wasn't good for his eyes.

But he didn't need to see; he knew where they all were: Crisium, Mare Fecunditatis, Mare Tranquillitatis—that one had a satisfying roll!—the Apennines, the Carpathians, old Tycho with its mysterious rays.

Two hundred and forty thousand miles—ten times around the Earth. Surely men could bridge a little gap like that. Why, he could almost reach out and touch it, nodding there behind the elm trees.

Not that he could help to do it. He hadn't the education.

"Son, I want to have a little serious talk with you."

"Yes, mother."

"I know you had hoped to go to college next year"—Hoped! He had lived or it. The University of Chicago to study under Moulton, then on to the Yerkes Observatory to work under the eye of Dr. Frost himself—"and I had hoped so, too. But with your father gone, and the girls growing up, it's harder to make

ends meet. You've been a good boy, and worked hard to help out. I know you'll understand."

"Yes, mother."

"Extra! Extra! Stratosphere Rocket Reaches Paris. Read aaaaallllll about 't." The thin little man in the bifocals snatched at the paper and hurried back to the office.

"Look at this, A. J."

"Huh? Hm-m-m, interesting, but what of it?"

"Can't you see? The next stage is to the Moon!"

"God, but you're a sucker, Delos. The trouble with you is, you read too many of those trashy magazines. Now, I caught my boy reading one of 'em just last week and dressed him down proper. Your folks should have done you the same favor."

Harriman squared his narrow, middle-aged shoulders. "They will so reach the Moon!"

His partner laughed. "Have it your own way. If baby wants the Moon, papa will bring it home for him. But you stick to your discounts and commissions; that's where the money is."

The big car droned down the Paseo, and turned off on Armour Boulevard. Old Harriman stirred uneasily in his sleep and muttered to himself.

"BUT, Mr. Harriman—" The young man with the notebook was plainly perturbed. The old man grunted.

"You heard me. Sell 'em. I want every share I own realized in cash as rapidly as possible; Spaceways, Spaceways Provisioning Co., Artemis Mines, Luna City Recreations, the whole lot of them."

"It will depress the market. You won't realize the full value of your holdings."

"Don't you think I know that? I can afford it."

"What about the shares you had earmarked for Tycho Observatory and for the Harriman Scholarships?"

"Oh, yes. Don't sell those. Set up a trust. Should have done it long ago. Tell Mr. Kamens to draw up the papers. He knows what I want."

The interoffice 'visor flashed into life. "The gentlemen are here, Mr. Harriman."

"Send 'em in. That's all, Ashley. Get busy." Ashley went out as McIntyre and Charlie entered. Harriman got up and trotted forward to greet them.

"Come in, boys, come in. I'm so glad to see you. Sit down. Sit down. Have a cigar."

"Mighty pleased to see you, Mr. Harriman," acknowledged Charlie. "In fact, you might say we need to see you."

"Some trouble, gentlemen?" Harriman glanced from face to face. McIntyre answered him.

"You still mean that about a job for us, Mr. Harriman?"

"Mean it? Certainly, I do. You're not backing out on me?"

"Not at all. We need that job now. You see, the *Carefree* is lying in the middle of the Osage River, with her jet split clear back to the injector."

"Dear me! You weren't hurt?"

"No, aside from sprains and bruises. We jumped."

Charlie chortled. "I caught a catfish with my bare teeth."

In short order they got down to business. "You two will have to buy a ship for me. I can't do it openly; my colleagues would figure out what I mean to do and stop me. I'll supply you with all the cash you need. You go out and locate some sort of a ship that can be refitted for the trip. Work up some good story about how you are buying it for some playboy as a stratosphere yacht, or that you plan to try to establish an Arctic-Antarctic tourist route. Anything as long as no one suspects that she is being outfitted for space flight.

"Then, after the department of transport licenses her for strato flight, you move to a piece of desert out West—I'll find a likely parcel of land and buy it—and then I'll join you. Then we'll install the extra fuel tanks, change the injectors and timers and so forth, to fit her for the hop. How about it?"

McIntyre looked dubious. "It'll take a lot of doing. Charlie, do you think you can accomplish that change-over without a dockyard and shops?"

"Me? Sure, I can—with your thick-fingered help. Just give me the tools and materials I want, and don't hurry me too much. Of course, it won't be fancy—"

"Nobody wants it to be fancy. I just want a ship that won't blow when I start slapping the keys."

"It won't blow, Mac."

"That's what you thought about the *Carefree.*"

"That ain't fair, Mac. I ask you, Mr. Harriman—that heap was junk, and we knew it. This'll be different. We're going to spend some dough and do it right. Ain't we, Mr. Harriman?"

Harriman patted him on the shoulder. "Certainly we are, Charlie. You can have all the money you want. That's the least of our worries. Now, do the salaries and bonuses I mentioned suit you? I don't want you to be short."

"—as you know, my clients are his nearest relatives and have his interests at heart. We contend that Mr. Harriman's conduct for the past several weeks, as shown by the evidence here adduced, gives clear indication that a mind, once brilliant in the world of finance, has become senile. It is, therefore, with the deepest regret that we pray this honorable court, if it pleases, to declare Mr. Harriman incompetent and to assign a conservator to protect his financial interests and those of his future heirs and assigns." The attorney sat down, pleased with himself.

Mr. Kamens took the floor. "May it please the court—if my esteemed friend is *quite* through—I suggest that in his last few words my opponent gave away his entire thesis. 'The financial interests of future heirs and assigns.' It is evident that the petitioners believe that my client should conduct his affairs in such a fashion as to insure that his nieces and nephews, and their issue, will be supported in unearned luxury for the rest of their lives. My client's wife has passed on; he has no children. It is admitted that he has provided generously for his sisters and their children in times past, and that he has established annuities for such near kin as are without means of support.

"But now, like vultures—worse than vultures, for they are not content to let him die in peace—they would prevent my client from enjoying his wealth in whatever manner best suits him for the few remaining years of his life. It is true that he has sold his holdings; is it strange that an elderly man should wish to retire? It is true that he suffered some paper losses in liquidation. 'The value of a thing is what that thing will bring.' He was retiring and demanded cash. Is there anything strange about that?

"It is admitted that he refused to discuss his actions with his so-loving kinfolk. What law, or principle, requires a man to consult with his nephews on anything?

"Therefore, we pray that this court will confirm my client in his right to do what he likes with his own, deny this petition, and send these meddlers about their business."

The judge took off his spectacles and polished them thoughtfully.

"Mr. Kamens, this court has as high a regard for individual liberty as you have, and you may rest assured that any action taken will be solely in the interests of your client. Nevertheless, men do grow old, men do become senile,

and in such cases must be protected.

"I shall take this matter under advisement until tomorrow. Court is adjourned."

From the Kansas City *Star:*

ECCENTRIC MILLIONAIRE DISAPPEARS

—failed to appear for the adjourned hearing. The bailiffs returned from a search of places usually frequented by Harriman with the report that he had not been seen since the previous day. A bench warrant under contempt proceedings has been issued and—

A DESERT sunset is a better stimulant for the appetite than a hot dance orchestra. Charlie testified to this by polishing off the last of the ham gravy with a piece of bread. Harriman handed each of the younger men cigars and took one himself.

"My doctor claims that these weeds are bad for my heart condition," Harriman remarked as he lighted his, "but I've felt so much better since I joined you boys here on the ranch that I am inclined to doubt him." He exhaled a cloud of blue-gray smoke and resumed. "I don't think a man's health depends so much on what he does as on whether he wants to do it. I'm doing what I want to do."

"That's all a man can ask of life," agreed McIntyre.

"How does the work look now, boys?"

"My end's in pretty good shape," Charlie answered. "We finished the second pressure tests on the new tanks and the fuel lines today. The ground tests are all done, except the calibration runs. Those won't take long—just the four hours to make the runs if I don't run into some bugs. How about you, Mac?"

McIntyre ticked them off on his fingers. "Food supplies and water on board. Three vacuum suits, a spare, and service kits. Medical supplies. The buggy already had all the standard equipment for strato flight. The late lunar ephemerides haven't arrived as yet."

"When do you expect them?"

"Any time—they should be here now. Not that it matters. This guff about how hard it is to navigate from here to the Moon is hokum to impress the public. After all, you can *see* your destination—it's not like ocean navigation. Gimme a sextant and a good stadimeter and I'll set you down any place on the Moon you like—without opening an almanac or a star table—just from a general knowledge of the relative speeds involved."

"Never mind the personal build-up, Columbus," Charlie told him. "We'll admit you can hit the floor with your hat. The general idea is, you're ready to go now. Is that right?"

"That's it."

"That being the case, I *could* run those tests tonight. I'm getting jumpy—things have been going too smoothly. If you'll give me a hand, we ought to be in bed by midnight."

"O. K. When I finish this cigar."

They smoked in silence for a while, each thinking about the coming trip and what it meant to him. Old Harriman tried to repress the excitement that possessed him at the prospect of immediate realization of his lifelong dream.

"Mr. Harriman—"

"Eh? What is it, Charlie?"

"How does a guy go about getting rich, like you did?"

"Getting rich? I can't say; I never tried to get rich. I never wanted to be rich, or well known, or anything like that."

"Huh?"

"No, I just wanted to live a long time and see it all happen. I wasn't unusual; there were lots of boys like me—radio hams, they were, and telescope builders, and airplane amateurs. We had science clubs, and basement laboratories, and

science-fiction leagues—the kind of boys that thought there was more romance in one issue of the *Electrical Experimenter* than in all the books Dumas ever wrote. We didn't want to be one of Horatio Alger's get-rich heroes, either; we wanted to build spaceships. Well, some of us did."

"Gosh, Pop, you make it sound exciting."

"It was exciting, Charlie. This has been a wonderful, romantic century, for all of its bad points. And it's grown more wonderful and more exciting every year. No, I didn't want to be rich; I just wanted to live long enough to see men rise up to the stars, and, if God was good to me, to go as far as the Moon myself." He carefully deposited an inch of white ash in a saucer. "It has been a good life. I haven't any complaints."

McIntyre pushed back his chair. "Come on, Charlie, if you're ready."

"O. K."

They all got up. Harriman started to speak, then grabbed at his chest, his face a dead gray-white.

"Catch him, Mac!"

"Where's his medicine?"

"In his vest pocket."

They eased him over to a couch, broke a small glass capsule in a handkerchief, and held it under his nose. The volatile released by the capsule seemed to bring a little color into his face. They did what little they could for him, then waited for him to regain consciousness.

Charlie broke the uneasy silence. "Mac, we ain't going through with this."

"Why not?"

"It's murder. He'll never stand up under the initial acceleration."

"Maybe not, but it's what he wants to do. You heard him."

"But we oughtn't to let him."

"Why not? It's neither your business nor the business of this damn paternalistic government to tell a man not to risk his life doing what he really wants to do."

"All the same, I don't feel right about it. He's such a swell old duck."

"Then what d'yuh want to do with him—send him back to Kansas City so those old harpies can shut him up in a laughing academy till he dies of a broken heart?"

"N-no-o-o—not that."

"Get out there, and make your set-up for those test runs. I'll be along."

A WIDE-TIRED desert runabout rolled into the ranch-yard gate the next morning and stopped in front of the house. A heavy-set man with a firm, but kindly, face climbed out and spoke to McIntyre, who approached to meet him.

"You James McIntyre?"

"What about it?"

"I'm the deputy Federal marshal hereabouts. I got a warrant for your arrest."

"What's the charge?"

"Conspiracy to violate the Space Precautionary Act."

Charlie joined the pair. "What's up, Mac?"

The deputy answered. "You'd be Charles Cummings, I guess. Warrant here for you. Got one for a man named Harriman, too, and a court order to put seals on your spaceship."

"We've no spaceship."

"What d'yuh keep in that big shed?"

"Strato yacht."

"So? Well, I'll put seals on her until a spaceship comes along. Where's Harriman?"

"Right in there." Charlie obliged by pointing, ignoring McIntyre's scowl.

The deputy turned his head. Charlie couldn't have missed the button by a fraction of an inch, for the deputy collapsed quietly to the ground. Charlie stood over him, rubbing his knuckles and mourning.

"That's the finger I broke playing

shortstop. I'm always hurting that finger."

"Get Pop into the cabin," Mac cut him short, "and strap him into his hammock."

"Aye, aye, skipper."

They taxied on the auxiliary motor out of the hangar, turned, and started out across the desert plain to find elbow room for the take-off. McIntyre saw the deputy from his starboard conning port. He was staring disconsolately after them.

McIntyre fastened his safety belt, settled his corset, and spoke into the engine-room speaking tube. "All set, Charlie?"

"All set, skipper. But you can't raise ship yet, Mac. *She ain't named!*"

"No time for your superstitions!"

Harriman's thin voice reached them. "Call her the *Lunatic*. It's the only appropriate name!"

McIntyre settled his head into the pads, punched two keys, then three more in rapid succession, and the *Lunatic* raised ground.

"How are you, Pop?"

Charlie searched the old man's face anxiously. Harriman licked his lips and managed to speak. "Doing fine, son. Couldn't be better."

"The acceleration won't be so bad from here on. I'll unstrap you so you can wiggle around a little. But I think you'd better stay in the hammock." He tugged at buckles. Harriman partially repressed a groan.

"What is it, Pop?"

"Nothing. Nothing at all. Just go easy on that side."

Charlie ran his fingers over the old man's side with the sure, delicate touch of a mechanic. "You ain't foolin' me none, Pop. But there isn't much I can do until we ground."

"Charlie—"

"Yes, Pop?"

"Can't I move to a port? I want to watch the Earth."

"Ain't nothin' to see yet; the blast hides it. As soon as we build up enough speed to coast up to the change-over point, I'll move you. Tell you what; I'll give you a sleepy pill, and then wake you when we cut the jets."

"No!"

"Huh?"

"I'll stay awake."

"Just as you say, Pop."

Charlie fought his way up to the nose of the ship, and braced himself on the gimbals of the pilot's chair. McIntyre questioned him with his eyes.

"Yeah, he's alive all right," Charlie told him, "but he's in bad shape."

"How bad?"

"Couple of cracked ribs, anyhow. I don't know what else. I don't know whether he'll last out the trip, Mac. His heart was pounding something awful."

"He'll last, Charlie. He's tough."

"Tough? He's delicate as a canary."

"I don't mean that. He's tough way down inside—where it counts."

"Just the same, you'd better set her down awful easy if you want to ground with a full complement aboard."

"I will. I'll make one full swing around the Moon and ease her in on an involute approach curve. We've got enough fuel, I think."

WHEN they commenced to coast in a free orbit, Charlie unslung the hammock and moved Harriman, hammock and all, to a side port. McIntyre turned the ship about a transverse axis so that the tail pointed toward the Sun, then gave a short blast on two tangential jets opposed in couple to cause the ship to spin slowly about her longitudinal axis, and thereby create a slight artificial gravity. The initial weightlessness when coasting commenced had knotted the old man with the characteristic nausea of free flight, and the pilot wished to save his passenger as much discomfort as possible.

But Harriman was not concerned with

the condition of his stomach.

There it was, all as he had imagined it so many times. The Moon swung majestically past the viewport, twice as wide as he had ever seen it before, all of her familiar features cameo-clear. She gave way to the Earth as the ship continued its slow swing, the Earth itself, as he had envisioned her, appearing like a noble moon, eight times as wide as the Moon appears to the Earthbound, and more luscious, more sensuously beautiful than the silver Moon could be. It was sunset near the Atlantic seaboard —the line of shadow ran down Hudson Bay, slashed through the eastern coast line of North America, touched Cuba, and obscured the eastern bulge of South America. He savored the mellow blue of the Pacific Ocean, felt the texture of the soft green and brown of the continents, admired the blue-white cold of the polar caps. Canada and the great Northwest were obscured by cloud, a vast low-pressure area that spread across the continent. It shone with an even more satisfactory dazzling white than the polar caps.

As the ship swung slowly around, Earth would pass from view, and the stars would march across the port—the same stars he had always known, but steady, brighter, and unwinking against a screen of perfect, live black. Then the Moon would swim into view again to claim his thoughts.

He was serenely happy in a fashion not given to most men, even in a long lifetime. He felt as if he were every man who had ever lived, and looked up at the stars, and longed.

At least once he must have fallen into deep sleep, or possibly delirium, for he came to with a start, thinking that his wife, Charlotte, was calling to him. "Delos!" the voice had said. "Delos! Come in from there! You'll catch your death of cold in that night air."

Poor Charlotte! She had been a good wife to him, a good wife. He was quite sure that her only regret in dying had been her fear that he would not take proper care of himself. It had not been her fault that she had not shared his dream and his need.

CHARLIE rigged the hammock in such a fashion that Harriman could watch from the starboard port when they swung around the far face of the Moon. He picked out the landmarks made familiar to him by a thousand photographs with nostalgic pleasure, as if he were returning to his own country. McIntyre brought her slowly down as they came back around to the Earthward face, and prepared to land in Mare Imbrium between Aristillus and Archimedes, about ten miles from Luna City.

It was not a bad landing, all things considered. He had to land without coaching from the ground, and he had

no second pilot to punch the stadimeter for him. In his anxiety to make it gentle he missed his destination by some thirty miles, but he did his cold-sober best. At that, it was rather bumpy.

As they scooted along to a stop, throwing up powdery pumice on each side, Charlie came up to the control station.

"How's our passenger?" Mac demanded.

"I'll see, but I wouldn't make any bets. That landing stunk, Mac."

"Damn it, I did my best."

"I know you did, skipper. Forget it."

But the passenger was alive and conscious, though bleeding from the nose, and with a pink foam on his lips. He was feebly trying to get himself out of his cocoon. They helped him, working together.

"Where are the vacuum suits?" was his first remark.

"Steady, Mr. Harriman. You can't go out there yet. We've got to give you some first aid."

"Get me that suit! First aid can wait."

Silently they did as he ordered. His left leg was practically useless, and they had to help him through the lock, one on each side. But with his inconsiderable mass having a lunar weight of only twenty pounds, he was no burden. They found a place some fifty yards from the ship where they could prop him up and let him look, a chunk of scoria supporting his head.

McIntyre put his helmet against the old man's and spoke. "We'll leave you here to enjoy the view while we get ready for the trek into town. It's a forty-miler, pretty near, and we'll have to break out spare air bottles and rations and stuff. We'll be back soon."

Harriman nodded without answering, and squeezed their gauntlets with a grip that was surprisingly strong.

He sat very quiet, rubbing his hands against the soil of the Moon and sensing the curiously light pressure of his body against the ground. At long last there was peace in his heart. His hurts had ceased to pain him. He *was* where he had longed to be—he had followed his need. Overhead hung the Earth in third quarter, a green-blue giant moon. The Sun's supper limb crowned the crags of Archimedes to his left. And underneath—the Moon; the soil of the Moon itself. He was on the Moon!

He lay back still while a bath of content flowed over him like a tide at flood, and soaked into his very marrow.

His attention strayed momentarily, and he thought once again that his name was called. Silly, he thought; I'm getting old—my mind wanders.

BACK in the cabin Charlie and Mac were rigging shoulder yokes on a stretcher. "There. That will do," Mac commented. "We'd better stir Pop out; we ought to be going."

"I'll get him," Charlie replied. "I'll just pick him up and carry him. He don't weigh nothing."

Charlie was gone longer than McIntyre had expected him to be. He returned alone. Mac waited for him to close the lock and swing back his helmet. "Trouble?"

"Never mind the stretcher, skipper. We won't be needin' it. Yeah, I mean it," he continued. "I did what was necessary."

McIntyre bent down without a word and commenced to strap on the wide skis necessary to negotiate the powdery ash. Charlie followed his example. Then they swung spare air bottles over their shoulders and passed out through the lock.

They didn't bother to close the outer door of the lock behind them.

Charlie looked toward the relaxed figure propped up on the bed of Lunar pumice, face fixed toward the Earth. "Well," he grunted, "he hit the Moon—"

IN THE DAY OF THE COLD

The wise ones had known how to read and build and work metals. But they had not known how to live—

By Sam Weston

Illustrated by R. Isip

He awoke with the bristling of hair at his neck. The rock floor of the cave was shaking. Bits of stone fell on his head. Outside he could see the great lights playing beyond the ice banks.

"Get up," he cried to his wife. He shook her shoulder and cuffed her face. "Get up."

She came from the sleep with her head raised, smelling. "Pengo! What is it?"

"The earth trembles." He saw the Stranger huddled in his furs beyond the embers of the fire. "Wake him, too."

She arose at once, gathering her skins about her.

The Stranger came from sleep with his eyes staring and uttered the cry of his kind. "A quake!" His face turned to the color of snow as he staggered to his feet. The rocks were crashing down the hill outside.

"Take only the skins and the pots," Pengo directed. He scooped embers from the fire into a pot with his big, shapeless hands and slung it in a thong carrier. There was no time for the wood.

He reached outside just as the cave collapsed, his wife and the Stranger beside him. The ice ground ominously all around them, breaking up with loud noises. The sky was lighted with ribbons of flame, green, blue and red, that moved in the dark. Great fissures opened in the snow, shooting up steam. His big nostrils dilated in his flat, expressionless face.

"Go to the fields," he ordered. "To the old river."

They obeyed without question; he was master. There was, he knew, a sod shelter near the place where the river had been. Once he had planted his maize there. But the land would no longer grow the maize because of the ice, but there was still the hut. His wife led the way to it and Pengo ran, his breath smoking in the cold.

The hut was there, sheltered by the rise of the bank, just the roof of it, covered with snow, and the thorn tree.

"Good," he grunted. He dug the snow away with his bare hands.

The Stranger sank to the snow, exhausted. "Earthquake," he babbled. "We knew them in the North, but never like this." He lay against the snow, clutching the frozen ground as it trembled. His thin, sensitive face was sick with fear. He cried aloud when the thorn tree spilled crusted snow upon him. "The earth is breaking in two!" he cried.

"It is always like this," Pengo said.

He wrenched the sod cover from the hut. It was empty inside. He was angry. The stealers had been. There was no wood. Not even moss. His wife cowered in the corner looking at him and making little whimpering noises.

"That is mine!" Pengo growled. "We found it, but it is mine!" Desperately the Stranger wailed and tried to shield his head—

"It is dry," he said stolidly. "Now I will be sick."

HE WAS sick. Greatly sick. Always, in the time the earth trembled, it was necessary to be sick. His wife, too, was sick, huddled in a corner. But Pengo was sick outside, his short, hairy legs planted, his thick body facing the ice floes, for he was a man. A choking, bitter smoke filled the air.

"The black stuff burns underground," he said. He pointed to the glowing coils of red where the earth had opened and the rock was burning. They wound through the cracks underneath like fiery snakes pouring forth thick yellow smoke, save where the glow touched the

ice and then it was steam. "It is good," Pengo said. "It will melt the snow. There will be planting. Let us give thanks to the Gods of the Ice."

The Stranger looked at him with haggard eyes, barely able to follow the uncouthness of his language. "Give me water," he croaked.

Pengo gave him water. The man drank avidly, slobbering it on his thin, scraggly beard. Thus it was with all the Northerners who managed to get through, the madness and the thirst. The madness of the ice, Pengo saw, was still in his eyes.

But Pengo let him have his fill. Soon, he knew, there would be plenty of water. Bare ground was already showing where the snow had melted. It lay packed in hard gray clods. The Stranger picked up handfuls of it, letting the frozen particles trickle through his fingers.

"Earth," he said, "I have not seen the ground in sixty moons."

Pengo shook his head distrustfully. He did not like this talk. "I do not know what sixty is," he said.

The Stranger regarded him wonderingly. He had been good to him, this amazingly strong little man with the squat, flat-browed head and wide, expressionless mouth. "I will go back and tell them there is land southward. I will tell them that there need be no more starving."

Pengo shook his head. "You will never get back," he said. "I have seen the others of your race who tried. The Curved Fangs got them before they reached the Second Ice."

The Stranger shuddered and ran the back of his hand over his forehead. He seemed dazed. He still has his sickness, Pengo thought contemptuously; he is weak, like all of his race.

Pengo's wife crawled to him, shivering with the cold. "There is no food," she moaned. "We will die."

Pengo struck her mouth. "We will not die," he said. "The Curved Fangs will come off the ice, seeing the heat. I will slay me one." She lay there, her blue eyes watching him fearfully, her yellow hair falling in two braids across her shoulders.

The Stranger saw the blood at her mouth and cried out. "You struck her!"

"Of course," Pengo said scornfully. "She is my wife, not the woman of a scientist."

The Stranger drew back afraid and Pengo saw this with satisfaction. He was like all his kind.

The earth tremble was over. It was getting light in the sky. Pengo arose, stretching the strength in his limbs.

"We will go and get wood," he said. He tossed one of the axes he had brought down from the cave to the Stranger.

His wife cried aloud. "Do not do this," she cried. "He will slay you—"

Pengo let his thick lips curl. "He will not slay me," he said. "He is a scientist."

"No, no," the Stranger protested eagerly. "I wish to be your friend. They have sent me to be your friend. You have the secrets down here that will enable men to live in spite of the ice."

"You are like all of your brethren," Pengo sneered. "Come."

PENGO LED the way across the great fields. The snow was nearly gone in many places. The Ball of Fire had risen now. It hung dimly in the haze over the ice. The Stranger shivered.

"It is the same here," he said. "No heat, no light." He beat his hand against his head. "There must be a way to find the heat again. A way we have lost."

"There is no way," Pengo told him sternly. "You have your sickness still."

He stopped, sniffing the air. "There is a wood fire near here, beside it a man."

They found the fire behind a jumble of rock boulders, a man and a woman squatted beside it. She saw Pengo and cried out. The man raised himself, snarling on his side and reached for his ax. He was wounded. His leg had been crushed. He thrust it under his skins to hide it.

"You cannot come here," the man cried. "There is no wood."

But there was wood. A big pile of dry thorn sticks by the woman. Pengo struck him with his ax. He fell with a gurgling cry. He was a big man with a black beard. Pengo beat his brains out on a stone. His woman shrank against the boulder, watching. She was a young woman with red hair. She smiled hesitantly but Pengo did not want her.

"Kill her," he ordered the Stranger. He bent to pick up the wood.

"No!" The thin man from the North recoiled in horror. "You can't make me do this!"

Pengo regarded him in wonder. "You scientists are all alike," he said wearily. He picked up his ax and slew her. He tossed both bodies in a crevasse.

It had been a good day. The man had a stout bow with his pots. Pengo slung it over his shoulder and later killed a Curved Fang with it. They caught the animal skulking at the edge of the floe sniffing at human bodies. Pengo brought him down with one arrow truly placed. They knelt on cleared ground and ate the raw meat, dripping.

When the Stranger had had enough, he turned to Pengo, staring curiously. "How long have I been here?"

"Two moons." Pengo saw that the madness had left the man now. His brown eyes were relaxed and the strain had gone out of his thin, ascetic face.

"Two moons." He seemed staggered. "Then I have been sick." He rubbed his sallow cheeks with his fingers. "I was going South."

"You are all going South," Pengo said. "Those of you who reach here."

The Stranger nodded. "It was the heat. We were looking for the heat."

Pengo shook his head. "There is no heat here. Only the ice. They will kill you if you go further."

"But somewhere . . . somewhere there must be the heat." He looked at Pengo with silent, desperate pleading.

"No," Pengo replied shortly. "There has always been the ice. There will always be the ice and the shaking of the earth. "He wiped the blood from his beard. "You can stay here if you like. You can till the soil."

"Vegetables can grow—in *that?*"

"Certainly." Pengo bristled. "It is good earth. It will make the seed sprout. I have saved some in my pot. Perhaps, if the black rock continues to burn there will be ears of corn, green, yellow and red." Pengo's belly felt good with the thought of it. His guttural voice softened. "See, the soil." He picked up handsful of it. It was moist, fragrant. "You may have some of it for yours. You can get yourself a woman from the caves and till this land with me. I say so, I am the master of it."

The Stranger's eyes narrowed. "A woman like yours with golden hair?"

"Aye," Pengo growled.

"I . . . I have never tilled the ground. I or my father or my father's father." He stared as if fascinated. "It would be a good thing." He took a step forward and stumbled as the soft earth gave way under him. It was a place, Pengo saw, where a wide crack lay under the thin covering of earth. He seized the Stranger's arm, pulling him back to his feet.

"You saved my life," the Stranger said.

"It was nothing," Pengo replied.

"No," he cried, "this is a thing to be remembered." He seemed deeply moved.

"We can be blood brothers if you like," Pengo said indifferently.

The Stranger's face glowed with excitement. "It is a symbol. I will help you till the soil. Your soil."

Pengo frowned. "You are one who dreams."

"Why not?" he cried. "In the North, as the others lay starving, I dreamed of this place. There would be land. And a woman with blue eyes and two braids of yellow hair—like yours. Perhaps in such a land, I dreamed, would lie the secret of the heat."

Pengo grew uneasy. "I will help you get the woman," he said shortly, "But the land keeps its secrets. That is holy. It is not right to search out what is holy."

The Stranger looked at him in surprise. "Is heat—holy?"

"Yes," Pengo said uncertainly. "It must be. It is like the Gods of the Ice. They must not be offended."

PENGO was uneasy. He wondered where he had gotten these words. They were good words. They had been told to him in the old times. But they made him fearful. Fearful and conscious of the terrible cold that was everywhere. He moved his feet in their skin coverings to keep the circulation going. A rock, dislodged by the movement, came loose and slid down into the crevasse. Something clanged, a queer noise.

Pengo became alert. "What was that?"

"Metal!" The Stranger had jerked upright. "It's metal!" His nostrils flared as if he could smell the thing. He lay on the edge of the yawning split, staring down in. "There is something there," he cried excitedly, something at the bottom of the pit. It is possible to reach it."

"Do not go down in," Pengo warned. "That is death."

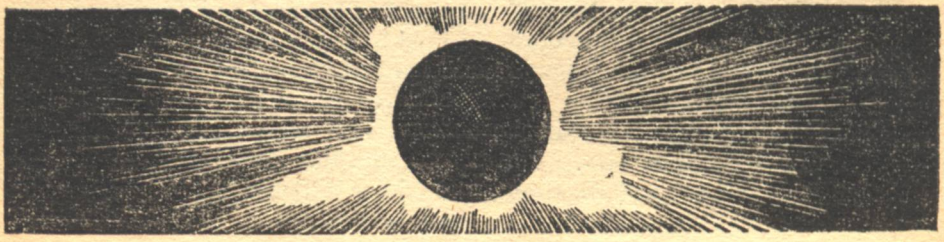
But the man from the North was beside himself. Pengo held his wrist to steady him. He heard him spring to solid footing below, then his voice calling up: "Pengo! Come down. It is a strange thing!"

Hair bristling, Pengo let himself down in the crevasse. It was a narrow place, where the earth had riven asunder, but at the bottom it widened and there was space for a man to move around. Pengo stood in the gloom with the damp smelling earth walls rising around him. The sky was a jagged sliver of blue whence he had come.

"Over here, Pengo. It is truly metal."

He was right, Pengo saw. It was metal. Much metal, all in one piece. It was like a tree trunk, rounded at both ends, long as a man. The Stranger called it a cylinder. He scraped dirt feverishly from its smooth sides. "There is lettering on it. It is in the language of the Old Tongue."

Pengo regarded the unfamiliar marks



with suspicion, shaking his head. "This offends the Ice Gods," he said. "Perhaps it is one of their machines for death."

"No; listen, it is hollow"—the Stranger struck it with his ax and it rang with a loud, quivering voice that made Pengo afraid—"we must find a way to open it."

Pengo watched the thin bearded man with distrust. He seemed suddenly full of authority, this scientist. This cylinder was a thing, obviously, made by other scientists. It could not be good. But he was his friend, his blood brother and it was so. He helped him fearfully.

It took doing to roll it over, for the Stranger would have it turned. Pengo saw now that there was an insert of some other material in the metal like a window. It was smooth and cool to the touch and one could see through it like water.

"Glass," the Stranger said reverently. "It is from the Old Time." His look of madness returned momentarily. But he became calm again and peered through it, cupping his hands. "There is a way to open it," he said. He pointed to a spot of red color on the metal surface. "This must be hit with an ax."

The Stranger struck repeated blows on the spot until the ringing sound of it dinned in Pengo's ears. But at last his strokes ceased and he was panting, exhausted. "I have not the strength," he gasped. "You are mighty. You will do it, my brother."

Pengo hesitated. Anything that would make the heat return could not offend the Gods. He thought of the Curved Fang he had slain with a single blow on the skull. Bunching his muscles, he smote the thing with all his power.

The damp earth walls muffled the blow of it. There was a sharp tinkle. Something fell away and a smell sprang from within it with a hiss. Pengo drew back against the wall white with fear.

"Do not be afraid," the Stranger cried. "It is a gas they used to preserve these things." He knelt beside it. He was brave, though a scientist.

Pengo watched him reach inside and turn something. The whole side of the cylinder swung outward with a clang, revealing what was inside.

Pengo gasped. There never was a thing like this.

There were shelves and compartments in the cylinder. Packed in these were all manner of things: metal instruments, shoes for the feet and coverings for the body, paper printed with symbols and brightly colored cloth. Pengo marveled. It was indeed a thing from the Old Times.

He stared uncomprehendingly at the glass tubes of colored waters and at the shiny flat metal cans stacked in neat rows. But the thing that fascinated him was an instrument that looked like a short double-headed hammer. It was black, of a substance like the stone that burned in the earth and set in a cradle base to which one end was attached by thongs of hard woven cord. Pengo took it out, marveling at its smoothness and the lightness of the club in the heavy base. He picked the instrument loose from its cradle and a bar came up with a smart click. He dropped it with a fearful outcry.

"It is a thing they talked with," the Stranger told him. "See." He put his finger in one of the holes on the dial that was in the face of the cradle, spun it. It whirled back with a strange clicking noise. "They could talk for miles, not seeing one another."

"This is not holy," Pengo said. "Let us go away."

"Go away? Now?" The Stranger looked at him as if he were mad. Pengo became wary.

BUT the man from the North was concerned only with what lay in the

Continued on page 100

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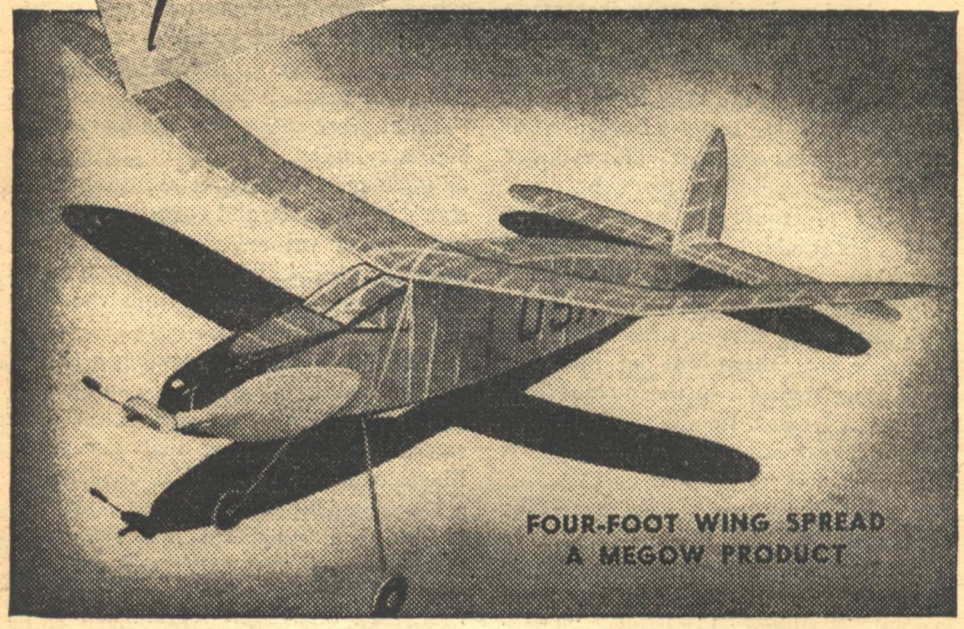

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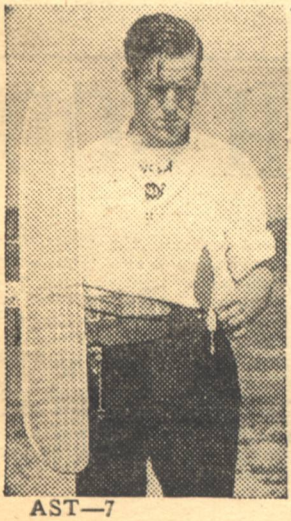

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Continued from page 97

cylinder. He reached eagerly for one of the flat metal cans. It was round like the Ball of Fire and the metal shone. He pried the cover loose with his fingernails. A metal reel lay inside. It was made of dull white metal perforated with holes. Through the holes Pengo saw black stuff wound in thin, tight layers.

"Film!" The Stranger snatched the reel from the canister, his thin face elated. "I have seen it. A few inches, in a museum." He ran it through his fingers, holding it to the light.

It was thin, glossy stuff like the glass, Pengo saw, only flexible. There were queer tiny pictures in the little square spaces, all alike.

He became aware of the Stranger staring at him, of the queer labor of the man's breathing. "We have found it, Pengo." He sat back on his heels, a look of wonder in his thin, colorless face. "It is their history on a film. We will know now why the heat has gone." He turned toward the cylinder, greed in his eyes.

Pengo saw the look. He stiffened, his nostrils widening. His voice was a grumbling growl, deep in his chest.

"This is mine," he said. "I am master."

But the Stranger did not hear him. He was feeling of the cloth, touching the other objects that lay within.

Pengo stood up, bristling. "This is mine," he said.

The man whirled, his smile vanishing. "You're joking, brother!" Then he saw Pengo's look. He saw the ax that was being raised over his head. With a cry he twisted sideways.

The blow went short. Pengo could feel the strength of it spending against rock. He saw the Stranger on his feet still holding the metal can against him as he clawed the ax from his belt.

"Give me that," Pengo said, advancing.

"You fool!" he yelled. "Get back—"

Pengo drew his arm back for a blow. The Stranger saw the blood-lust in his eyes. With sudden desperation, he rushed at Pengo, his ax flicking upward. The blow caught Pengo's wrist, gashing the flesh open. With a howl Pengo dropped the ax, springing backward. The Stranger pinned it with his foot, drew it to him. He had both axes now. Pengo stood there, arms spread, making snarling animal noises in his throat, his little eyes glowing as he waited for the attack. But it did not come.

"Listen," the Stranger cried. "I do not want to kill you. You are my brother. We have the secret of the heat. Soon we will have all the power

over the men in the South." He glanced back up over his shoulder, trembling with fear. "You . . . you will help me get out of here—"

But the smell of blood was hot in Pengo's nostrils, his own blood. This man, a Stranger, had disputed his right to be master. His eye fell on the instrument that looked like the two-headed hammer lying in the dirt. He picked it up, letting the cloth bottomed cradle hang by the cord. It was heavy, heavier than any sling. He advanced slowly, whirling it around his head.

"Don't!" the man screamed. "You are my brother!"

Then the flailing thing struck him against the side of the head.

He spun backward, flinging the can from him. It crashed on a rock, spewing the film out in great coils. Pengo fought the snarling stuff, cursing. The Stranger made one last desperate effort to squirm aside, then Pengo was free of it. He put his foot on the man's neck where he lay. The Stranger's eyes rolled in terror, the saliva spewing over his scraggly beard. "The heat —" he choked.

"You planned to take these things," Pengo said. "Also my wife. I saw it in your eyes."

Pengo beat him over the head until he no longer quivered.

He stepped back finally, staring at the short, two-headed instrument. It was cracked open in a dozen places, a hollow thing full of coils and wires, useless as a weapon. He threw it from him contemptuously.

But there were other weapons in the cylinder. Knives of steel, exceedingly sharp and strange-looking snouted things with handles to fit the hand and a ring in which the finger curled. He took the knives and the cloth, spilling out everything that was in the boxes, and also some of the bright colored baubles for his wife. He tied as much as he could carry in a cloth and pulled himself to the level of the snow. Curved Fangs retreated snarling from the animal he and the Stranger had eaten of. He slung the carcass over his shoulder, leaving some of the instruments from the cylinder on the snow. There would be plenty of time for what remained later.

His wife's blue eyes widened at the wonder of the thing when he crept back to the sod hut.

"Where is the Stranger?" she asked.

"I slew him," he said briefly. "He was like all of his kind." He tossed the wood to the floor and gave her the cloth and the colored baubles.

"Cloth!" she cried.

"Make the fire," Pengo ordered. He rubbed his blunt, numbed fingers.

She obeyed, but it was the cloth that had the wonder of her. She let the woven stuff ripple over her bare arm and put the string of milk-white baubles about her neck. Color came into her cheeks and her eyes flashed. She pointed to the piece of paper in which Pengo had wrapped the stones. "What is that?"

He laughed. "It is some of their symbols, printed." He smoothed it out on the sod floor for her to see. "Now; is not this a thing?"

They stared at it together, at the meaningless marks which seemed to dance and flicked in the light of the smoking fire:

TIME CAPSULE
PLACED BELOW SITE OF
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WORLD'S FAIR
1939

She laughed, shrugged her shoulders. "They could read," she said uninterestedly, "but they died just the same in the cold. Maybe we can't, but we're here."

GRAY LENSMAN

PART IV
CONCLUSION

By E. E. SMITH, Ph. D.

SYNOPSIS:

When the inertialess drive was perfected and commerce throughout the Galaxy became commonplace, crime became so rampant as to threaten civilization. Then came into being the Galactic Patrol, an organization whose highest members, the Lensmen, are of unlimited authority and scope. Each is identified by his Lens, a pseudoliving, telepathic jewel matched to the ego of its owner by the Arisians. The Lens

cannot be counterfeited, since it glows with color when its owner wears it and kills any other who attempts to do so.

Of all the eighteen-year-olds of Earth, only about one hundred win through the five-year period of weeding out and become Lensmen. Kimball Kinnison graduates Number One in his class and sets out to capture one of the new-type ships of the "pirates"—in reality Boskonians, adherents to a culture as widespread as civilization—to learn the secret of their source of power. He succeeds, but with Van Buskirk, a Valerian, is compelled to take to a lifeboat.

They land upon Velantia and aid Worsel, a scientist, in overcoming the Overlords of Delgon, a parasitic race of a neighboring planet. En route to Earth they land for repairs upon Trenco, the planet upon which is produced thionite, the deadliest of all habit-forming drugs. He reaches Earth with his data.

He searches for Grand Base, Boskonia's galactic headquarters. He is wounded seriously, and in Base Hospital is cared for by Nurse Clarrissa MacDougall. Surgeon General Lacy and Port Admiral Haynes, chief of staff, promote a romance between nurse and Lensman.

Recovering, Kinnison goes back to Arisia for advanced mental training, acquiring the sense of perception and the ability to control the minds of others. He investigates Grand Base, finding that it is impregnable to direct attack. A zero time is set, at which the Patrol is to attack in force. He goes to Trenco, obtaining a vast supply of thionite. He gets into Grand Base. He dumps his thionite into the primary air duct, thus wiping out all the personnel except Helmuth. He kills Helmuth in hand-to-hand combat. The Patrol attacks. Grand Base falls.

He discovers that Boskone's headquarters are in another galaxy, and decides that the best way to get a line upon it is to work upward through the drug syndicate. Disguised as a dock walloper, he frequents the saloon of the drug baron of the planet Radelix, and helps raid it. He calls a Conference of Science, which devises the means of building a bomb of negative matter.

He investigates the stronghold of Prellin, a regional director of Boskone, but cannot get through his screens. Changing his plan of action, he becomes a meteor miner, Wild Bill Williams, of Aldebaran II. While apparently helpless from alcohol and drugs he observes a conference and gets a line upon another regional director. Boskone forms an alliance with the Overlords of Delgon, and through a hyperspatial tube the combined forces again attack humanity.

Kinnison and the scientists of the Patrol analyze the mystery of the tube, and send the Dauntless, *the Patrol's supership, down the Delgonian's tube to wreak havoc from the inside of their heavily fortified base, reducing it completely.*

Kinnison now needs one more regional director of Boskone to complete the chain, to find the Galactic director. Returning to the character of Meteor Bill, he contacts Crowninshield, who knows him only as a harmless, drink-and-drug-sodden miner. Through Crowninshield's mind, he gets the long-sought clue to the Galactic director, Jalte, a Kalonian, on a planet in a star cluster just outside the First Galaxy.

Kinnison conducts a lone raid on the stupendously fortified base, sneaking past their defenses to get within their thought screen and pry, with sense of perception and finally by entering Jalte's mind. He learns that Boskone is not a single entity, but a council, just where, even Jalte does not know. Eichmil, Jalte's superior on the planet Jarnevon, in the Second Galaxy, would know, however. Kinnison realizes he must investigate Jarnevon. First, however, he returns to Grand Base to report to Port

Admiral Haynes, and to get Worsel to accompany and aid him.

XIX.

"BEFORE you go anywhere; or, rather, whether you go anywhere or not, we want to knock down that Bronsecan base of Prellin's," Haynes declared to Kinnison in no uncertain voice. "It's a Galactic scandal, the way we've been letting them thumb their noses at us. Everybody in space thinks that the Patrol has gone soft all of a sudden. When are you going to let us smack them down? Do you know what they've done now?"

"No. What?"

"Gone out of business. We've been watching them so closely that they couldn't do any queer business—goods, letters, messages, or anything—so they closed up the Bronseca branch entirely. 'Unfavorable conditions,' they said. Locked up tight—telephones disconnected, communicators cut, everything."

"Hm-m-m. In that case we'd better take 'em, I guess. No harm done, anyway, now—maybe all the better. Let Boskone think that our strategy failed and we had to fall back on brute force."

"You say it easy. You think that it'll be a push-over, don't you?"

"Sure—why not?"

"You noticed the shape of their screens?"

"Roughly cylindrical"—in surprise. "They're hiding a lot of stuff, of course, but they can't possibly—"

"I'm afraid that they can, and will. I've been checking up on the building. Ten years old. Plans and permits QX except for the fact that nobody knows whether or not the inside of the building resembles the plans in any particular."

"Klono's whiskers!" Kinnison was aghast, his mind racing. "How could that be, chief? Inspectors—builders—contractors—workmen?"

"The city inspector who had the job came into money later, retired, and nobody has seen him since. Nobody can locate a single builder or workman who saw it constructed. No competent inspector has been in it since. Cominoche is lax—all cities are, for that matter—with an outfit as big as Wembleson's, that carries its own insurance, does its own inspecting, and won't allow outside interference. Wembleson's isn't alone in that attitude—they're not all zwilniks, either."

"You think that it's really fortified, then?"

"Sure of it. That's why we ordered a gradual, but complete, evacuation of the city, beginning a couple of months ago."

"How could you?" Kinnison was growing more surprised by the minute. "The businesses—the houses—the expense!"

"Martial law—the Patrol takes over in emergencies, you know. Businesses moved, and mostly carrying on very well. People ditto—very nice temporary camps, lake and river cottages, and so on. As for expense, the Patrol pays damages. We'll pay for rebuilding the whole city if we have to—much rather that than leave that Boskonian base standing there untouched."

"What a mess! Never thought of it that way, but you're right, as usual. They wouldn't be there at all unless they thought—but they must know, chief, that they can't hold off the stuff that you can bring to bear."

"Probably betting that we won't destroy our own city to get them—if so, they're wrong. Or possibly they hung on a few days too long."

"How about the observers?" Kinnison asked. "They have four auxiliaries there, you know."

"That's strictly up to you." Haynes was unconcerned. "Smearing that base is the only thing I insist on. We'll wipe out the observers or let them ob-

serve and report, whichever you say; but that base goes—it has been there far too long already."

"Be nicer to let them alone," Kinnison decided. "We're not supposed to know anything about them. You won't have to use the primaries, will you?"

"No. It's a fairly large building, as business blocks go, but it lacks a lot of being big enough to be a first-class base. We can burn the ground out from under all its foundations with our secondaries."

He called an adjutant. "Get me Sector 19." Then, as the seamed, scarred face of an old Lensman appeared upon a plate:

"You can go to work on Cominoche now, Parker. Twelve maulers. Twenty heavy caterpillars and about fifty units of Q-type screen, remote-control. Supplies and service. Have them muster all available fire-fighting apparatus. If desirable, import some—we want to save as much of the place as we can. I'll come over in the *Dauntless.*"

He glanced at Kinnison, one eyebrow raised quizzically.

"I feel as though I rate a little vacation; I think I'll go and watch this," he commented. "Got time to come along?"

"I think so. It's more or less on my way to Lundmark's Nebula."

Upon Bronseca, then, as the *Dauntless* ripped her way through protesting space, there converged structures of the void from a dozen nearby systems; each ship emblazoned with the device of ray-emitting intertwined spirals which is the emblem of the Galactic Patrol. There came maulers; huge, ungainly flying fortresses of stupendous might. There came transports, bearing the commissariat and the service units. Vast freighters, under whose unimaginable mass the Gargantuanly braced and latticed and trussed docks yielded visibly and groaningly, crushed to a standstill and disgorged their varied cargoes.

What Haynes had so matter-of-factly referred to as "heavy" caterpillars were all of that; and the mobile screens were even heavier. Clanking and rumbling, but with their weight so evenly distributed over huge, flat treads that they sank only a foot or so into even ordinary ground, they made their ponderous way along Cominoche's deserted streets.

What thoughts seethed within the minds of the Boskonians can only be imagined. They knew that the Patrol had landed in force, but what could they do about it? At first, when the Lensmen began to infest the place, they could have fled in safety; but at that time they were too certain of their immunity to abandon their richly established position. Even now, they would not abandon it until that course became absolutely necessary.

They could have destroyed the city, true; but it was not until after the noncombatant inhabitants had unobtrusively moved out that that course suggested itself as a desirability. Now the destruction of property would be a gesture worse than meaningless; it would be a waste of energy which would all too certainly be needed—badly and soon.

Hence, as the Patrol's land forces ground clangorously into position the enemy made no demonstration. The mobile screens were in place, surrounding the doomed section with a wall of force to protect the rest of the city from the hellish energies so soon to be unleashed. The heavy caterpillars, mounting projectors quite comparable in size and power with the warships' own—weapons similar in purpose and function to the railway-carriage coast-defense guns of an earlier day—were likewise ready. Far back of the line, but still too close, as they were to discover later, heavily armored men crouched at their remote controls behind their shields; barriers both of hard-driven, immaterial fields of force and of solid, grounded, ultrarefrigerated walls of the most re-

fractory materials possible of fabrication. In the sky hung the maulers, poised stolidly upon the towering pillars of flame erupting from their under jets.

Cominoche, Bronseca's capital city, witnessed then what no one there present had ever expected to see; the warfare designed for the illimitable reaches of empty space being waged in the very heart of its business district!

For Port Admiral Haynes had directed the investment of this minor stronghold almost as though it were a regulation base, and with good reason. He knew that from their coigns of vantage afar four separate Boskonian observers were looking on, charged with the responsibility of recording and reporting everything that transpired, and he wanted that report to be complete and conclusive. He wanted Boskone, whoever and wherever he might be, to know that when the Galactic Patrol started a thing, that thing it finished; that the mailed fist of civilization would not spare an enemy base simply because it was so located within one of humanity's cities that its destruction must inevitably result in severe property damage. Indeed, the chief of staff had massed there thrice the force necessary; specifically and purposely to drive that message home.

At the word of command there flamed out, almost as one, a thousand lances of energy intolerable. Masonry, brickwork, steel, glass, and chromium trim disappeared; flaring away in sparkling, hissing vapor or cascading away in brilliantly mobile streams of fiery, corrosive liquid. Disappeared, revealing the unbearably incandescent surface of the Boskonian defensive screen.

Full-driven, that barrier held, even against the titanic thrusts of the maulers above and of the heavy defense guns below. Energy rebounded in scintillating torrents, shot off in blinding streamers, released itself in bolts of lightning hurling themselves frantically to ground.

Nor was that superbly disguised citadel designed for defense alone. Knowing now that the last faint hope of continuing in business upon Bronseca was gone, and grimly determined to take full toll of the hated Patrol, the defenders in turn loosed their beams. Five of them shot out simultaneously, and five of the panels of mobile screen flamed instantly into eye-tearing violet. Then black. These were not the comparatively feeble, antiquated rays which Haynes had expected, but were the output of up-to-the-minute, first-line space artillery!

Defenses down, it took but a blink of time to lick up the caterpillars. On, then, the destroying beams tore, each in a direct line for a remote-control station. Through tremendous edifices of masonry and steel they drove, the upper floors collapsing into the cylinders of annihilation only to be consumed almost as fast as they could fall.

"All screen-control stations, back, fast!" Haynes directed crisply. "Back, dodging! Put your screens on automatic block until you get back beyond effective range. Spy-ray men! See if you can locate the enemy observers directing fire!"

But no matter how far back they went, Boskonian beams still sought them out in grimly persistent attempts to slay. Their shielding fields blazed white, their refractories wavered in the high blue as the overdriven refrigerators strove mightily to cope with the terrific load. The operators, stifling, almost roasting in their armor of proof, shook sweat from the eyes they could not reach as they drove themselves and their mechanisms on to even greater efforts; cursing luridly, fulminantly the while at carrying on a space war in the hotly reeking, the hellishly reflecting and heat-retaining environment of a metropolis!

AND all around the embattled structure, within the Patrol's now partially open wall of screen, spread holocaust supreme; holocaust spreading wider and wider during each fractional split second. In an instant, it seemed, nearby buildings burst into flame. The fact that they were fireproof meant nothing whatever. The air inside them, heated in moments to a point far above the ignition temperature of organic material, fed furiously upon furniture, rugs, drapes, and whatever else had been left in place. Even without such adventitious aids the air itself, expanding tremendously, irresistibly, drove outward before it the glass of windows and the solid brickwork of walls. And as they fell, glass and brisk ceased to exist as such. Falling, they fused; coalescing and again splashing apart as they descended through the inferno of annihilatory vibrations in an appalling rain which might very well have been sprinkled from the hottest middle of the central core of hell itself. And in this fantastically potent, this incredibly corrosive flood the ground itself, the metaled pavement, the sturdily immovable foundations of skyscrapers, dissolved as do lumps of sugar in boiling coffee. Dissolved, slumped down, flowed away in blindingly turbulent streams. Superstructures toppled into disintegration, each discrete particle contributing as it fell to the utterly indescribable fervency of the whole.

More and more panels of mobile screen went down. They were not designed to stand up under such heavy projectors as "Wemblesons" mounted, and the Boskonians blasted them down in order to get at the remote-control operators back of them. Swath after swath of flaming ruin was cut through the Bronsecan capital as the enemy gunners tried to follow the dodging caterpillar tractors.

"Drop down, maulers!" the commander in chief ordered. "Low enough so that your screens touch ground. Never mind damage—they'll blast the whole city if we don't stop those beams. Surround him!"

Down the maulers came, ringwise; mighty protective envelopes overlapping; down until the screens bit ground. Now the caterpillar and mobile-screen crews were safe; powerful as Prellin's weapons were, they could not break through those maulers' screens.

Now holocaust waxed doubly infernal. The wall was tight, the only avenue of escape of all that fiercely radiant energy straight upward; and adding to the furor were the flaring under jets —themselves destructive agents by no means to be despised!

Inside the screens, then, raged pure frenzy. At the line raved the maulers' prodigious lifting blasts. Out and away, down every avenue of escape, swept torrents of superheated air at whose touch anything and everything combustible burst into flame. But there could be no fire-fighting—yet. Outlying fires, along the lines of destruction previously cut, yes; but personal armor has never been designed to enable life to exist in such an environment as that near those screens then was.

"Burn out the ground under them!" came the order. "Tip them over—slag them down!"

Sharply downward angled twoscore of the beams which had been expending their energies upon Boskone's radiant defenses. Downward into the lake of lava which had once been pavement. That lake had already been seething and bubbling; emitting momently bursts of lambent flame. Now it leaped into a frenzy of its own; a transcendent fury of volatilization. High-explosive shells by the hundred dropped also into the incandescent mess, hurling the fiery stuff afar; deepening and broadening the sulphurous moat.

"Deep enough," Haynes spoke into his microphone. "Tractors and press-

ors as assigned—tip him over."

The intensity of the bombardment did not slacken, but from the maulers to the north there reached out pressors, from those upon the south came tractors; each a beam of terrific power, each backed by all the mass and all the driving force of a veritable flying fortress.

Slowly that which had been a building leaned from the perpendicular, its inner defensive screen still intact.

"Chief?" From his post as observer, Kinnison flashed a thought to Haynes. "Are you beginning to think any funny thoughts about that ape down there?"

"No. Are you? What?" asked the port admiral, surprised.

"Maybe I'm nuts, but it wouldn't surprise me if he'd start doing a flit pretty quick. I've got a CRX tracer on him, just in case, and it might be smart to caution Henderson to keep up on his toes."

"Your diagnosis—'nuts'—is correct, I think," came the answering thought; but the port admiral followed the suggestion, nevertheless.

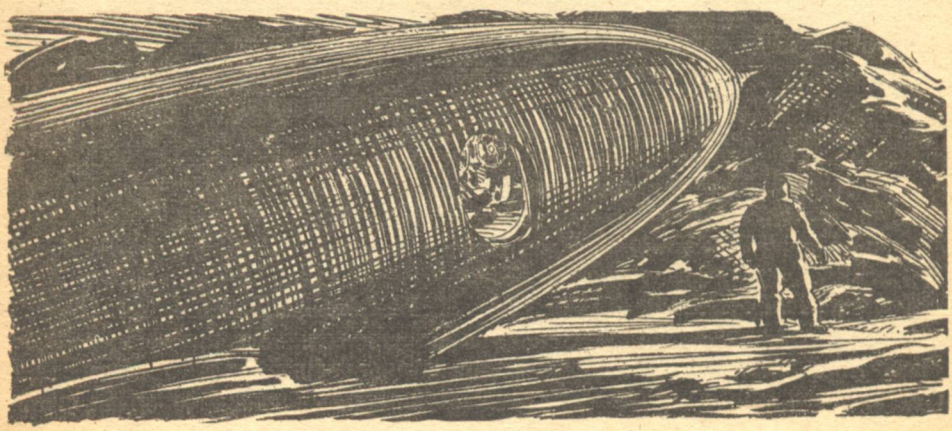
AND NONE too soon. Deliberately, grandly, the Colossus was leaning over, bowing in stately fashion toward the awful lake in which it stood. But only so far. Then there was a flash, visible even in the inferno of energies already there at war, and the already coruscant lava was hurled to all points of the compass as the full-blast drive of a superdreadnought was cut loose beneath its surface!

To the eye the thing simply and instantly disappeared; but not to the ultravision of the observers' plates, and especially not to the CRX tracers attached by Kinnison and by Henderson. They held, and the chief pilot, already warned, was on the trail as fast as he could punch his keys.

Through atmosphere, through stratosphere, into interplanetary space flew pursued and pursuer at ever-increasing speed. The *Dauntless* overtook her proposed victim fairly easily. The Boskonian was fast, but the Patrol's new flier was the fastest thing in space. But tractors would not hold against the now universal standard equipment of shears, and the heavy secondaries served only to push the fleeing vessel along all the faster. And the dreadful primary beams could not be used—yet.

"Not yet," cautioned the admiral. "Don't get too close—wait until there's nothing detectable in space."

Finally an absolutely empty region was entered, the word to close up was given, and Prellin drank of the bitter cup which so many commanders of vessels of the Patrol had had to drain—the gallingly fatal necessity of engaging a ship which was both faster and more



powerful than his own. The Boskonian tried, of course. His beams raged out at full power against the screens of the larger ship, but without effect. Three primaries lashed out as one. The fleeing vessel, structure and contents, ceased to be. The *Dauntless* returned to the torn and ravaged city.

The maulers had gone. The lumbering caterpillars—what were left of them—were clanking away; reeking, smoking hot in every plate and member. Only the firemen were left, working like Trojans with explosives, rays, water, carbon-dioxide snow, clinging and smothering chemicals; anything and everything which would isolate, absorb, or dissipate any portion of the almost incalculable heat energy so recently and so profligately released.

Fire apparatus from four planets was at work. There were pumpers, ladder trucks, hose and chemical trucks. There were men in heavily insulated armor. Vehicles and men alike were screened against the specific wave lengths of heat; and under the direction of a fire marshal in his red speedster high in air they fought methodically and efficiently the conflagration which was the aftermath of battle. They fought, and they were winning.

And then it rained. As though the heavens themselves had been outraged by what had been done, they opened and rain sluiced down in level sheets. It struck hissingly the nearby structures, but it did not touch the central area at all. Instead, it turned to steam in midair, and, rising or being blow aside by the tempestuous wind, it concealed the redly glaring, raw wound beneath a blanket of crimson fog.

"Well, that is that," the port admiral said slowly. His face was grim and stern. "A good job of clean-up—expensive, but worth the price. So be it to every pirate base and every zwilnik hide-out in the Galaxy! Henderson, land us at Cominoche Spaceport."

And from four other cities of the planet four Boskonian observers, each unknown to all the others, took off in four spaceships for four different destinations. Each had reported fully and accurately to Jalte everything that had transpired until the two fliers had faded into the distance. Then, highly elated—and probably, if the truth could be known, no little surprised as well—at the fact that he was still alive, each had left Bronseca at maximum blast.

The Galactic director had done all that he could, which was little enough. At the Patrol's first warlike move he had ordered a squadron of Boskone's ablest fighting craft to Prellin's aid. It was almost certainly a useless gesture, he knew as he did it. Gone were the days when pirate bases dotted the Tellurian Galaxy; only by a miracle could those ships reach the Bronsecan's line of flight in time to be of service.

Nor could they. The howl of interfering vibrations which was smothering Prellin's communicator beam snapped off into silence while the would-be rescuers were many hours away. For minutes, then, Jalte sat immersed in thought at his great desk in the Center, his normally bluish face turning a sickly green, before he called the planet Jarnevon to report to Eichmil, his chief.

"There is, however, a bright side to the affair," he concluded. "Prellin's records were destroyed with him. Also, there are two facts—that the Patrol had to use such force as practically to destroy the city of Cominoche, and that our four observers escaped unmolested—which furnish conclusive proof that the vaunted Lensman failed completely to penetrate with his mental powers the defenses we have been using against him."

"Not conclusive proof," Eichmil rebuked him harshly. "Not proof at all, in any sense—scarcely a probability. Indeed, the display of force may very well mean that he has already attained

his objective. He may have allowed the observers to escape, to lull our suspicions. You yourself are probably the next in line. How certain are you that your own base has not already been invaded?"

"Absolutely certain, sir." Jalte's face, however, turned a shade greener at the thought.

"You use the term 'absolutely' very loosely—but I hope that you are right. Use all the men and all the equipment we have sent you to make sure that it remains impenetrable."

XX.

In their nonmagnetic, practically invisible speedster, Kinnison and Worsel entered the terra incognita of the Second Galaxy and approached the solar system of the Eich, slowing down to a crawl as they did so. They knew as much concerning dread Jarnevon, the planet which was their goal, as did Jalte, from whom the knowledge had been acquired; but that was all too little.

They knew that it was the fifth planet out from the Sun and that it was bitterly cold. It had an atmosphere, but one containing no oxygen; one poisonous to oxygen breathers. It had no rotation—or rather, its day coincided with its year—and its people dwelt upon its eternally dark hemisphere. If they had eyes, a point upon which there was doubt, they did not operate upon the frequencies ordinarily referred to as "visible" light. In fact, about the Eich as persons or identities they knew next to nothing. Jalte had seen them, but either he did not perceive them clearly or else his mind could not retain their true likeness; his only picture of the Eichian physique being a confusedly horrible blur.

"I'm scared, Worsel," Kinnison declared. "Scared purple, and the closer we come the more scared I get."

And he was scared. He was afraid as he had never before been, in all his short life. He had been in dangerous situations before, certainly; not only that, he had been wounded almost unto death. In those instances, however, peril had come upon him suddenly. He had reacted to it automatically, having had little if any time to think about it beforehand.

Never before had he gone into a place in which he knew in advance that the advantage was all upon the other side; from which his chance of getting out alive was so terrifyingly small. It was worse, much worse, than going into that vortex. There, while the road was strange, the enemy was known to be one whom he had conquered before; and furthermore, he had had the *Dauntless,* its eager young crew, and the scientific self-abnegation of old Cardynge to back him. Here he had the speedster and Worsel—and Worsel was just as scared as he was.

The pit of his stomach felt cold, his bones seemed bits of rubber tubing. Nevertheless, the two Lensmen were going in. That was their job. They had to go in, even though they knew that the foe was at least their equal mentally, was overwhelmingly their superior physically, and was upon his own ground.

"So am I," Worsel admitted. "I'm scared to the tip of my tail. I have one advantage over you, however—I've been that way before." He was referring to the time when he had gone to Delgon, abysmally certain that he would not return. Nor would he have returned save for Kinnison and Van Buskirk. "What is fated, happens. Shall we prepare?"

They had spent many hours in discussion of what could be done, and in the end had decided that the only possible preparation was to make sure that if Kinnison failed, his failure would not bring disaster to the Patrol.

"Might as well. Come in; my mind's wide open."

The Velantian insinuated his mind into Kinnison's and the Earthman slumped down, unconscious. Then for many minutes Worsel wrought within the plastic brain. Finally:

"Thirty seconds after you leave me these inhibitions will become operative. When I release them your memory and your knowledge will be exactly as they were before I began to operate," he thought, slowly, intensely, clearly. "Until that time you know nothing whatever of any of these matters. No mental search, however profound; no truth drug, however potent; no probing, even of the subconscious, will or can discover them. They do not exist. They never have existed. They shall not exist until I so allow. These other matters have been, are, and shall be the facts until that instant. Kimball Kinnison, awaken!"

The Tellurian came to, not knowing that he had been out. Nothing had occurred; for him no time whatever had elapsed. He could not perceive even that his mind had been touched.

"Sure it's done, Worsel? I can't find a thing!" Kinnison, who had himself operated upon so many minds as tracelessly, could scarcely believe that his own had been tampered with.

"It is done. If you could detect any trace of the work it would have been poor work, and wasted."

THE speedster dropped as nearly as the Lensmen dared toward Jarnevon's tremendous primary base. They did not know whether they were being observed or not. For all they knew, these incomprehensible beings might be able to see or to sense them as plainly as though their ship were painted with radium and were landing openly, with searchlights ablaze and with bells a-clang. Muscles tense, ready to hurl their tiny flier away at the slightest alarm, they wafted downward.

Through the screens they dropped. Power off, even to the gravity pads; thought, even, blanketed to zero. Nothing happened. They landed. They disembarked. Foot by foot they made their cautious way forward.

In essence the plan was simplicity itself. Worsel would accompany Kinnison until both were within the thought screens of the dome. Then the Tellurian would get, some way or other, the information the Patrol had to have, and the Velantian would get it back to Prime Base. If the Gray Lensman could go, too, well and good. After all, there was no real reason to think that he couldn't —he was merely playing safe, on general principles. If, however, worst came to worst, well—

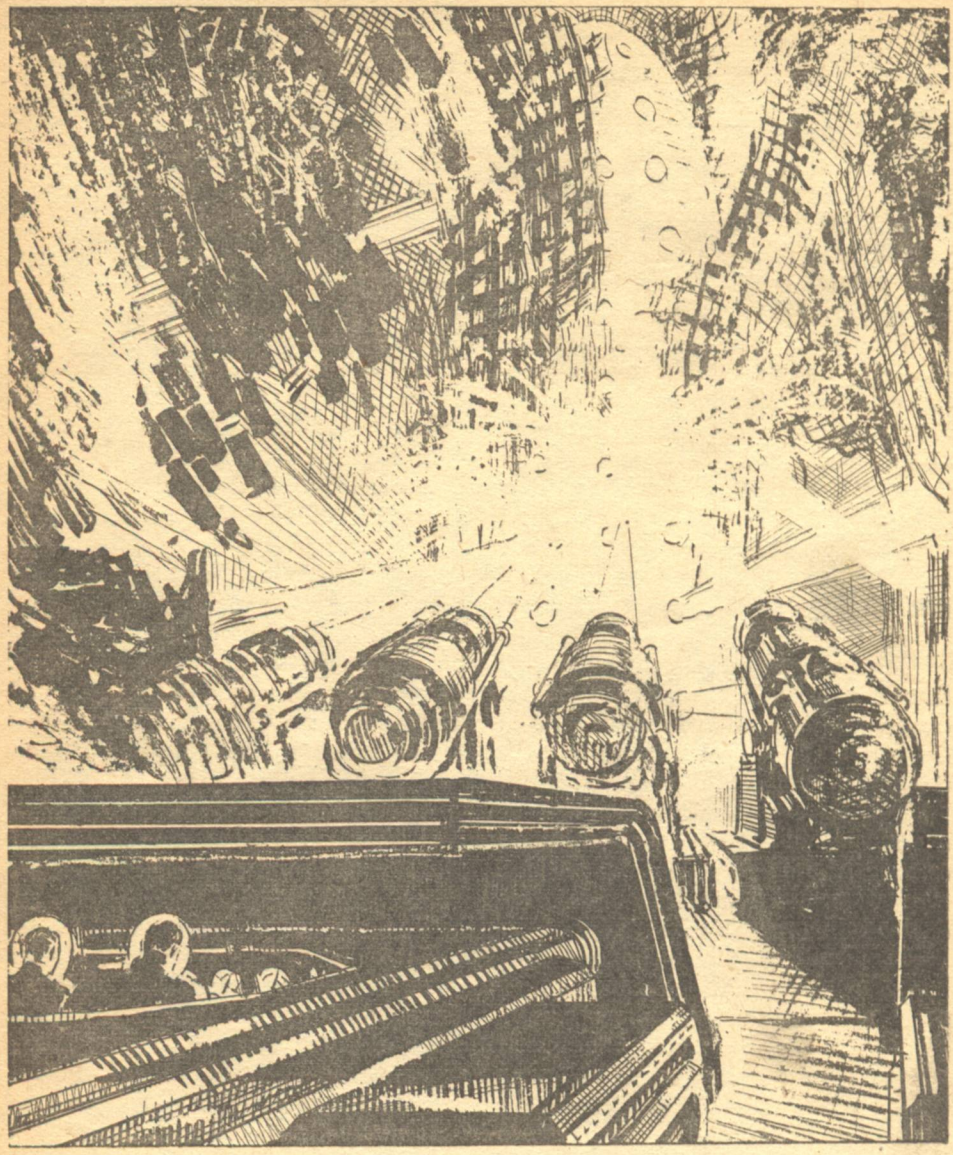
They arrived.

"Now remember, Worsel, no matter what happens to me, or around me, you stay out. Don't come in after me. Help me all you can with your mind, but not otherwise. Take everything I get, and at the first sign of danger you flit back to the speedster and give her the oof, whether I'm around or not. Check?"

"Check," Worsel agreed, quietly. Kinnison's was the harder part. Not because he was the leader, but because he was the better qualified. They both knew it. The Patrol came first. It was bigger, vastly more important than any being or any group of beings in it.

The man strode away and in thirty seconds underwent a weird and striking mental transformation. Three quarters of his knowledge disappeared so completely that he had no inkling that he had ever had it. A new name, a new personality were his, so completely and indisputably his that he had no faint glimmering of a recollection that he had ever been otherwise.

He was wearing his Lens. It could do no possible harm, since it was almost inconceivable that the Eich could be made to believe that any ordinary agent could have penetrated so far, and the fact should not be revealed to the foe



The fury of the beams rebounded in scintillating torrents, shot off in blinding streamers—

that any Lensman could work without his Lens. That would explain far too much of what had already happened. Furthermore, it was a necessity in the only really convincing rôle which Kinnison could play in the event of his capture.

He would not think into that base until he was far enough away from Worsel so that the Velantian's hiding place, if it were not already known, would not be revealed. He did not then know that that such a being as Worsel existed; he did not think into the stronghold sim-

ply because he was not yet close enough to work efficiently.

Closer he crept. Closer. There were pits beneath the pavement, he observed, big enough to hold a speedster. Traps. He avoided them. There were various mechanisms within the blank walls he skirted. More traps. He avoided them. Photo cells, trigger beams, invisible rays, networks. He avoided them all. Close enough.

DELICATELY he sent out a mental probe, and almost in the instant of its sending, cables of steel came whipping from afar. He perceived them as they came, but he was unable to dodge them all. His projectors flamed briefly, only to be sheared away. The cables wrapped about his limbs, binding him fast. Helpless, he was carried through the atmosphere, into the dome, through an air lock into a chamber housing much grimly unmistakable apparatus. And in the council room, where the nine of Boskone and one armored Delgonian Overlord held meeting, a communicator buzzed and snarled.

"Ah!" exclaimed Eichmil. "Our visitor has arrived and is awaiting us in the Delgonian hall of question. Shall we meet again, there?"

They did so; they of the Eich armored against the poisonous oxygen, the Overlord naked. All wore screens.

"Earthling, we are glad indeed to see you here," the First of Boskone welcomed the prisoner. "For a long time we have been anxious indeed—"

"I don't see how that can be," the Lensman blurted. "I just graduated. My first big assignment, and I have failed," he ended bitterly.

A start of surprise swept around the circle. Could this be?

"He is lying," Eichmil decided. "You of Delgon, take him out of his armor." The Overlord did so, the Tellurian's struggles meaningless to the reptile's superhuman strength. "Release your screen and see whether or not you can make him tell the truth."

After all, the man might not be lying. The fact that he could understand a strange language meant nothing at all. All Lensmen could.

"But in case he *should* be the one we seek—" The Overlord hesitated.

"We will see to it that no harm comes to you—"

"We cannot," the Ninth—the psychologist—broke in. "Before any screen is released I suggest that we question him verbally, under the influence of the drug which renders it impossible for any warm-blooded oxygen breather to tell anything except the complete truth."

The suggestion, so eminently sensible, was adopted forthwith.

"Are you the Lensman who has made it possible for the Patrol to drive us out of the Tellurian Galaxy?" came the sharp demand.

"No," was the flat and surprising reply.

"Who are you, then?"

"Philip Morgan, class of—"

"Oh, this will take forever!" snapped the Ninth. "Let me question him. Can you control minds at a distance and without previous treatment?"

"If they are not too strong, yes. All of us specialists in psychology can do that."

"Go to work upon him, Overlord!"

The now fully reassured Delgonian snapped off his screen and a battle of wills ensued which made the subether boil. For Kinnison, although he no longer knew what the truth was, still possessed a large part of his mental power, and the Delgonian's mind, as has already been made clear, was a capable one indeed.

"Desist!" came the command. "Earthman, what happened?"

"Nothing," Kinnison replied truthfully. "Each of us could resist the other; neither could penetrate or control."

"Ah!" and nine Boskonian screens snapped off. Since the Lensman could not master one Delgonian, he would not be a menace to the massed minds of the nine of Boskone, and the questioning need not wait upon the slowness of speech. Thoughts beat into Kinnison's brain from all sides.

THIS POWER of mind was relatively new, yes. He did not know what it was. He went to Arisia, fell asleep, and woke up with it. A refinement, he thought, of hypnotism. Only advanced students in psychology could do it. He knew nothing except by hearsay of the old *Brittania*—he was a cadet then. He had never heard of Blakeslee, or of anything unusual concerning any one hospital ship. He did not know who had scouted Helmuth's base, or put the thionite into it. He had no idea who it was who had killed Helmuth. As far as he knew, nothing had ever been done about any Boskonian spies in Patrol bases. He had never happened to hear of the planet Medon, or of anyone named Bominger, or Madame Desplaines, or Prellin. He was entirely ignorant of any unusual weapons of offense—he was a psychologist, not an engineer or a physicist. No, he was not unusually adept with DeLameters—

"Hold on!" Eichmil commanded. "Stop questioning him, everybody! Now, Lensman, instead of telling us what you do not know, give us positive information, in your own way. How do you work? I am beginning to suspect that the man we really want is a director, not an operator."

This was a more productive line. Lensmen, hundreds of them, each worked upon a definite assignment. None of them had ever seen or ever would see the man who issued orders. He had not even a name, but was a symbol—Star A Star. They received orders through their Lenses, wherever they might be in space. They reported back to him in the same way. Yes, Star A Star knew what was going on in that room. He was reporting constantly—

A knife descended viciously. Blood spurted. The stump was dressed, roughly but effectively. They did not wish their victim to bleed to death when he died, and he was not to die in any fashion—yet.

And in the instant that Kinnison's Lens went dead, Worsel, from his safely distant nook, reached out direct to the mind of his friend, thereby putting his own life in jeopardy. He knew that there was an Overlord in that room, and the grue of a thousand helplessly sacrificed generations of forbears swept his sinuous length at the thought, despite his inward certainty of the new powers of his mind. He knew that of all the entities in the Universe, the Delgonians were most sensitive to the thought vibrations of Velantians. Nevertheless, he did it.

He narrowed the beam down to the smallest possible coverage, employed a frequency as far as possible from that ordinarily used by the Overlords, and continued to observe. It was risky, but it was necessary. It was beginning to appear as though the Earthman might not be able to escape, and he must not die in vain.

"Can you communicate now?" In the ghastly chamber the relentless questioning went on.

"I cannot communicate."

"It is well. In one way I would not be averse to letting your Star A Star know what happens when one of his minions dares to spy upon the Council of Boskone itself, but the information is as yet a trifle premature. Later, he shall learn—"

Kinnison did not consciously thrill at that thought. He did not know that the news was going beyond his brain; that he had achieved his goal. Worsel, however, did; and Worsel thrilled for him.

The Gray Lensman had finished his job; all that was left to do was to destroy this world and the power of Boskone would be broken. Kinnison could die, now, content.

But no thought of leaving entered Worsel's mind. He would, of course, stand by as long as there remained the slightest shred of hope, or until some development threatened his ability to leave the planet with his priceless information. And the pitiless inquisition went on.

STAR A STAR had sent him to investigate their planet, to discover whether or not there was any connection between it and the zwilnik organization. He had come alone, in a speedster. No, he could not tell them even approximately where the speedster was. It was so dark, and he had come such a long distance on foot. In an hour or so, though, it would start sending out a thought signal which he could detect—

"But you must have some ideas about this Star A Star!" This director was the man they wanted so desperately to get. They believed implicitly in this figment of a Lensman director. Fitting in so perfectly with their own ideas of efficient organization, it was more convincing by far than the actual truth would have been. They knew now that he would be hard to find. They did not now insist upon facts; they wanted every possible crumb of surmise. "You must have wondered who and where Star A Star is? You must have tried to trace him?"

Yes, he had tried, but the problem could not be solved. The Lens was non-directional, and the signals came in at practically the same strength, anywhere in the Galaxy. They were, however, very much fainter out here. That might be taken to indicate that Star A Star's office was in a star cluster, well out in either the zenith or the nadir direction—

The victim sucked dry, eight of the Council departed, leaving Eichmil and the Overlord with the Lensman.

"What you have in mind to do, Eichmil, is childish. Your basic idea is excellent, but your technique is pitifully inadequate."

"What could be worse?" Eichmil demanded. "I am going to dig out his eyes, smash his bones, flay him alive, roast him, cut him up into a dozen pieces, and send him back to his Star A Star with a warning that every creature he sends into this Galaxy will be treated the same way. What would *you* do?"

"You of the Eich lack finesse," the Delgonian sighed. "You have no subtlety, no conception of the nicer possibilities of torture, either of an individual or of a race. For instance, to punish Star A Star adequately this man must be returned to him alive, not dead."

"Impossible! He dies—*here!*"

"You misunderstand me. Not alive as he is now—but not entirely dead. Bones broken, yes, and eyes removed; but those minor matters are but a beginning. If I were doing it, I should then apply several of these devices here, successively; but none of them to the point of complete incompatibility with life. I should inoculate the extremities of his four limbs with an organism which grows—shall we say—unpleasantly? Finally, I should extract his life force and consume it—as you know, that essence is a rarely satisfying delicacy with us—taking care to leave just enough to maintain a bare existence. I would then put what is left of him aboard his ship, start it toward the Telurian Galaxy, and send notice to the Patrol as to its exact course and velocity."

"But they would find him *alive!*" Eichmil stormed.

"Exactly. For the fullest vengeance they must, as I have said. Which is worse, think you? To find a corpse, however dismembered, and to dispose of it with full military honors, or to find

and to have to take care of for a full lifetime a something that has not enough intelligence even to swallow food placed in its mouth? Remember also that the organism will be such that they themselves will be obliged to amputate all four of the creature's limbs to save its life."

While thinking thus the Delgonian shot out a slender tentacle which, slithering across the floor, flipped over the tiny switch of a small mechanism in the center of the room. This entirely unexpected action surprised Worsel. He had been debating for minutes whether or not to release the Gray Lensman's inhibitions. He would have done so instantly if he had had any warning of what the Delgonian was about to do. Now it was too late.

"I have set up a thought screen about the room. I do not wish to share this titbit with any of my fellows, as there is not enough to divide," the monster explained, parenthetically. "Have you any suggestions as to how my plan may be improved?"

"No. You have shown that you understand torture better than we do."

"I should, since we Overlords have practiced it as a fine art since our beginnings as a race. Do you wish the pleasure of co-operating with me in the work?"

"I do not torture for pleasure. Since you do, you may carry out the procedure as outlined. All I require is the assurance that he will be a warning and an object lesson to Star A Star of the Galactic Patrol."

"I can assure you definitely that he will be both. More, I will show you the results when I have finished with him. Or, if you like, I would be glad to have you stay and look on—you will find the spectacle interesting, entertaining and highly instructive."

"No, thanks—that is, not if you are sure that you can handle him alone."

"Handle him! This pitiful weakling?" The Overlord snorted contemptuously. "I could handle seven like him. He is on the verge of fainting already. Observe, please, his reaction to the fungus-culture injections."

Four times the Delgonian rammed the needle home; and, true to prediction, Kinnison's body went limp in its shackles.

"Ah, yes; a weak race, physically—very weak," Eichmil observed, as he left the room; and the Overlord, alone with his victim, cast off the chains in order to stretch the Lensman out upon one of the sinister machines so close at hand.

BUT KINNISON had not fainted. He had not allowed himself to feel the hurt of the knife, of the needle, nor of the injected fluid. Never before had he been more coldly, intently alert than in this, the climactic minute of his life. The full of his powers he did not have, perhaps, yet even now he was better equipped, mentally and physically, than the Kinnison of even a short year ago, able to establish a nerve block that would permit full and unshaken concentration on every move of offense and defense he might make, whatever frightful toll of pain and injury the inhumanly powerful, semireptilian Delgonian might inflict in the struggle that the Lensman now proposed. Thus, upon the first instant of opportunity, he exploded into action with a violence which took even the trigger-nerved Overlord entirely by surprise.

In practically one motion he rolled, ducked, gathered himself together and launched a kick behind which there was the driving force of every ounce of his powerful body and the concentrated urge of every cell of his brain. It struck its mark squarely—the hard toe of the Lensman's heavy boot crashed squarely against the Overlord's plated neck at the exact base of the skull. That kick would have pulped any human or near-

human head—it would have slain a horse—it staggered momentarily even the reptilianly armored monstrosity which was the Delgonian.

Kinnison went leaping across the room toward a rack of implements and weapons, only to be buried in mid-course beneath a hurtling avalanche of fury. For a moment man and monster stood poised, almost en tableau, then they crashed to the floor together—talons and fingers clawing, gouging at eyes; wings, feet, hard-gnarled hands, scimitared tail, balled fist, boots and teeth wreaking every ultimate possibility of damage. Against the frightfully armed and naturally armored body of the Delgonian, human physical weapons and human strength were near useless; but, insulated against the agony of snapping bones and bludgeon blows of the mighty tail by that hard-held nerve block, the Lensman's furiously active mind had a goal—a vaguely understood goal—toward which he directed the deadly struggle he could not control or hope to win—

Upon and over the thought-screen generator rolled the madly warring pair, and as the delicate mechanism disintegrated it ceased to function.

Worsel's prodigious mentality had been beating ceaselessly against that screen ever since its erection, and in the very instant of its fall Kinnison became again the Gray Lensman of old. And in the next instant both of those mighty minds—the two most powerful then known to civilization—had hurled themselves against that of the Delgonian. Bitter though the ensuing struggle was, it was brief. Nothing short of an Arisian mentality could have withstood the venomous intensity, the berserk power, of that concerted and synchronized attack.

Brain half burned out, the Overlord wilted; and, docility itself, he energized the communicator.

"Eichmil? The work is done. Thoroughly done, and well."

"So soon?"

"Yes. I was hungry—and, as I intimated, Tellurians are much too weak to furnish any real sport. Do you wish to inspect what is left of the Lensman?" This question was safe enough; Worsel knew exactly how Kinnison had fared during his whirlwind bodily encounter with the frightfully armed, heavily armored engine of destruction which was the Delgonian.

"No." Eichmil, as a high executive, was accustomed to delegating far more important matters to competent underlings. "If you say that it is well done, that is sufficient."

"Clear the way for me, then, please," the Overlord requested. Then, picking up the hideously mangled thing that was Kinnison's body, he incased it in its armor and, donning his own, wriggled boldly away with his burden. "I go to place this residuum within its ship and to return it to Star A Star."

"You will be able to find the speedster?"

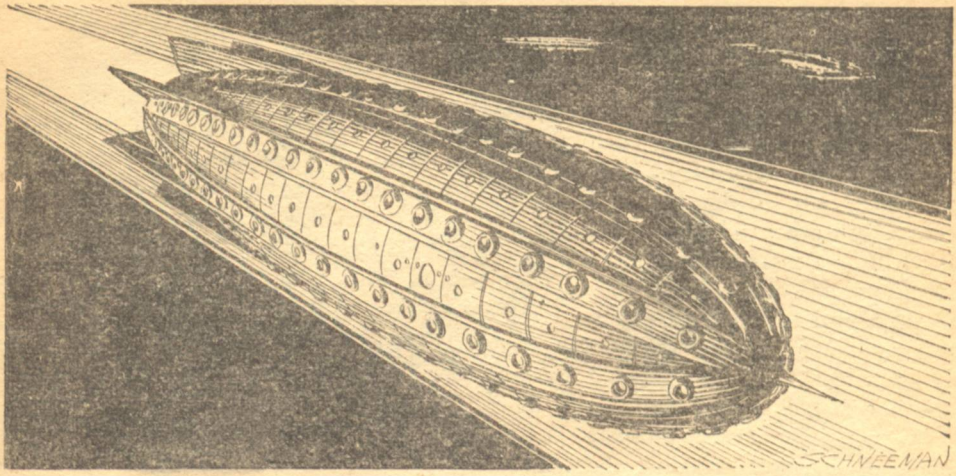
"Certainly. He was to find it. Whatever he could have done, I, working through the cells of his brain, can likewise do."

"Can you handle him alone, Kinnison?" Worsel asked presently. "Can you hold out until you reach the boat?"

"Yes, to both. I can handle him—we softened him down plenty. I will last—I'll make myself last, long enough."

"I go, then, lest they be observing with spy rays."

To the black flier the completely subservient Delgonian then bore his physically disabled master, and carefully he put him aboard. Worsel helped openly there, for he had put out screens against all forms of intrusion. The vessel took off and the Overlord wriggled blithely back toward the dome. He was full of the consciousness of a good job, well done. He even felt the sensation of



repletion concomitant with having consumed much vital force!

"I hate to let him go!" Worsel's thought was a growl of baffled fury. "It gripes me to the tail to let him think that he has done everything he set out to do; that he will never even know how he got those bruises and contusions. I wanted—I still want—to tear him apart for what he has done to you, my friend."

"Thanks, old snake." Kinnison's thought came faintly. "Just temporary. He's living on borrowed time. He'll get his. You've got everything under control, haven't you?"

"On the green. Why?"

"Because I can't hold this nerve block any longer. . . . It hurts. . . . I'm sick. . . . I think I'm going to—"

He fainted. More, he plunged parsecs deep into the blackest depths of oblivion as outraged nature took the toll she had been so long denied.

Worsel hurled a call to Earth, then turned to his maimed and horribly broken companion. He applied splints to the shattered limbs, he dressed and bandaged the hideous wounds and the raw sockets which had once held eyes, he ministered to the raging, burning thirst. Whenever Kinnison's mind wearied he held for him the nerve block, the priceless anodyne without which the Gray Lensman must have died from sheerest agony.

"Why not allow me, friend, to relieve you of all consciousness until help arrives?" the Velantian asked pityingly.

"Can you do it without killing me?"

"If you so allow, yes. If you offer any resistance, I do not believe that any mind in the Universe could."

"I won't resist you. Come in," and Kinnison's suffering ended.

But kindly Worsel could do nothing about the fantastically atrocious growths which were transforming the Earthman's legs and arms into monstrosities out of nightmare.

He could only wait—wait for the skilled assistance which he knew must be so long in coming.

XXI.

When Worsel's hard-driven call impinged upon the port admiral's lens, Haynes dropped everything to take the report himself. Characteristically Worsel sent first and Haynes first recorded a complete statement of the successful mission to Jarnevon. Last came personalities, the tale of Kinnison's ordeal and of his present plight.

"Are they following you in force, or can't you tell?"

"Nothing has been detectable, and at the time of our departure there had been no suggestion of any such action," Worsel replied carefully.

"We'll come in force, anyway, and fast. Keep him alive until we meet you," Haynes urged, and disconnected.

It was an unheard-of occurrence for the port admiral to turn over his very busy and extremely important desk to a subordinate without notice and without giving him detailed instructions, but Haynes did it now.

"Take charge of everything, Southworth!" he snapped. "I'm called away —emergency. Kinnison found Boskone —got away—hurt—I'm going after him in the *Dauntless*. Taking the new flotilla with me. Time indefinite—probably a few weeks."

He strode toward the communicator desk. The *Dauntless* was, as always, completely serviced and ready for any emergency. Where was that fleet of her sister ships, on its shakedown cruise? He'd shake them down! They had with them the new hospital ship, too—the only Red Cross ship in space that could leg it, parsec for parsec, with the *Dauntless*.

"Get me Navigations. . . . Figure best point of rendezvous for the *Dauntless* and Flotilla ZKD, both at full blast, en route to Lundmark's Nebula. Fifteen minutes departure. Figure approximate time of meeting with speedster, also at full blast, leaving that nebula hour nine fourteen today. Correction! Cancel speedster meeting; we can compute that more accurtely later. Advise adjutant. Vice Admiral Southworth will send order, through channels. Get me Base Hospital. . . . Lacy, please. . . . Kinnison's hurt, sawbones, bad. I'm going out after him. Coming along?"

"Yes. How about—"

"On the green. Flotilla ZKD, including your new two-hundred-million-credit hospital, is going along. Slip twelve, *Dauntless*, eleven and one half minutes from now. Hipe!" And the surgeon general "hiped."

Two minutes before the scheduled take-off Base Navigations called the chief navigating officer of the *Dauntless*.

"Course to rendezvous with Flotilla ZKD latitude three fifty-four dash thirty longitude nineteen dash forty-two time approximately twelve dash seven dash twenty-six place one dash three dash oh outside arbitrary galactic rim check and repeat," rattled from the speaker without pause or punctuation. Nevertheless, the chief navigator got it, recorded it, checked and repeated it.

"Figures only approximations because of lack of exact data on variations in density of medium and on distance necessarily lost in detouring stars," the speaker chattered on. "Suggest instructing your second navigator to communicate with navigating officers Flotilla ZKD at time twelve dash oh dash oh to correct courses to compensate unavoidably erroneous assumptions in computation Base Navigations off."

"I'll say he's off—'way off!" growled the second. "What does he think I am—a complete nitwit? Pretty soon he'll be telling me that two plus two equals four point oh."

THE fifteen-second warning bell sounded. Every man came to the ready at his post, and precisely upon the designated second the superdreadnought blasted off. For six miles she rose inert upon her under jets, sirens and flaring lights clearing her way. Then she went free, her needle prow slanted sharply upward, her full battery of main driving projectors burst into action, and to all intents and purposes she vanished.

The Earth fell away from her at an incredible rate, dwindling away into invisibility in less than a minute. In two minutes the Sun itself was merely a bright star, in five it had merged indistinguishably into the sharply defined,

brilliantly white belt of the Milky Way.

Hour after hour, day after day, the *Dauntless* hurtled through space, swinging almost imperceptibly this way and that to avoid the dense ether in the neighborhood of suns through which the designated course would have led; but never leaving far or for long the direct line, almost exactly in the equatorial plane of the Galaxy, between Tellus and the place of meeting. Behind her the Milky Way clotted, condensed, gathered itself together; before her and around her the stars began rapidly to thin out. Finally there were no more stars in front of her. She had reached the "arbitrary rim" of the Galaxy, and the second navigator plugged into Communications.

"Please get me Flotilla ZDK, Flagship Navigations," he requested; and, as a clean-cut young face appeared upon his plate: "Hi, Harvey, old spacehound! Fancy meeting you out here! It's a small Universe, ain't it? Say, did that crumb back there at Base tell you, too, to be sure and start checking course before you overran the rendezvous? If he was singling me out to make that pass at, I'm going to take steps, and not through channels, either."

"Yeah, he told me the same. I thought it was funny, too—an oiler's boy would know enough to do that without being told. We figured maybe he was jittery on account of us meeting the admiral or something. What's burned out all the jets, Paul, to get the big brass hats 'way out here and all dithered up, and to pull us offa the cruise this way? Must be a hell of an important flit! You're computing the Old Man himself; you oughta know something. What's all this about a speedster that we're going to escort? Spill it—give us the dope!"

"I don't know a thing, Harvey, honest, any more than you do. They didn't put out a word. Well, we'd better be getting onto the course—'to compensate unavoidably erroneous assumptions in computation,'" he mimicked caustically. "What do you read on my lambda? Fourteen—three—oh point six—decrement—"

The conversation became a technical jargon; because of which, however, the courses of the flying spaceships changed subtly. The flotilla swung around, through a small arc of a circle of prodigious radius, decreasing by a tenth its driving force. Up to it the *Dauntless* crept; through it and into the van. Then again in cone formation, but with fifty-five units instead of fifty-four, the flotilla screamed forward at maximum blast.

Well before the calculated time of meeting the speedster a Velantian Lensman who knew Worsel well put himself en rapport with him and sent a thought out far ahead of the flying squadron. It found its goal—Lensmen of that race, as has been brought out, have always been extraordinarily capable communicators—and once more the course was altered slightly. In due time Worsel reported that he could detect the fleet, and shortly thereafter:

"Worsel says to cut your drive to zero," the Velantian transmitted. "He's coming up. He's close. He's going to go inert and start driving. We're to stay free until we see what his intrinsic velocity is. Watch for his flare."

It was a weird sensation, this of knowing that a speedster—quite a sizable chunk of boat, really—was almost in their midst, and yet having all their instruments, even the electros, register empty space.

There it was! The flare of the driving blast, a brilliant streamer of fierce white light, sprang into being and drifted rapidly away to one side of their course. When it had attained a safe distance:

"All ships of the flotilla except the *Dauntless* go inert," Haynes directed. Then, to his own pilot, "Back us off a bit, Henderson, and do the same," and

the new flagship also went inert.

"How can I get onto the *Pasteur* the quickest, Haynes?" Lacy demanded.

"Take a gig," the admiral grunted. "Strapped down, you can use as much acceleration as you like. Three G's is all we can use without warning and preparation."

THERE FOLLOWED a curious and fascinating spectacle, for the hospital ship had an intrinsic velocity entirely different from that of either Kinnison's speedster or Lacy's powerful gig. The *Pasteur,* gravity pads cut to zero, was braking down by means of her under jets at a conservative one point four gravities, since hospital ships were not allowed to use the brutal inert accelerations employed as a matter of course by ships of war.

The gig was on her brakes at five gravities, all that Lacy wanted to take —but the speedster! Worsel had put his patient into a pressure pack and had hung him on suspension, and was "balancing her down on her tail" at everything he could stand—a full eleven gravities!

But even at that, the gig first matched the velocity of the hospital ship. The intrinsics of those two were at least of the same order of magnitude, since both had come from the same galaxy. Therefore, Lacy boarded the Red Cross vessel and was escorted to the office of the chief nurse while Worsel was still blasting at eleven G's—fifty thousand miles distant then and getting farther away by the second—to kill the speedster's Lunkmarkian intrinsic velocity. Nor could the tractors of the warships be of any assistance—the speedster's own vicious jets were fully capable of supplying more acceleration than even unhuman Worsel could endure!

"How do you do, Dr. Lacy? Everything is ready." Clarrissa MacDougall met him, hand outstretched. Her saucy white cap was worn as jerkily cocked as ever; perhaps even more so, now that it was emblazoned with the cross-surmounted wedge which is the insignia of sector chief nurse. Her flaming hair was as gorgeous, her smile was as radiant, her bearing as confidently—Kinnison has said of her more than once that she is the only person he has ever known who can strut sitting down!—as calmly poised. "I'm very glad to see you, doctor. It's been quite a while—" Her voice died away, for the man was looking at her with an expression defying analysis.

For Lacy was thunderstruck. If he had ever known it—and he must have —he had forgotten completely that MacDougall had this ship. This was awful —terrible!

"Oh, yes . . . yes, of course. How do you do? Mighty glad to see you again. How's everything going?" He pumped her hand vigorously, thinking frantically the while what he would—what he *could*—say next. "Oh, by the way, who is to be in charge of the operating room?"

"Why, I am, of course," she replied in surprise. "Who else would be?"

"*Anyone* else," he wanted to say, but did not—then. "Why, that isn't at all necessary. I would suggest—"

"You'll suggest nothing of the kind!" She stared at him intently; then, as she realized what his expression really meant —she had never before seen such a look of pitying anguish upon his usually sternly professional face—her own turned white and both hands flew to her throat.

"Not Kim, Lacy!" she gasped. Gone now was everything of poise, of insouciance, which had so characterized her a moment before. She who had worked unflinchingly upon all sorts of dismembered, fragmentary, maimed and mangled men was now a pleading, stricken, desperately frightened girl. "Not Kim—please! Oh, merciful God,

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don't let it be my Kim!"

"You *can't* be there, Mac." He did not need to tell her. She knew; he knew that she knew. "Somebody else —*anybody* else."

"No!" came the hot negative, although the blood drained completely from the chief nurse's face, leaving it as white as the immaculate uniform she wore. Her eyes were black, burning holes. "It's my job, Lacy, in more ways than one. Do you think that I would *ever* let anyone else work on *him?*" she finished passionately.

"You'll have to," he declared. "I didn't want to tell you this, but he's a ghastly mess. Altogether too much so for any woman, to say nothing of one who loves him." This, from a surgeon of Lacy's long and wide experience, was an unthinkable statement. Nevertheless:

"All the more reason why I've got to do it. No matter what shape he's in, I'll let no one else work on my Kim."

"I say no. That's an order—official!"

"Damn such orders!" she flamed. "There's nothing back of it—you know that as well as I do!"

"See here, young woman—"

"Do you think that you can get away with ordering me not to perform the very duties I have taken an oath to do?" she stormed. "And even if it were not my job, I'd come in and work on him if I had to get a torch and cut the ship apart, plate by plate, to do it! The only way you can keep me out of that operating room, Lacy, is to have about ten of your men put me into a strait jacket—and if you do that I'll have you kicked out of the service bodily. You know that I could and that I would!"

"QX, MacDougall, you win." She had him there. This girl could and would do exactly that. "But if you faint, I swear that I'll make you wish—"

"You know me better than that, doctor." She was cold now as a woman of marble. "If he dies. I'll die, too, right then. But if he lives, I'll stand by as long as I can do a single thing, however small, to help."

"You would, at that," the surgeon admitted. "Probably you would be able to hold together better than anyone else could. But there'll be after-effects in your case, you know."

"I know." Her voice was bleak. "I'll live through them—if Kim lives." She became all nurse in the course of a breath. White, cold, inhuman; strung to highest tension and yet placidly calm, as only a truly loving woman in life's great crises can be. "You have had reports on him, doctor. What is your provisional diagnosis?"

"Something like elephantiasis, only worse, affecting both arms and both legs. Drastic amputations indicated. Eye sockets require attention. Various multiple and compound fractures. Punctured and incised wounds. Traumatism, ecchymosis, extensive extravasations, œdema. Profound systemic shock, of course. The prognosis, however, seems to be distinctly favorable, as far as we can tell."

"Oh, I'm glad of that!" she breathed, the woman for a moment showing through the armor of the nurse. She had not dared even to think of prognosis. Then she had a thought. "Is that really true, or are you just giving me a shot in the arm?" she demanded.

"The truth—strictly," he assured her. "Worsel has an excellent sense of perception, and he has reported fully and clearly. Kinnison's mind, brain, and spine are not affected in any way, and we should be able to save his life. That is the one good feature of the whole thing."

THE SPEEDSTER finally matched the velocity of the hospital ship. She went free, flashed up to the *Pasteur,* inerted, and maneuvered briefly. The larger vessel engulfed the smaller. The Gray Lensman was carried into the operating

room. The anæsthetist approached the table and Lacy was stunned at a thought from Kinnison.

"Never mind the anæsthetic, Dr. Lacy. You can't make me unconscious without killing me. Go ahead with your work. I'll hold a nerve block while you're doing what has to be done. I can do it perfectly—I've had lots of practice."

"But we can't, man!" Lacy exclaimed. "You've got to be under a general for this job—we can't have you conscious. You're raving, I think. It will work, surely; it always has. Let us try it, anyway, won't you?"

"Sure. It'll save me the trouble of holding the block, even though it won't do anything else. Go ahead."

The attendant physician did so, with the same cool skill and to the same end point as in thousands of similar and successful undertakings. At its conclusion: "Gone now, aren't you, Kinnison?" Lacy asked, through his Lens.

"No," came the surprising reply. "Physically, it worked. I can't feel a thing and I can't move a muscle, but mentally I am as wide awake as I ever was."

"But you shouldn't be!" Lacy protested. "Perhaps you were right, at that—we can't give you much more without danger of collapse. But you've *got* to be unconscious! Isn't there some way in which you can be made so?"

"Yes, there is. But why do I have to be unconscious?" Kinnison asked curiously.

"To avoid mental shock—seriously damaging," the surgeon explained. "In your case particularly the mental aspect is much graver than the purely physical one."

"Maybe you're right but you can't do it with drugs. Call Worsel; he has done it before. He had me unconscious most of the way over here, except when he had to give me a drink or something to eat. He's the only man this side of Arisia who can operate on my mind."

Worsel came. "Sleep, my friend," he commanded, gently but firmly. "Sleep profoundly, body and mind, with no physical or mental sensations, no consciousness, no perception even of the passage of time. Sleep until someone having authority to do so bids you awaken."

And Kinnison slept; so deeply that even Lacy's probing Lens could elicit no response.

"He will *stay* that way?" the surgeon asked in awe.

"Yes."

"For how long?"

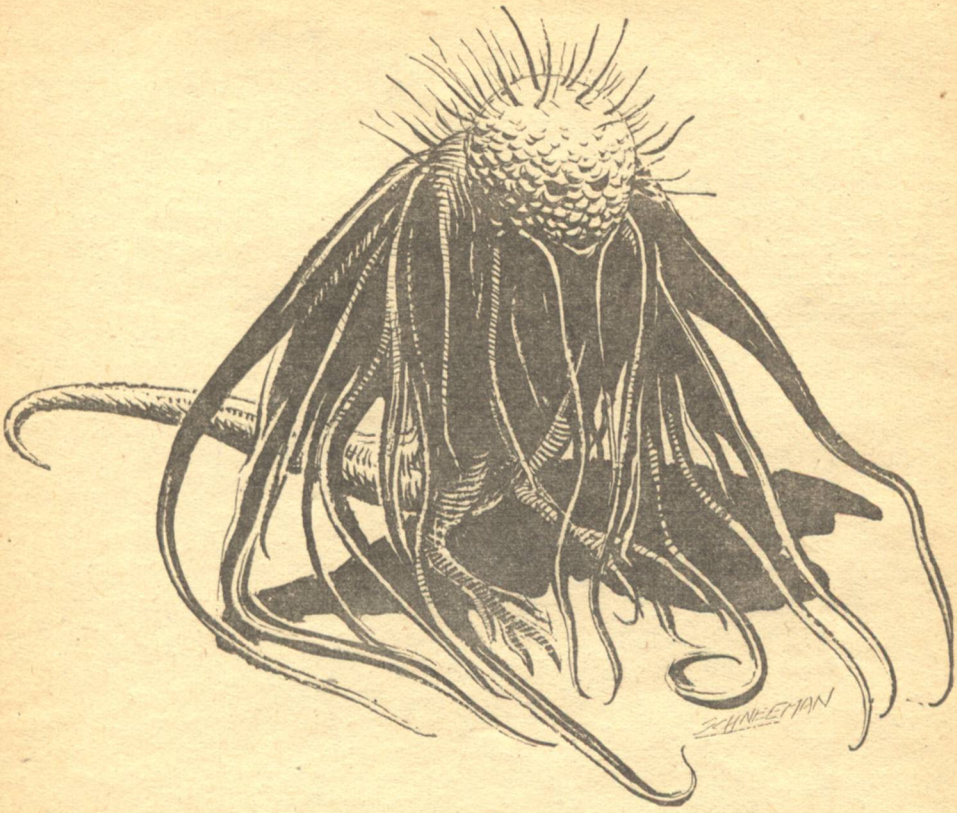
"Indefinitely. Until one of you doctors or nurses tells him to wake up, or until he dies for lack of food or water."

"We will see to it that he gets nourishment. He would make a much better recovery if we could keep him in that state until his injuries are almost healed. Would that do him harm, think you?"

"None whatever."

Then the surgeons and the nurses went to work. Lacy was not guilty of exaggeration when he described Kinnison as being a "ghastly mess." He was all of that. The job was long and hard. It was heartbreaking, even for those to whom Kinnison was merely another case, not a beloved personality. What they had to do they did, and the white marble chief nurse carried on through every soul-wrenching second, through every shocking, searing motion of it. She did her part, stoically, unflinchingly, as efficiently as though the patient upon the table were a total stranger undergoing a simple appendectomy and not the one man in her entire universe suffering radical dismemberment. Nor did she faint—then.

BACK in Base Hospital, then, time wore on until Lacy decided that the Lensman could be aroused from his trance. Clarrissa it was who woke him



up. She had fought for the privilege; first claiming it as a right and then threatening to commit mayhem upon the person of anyone else who dared even to think of doing it.

"Wake up, Kim, dear," she whispered. "The worst of it is over now. You are getting well."

The Gray Lensman came to instantly, in full command of every faculty, knowing everything that had happened up to the instant of his hypnosis by Worsel. He stiffened, ready to establish again the nerve block against the intolerable agony to which he had been subjected so long, but there was no need. His body was, for the first time in untold æons, free from pain; and he relaxed blissfully, reveling in the sheer comfort of it.

"I'm *so* glad that you're awake, Kim," the nurse went on. "I know that you can't talk to me—we can't unbandage your jaw until next week—and you can't think at me, either, because your new Lens hasn't come yet. But I can talk to you and you can listen. Don't be discouraged, Kim. Don't let it get you down. I love you just as much as I ever did, and as soon as you can talk we're going to get married. I am going to take care of you—"

"Don't 'poor dear' me, Mac," he interrupted her with a vigorous thought. "You didn't say it, I know, but you were thinking it. I'm not half as helpless as you think I am. I can still communicate, and I can see as well as I ever could, or better. And if you think that I'm going to let you marry me to take care of me, you're crazy."

"You're raving! Delirious! Stark,

staring mad!" She started back, then controlled herself with an effort. "Maybe you can think at people without a Lens—of course you can, since you just did, at me—but you *can't* see, Kim, possibly. Believe me, boy, I *know* that you can't. I was there—"

"I can, though," he insisted. "I got a lot of stuff on my second trip to Arisia that I couldn't let anybody know about then, but I can now. I've got as good a sense of perception as Tregonsee has—maybe better. To prove it, you look thin, worn—whittled down to a nub. You've been working too hard—on me."

"Deduction," she scoffed. "You would know that I would."

"QX. How about those roses over there on the table? White ones, yellow ones, and red ones? With ferns?"

"You can smell them, perhaps"—dubiously. Then, with more assurance: "You would know that practically all the flowers known to botany would be here."

"Well, I'll count 'em and point 'em out to you, then—or, better, how about that little gold locket, with 'CM' engraved on it, that you're wearing under your uniform? I can't smell that, nor the picture in it—" The man's thought faltered in embarrassment. "*My* picture! Klono's whiskers, Mac, where did you get that—and why?"

"It's a reduction that Admiral Haynes let me have made. I am wearing it because I love you—I've said that before."

The girl's entrancing smile was now in full evidence. She knew now that he *could* see, that he would never be the helpless hulk which she had so gallingly thought him doomed to become, and her spirits rose in ecstatic relief. But he would *never* take the initiative now. Well, then, she would; and this was as good an opening as she ever would have with the stubborn brute. Therefore:

"More than that, as I said before, I am going to marry you, whether you like it or not." She blushed a heavenly—and discordant—magenta, but went on unfalteringly: "And not out of pity, either, Kim, or just to take care of you. It's older than that—much older."

"It can't be done, Mac." His thought was a protest to high Heaven at the injustice of Fate. "I've thought it over out in space a thousand times—thought until I was black in the face—but I get the same result every time. It's just simply no soap. You are much too fine a woman—too splendid, too vital, too much of everything a woman should be—to be tied down for life to a thing that's half steel, rubber, and phenoline. It just simply is not on the wheel, that's all."

"You're full of pickles, Kim." Gone was all her uncertainty and nervousness. She was calm, poised; glowing with a transcendent inward beauty. "I didn't really *know* until this minute that you love me, too, but I do now. Don't you realize, you big, dumb, wonderful clunker, that as long as there's one single, little bit of a piece of you left alive I'll love that piece more than I ever could any other man's entire being?"

"But I *can't*, I tell you!" He groaned the thought. "I can't and I won't! My job isn't done yet, either, and the next time they'll probably get me. I *can't* let you waste yourself, Mac, on a fraction of a man for a fraction of a lifetime!"

"QX, Gray Lensman." Clarrissa was serene, radiantly untroubled. She could make things come out right now; everything was on the green. "We'll put this back up on the shelf for a while. I'm afraid that I have been terribly remiss in my duties as a nurse. Patients mustn't be excited or quarreled with, you know."

"That's another thing. How come you, a sector chief, to be on ordinary room duty, and night duty at that?"

"Sector chiefs assign duties, don't

they?" she retorted sunnily. "Now I'll give you a rub and change some of these dressings."

XXII.

"Hi, Skeleton-gazer!"

"Ho, Big Chief Feet-on-the-desk!"

"I see that your red-headed sector chief is still occupying all strategic salients in force." Haynes had paused in the surgeon general's office on his way to another of his conferences with the Gray Lensman. "Can't you get rid of her or don't you want to?"

"Don't want to. Couldn't, anyway, probably. The young vixen would tear down the hospital—she might even resign, marry him out of hand, and lug him off somewhere. You want him to recover, don't you?"

"Don't be any more of an idiot than you have to. What a question!"

"Don't work up a temperature about MacDougall, then. As long as she's around him—and that's twenty-four hours a day—he'll get everything in the Universe that he can get any good out of."

"That's so, too. This other thing's out of our hands now, anyway. Kinnison can't hold his position long against her and himself both—overwhelmingly superior force. Just as well, too—civilization needs more like those two."

"Check, but the affair isn't out of our hands yet, by any means. We've got quite a little more fine work to do there, as you'll see, before it's a really good job. But about Kinnison—"

"Yes. When are you going to fit arms and legs on him? He should be practicing with them at this stage of the game, I should think—I was."

"You *should* think—but, unfortunately, you don't, about anything except war," was the surgeon's dry rejoinder. "If you did, you would have paid more attention to what Phillips has been doing. He is making the final test today. Come along—your conference with Kinnison can wait half an hour."

In the research laboratory which had been assigned to Phillips they found von Hohendorff with the Posenian. Haynes was surprised to see the old commandant of cadets, but Lacy quite evidently had known that he was to be there.

"Phillips," the surgeon general began, "explain to Admiral Haynes, in nontechnical language, what you are doing."

"The original problem was to discover what hormone or other agent caused proliferation of neural tissue—"

"Wait a minute; I'd better do it," Lacy broke in. "Anyway, you wouldn't do yourself justice. The first thing that Phillips found out was that the problem of repairing damaged nervous tissue was inextricably involved with several other unknown things, such as the original growth of such tissue, its relationship to growth in general, the regeneration of lost members in lower forms, and so on. You see, Haynes, it is a known fact that nerves do grow, or else they could not exist; and in some lower forms of life they regenerate. Those facts were all he had, at first. In higher forms, even during the growth stage, regeneration does not occur spontaneously. Phillips set out to find out why.

"The thyroid controls growth, but does not initiate it, he learned. This fact seemed to indicate that there was an unknown hormone involved—that certain lower types possess an endocrine gland which is either atrophied or nonexistent in higher types. If the latter, he was sunk. He reasoned, however, that, since higher types evolved from lower, the gland in question might very well exist in a vestigial stage. He studied animals, thousands of them, from the germ upward. He exhausted the patience of the Posenian authorities; and when they cut off his appropriation, on the ground that the thing was impossible, he came here. We gave him carte blanche.

"The man is a miracle of perseverence, a keen observer, a shrewd reasoner, and a mechanic par excellence—a born researcher. Therefore, in time he learned what it must be: to cut it short, the pineal body. Then he had to find the stimulant. Drugs, chemicals, and spectrum of radiation; singly and in combination. Years of plugging, with just enough progress to keep him at it. Visits to other planets peopled by races human to two places or more; learning everything that had been done along the line of his problem. When you fellows moved Medon over here he visited it as a matter of routine, and there he hit the jackpot. Wise himself is a surgeon, and the Medonians have for centuries been having warfare and grief enough, steadily and in heroic doses, to develop the medical and surgical arts no end.

"They knew how to stimulate the pineal—a combination of drugs and specific radiations—but their method was dangerous. With Phillips' fresh viewpoint, his wide, new knowledge, and his mechanical genius, they worked out a new and highly satisfactory technique. He was going to try it out on a pirate going into the lethal chamber, but von Hohendorff heard about it and insisted that it should be tried on him. Got up on his Unattached Lensman's high horse and won't come down. So here we are."

"Hm-m-m—interesting!" The admiral had listened attentively. "You're pretty sure that it will work, aren't you?"

"As sure as we can be of anything that hasn't been tried. Ninety-percent probability, say—certainly not over ninety-five."

"Good enough odds." Haynes turned to the commandant. "What do you mean, you old reprobate, by sneaking around behind my back and horning in on my reservation? I rate Unattached, too, you know, and it's mine. You're out, von."

"I saw it first and I refuse to relinquish." Von Hohendorff was adamant.

"You've got to," Haynes insisted. "He isn't your cub any more; he's my Lensman. Besides, I'm a better test than you are—I've got more parts to replace than you have."

"Four or five make just as good a test as a dozen," the commandant declared.

"Gentlemen, think!" the Posenian pleaded. "Please consider that the pineal is actually inside the brain. It is true that I have not been able to discover any brain injury so far, but the process has not yet been applied to a reasoning brain and I can offer no assurance whatever that some obscure injury will not result."

"What of it?" and the two old Unattached Lensmen resumed their battle, hammer and tongs. Neither would yield a millimeter.

"Operate on them both, then, since they are both above law or reason," Lacy finally ordered in exasperation. "There ought to be a law to reduce Gray Lensmen to the ranks when they begin to suffer from ossification of the intellect."

"Starting with yourself, perhaps?" the admiral shot back, not at all abashed.

Haynes relented enough to let von Hohendorff go first, and both were given the necessary injections. The commandant was then strapped solidly into a chair; his head was clamped so firmly that he could not move it in any direction.

The Posenian swung his needle rays into place; two of them, diametrically opposed, each held rigidly upon micrometered racks and each operated by two huge, double, rock-steady hands. The operator *looked* entirely aloof—being eyeless and practically headless, it is impossible to tell from a Posenian's attitude or posture anything about the focal point of his attention—but the watchers knew that he was observing in micro-

scopic detail the tiny gland within the old Lensman's skull.

Then Haynes. "Is this all there is to it, or do we come back for more?" he asked, when he was released from his shackles.

"That's all," Lacy answered. "One stimulation lasts for life, as far as we know. But if the treatment is successful you'll come back—about day after tomorrow, I think—to go to bed here. Your spare equipment won't fit and your stumps may require surgical attention."

Sure enough, Haynes did come back to the hospital, but not to go to bed. He was too busy. Instead, he got a wheel chair, and in it he was taken back to his now-boiling office. And in a few more days he called Lacy in high exasperation.

"Know what you've done?" he demanded. "Not satisfied with taking my perfectly good parts away from me, you've taken my teeth, too. They don't fit—I can't eat a thing! And I'm hungry as a wolf—I was never so hungry before in all my life! I *can't* live on soup, man; I've got work to do. What are you going to do about it?"

"Ho-ho-haw!" Lacy roared. "Serves you right—von Hohendorff is taking it easy here; sitting right on top of the world. Easy, now, sailor, don't rupture your aorta. I'll send a nurse over with a soft-boiled egg and a spoon. *Teething*—at *your* age— *Haw-ho-haw!"*

But it was no ordinary nurse who came, a few minutes later, to see the port admiral; it was the sector chief herself. She looked at him pityingly as she trundled him into his private office and shut the door, thereby establishing complete coverage.

"I had no idea, Admiral Haynes, that you . . . that there—" She paused.

"That I was so much of a machine-shop rebuild?"—complacently. "Except in the matter of eyes—which he doesn't need, anyway—our mutual friend Kinnison has very little on me, my dear. I got so handy with the replacements that very few people knew how much of me was artificial. But it's these teeth that are taking all the joy out of life. I'm hungry, confound it! Have you got anything really satisfying that I can eat?"

"I'll say I have!" She fed him; then, bending over, she squeezed him tight and kissed him emphatically. "You and the commandant are just perfectly wonderful old darlings, and I love you all to pieces," she declared. "I think Lacy was simply poisonous to laugh at you the way he did. Why, you two are the world's greatest heroes! He knew perfectly well all the time, the lug, that of course you'd be hungry; that you'd have to eat twice as much as usual while your legs and things were growing. Don't worry, admiral, I'll feed you until you bulge. I want you to hurry up with this, so that they'll do it to Kim."

"Thanks, Mac," and as she wheeled him back into the main office he considered her anew. A ravishing creature, but sound. Rash, and a bit stubborn, perhaps; impetuous and headstrong; but clean, solid metal all the way through. She had what it takes—she qualified. She and Kinnison would make a mighty fine couple when the lad got some of that heroic damn nonsense knocked out of his head—but there was work to do.

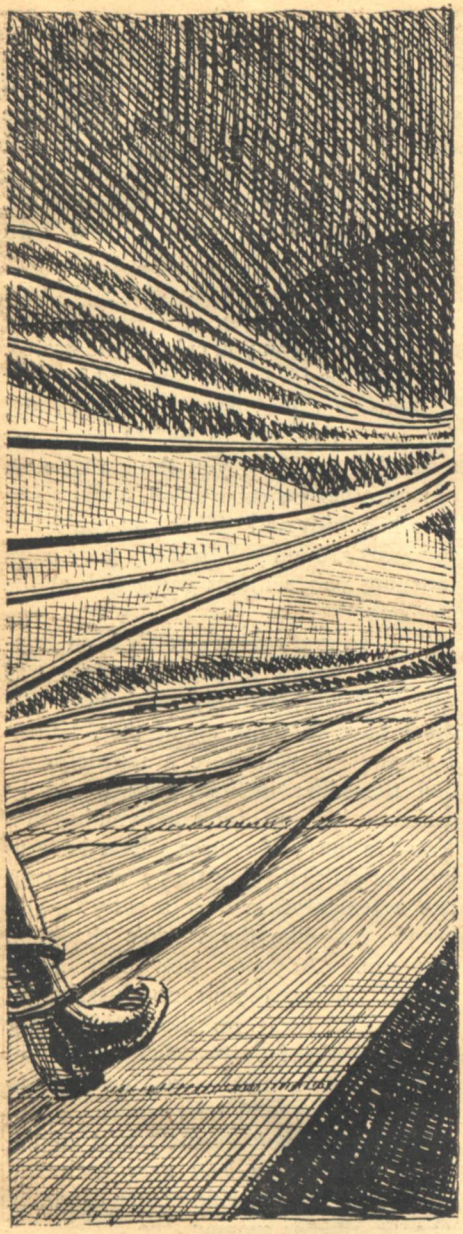
THERE was. The Galactic Council had considered thoroughly Kinnison's reports; its every member had conferred with him and with Worsel at length. Throughout the First Galaxy the Patrol was at work in all its prodigious might, preparing to wipe out the menace to civilization which was Boskone. First-line superdreadnoughts—no others would go upon that mission—were being built and armed, rebuilt and rearmed.

Well it was that the Galactic Patrol

At the first faint touch of Kim's mind, the Eich reacted. Tentacles like steel whips lashed out to bind and hold him, to drag him into the frowning fortress—

had previously amassed an almost inexhaustible supply of wealth, for its "reserves of expendible credit" were running like water.

Weapons, supposedly of irresistible power, were made even more powerful. Screens already "impenetrable" were stiffened into even greater stubbornness.



Primary projectors were made to take even higher loads, for longer times. New and heavier Q-type helices were designed and built. Larger and more destructive duodec bombs were hurled against already ruined, torn, and quivering test planets. Uninhabited worlds were being equipped with super-Bergenholms and with driving projectors. The negasphere, the most incredible menace to navigation which had ever existed in space, was being patrolled by a cordon of guard ships.

And all this activity centered in one vast building and culminated in one man—Port Admiral Haynes, Galactic councilor and chief of staff. And Haynes could not get enough to eat because he was cutting a new set of teeth!

He cut them, all thirty-two of them. His new limbs grew perfectly, even to the nails. Hair grew upon what had for years been a shining expanse of pate. But, much to Lacy's relief, it was old skin, not young, which covered the new limbs. It was white hair, not brown, that was dulling the glossiness of Haynes' bald old head. His bifocals, unchanged, were still necessary if he were to see anything clearly, near or far.

"Our experimental animals aged and died normally," Lacy explained graciously, "but I was beginning to wonder if we had rejuvenated you two, or perhaps endowed you with eternal life. Glad to see that the new parts have the same physical age as the rest of you—it would be mildly embarrassing to have to kill two Gray Lensmen to get rid of them."

"You aren't even as funny as a rubber crutch," Haynes grunted. "When are you going to give young Kinnison the works? Don't you realize that we need him?"

"Pretty soon now—just as soon as we give you and von your psychological examinations."

"Bah! That isn't necessary—my brain's QX!"

"That's what you think, but what do you know about brains? Worsel will tell us what shape your mind—if any—is in."

The Velantian put both Haynes and von Hohendorff through a grueling examination, finding that their minds had

not been affected in any way by the stimulants applied to their pineal glands.

Then and only then did Phillips operate upon Kinnison; and in his case, too, the operation was a complete success. Arms and legs and eyes replaced themselves flawlessly. The scars of his terrible wounds disappeared, leaving no sign of ever having been.

He was a little slower, however; somewhat clumsy, and woefully weak. Therefore, instead of discharging him from the hospital as cured, which procedure would have restored to him automatically all the rights and privileges of an Unattached Lensman, the Council decided to transfer him to a physical-culture camp. A few weeks there would restore to him entirely the strength, speed, and agility which had formerly been his, and he would then be allowed to resume active duty.

JUST BEFORE he left the hospital, Kinnison strolled with Clarrissa out to a bench in the grounds.

"—and you're making a perfect recovery," the girl was saying. "You'll be exactly as you were before. But things between us aren't just as they were, and they never can be again. You know that, Kim. We've got unfinished business to transact—let's take it down off the shelf before you go."

"Better let it lay, Mac," and all the newfound joy of existence went out of the man's eyes. "I'm whole, yes, but that angle was really the least important of all. You never yet have faced squarely the fact that my job isn't done and that my chance of living through it is just about one in ten. Even Phillips can't do anything about a corpse."

"No, and I won't face it, either, unless and until I must." Her reply was tranquillity itself. "Most of the troubles people worry about in advance never do materialize. And even if I did, you ought to know that I . . . that any woman would rather . . . well, that half a loaf is better than no bread."

"QX. I haven't ever mentioned the worst thing. I didn't want to—but if you've got to have it, here it is," the man wrenched out. "Look at what I am. A barroom brawler. A rum-dum. A hard-boiled egg. A cold-blooded, ruthless murderer, even of my own men—"

"Not that, Kim, ever, and you know it," she rebuked him.

"What else can you call it?" he grated. "A killer besides; a red-handed butcher if there ever was one—then, now, and forever. I've got to be. I can't get away from it. Do you think that you, or any other decent woman, could stand it to live with me? That you could feel my arms around you, feel my gory paws touching you, without going sick at the stomach?"

"Oh, so *that's* what's really been griping you all this time!" Clarrissa was surprised and entirely unshaken. "I don't have to think about that, Kim—I know. If you were a murderer or had the killer instinct, that would be different, but you aren't and you haven't. You are hard, of course. You have to be—but do you think that I would ever run a temperature over a softy? You brawl, yes—like the world's champion you are. Anybody you ever killed needed killing, there's no question of that. You don't do those things for fun; and the fact that you can drive yourself to do the things that have to be done shows your true caliber.

"Nor have you ever thought of the obverse; that you lean over backward in wielding that terrific power of yours. The Desplaines woman, the countess—lots of other instances. I respect and honor you more than any other man I have ever known. Any woman who really knew you would—*she must! And I know!* Remember that wide-open two-way put me *in* your mind for an instant—long enough—that let me understand something of the horrible weight

you have to carry, something of the terrible power you must—for civilization—leash or release, direct and control. *I know*—no words you may say now can add to or change that single, full-view understanding I got then.

"Listen, Kim. Read my mind, all of it. You will know me then, and understand me better than I can ever explain myself."

"Have you got a picture of me doing that?" he asked flatly.

"No, you big, unreasonable clunker, I haven't!" she flared, "and that's just what's driving me mad!" Then, voice dropping to a whisper, almost sobbing: "Cancel that, Kim—I didn't mean it. You wouldn't—you couldn't, I suppose, and still be you, the man I love. But isn't there something—*anything*—that will make you understand what I really am?"

"I know what you are." Kinnison's voice was uninflected, weary. "As I told you before—the Universe's best. It's what I am that's clogging the jets. What I have been and what I have to keep on being. I simply don't rate up, and you'd better lay off me, Mac, while you can. There's a poem by one of the ancients—Kipling—the 'Ballad of Boh Da Thone'—that describes it exactly. You wouldn't know it—"

"You just think that I wouldn't"—nodding brightly. "The only trouble is that you always think of the wrong verses. Part of it really is descriptive of you. You know, where all the soldiers of the Black Tyrone thought so much of their captain?"

She recited:

"And worshiped with fluency, fervor, and zeal
The mud on the boot heels of Crook O'Neil.

"That describes you exactly."

"You're crazy for the lack of sense," he demurred. "I don't rate like that."

"Sure, you do," she assured him. "All the men think of you that way. And not only men. Women, too, darn 'em—and the very next time that I catch one of them at it I'm going to kick her cursed teeth out, one by one!"

KINNISON laughed, albeit a trifle sourly. "You're raving, Mac. Imagining things. But to get back to that poem, what I was referring to went like this—"

"I know how it goes. Listen:

"But the captain had quitted the long-drawn strife
And in far Simoorie had taken a wife;

"And she was a damsel of delicate mold,
With hair like the sunshine and heart of gold.

"And little she knew the arms that embraced
Had cloven a man from the brow to the waist;

"And little she knew that the loving lips
Had ordered a quivering life's eclipse,

"And the eyes that lit at her lightest breath
Had glared unawed in the Gates of Death.

"(For these be matters a man would hide,
As a general thing, from an innocent bride.)

"That's what you, mean, isn't it?" she asked quietly.

"Mac, you know a lot of things that you've got no business knowing." Instead of answering her question, he stared at her speculatively. "My sprees and brawls, Dessa Desplaines and the Countess Avondrin, and now this. Would you mind telling me how you get the stuff?"

"I'm closer to you than you suspect, Kim, and have been for a long time. Worsel calls it being 'en rapport,' I believe. You don't need to think at me—in fact, you have to put up a conscious block to keep me out. So I know a lot that I shouldn't, but Lensmen aren't the only ones who don't talk. You have been thinking about that poem a lot—

it worried you—so I went to the library and looked it up. I memorized most of it."

"Well, to get the true picture of me you'll have to multiply that by a thousand. Also, don't forget that loose heads might be rolling onto your breakfast table almost any morning instead of only once."

"So what?" she countered evenly. "Do you think that I could sit for Kipling's portrait of Mrs. O'Neil? Nobody ever called my mold delicate, and he would have said of me:

> "With hair like a conflagration
> And a heart of solid brass!

"Captain O'Neil's bride, as well as being innocent and ignorant, strikes me as having been a good deal of a sissy, something of a weeping willow, and no little of a shrinking violet. Tell me, Kim, do you think that she would have made good as a sector chief nurse?"

"No, but that's neither here—"

"It is, too," she interrupted. "You've got to consider what I did, and that it's no job for a girl with a weak stomach. Besides, the Boh's head took the fabled Mrs. O'Neil by surprise. She didn't know that her husband used to be in the wholesale mayhem-and-killing business. I do.

"And lastly, you big lug, do you think that I'd be making such barefaced passes at you—playing the brazen hussy this way—unless I was very, *very* certain of the truth?"

"Huh?" he demanded, blushing furiously. "I thought that you were running a blazer on me before—you really do *know*, then, that—" He would not say it, even then.

"Of course I know!" She nodded; then, as the man spread his hands helplessly, she abandoned her attempts to keep the conversation upon a light level.

"I know, my dear; there is nothing we can do about it yet." Her voice was unsteady, her heart in every word. "You have to do your job, and I honor you for that, too; even if it does take you from me. It will be easier for you, though, I think, and I *know* that it will be easier for me, to have us both know the truth. Whenever you are ready, Kim, I'll be here—or somewhere—waiting. Clear ether, Gray Lensman!" and, rising to her feet, she turned back toward the hospital.

"Clear ether, Chris!" Unconsciously he used the pet name by which he had thought of her so much. He stared after her for a minute, hungrily. Then, squaring his shoulders, he strode away.

AND UPON far Jarnevon Eichmil, the First of Boskone, was conferring with Jalte via communicator. Long since, the Kalonian had delivered through devious channels the message of Boskone to an imaginary director of Lensmen; long since he had transmitted this cryptically direful reply:

"Lensman Morgan lives, and so does Star A Star."

Jalte had not been able to report to his chief any news concerning the fate of that which the speedster bore, since spies no longer existed within the reservations of the Patrol. He had learned of no discovery that any Lensman had made. He could not venture any hypothesis as to how this Star A Star had heard of Jarnevon or had learned of its location in space. He was sure of only one thing, and that was a grimly disturbing fact indeed. The Patrol was rearming throughout the Galaxy, upon a scale theretofore unknown. Eichmil's thought was cold:

"That means but one thing. A Lensman invaded you and learned of us here—in no other way could knowledge of Jarnevon have come to them."

"Why me?" Jalte demanded. "If there exists a mind of power sufficient to break my screens and tracelessly to

They wheeled Kim out of the speedster, grim Worsel's vast strength gentle to help him into the hospital ship.

invade my mind, what of yours?"

"It is a thing proven by the outcome." The Boskonian's statement was a calm summation of fact. "The messenger sent against you succeeded; the one sent against us failed. The Patrol intends and is preparing: certainly to wipe out our remaining forces within the Tellurian Galaxy; probably to attack your stronghold; eventually to invade our own galaxy. It is well—for that reason, in part, was the Lensman Morgan sent back as he was sent."

"Let them come!" snarled the Kalonian. "We can and we will hold this planet forever against anything they can bring through space!"

"I would not be too sure of that," cautioned the superior. "In fact, if—as I am beginning to regard as a probability—the Patrol does make a concerted drive against any significant number of our planetary organizations, you should abandon your base there and return to Kalonia, after disbanding and so preserving for future use as many as possible of the planetary units."

"Future use? In that case there will be no future."

"There will be," Eichmil replied, coldly vicious. "We are strengthening the defenses of Jarnevon to withstand any conceivable assault. If they do not attack us here of their own free will, we shall compel them to do so. Then, after destroying their every mobile force, we shall again take over their galaxy. Arms for that purpose are even now in the building. Is the matter entirely clear?"

"It is clear. We shall warn all our groups that such orders may issue; and we shall prepare to abandon this base if such a step should become desirable."

So it was planned: neither Eichmil nor Jalte even suspecting two startling truths:

First, that when the Patrol was ready it would strike hard and without warning, and

Second, that it would strike—not low, but high!

XXIII.

KINNISON played, worked, rested, ate, and slept. He boxed, strenuously and viciously, with masters of the craft. He practiced with his DeLameters until he had regained his old-time speed and dead-center accuracy. He swam for hours at a time, he ran in cross-country races. He lolled, practically naked, in hot sunshine. And finally, when his muscles were writhing and rippling as of yore beneath the bronzed satin of his skin, Lacy answered his insistent demands by coming to see him.

The Gray Lensman met the flier eagerly, but his face fell when he saw that the surgeon general was alone.

"No, MacDougall didn't come—she isn't around any more," he explained guilefully.

"Huh?" came the startled query. "How come?"

"Out in space—out Borova way somewhere. What do you care? After the way you acted you've got the crust of a rhinoceros to think that—"

"You're crazy, Lacy! Why, we . . . she— It's all fixed up."

"Funny kind of fixing. Moping around Base, crying her red head off. Finally, though, she decided that she had some Scotch pride left, and I let her go aboard again. If she isn't all done with you, she ought to be." This, Lacy figured, would be good for what ailed the big saphead. "Come on, and I'll see whether you're fit to go back to work or not."

He was fit. "QX, lad, flit!" Lacy discharged him informally with a slap upon the back. "Get dressed and I'll take you back to Haynes—he's been snapping at me like a turtle ever since you've been out here."

At Prime Base, Kinnison was welcomed enthusiastically by the admiral.

"Feel those fingers, Kim!" he ex-

claimed. "Perfect! Just like the originals!"

"Mine, too. They do feel good."

"It's a pity that you got your new ones so quick. You'd appreciate 'em much more after a few years without 'em. But to get down to business. The fleets have been taking off for a couple of weeks—we're to join up as the line passes. If you haven't anything better to do, I'd like to have you aboard the *Z9M9Z.*"

"I don't know of any place I'd rather be, sir—thanks."

"QX. Thanks should be the other way. You can make yourself mighty useful between now and zero time." He eyed the young man speculatively.

Haynes had a special job for him, Kinnison knew. As a Gray Lensman, he could not be given any military rank or post, and he could not conceive of the admiral of Grand Fleet wanting him around as an aid-de-camp.

"Spill it, chief," he invited. "Not orders, of course—I understand that perfectly. Requests or . . . ah-hum . . . suggestions."

"I *will* crown you with something yet, you whelp!" Haynes snorted, and Kinnison grinned. These two were very close, in spite of their disparity in years; and very much of a piece. "As you get older you will realize that it is good tactics to stick pretty close to Gen Regs. Yes, I *have* got a job for you, and it's a nasty one. Nobody else has been able to handle it, not even two companies of Rigellians. Grand Fleet Operations."

"Grand Fleet Operations!" Kinnison was aghast. "Holy . . . Klono's . . . brazen . . . bowels! What makes you think I've got jets enough to swing *that* load, chief?"

"I haven't any idea whether you can or not. I know, however, that if you can't, nobody can; and in spite of all the work we've done on the thing we'll have to operate as a mob, as we did before, and not as a fleet. If so, I shudder to think of the results."

"QX. If you'll send for Worsel, we'll try it a fling or two. It'd be a shame to build a whole ship around an Operations tank and then not be able to use it; I'll see what I can do. By the way, I haven't seen my head nurse—Miss MacDougall, you know—any place lately. Have you? I ought to tell her 'thanks' or something—maybe send her a flower."

"Nurse? MacDougall? Oh, yes, the redhead. Let me see—did hear something about her the other day. Married? No, that wasn't it. . . . She took a hospital ship somewhere. Alsakan—Vandemar—somewhere; didn't pay any attention. She doesn't need thanks—or flowers, either—she's getting paid for her work. Much more important, don't you think, to get Operations straightened out?"

"Undoubtedly, sir," Kinnison replied stiffly, and as he went out Lacy came in.

The two old conspirators greeted each other with knowing grins. *Was* Kinnison taking it big! He was falling, like ten thousand bricks down a well.

"Do him good to undermine his position a bit. Too cocky altogether. But *how* they suffer!"

"Check!"

KINNISON rode toward the flagship in a mood which even he could not have described. He had expected to see her, as a matter of course—he wanted to see her—confound it, he *had* to see her! Why did she have to do a flit now, of all the times on the calendar? She knew that the fleet was shoving off, and that he'd have to go along—and nobody knew where she was. When he got back he'd find her if he had to chase her all over the Galaxy. He'd put an end to this. Duty was duty, of course—but Chris was CHRIS—and half a loaf *was* better than no bread!

He jerked back to reality as he en-

tered the gigantic teardrop which was technically the *Z9M9Z*, socially the *Directrix*, and ordinarily *GFHQ*. She had been designed and built specifically to be Grand Fleet Headquarters, and nothing else. She bore no offensive armament; but since she had to protect the presiding geniuses of combat, she had every possible defense.

Port Admiral Haynes had learned a bitter lesson during the expedition to Helmuth's base. Long before that relatively small Grand Fleet got there he was sick to the core, realizing that fifty thousand vessels simply could not be controlled or maneuvered as a group. If that base had been capable of an offensive, or even of a real defensive, or if Boskone could have put their fleets into that star cluster in time, the Patrol would have been defeated ignominiously; and Haynes, wise old tactician that he was, knew it only too well.

Therefore, immediately after the return from that "triumphant" venture, he gave orders to design and to build, at whatever cost, a flagship capable of directing efficiently a million combat units.

The "tank"—the three-dimensional galactic chart which is a necessary part of every pilot room—had grown and grown as it became evident that it must be the prime agency in Grand Fleet Operations. Finally, in this last rebuilding, the tank was seven hundred feet in diameter and eighty feet thick in the middle—over seventeen million cubic feet of space in which more than two million tiny lights crawled hither and thither in hopeless confusion. For, after the technicians and designers had put that tank into actual service, they had discovered that it was useless. No available mind had been able either to perceive any situation as a whole, or to identify with certainty any light or group of lights needing correction. And as for linking up any particular light with its individual, blanket-proof communicator in time to issue orders in space combat—

Kinnison looked at the tank, then around the full circle of the million-plug board encircling it. He observed the horde of operators, each one trying frantically to do something. Next he shut his eyes, the better to perceive everything at once, and studied the problem for an hour.

"Attention, everybody!" he thought then. "Open all circuits—do nothing at all for a while." He then called Haynes.

"I think that we can clean up this mess if you'll send over some Simplex analyzers and the crew of technicians. Helmuth had a sweet set-up on multiplex controls, and Jalte had some ideas that we can adapt to fit this tank. If we add them all together, we may have something."

And by the time Worsel arrived, they did.

"Red lights are fleets already in motion," Kinnison explained rapidly to the Velantian. "Greens are fleets still at their bases. Ambers are the planets the greens took off from—connected, you see, by Ryerson string-lights. The white star is us, the *Directrix*. That violet cross 'way over there is Jalte's planet, our first objective. The pink comets are our free planets, their tails showing their intrinsic velocities. Being so slow, they had to start long ago. The purple circle is the negasphere. It's on its way, too. You take that side, I'll take this. They were supposed to start from the edge of the twelfth sector. The idea was to make it a smooth, bowl-shaped sweep across the Galaxy, converging upon the objective, but each of the fleet commanders apparently wants to run this war to suit himself. Look at that guy there—he's beating the gun by nine thousand parsecs. Watch me pin his ears back!"

Some ships, attacked on every hand, watched meters climb, strain against stopping—and saw huge converters, hopelessly overloaded, vanish in gouts of atomic flame.

He pointed his Simplex at the red light which had so offendingly sprung into being. There was a whirring click and the number 449276 flashed above a board. An operator flicked a switch.

"Grand Fleet Operations!" Kinnison snapped. "Why are you taking off without orders?"

"Why, I . . . I'll give you the vice admiral, sir—"

"No time! Tell your vice admiral that one more such break will put him in irons. Land at once! GFO—off!"

"With around a million fleets to handle, we can't spend much time on anyone," he thought at Worsel, "but after we get them lined up and get our Rigellians broken in, it won't be so bad."

The breaking in did not take long; definite and meaningful orders flew faster and faster along the tiny, but steel-hard beams of the communicators.

"Take off. . . . Increase drive four point five. . . . Decrease drive two point seven. . . . Change course to—" and so it went, hour after hour and day after day.

And with the passage of time came order out of chaos. The red lights formed a gigantically sweeping, curving wall, its almost imperceptible crawl representing an actual velocity of almost one hundred parsecs an hour. Behind that wall blazed a sea of amber, threaded throughout with the brilliant filaments which were the Ryerson lights. Ahead of it lay a sparkling, almost solid blaze of green. Closer and closer the wall crept toward the bright white star.

And in the "reducer"—the standard, ten-foot tank in the lower well—the entire spectacle was reproduced in miniature. It was plainer there, clearer and much more readily seen; but it was so crowded that details were indistinguishable.

Haynes stood beside Kninison's padded chair one day, staring up into the immense lens and shaking his head. He went down the flight of stairs to the reducer, studied that, and again shock his head.

"This is very pretty, but it doesn't mean a thing," he thought at Kinnison. "It begins to look as though I'm going along just for the ride. You—or you and Worsel—will have to do the fighting, too, I'm afraid."

"Uh-huh," Kinnison demurred. "What do we—or anyone else—know

about tactics, compared to you? You've got to be the brains. That's why we had the boys rig up the original working model there, for a reducer. On that you can watch and figure out the gross developments and tell us in general terms what to do. Knowing that, we will know who ought to do what, from the big tank here, and we will pass your orders along."

"Say, that *will* work, at that!" and Haynes brightened visibly. "Looks as though a couple of those reds are going to knock our star out of the tank, doesn't it?"

"It'll be close in that reducer. They'll probably touch. Close enough in real space—less than three parsecs."

The zero hour came and the Tellurian armada of eighty-one sleek destroyers —eighty superdreadnoughts and the *Directrix*—spurned Earth and took its place in that hurtling wall of crimson. Solar system after solar system was passed; fleet after fleet leaped into the ether and fitted itself into the smoothly geometrical pattern which GFO was nursing along so carefully.

Through the Galaxy the formation swept, and out of it, toward a star cluster. It slowed its mad pace; the center hanging back, the edges advancing and folding in.

"Surround the cluster and close in," the admiral directed; and, under the guidance now of two hundred Rigellians, civilization's vast Grand Fleet closed smoothly in and went inert. Drivers flared white as they fought to match the intrinsic velocity of the cluster.

"Vice admirals of all fleets, attention! Using secondaries only, fire at will upon any enemy object coming within range. Engage outlying structures and such battle craft as may appear. Keep assigned distance from planet and stiffen cosmic screens to maximum. Haynes —off!"

From untold millions of projectors there raved out gigantic rods, knives, and needles of force, under the impact of which the defensive screens of Jalte's guardian citadels flamed into terrible refulgence. Duodec bombs were hurled—tight-beam-directed monsters of destruction which, swinging around in huge circles to attain the highest possible measure of momentum, flung themselves against Boskone's defenses in Herculean attempts to smash them down. They exploded; each as it burst filling all nearby space with blindingly intense violet light and with flying scraps of metal. Q-type helices, driven with all the frightful kilowattage possible to Medonian conductors and insulation, screwed in, biting, gouging, tearing in wild abandon. Shear planes, hellish knives of force beside which Tellurian lightning is pale and wan, struck and struck and struck again—fiendishly, crunchingly.

But those grimly stolid fortresses could take it. They had been repowered; their defenses stiffened to such might as to defy, in the opinion of Boskone's experts, any projectors capable of being mounted upon mobile bases. And not only could they take it—those formidably armed and armored planetoids could dish it out as well. The screens of the Patrol ships flared high into the spectrum under the crushing force of sheer enemy power. Not a few of those defenses were battered down, clear to the wall shields, before the unimaginable ferocity of the Boskonian projectors could be neutralized.

And at this spectacularly frightful deep-space engagement Jalte, Boskone's galactic director, and through him Eichmil, First of Boskone itself, stared in stunned surprise.

"It is insane!" Jalte gloated. "The fools judged our strength by that of Helmuth; not considering that we, as well as they, would be both learning and doing during the intervening time. They have a myriad of ships, but mere

numbers will never conquer my outposts, to say nothing of my works here."

"They are not fools. I am not sure—" Eichmil cogitated.

He would have been even less sure could he have listened to a conversation which was even then being held.

"QX, Thorndyke?" Kinnison asked.

"On the green," came instant reply. "Intrinsic, placement, releases—everything on the green!"

"Cut!" and the lone purple circle disappeared from tank and from reducer. The master technician had cut his controls and every pound of metal and other substance surrounding the negasphere had been absorbed by that enigmatic volume of nothingness. No connection or contact with it was now possible; and with its carefully established intrinsic velocity it rushed engulfingly toward the doomed planet. One of the mastodonic fortresses which lay in its path vanished utterly, with nothing save a burst of invisible cosmics to mark its passing. It approached its goal. It was almost upon the planet before any of the defenders perceived it; and even then they could neither understand nor grasp it. All detectors and other warning devices remained static, but:

"Look! There! Something's *coming!*" an observer jittered, and Jalte swung his plate.

Jalte saw—nothing. Eichmil saw the same thing. There was nothing to see. A vast, intangible nothing—yet a nothing tangible enough to occult everything material in a full third of the cone of vision! Jalte's operators hurled into it their mightiest beams. Nothing happened. They struck nothing and disappeared. They loosed their heaviest duodec torpedoes; gigantic missiles whose warheads contained enough of that frightfully violent detonate to disrupt a world. Nothing happened—not even an explosion. Not even the faintest flash of light. Shell and contents alike merely and, oh, so incredibly peaceful, ceased to exist. There were important bursts of cosmics, but they were invisible and inaudible; and neither Jalte nor any member of his crew were to live long enough to realize how terribly they had already been burned.

Gigantic pressors shoved against it; beams of power sufficient to deflect a satellite; beams whose projectors were braced, in steel-laced concrete down to bedrock, against any conceivable thrust. But this was *negative*, not positive, matter—matter negative in every respect of mass, inertia, and force. To it a push was a pull. Pressors to it were tractors—at contact they pulled themselves up off their massive foundations and hurtled into the appalling blackness.

THEN the negasphere struck. Or did it? Can nothing strike anything? It would be better, perhaps, to say that the spherical hyperplane which was the three-dimensional cross-section of the negasphere began to occupy the same volume of space as that in which Jalte's unfortunate world already was. And at the surface of contact of the two the materials of both disappeared. The substance of the planet vanished; the incomprehensible nothingness of the negasphere faded away into the ordinary vacuity of empty space.

Jalte's base, all the three hundred square miles of it, was taken at the first gulp. A vast pit opened where it had been, a hole which deepened and widened with horrifying rapidity. And as the yawning abyss enlarged itself the stuff of the planet fell into it, in turn to vanish. Mountains tumbled into it, oceans dumped themselves into it. The hot, frightfully compressed and nascent material of the planet's core sought to erupt—but instead of moving, it, too, vanished. Vast areas of the world's surface crust, tens of thousands of square miles in extent, collapsed into it, splitting off along crevasses of appalling depth, and became nothing. The

stricken globe shuddered, trembled, ground itself to bits in paroxysm after ghastly paroxysm of disintegration.

What was happening? Eichmil did not know, since his "eye" was destroyed before any really significant developments could eventuate. He and his scientists could only speculate and deduce —which, with surprising accuracy, they did. The officers of the Patrol ships, however, *knew* what was going on, and they were scanning with intently narrowed eyes the instruments which were recording instant by instant the performance of the new cosmic superscreens which were being assaulted so brutally.

For, as has been said, the negasphere was composed of negative matter. Instead of electrons, its building blocks were positrons—the "Dirac holes" in an infinity of negative energy. Whenever the field of a positron encountered that of an electron, the two neutralized each other, giving rise to two quanta of hard radiation. And, since those encounters were occurring at the rate of countless trillions per second, there was tearing at the Patrol's defenses a flood of cosmic rays of an intensity which no spaceship had ever before been called upon to withstand. But the new screens had been figured with a factor of safety of five, and they stood up.

The planet dwindled with soul-shaking rapidity to a moon, to a moonlet, and finally to a discreetly conglomerate aggregation of meteorites before the mutual neutralization ceased.

"Primaries now," Haynes ordered briskly, as the needles of the cosmic-ray-screen meters dropped back to the points of normal functioning. The probability was that the defenses of the Boskonian

citadels would now be automatic only, that no life had endured through that awful flood of lethal radiation; but he was taking no chances. Out flashed the penetrant super rays and the fortresses, too, ceased to exist save as the impalpable infradust of space.

And the massed Grand Fleet of the Galactic Patrol, remaking its formation, hurtled outward through the intergalactic void.

XXIV.

"THEY are not fools. I am not so sure—" Eichmil had said; and when the last force ball, his last means of intergalactic communication, went dead, the First of Boskone became very unsure indeed. The Patrol undoubtedly had something new—he himself had had glimpses of it—but what was it?

That Jalte's base was gone was obvious. That Boskone's hold upon the Tellurian Galaxy was gone, followed as a corollary. That the Patrol was or would soon be wiping out Boskone's regional and planetary units was a logical inference. Star A Star, that accursed director of Lensmen, had—must have—succeeded in stealing Jalte's records, to be willing to destroy out of hand the base which had housed them.

Nor could Boskone do anything to help the underlings, now that the long-awaited attack upon Jarnevon itself was almost certainly coming. Let them come—Boskone was ready. Or was it—quite? Jalte's defenses had been strong, but they had not withstood that unknown weapon even for seconds.

Eichmil called a joint meeting of Boskone and the Academy of Science. Coldly and precisely he told them everything that he had seen. Discussion followed.

"Negative matter beyond a doubt," a scientist summed up the consensus of opinion. "It has long been surmised that in some other, perhaps hyperspatial universe there must exist negative matter of mass sufficient to balance the positive material of the universe we know. It is conceivable that by hyperspatial explorations and manipulations the Tellurians have discovered that other universe and have transported some of its substance into ours."

"Can they manufacture it?" Eichmil demanded.

"The probability that such material can be manufactured is exceedingly small," was the studied reply. "An entirely new mathematics would be necessary. In all probability they found it already existent."

"We must find it also, then, and at once."

"We will try. Bear in mind, however, that the field is large, and do not be optimistic of an early success. Note, also, that the substance is not necessary—perhaps not even desirable—in a defensive action."

"Why not?"

"Because, by directing pressors against such a bomb, Jalte actually pulled it into his base, precisely where the enemy wished it to go. As a surprise attack, against those ignorant of its true nature, such a weapon would be effective indeed; but against us it will prove a boomerang. All that is needful is to mount tractor heads upon pressor bases, and thus drive the bombs back upon those who send them." It did not occur, even to the coldest scientist of them all, that that bomb had been of planetary mass. Not one of the Eich suspected that all that remained of the entire world upon which Jalte's base had stood was a handful of meteorites.

"Let them come, then," the First of Boskone announced grimly. "Their dependence upon a new and supposedly unknown weapon explains what would otherwise be insane tactics. With that weapon impotent, they cannot possibly win a long war waged so far from their bases. We can match them ship for

ship, and more; and our supplies and munitions are close at hand. We will wear them down—blast them out—the Telurian Galaxy shall yet be ours!"

ADMIRAL HAYNES spent almost every waking hour setting up and knocking down tactical problems in the practice tank, and gradually his expression changed from one of strained anxiety to one of pleased satisfaction. He went over to his sealed-band transmitter, called all communications officers, and ordered:

"Each vessel will direct its longest-range detector, at highest possible power, centrally upon the objective galaxy. The first observer to find enemy activity will report it instantly to us here. We will send out a general C. B., at which every vessel will cease blasting at once, remaining motionless until further orders." He then called Kinnison.

"Look here," he directed the attention of the younger man into the reducer, which now repesented intergalactic space, with a portion of the Second Galaxy filling one edge. "I have a solution, but its practicability depends upon whether or not it calls for the impossible from you, Worsel, and your Rigellians. You remarked at the start that I knew my tactics. I wish that I knew more—or at least could be certain that Boskone and I agree upon what constitutes good tactics. I feel quite safe in assuming, however, that we shall meet their Grand Fleet well outside the Galaxy—"

"Why?" asked the startled Kinnison. "If I were Eichmil, I'd pull every ship I had in around Jarnevon and keep it there; they can't force engagement with us!"

"Poor tactics. The very presence of their fleet out in space will force us to engage, and decisively at that. From his viewpoint, if he defeats us there, that ends it. If he loses, that is only his first line of defense. His observers will have reported fully. He will have invaluable data upon which to work, and much time before even his outlying fortresses can be threatened.

"From our viewpoint, we cannot refuse battle if his fleet is there. It would be suicidal for us to enter that Galaxy, leaving intact outside it a fleet as powerful as that one is bound to be."

"Why? Harrying us from the rear might be bothersome, but I don't see how it could be disastrous."

"Not that. They could, and would, attack Tellus."

"Oh—I never thought of that. But couldn't they, anyway—two fleets?"

"No. He knows that Tellus is very strongly held, and that this is no ordinary fleet. He will have to concentrate everything he has upon either one or the other—it is almost inconceivable that he would divide his forces."

"QX. I said that you're the brains of the outfit, and you are!"

"Thanks, lad. At the first sign of detection, we stop. They may be able to detect us, but I doubt it, since we are looking for them with special instruments. But that's immaterial. What I want to know is, can you and your crew split the fleet, making two big, hollow hemispheres of it? Let this group of ambers represent the enemy. Since they know that we will have to carry the battle to them, they will probably be in fairly close formation. Set your two hemispheres—the reds—there and there. Close in, making a sphere, like this—englobing their whole fleet. Can you do it?"

Kinnison whistled through his teeth; a long, low, unmelodious whistle. "Yes—but Klono's brazen claws, chief, suppose they catch you at it?"

"How can they? If you were using detectors, instead of double-ended, tight-beam binders, how many of our own vessels could you locate?"

"That's right, too—less than one percent of them. They couldn't tell that

they were being englobed until long after it was done. They could, however, globe up inside us—"

"Yes—and that would give them the tactical advantage of position," the admiral admitted. "We probably have, however, enough superiority in firing power, if not in actual tonnage, to make up the difference. Also, we have speed enough, I think, so that we could retire in good order. But you are assuming that they can maneuver as rapidly and as surely as we can, a condition which I do not consider at all probable. If, as I believe much more likely, they have no better Grand Fleet Operations than we had in Helmuth's star cluster—if they haven't the equivalent of you and Worsel and this supertank here—then what?"

"In that case it'd be just too bad. Just like pushing baby chicks into a pond." Kinnison saw the possibilities clearly enough after they had been explained to him.

"How long will it take you?"

"With Worsel and both full crews of Rigellians I would guess it at about ten hours—eight to compute and assign positions and two to get there."

"Fast enough—faster than I would have thought possible. Oil up your calculating machines and Simplexes and get ready."

IN DUE TIME the enemy fleet was detected and detection was confirmed. The "Cease Blasting" signal was sent out. Civilization's prodigious fleet stopped dead, hanging motionless in space with its nearest units at the tantalizing limit of detectability from the warships awaiting them. For eight hours two hundred Rigellians stood at whirring calculators, each solving course-and-distance problems at the rate of ten per minute. Two hours or less of free flight, and Haynes rejoiced audibly in the perfection of the two red hemispheres shown in his reducer. The two immense bowls flashed together, rim to rim. The sphere began inexorably to contract. Each ship put out a red K6T screen as a combined battle flag and identification, and the greatest naval engagement of the age was on.

It soon became evident that the Boskonians could not maneuver their forces efficiently. Their fleet was too huge, too unwieldy for their operations officers to handle. Against an equally uncontrollable mob of battle craft it would have made a showing, but against the carefully planned, chronometer-timed attack of the Patrol individual action, however courageous or however desperate, was useless.

Each red-sheathed destroyer hurtled along a definite course at a definite force of drive for a definite length of time. Orders were strict; no ship was to be lured from course, pace, or time. They could, however, fight en passant with their every weapon if occasion arose; and occasion did arise, some thousands of times. The units of Grand Fleet flashed inward, lashing out with their terrible primaries at everything in space not wearing the crimson robe of civilization. And whatever those beams struck did not need striking again.

The warships of Boskone fought back. Many of the Patrol's defensive screens blazed hot enough almost to mask the scarlet beacons; some of them went down. A few Patrol ships were englobed by the concerted action of two or three subfleet commanders more cooperative or more farsighted than the rest, and were blasted out of existence by an overwhelming concentration of power. But even those vessels took toll with their primaries as they went out; few, indeed, were the Boskonians who escaped through holes thus made.

At a predetermined instant each dreadnought stopped, to find herself one nut of an immense, red-flaming hollow sphere of ships packed almost screen to screen. And upon signal every primary

projector that could be brought to bear hurled bolt after bolt, as fast as the burned-out shells could be replaced, into the ragingly incandescent inferno which that sphere's interior instantly became. For two hundred million discharges such as those will convert even a very large volume of space into something utterly impossible to describe.

The raving torrents of energy subsided and keen-eyed observers swept the scene of action. Nothing was there except jumbled and tumbling white-hot wreckage. A few vessels had escaped during the closing in of the sphere, but none inside it had survived this climactic action—not one in five thousand of Boskone's massed fleet made its way back to dark Jarnevon.

"Maneuver fifty-eight—hipe!" and Grand Fleet shot away. There was no waiting, no hesitation. Every course and time had been calculated and assigned.

Into the Second Galaxy the scarcely diminished armada of the Patrol hurtled—to Jarnevon's solar system—around it. Once again the crimson sheathing of civilization's messengers almost disappeared in blinding coruscance as the outlying fortresses unleashed their mighty weapons; once again a few ships, subjected to such concentrations of force as to overload their equipment, were lost; but this conflict, although savage in its intensity, was brief. Nothing mobile *could* endure for long the utterly hellish energies of the primaries, and soon the armored planetoids, too, ceased to be.

"Maneuver fifty-nine—hipe!" and Grand Fleet closed in upon somber Jarnevon itself.

"Sixty!" It rolled in space, forming an immense cylinder; the doomed planet the midpoint of its axis.

"Sixty-one!" Tractors and pressors leaped out, from ship to ship and from ship to shore. The Patrol did not know whether or not the scientists of the Eich could render their planet inertialess, but now it made no difference. Planet and fleet were for the time being one rigid system.

"Sixty-two—blast!" And against the world-girdling battlements of Jarnevon there flamed out in all their appalling might the dreadful beams against which the defensive webs of battleships and of mobile citadels alike had been so pitifully inadequate.

But these which they were attacking now were not the limited installations of a mobile structure. The Eich had at their command all the resources of a galaxy. Their generators and conductors could be of any desired number and size. Hence Eichmil, in view of prior happenings, had strengthened the defenses of his planet to a point which certain of his fellows derided as being beyond the bounds of sanity or reason.

Now those unthinkably powerful screens were being tested to the utmost. Bolt after bolt of quasi-solid lightning struck against them, spitting mile-long sparks in baffled fury as they raged to ground. Plain and incased in Q-type helices they came; biting, tearing, gouging. Often and often, under the thrust of half a dozen at once, local failures appeared; but these were only momentary, and not even the newly devised shells of the projectors could stand the load long enough to penetrate effectively Boskone's indescribably capable defenses. Nor were the enemies' offensive weapons less capable.

Rods, cones, planes, and shears of pure force bored, cut, stabbed, and slashed. Bombs and dirigible torpedoes charged to the skin with duodec sought out the red-cloaked ships. Beams, sheathed against atmosphere in Q-type helices, crashed against and through their armor—beams of an intensity almost to rival that of the Patrol's primary weapons and of a hundred times their effective aperture. And not singly

did those beams come. Eight, ten, twelve at once they clung to and demolished dreadnought after dreadnought of the Expeditionary Force.

Eichmil was well content. "We can hold them and we are burning them down!" he gloated. "Let them loose their negative-matter bombs! Get the analysis of those beams—build them! They are burning out projectors, which means that they cannot keep this up indefinitely. They will have to retire, what there are left of them, for more munitions; and when they come back we will blast them out of space!"

He was wrong. Grand Fleet did not stay there long enough so that even the projectors of the Eich could destroy more than a few thousands of ships. For even while the cylinder was forming, Kinnison was in rapid but careful consultation with Thorndyke, checking intrinsic velocities, directions, and speeds.

"QX, Verne—*cut!*" he yelled.

Two planets, one well within each end of the combat cylinder, went inert at the word; resuming instantaneously their diametrically opposed intrinsic velocities, each of some thirty miles per second. And it was these two very ordinary, but utterly irresistible planets, instead of the negative-matter bombs with which the Eich were prepared to cope, which hurtled then along the axis of the immense tube of warships toward Jarnevon. Whether or not the Eich could make their planet inertialess has never been found out. Free or inert, the end would have been the same.

"Every Y14M officer of every ship of the Patrol, attention!" Haynes ordered. "Don't get all tensed up. Take it easy; there's lots of time. Any time within a second after I give the word will be p-l-e-n-t-y o-f t-i-m-e—*cut!*"

The two worlds rushed together, doomed Jarnevon squarely between them. Haynes snapped out his order as the three were within two seconds of contact, and as he spoke all the tractors and all the pressors were released. The ships of the Patrol were already free—none had been inert since leaving Jalte's ex-planet—and thus could not be harmed by flying débris.

The planets touched. They coalesced, squishingly at first, the encircling warships drifting lightly away before a cosmically violent blast of superheated atmosphere; Jarnevon burst open, all the way around, and spattered; billions upon billions of tons of hot core-magma being hurled afar in gouts and streamers. The two planets, crashing through what had been a world, met, crunched, crushed together in all the unimaginable momentum of their masses and velocities. They subsided, crashingly. Not merely mountains, but entire halves of worlds disrupted and fell, in such Gargantuan paroxysms as the eye of man had never elsewhere beheld. And every motion generated heat. The kinetic energy of translation of two worlds became heat. Heat added to heat, piling up ragingly, frantically, unable to escape!

The masses, still falling upon and through and past themselves and each other, melted—boiled—vaporized incandescently. The entire mass, the mass of three fused worlds, began to equilibrate; growing hotter and hotter as more and more of its terrific motion was converted into pure heat. Hotter! *Hotter!* HOTTER!

And as the Grand Fleet of the Galactic Patrol blasted through intergalactic space toward the First Galaxy and home, there glowed behind it a new, small, comparatively cool, and probably short-lived companion to an old and long-established star.

XXV.

THE UPROAR of the landing of the Tellurian contingent was over; the celebration of victory had not yet begun. Haynes had, peculiarly enough, set a definite time for a conference with Kin-

nison and the two of them were in the admiral's private office, splitting a bottle of fayalin and discussing—apparently—nothing at all.

"Narcotics has been yelling for you." Haynes finally got around to business. "But they don't need you to help them clean up the zwilnik mess; they just want to have the honor of having you work with them—so I told Ellington, as diplomatically as possible, to take a swan dive off of an asteroid. Hicks wants you, too; and Spencer and Frelinghuysen and thousands of others. See that basketful of stuff? All requests for you, to be submitted to you for your consideration. I submit 'em, thus—into the wastebasket. You see, there's something really important—"

"Nix, chief, nix—jet back a minute, please!" Kinnison implored. "Unless it's something that's got to be done right away, gimme a break, can't you? I've got a couple of things to do first—stuff to attend to. Maybe a little flit somewhere, too, I don't know yet."

"More important than Patrol business?"—dryly.

"Until it's cleaned up, yes." Kinnison's face burned scarlet and his eyes revealed the mental effort necessary for him to make that statement. "The most important thing in the Universe," he finished, quietly but doggedly.

"Well, of course I can't give you orders—" Haynes' frown was distinct with disappointment.

"Don't, chief—that hurts. I'll be back, honest, as soon as I possibly can, and I'll do anything you want me to—"

"That's enough, son." Haynes stood up and grasped Kinnison's hands—hard—in both his own. "I know. Forgive me for taking you for this little ride,

but you and Mac suffer so! You're so young, so intense, so insistent upon carrying the entire Cosmos upon your shoulders—I couldn't help it. You won't have to do much of a flit." He glanced at his chronometer. "You'll find all your unfinished business in Room 7295, Base Hospital."

"Huh? You know, then?" shouted the overjoyed young giant.

"Who doesn't?" was the admiral's quizzical rejoinder. "There may be a few members of some backward race somewhere who do not know all about you and your red-headed sector riot, but I don't happen to know—" He was addressing empty air.

Kinnison shot out of the building and, exerting his Gray Lensman's authority, he did a thing which he had always longed boyishly to do but which he had never before really considered doing. He whistled, shrill and piercingly, and waved a Lensed arm, even while he was directing a Lensed thought at the driver of the fast ground car always in readiness in front of GHQ.

"Base Hospital—full emergency blast!" he ordered, and the Jehu obeyed. That chauffeur loved emergency stuff, and the long, low, wide racer took off with a deafening roar of unmuffled exhaust and a scream of tortured, burning rubber.

"Thanks, Jack—you needn't wait." At the hospital's door Kinnison rendered tribute to fast service and strode along a corridor. An express elevator whisked him up to the seventy-second floor, and there his haste departed completely. This was Nurses' Quarters, he realized suddenly. He had no more business there than—yes, he did, too. He found Room 7295 and rapped upon its door. Boldly, he intended, but the resultant sound was surprisingly small.

"Come in!" called a clear contralto. Then, after a moment, *"Come in!"* more sharply; but the Lensman did not, could not obey the summons. She might be —dammitall, he *didn't* have any business on this floor! Why hadn't he called her up or sent her a thought or something? Why didn't he think at her now?

THE DOOR opened, revealing the mildly annoyed sector chief. At what she saw, her hands flew to her throat and her eyes widened in starkly unbelieving rapture.

"Kim!" she shrieked in ecstasy.

"Chris—my Chris!" Kinnison whispered unsteadily, and for minutes those two uniformed minions of the Galactic Patrol stood motionless upon the room's threshold, strong young arms straining, nurse's crisp and spotless white crushed unregarded against Lensman's pliant gray.

"Oh . . . I've missed you so terribly, my darling!" Clarrissa crooned. Her voice, always sweetly rich, was pure music.

"You don't know the half of it, Chris. This isn't real, I don't think. It can't be—nothing *can* feel this good!"

"You did come back to me—you really did!" she lilted. "I didn't dare to hope that you could come so soon."

"I had to." Kinnison drew a deep breath. "I simply couldn't stand it any longer. It'll be tough sometimes, but you were right—half a loaf *is* better than no bread."

"Of course it is!" She released herself—partially—after the first transports of their first embrace and eyed him shrewdly. "Tell me, Kim, did Lacy have a hand in this surprise?"

"Uh-huh," he denied. "I haven't seen him for ages—but jet back! Haynes told me—say, what'll you bet that those two old hardheads haven't been giving us the works?"

"Who are old hardheads?" Haynes —in person—demanded. So deeply immersed had Kinnison been in his rapturous delirium that even his sense of perception was in abeyance; and there,

not two yards from the entranced couple, stood the two old Lensmen!

The culprits sprang apart, flushing guiltily, but Haynes went on imperturbably, quite as though nothing out of the ordinary had been either said or done:

"We gave you fifteen minutes, then came up to be sure to catch you before you flited off to the celebration or some where. We have matters to discuss—important matters, but pleasant."

"QX. Come in, all of you." As she spoke, the nurse stood aside in invitation. "You know, don't you, that it's exceedingly much contraregs for nurses to entertain visitors of the opposite sex in their rooms? Fifty demerits. Most girls never get a chance at even one Gray Lensmen, and here I've got three!" She giggled infectiously. "Wouldn't it be one for the book for me to get a hundred and fifty black spots for this? And to have Surgeon General Lacy, Port Admiral Haynes, and Unattached Lensman Kimball Kinnison all heaved into the clink to boot? Boy, oh, boy, ain't we got fun?"

"Lacy's too old and I'm too moral to be affected by the wiles even of the likes of you, my dear," Haynes explained equably, as he seated himself upon the davenport—the most comfortable thing in the room.

"Old? Moral? Tommyrot!" Lacy glared an "I'll-see-you-later" look at the admiral, then turned to the nurse. "Don't worry about that, MacDougall. No penalties accrue—regulations apply only to nurses actually in the service—"

"And what—" she started to blaze, but checked herself and her tone changed instantly. "Go on—you interest me strangely, sir. I'm just going to love this!" Her eyes sparkled, her voice was vibrant with unconcealed eagerness.

"Told you she was quick on the uptake!" Lacy gloated. "Didn't fox her for a second!"

"But say—listen—what's this all about, anyway?" Kinnison demanded.

"Never mind; you'll learn soon enough," from Lacy, and:

"Kinnison, you are very urgently invited to attend a meeting of the Galactic Council tomorrow afternoon," from Haynes.

"Huh? What's up now?" Kinnison protested. His arm tightened about the girl's supple waist and she snuggled closer, a trace of foreboding beginning to dim the eagerness in her eyes.

"Promotion. We want to make you something—galactic co-ordinator, director, something like that—the job hasn't been named yet. In plain language, the big shot of the Second Galaxy, formerly known as Lundmark's Nebula."

"But, Klono's brazen claws! Chief, I can't swing it—I haven't got jets enough!"

"You always yelp about a deficiency of jets whenever a new job is mentioned, but we notice that you usually deliver the goods. Think it over for a minute. Who else could we wish such a job as that onto?"

"Worsel," Kinnison declared without hesitation. "He's—"

"Balloon juice!" snorted the older man.

"Well, then . . . ah . . . er—" He stopped. Clarrissa opened her mouth; then shut it, ridiculously, without having uttered a word.

"Go ahead, MacDougall—you are an interested party, you know."

"No." She shook her spectacular head. "I'm not saying a word or thinking a thought to sway his decision one way or the other. Besides, he'd have to flit around as much then as now."

"Some travel involved, of course," Haynes admitted. "All over that Galaxy, some in this one, and back and forth between the two. However, the *Dauntless*—or something newer, bigger, and faster—will be his private yacht, and I do not see why it is either necessary or desirable that his flits be solo."

"Say, I never thought of that!" Kinnison blurted, and, as thoughts began to race through his mind of what he could do, with Chris beside him all the time, to straighten out the mess in the Second Galaxy:

"Oh, Kim!" Clarrissa squealed in ecstasy, squeezing his arm even tighter against her side.

"Hooked!" the surgeon general chortled in triumph.

"But I'd have to retire!" That thought was the only thorn in Kinnison's whole wreath of roses. "I wouldn't like that."

"CERTAINLY you wouldn't," Haynes agreed. "But remember that all such assignments are conditional, subject to approval, and with a very definite cancellation agreement in case of what the Lensman regards as an emergency. If a Gray Lensman had to give up his right to serve the Patrol in any way he considered himself most able, they'd have to shoot us all before they could make executives out of us. And finally, I don't see how the job we're talking about can be figured as any sort of a retirement. You will be as active as you are now—yes, more so, I think."

"QX. I'll be there—I'll try it," Kinnison promised.

"Now for some more news," Lacy announced. "Haynes didn't tell you, but he has been made president of the Galactic Council. You are his first appointment. I hate to say anything good about the old scoundrel, but he has one outstanding ability. He doesn't know much or do much himself, but he certainly can pick the men who have to do the work for him!"

"There's something vastly more important than that," Haynes steered the acclaim away from himself.

"Just a minute," Kinnison interposed. "I haven't got this all straight yet. What was that crack about active nurses a while ago?"

"Why, Dr. Lacy was just intimating that I had resigned, goose," Clarrissa chuckled. "I didn't know a thing about it myself, but I imagine that it must have been just before this conference started. Am I right, doctor?" she asked innocently.

"Or tomorrow, or even yesterday—any convenient time will do," Lacy blandly assented. "You see, young man, MacDougall has been a mighty busy girl, and wedding preparations take time, too. Therefore, we have very reluctantly accepted her resignation."

"Especially, preparations take time when it's going to be such a wedding as the Patrol is going to stage," Haynes volunteered. "That was what I was starting to talk about when I was so rudely interrupted."

"Nix—not in seven thousand years!" Kinnison exploded. "Cancel that, right now. I won't stand for it. I'll not—"

"Close the pan, young fellow," the admiral advised him, firmly. "Bridegrooms are to be seen—just barely visible—but not heard, ever. A wedding is where the girls really strut their stuff. How about it, you gorgeous young menace to civilization?"

"I'll say so!" she exclaimed in high animation. "I'd just *love* it, admiral—" She broke off, aghast. Her face fell. "No, I didn't mean that, really. Kim's right. Thanks a million, just the same, but—"

"But nothing!" Haynes broke in. "I know what's the matter. Don't try to fib to an old campaigner, and don't be silly. I said the Patrol was throwing this wedding—*all* of it. All you have to do is to participate in the action. Got any money, Kinnison? On you, I mean."

"No," in surprise. "What would I be doing with money?"

"Here's ten thousand credits—Patrol funds. Take it and—"

"He will not!" the nurse stormed. "No! You can't, Admiral Haynes,

really. Why, a bride has *got* to buy her own clothes!"

"She's right, Haynes," Lacy announced. The admiral stared at him in wrathful astonishment, and even the girl seemed disappointed at her easy victory. "But listen to this: As surgeon general, et cetera, in recognition of the unselfish services, et cetera, unflinching bravery under fire, performance beyond and above requirements or reasonable expectations, et cetera, et cetera, Sector Chief Nurse Clarrissa MacDougall, upon the occasion of her separation from the service, is hereby granted a bonus of ten thousand credits. That goes on the record as of hour twelve today. Now, you red-headed young spitfire, if you refuse to accept that bonus, I'll cancel your resignation and put you back to work! What do you say to that?"

"I say QX, Dr. Lacy. Thanks a million, both of you—you're perfect darlings and I love all two of you!" The gaspingly happy girl kissed them both, then turned to her betrothed.

"Let's go and walk about ten miles, shall we, Kim? I've got to do *something* or I'll explode all over the place!"

And the tall Lensman—no longer unattached—and the radiant nurse swung down the hall.

Side by side, in step, heads up, laughing; a beginning symbolical indeed of the life which they were to live together.

THE END.

WATCH THIS CREEP UP IN STORIES NOW!

A CHAIN being as strong as its weakest link, metallurgists have long been interested in the actual strength of the fundamental link in metallurgy's chain: the atom-to-atom binding forces which constitute the ultimate limitation of the strength of metals. The atom-to-atom binding forces between iron atoms, if known, would tell them whether or not there were any sense in trying to make the iron crystals in a piece of metal—the present weakest link—any more tenacious.

They've found out, recently, by X-ray and crystal studies. Perhaps they're a little sorry about it all. It turns out that the "weakest" link in the ultimate chain—those atom-to-atom binding forces—make possible a steel about one thousand times stronger than the best they've ever done. They seem to have proven quite conclusively that they don't begin to know anything about making tough, strong steel. In keeping with science-fiction, many an author has discovered a miraculous new metal on some far planet, has synthesized new and unnatural atoms for super-metals, has compounded precious alloys.

Let's go back and start over. We'll just learn something about the metal we already have: steel. Then, getting that maximum known possible strength, we'll make a wire twelve thousandths of an inch in diameter which will lift an ordinary automobile, and one a quarter-inch thick to hoist wrecked locomotives. Further, using this new steel, we'll make automobiles of full size that will act like children's toys. Drop one off the roof of a building, and it will bounce. Have a full-speed, head-on collision, and after the bouncing stops we can paint out the scratches. (But the drivers will have to be mopped up in the old-fashioned way.) Spaceships with half-inch walls will scrape off the flattened remains of meteors that injudiciously attacked them—

Generally, why go looking for miracle metals? —ARTHUR MCCANN.

BRASS TACKS

I think Heinlein's character, "Pinky," is a legitimate super-calculator. Such freaks are known, and could do such a job.

Dear Mr. Campbell:

Have gnawed my fingers down to the elbow waiting for the October Astounding with "Gray Lensman." Dr. Smith's stories are always outstanding. Might remark, too, that "The Morons" was the best short story that I have ever read in Astounding.

Very often in interplanetary stories our hero, mental giant that he is, "with a little mental arithmetic" or "with a rapid calculation" computes an orbit or determines the position of a planet in nothing flat. Now, if you would give these gentlemen some super machinery to do the computing, as Berryman did in "Special Flight," all well and good. I'd swallow it without even a whimper; but when said gentry perform these feats with their own little minds I throw up my hands in holy horror. Do these authors know, perchance, how much work it is to compute even a preliminary orbit or maybe to compute an ephemeris for a single date?

Using a high-speed computing machine, the orbit will take about ten hours of work and the ephemeris about two. Such computations also require quite extensive tables, so please let's give our mental marvels at least a little equipment to aid them.

The articles I do not care for as a rule. Those that do not pretend to be technical, such as "The Other Side of Astronomy" are fine business, but all attempts to make technical discussions understandable to the lay reader make me very unhappy.

To the Rogers combination, feminine half: I do not think that women are nearly as capable of attaining prominence in the professions because of emotional disabilities. Among the gentler sex, careers appear to be little more than stopgaps to provide a living and an interest until such time as marriage occurs.

Scoop! Just obtained the October issue. "Gray Lensman" is excellent! "Space Rating" is just a little bit childish, I thought. You know: Betcha can't do this. Sure I can; but can *you* do this? "Rust," depressing but well written.

Regards Mr. Kapetansky's question as to how it happens that the same reader enjoys both Astounding and *Unknown*—I half suspect that it results from a type of wishful thinking on the part of the reader. If you will notice, almost all stories in both magazines portray one or more individuals with special powers not vouchsafed to us who live today. I believe it is the reader's tendency to identify himself with these essential supermen and hence the enjoyment from both kinds of story.—R. A. Langevin, 4111 Carthage Rd., Toledo, Ohio.

The gentleman hadn't seen Rogers' October and November covers. Maybe he'll like them.

Dear Mr. Campbell:

You wouldn't know it, but I am a prolific writer of letters to Astounding—letters that never get posted. You see, the only thing that makes me want to write is an excess of enthusiasm over something or other and a corresponding urge to say: "Thanks, John; you've done it again." And I tear them up because by about page three I realize that you are far more interested in what we temperamental and unreasonable readers don't like.

I wonder if I can write an entire letter about things I don't like. Let's see, now.

Everybody seems to be writing large-scale reports about the past year of Astounding, so I guess I'll do a bit of that.

A year of experiments—and how! Plenty of successes, a few failures, and several doubtful results that only time and unpredictable reader reaction can seal or condemn.

Your experiments with artists have been positively courageous, and the effects have ranged from brilliant to Godawful. Isip is far and away the most interesting discovery for inside work, and I would like to see him on a cover; his illustration of "General Swamp, C. I. C." suggests that he might turn in something after the style of Finlay's August painting, which took my eye in no small way.

I am also heavily in favor of the retention of the services of that lovely colorist, Graves Gladney. No matter what any dyspeptic fan may say about his June cover—and they've said plenty—he remains the best man you have for such work. His style of painting has some-

thing approaching dignity, and in July attained a degree of unsensational dramatic force that did my heart good to see.

Astounding needs that quiet forcefulness. Schneeman's astronomical cover had it, as did Finlay's spaceship engine room. It represents the lifting of science fiction from the rut of cheapness which you and the majority of your authors have left behind.

This improvement of cover painting has been, to my mind, one of the most important of the year's advances. It implies a new outlook on one of the most distrusted ugly ducklings of fiction. It's time the scoffers were shown that fantasy and artistry can mix, though as yet Astounding is alone in making the attempt.

On the other hand, how did you manage to pass Rogers' September cover? Sure, I know it has a measure of restraint and is competently drawn and respectably colored. But, oh, Lord, the lighting effects! The rays! The auras! That inexplicable staircase of purple light from ship to ship! And all this, mark you, in open space, where approximately one tenth of this pyrotechnical illumination would have been visible.

Still, I suppose you have to sleep sometimes, and such things steal by you in the still of the night.

Just as did Koll's abominable inventions for the desecration of "Pleasure Trove," and Orban's quaint little blueprints for the complete spoliation of "One Against the Legion."

Oh, yes, some dreadful things have happened this year in the fair name of art. For instance, Cartier has happened. Fling him to the Hounds and Eaters! The man either can't or won't draw. Coeurl! Forward for a drop of Mr. Cartier's id.

But, before I leave the subject of artists, let me bow humbly down and with reverence remark that the cover illustration for "Maiden Voyage" was a thing of beauty and a constant joy.

Now to the meat of the matter. The stories.

More experiments—more Campbell courage—failures, successes, and the gradual changing of the whole tone of science fiction. Something has happened! The boys are no longer content to tell a story. They are learning to write!

After all these years! I've watched science fiction grow from the first Gernsback issue back in the dark ages, when we were very young and thought a molecule was either an animal, a disease or a new kind of toothpaste. I read my first stf. story at the age of nine. (Precocious brat.) At the stalwart manhood of eleven or thereabouts I was complaining that the authors couldn't write. I used to write furious letters to Hugo Gernsback about it.

Now, at twenty-three, I'm taking my hat out of the ring. Most of them can't write yet, but they will. They've got the stuff it takes. Particularly the Berrymans, the Knights, the Gregors.

All things considered, it has been an ecstatic year for fans, due, be it noticed and checked by reference to the Analytical Laboratory, mainly to the influx of surprsingly good first efforts by boys who want to write a good story as well as make money out of it. Science fiction is their hobby and they have it at heart; and if this fiction form ever gets anywhere in the world's literary race, they will be the people who get it there. Hats off to Van Vogt, Berryman, Phillips, Del Rey, Gregor, Engelhardt, Evans and Gold.

So much for the good times. But we've had some bad ones, too. And you finished the sixth year of Street & Smith's ownership with that year's worst issue.

Now I've got something I really can get my teeth into—something that rubbed me up about nine wrong ways at once.

"Forces Must Balance."

Like the unregretted Mr. van Lorne, Wellman has tried to put over a story with an idea. What a pity! Like the regrettable Mr. Schachner in his quaintly popular "Past, Present and Future" series, he has tried to mix half-baked science with quarter-baked political ideas. A cause for national mourning—or a good, solid, forty-eight-hour bender—anything to make me forget.

Let me put it into words as near to one syllable as this bout of hopeless despair will allow me.

First of all, it requires an artist to put over an idea. If Mr. Wellman could write like Stuart or Van Vogt or De Camp, he might possibly get away with it—if the idea was good.

But, pickle my bones in molil, the idea was awful!

For instance, one assumes that the mental standard of the time was not really as far below par as the actions of some of the characters would have us believe. In which case, the World Rush would never have been allowed to happen. The planetary governments, if they were as scared of each other as Wellman went to such pains to point out, would probably have elected a combined geographical committee to survey the planet, and then divided it up between them. Or, more probably, they would have had a lovely, lovely war with rays and screens and things everywhere for Mr. Wellman's delectation.

They certainly wouldn't have chanced any one world getting it.

And the Hudspeth expedition was, of course, the crowning giggle in this edifice of demoniac laughter. Would any man really be silly enough to think he could get away with such a plan? Hitleresque in conception, but without that Teuton gramophone's amazing ability to take care of the consequences of his actions.

Let him win. Let him get his planet. Just let him. The next arrival thereupon wipes out Mr. Hudspeth with one blast from the landing jets or whatever he sits down on (this extinction also includes the other Earthmen and the perambulating carnation or dahlia or whatever it is evolution does to Martians). He then claims that the original inhabitants, being irreparable, have left the planet vacant, and claims it in the name of his government.

Even if they didn't bother to murder the man, any second-rate diplomat could have lifted the entire planet from under his nose in one conference and half a treaty.

It takes more than one bright idea to make a story. Too many authors imagine that one original thought will excuse and obliterate any amount of subsequent sloppy writing and loose thinking.

In this same issue the shorts were merely fair; not good enough to wipe away the taste of "Forces Must Balance." "Atmospherics" was far ahead of the others, picturing a possible job of the future, given the requisite conditions. But "Ether Breather" belonged more to the *Unknown* category, being barely amusing when presented as science fiction, and "Masson's Secret" might just as well have died with him, fading as it did to an obvious climax and dull ending.

"The Last Hope," on the other hand, was a breath of springtime. In contrast to that other thoroughly flagellated opus, this was a high-class example of the story setting out to sell an idea, and getting away with it. More Don Evans!

"General Swamp, C. I. C.," while not brilliant, was good, unspectacular, solid fare, very satisfying after the slightly undercooked soufflés of the shorts.

The article—a gem. But aren't they all?

In spite of this issue, the general tone of the '38-'39 year has been one of all-around improvement, seven-league-boot advancement reaching a new high—bit of metaphor mixing going on here—with "Cloak of Aesir," nearly touching it again with "Black Destroyer" and "Special Flight."

An interesting point of the year's changes has been, with the emergence of new stars, a timely fading of some old ones. Some are quietly vanishing who can't stand the pace of a swiftly evolving fiction form.

At long last the deadweights are leaving us—notably Fearn and Van Lorne—unmourned,

practically unnoticed. Schachner does not see the light so often, nor Gallun. But these two can occasionally do good work, and Gallun, at any rate, has it in him to become a master of that nostalgic prose which so well suits some stf. themes. Remember "Old Faithful"? But he got too facile with it, and slipped down the road to "Seeds of the Dusk" and "Fires of Genesis."

This careless facility is so much a besetting sin with stf. authors. But this new crop of young masters will show the old hands a thing or two before another year is out.

Burks is another whose ability goes hidden because he has to write at top speed to be sure of the rent or something. He turns out incredibilities of a J. R. Fearnian order in people like Parsons and McNab, writes a psychological mess like "Done in Oil" at nearly three times the necessary length, or, again, a vilely, badly informed piece of pseudo-historical claptrap like "The Trapper." Yet he, too, when the fit is on him can write.

This Topsyesque letter has growed. Two thousand words of fulmination and flattery. Well, it's too long ever to get into Brass Tacks, so I will just content myself with the hope that you, at any rate, being a kind-hearted guy—spread on the jam, George, spread on the jam—will have struggled thus far. For the end is in sight.

I want to throw just one last bouquet. A small one, but very lovely and rare with orchids. To Arthur McCann, for those fascinating little articles that pop out at one from odd corners and make page turning quite an adventure in case there should be one just over the leaf.

And a bunch of geraniums for Sprague de Camp. A most irritatingly knowledgeable man, but possessed of the kind of brains that Astounding needs to tell it off occasionally. I'm proud to be a fellow fan with him.

And that really does finish me off for a while. Good luck to you, John Campbell, and thanks for a great year.

Yours till the Cosmic Engineers take over—George R. Turner, 32 George Street, Fitzroy, N. 6, Melbourne, Australia.

But it's that careful working out that keeps manucripts out of the "slush pile" and checks in the mail!

Dear Mr. Campbell:

Skylark Smith, Ace Science Fiction Writer, is certainly clicking in the "Gray Lensman." It is impossible to say which serial from Smith's pen is the best—all are so well plotted and worked out that each appears the best when first read. Smith is *very* clever, he plots his stories so well that the reader seldom realizes that his plots and situations are no different than any other major science-fiction story. Each and every detail is carefully worked out and the consequence is the reader thinks he has a brand-new situation. The writing is well-done and the postulations from today's science is not overly embarrassing. However, Smith *excels* in his characterizations. When one thinks of past stories, it is characters and not action that comes to the memory. He is so clever in picturing his characters that they seem to live. For example, I don't like his heroes, they are too perfect and always succeed. His heroines are worse. You want to spank them every time they appear in the story—and yet you would give anything to meet a girl like them. Strange is the contradiction thus indulged in! But they affect me that way. I admire his villains and hope they will lick the hero—but Smith always has them lose as a sop to convention.

In the November Astounding I object to one thing in the "Gray Lensman" strenuously. Smith has Kinnison to maintain that narcotics do not affect a strong nervous system to any serious extent. He is wrong there. Alkaloids affect the stronger nervous systems in a terrible way—and even the weakest alkaloid has its bad effect. I doubt if Dr. Smith actually believes that any intelligence, no matter how great, can use alkaloids without deleterious effects. There are synthetic alkaloids that have

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been synthesized by the Research group at the University of Virginia that are so terrible that the synthesis have never been published. In fact scores are too dangerous to even include in the chemical literature—yet Kinnison makes the statement that no matter what drug he took, unless the hypothetical thionite, it could not seriously affect his great mind. Applesauce! Dr. Smith, I'm surprised at you. Can you give a good excuse for such a statement? I know that you are a good scientist and to make such a slip was probably a psychological mistake or a method to make the character of the meteor miner in keeping, but still, some who read the "Gray Lensman" *might* believe you. The adulation of your fans is sufficient to even believe such statements from your fiction characters.

Jameson's article "Space War Tactics" was very good, and he, with the help of Willy Ley, is certainly laying down tactics of space fighting not used in STF stories—because they know what can be used and the average writer can cut loose and bang away as he pleases because he figures anything goes. However, neither Ley nor Jameson has eliminated the use of rays, et cetera. The reasons rays are improbable is that we have no generators nor shields for fields. It takes too much power to run them. A cathode ray of high concentration might affect a ship at a distance, but the power loss would be terrific. Still it is possible that supersound and the heat ray can be used here on Earth. Solar concentration engines can be made to melt lead at a distance of about a hundred feet now. So although Ley and Jameson are giving us straight dope—it is well to remember that the traditional modes of warfare have changed—against the opposition of the military experts.

The November issue is very good. Also Stuart's "The Elder Gods," in the next to the last *Unknown* was great. It must have a sequel—for the hero never reached the temple.—Thos. S. Gardner, 1416 Northwest Blvd., Columbus, Ohio.

I suspect "Skinner's Constant" as being the same as the "bugger factor," defined as "that quantity which, added to, subtracted from, multiplied or divided by the wrong answer, gives the right answer." We'll put Pinkie to work.

Dear Mr. Campbell:

Tsk, tsk. We didn't think Mr. Heinlein would do such a thing. We met the gentleman once—at an L.A. S-F League meeting—he wouldn't remember us—and he seemed to be such a nice fellow, too. Even reads Cabell. And then he has to come out with something like "Misfit." It started out so well. Much better written than "Life-Line," more human interest. We especially liked the way he handled the rookies' first experience in free space. But when he started to make Pinkie a human adding machine, that was too much! Not even a slide-rule! Suppose he had to give it some sort of a twist, but he really didn't have to resort to the somewhat overdone unconscious mathematical genius angle. Oh, well, when he gets through with Pinkie, he can send him out here to work out Skinner's Constant.

Oh, yes, while we're throwing in our two cents worth, Shasta is not granite, Engelhardt to the contrary. Shasta, being a defunct volcano, couldn't possibly be granite, as granite is only formed when the liquid magma cools slowly under the surface, which definitely isn't what happens in a volcano. It's the little things that count. Have Engelhardt check with an elementary geology textbook next time. Also, while practically anything will pick up high-powered radio waves if they are at short enough range, and convert them into audio waves—the false-teeth episode sometime back at WLW—it is extremely doubtful if copper-oxide, all by its lonesome, would do so at the distance the haunted ship would be from the nearest transmitter. However, maybe we're not taking the future advancement of radio into account.

Here's one rave for you. We do think the Smith epic is all that it was built up to be—

and that's saying plenty! Even better than the original GP story. We're inclined to think that it's the editing—take a bow Mr. C.—as Smith's philosophy has been left in the story. The first GP saga was edited down so far that all that was left was a glorified action story. But we still have one beef. If the illustrations are Schneeman's new technique, we are very much in favor of the old style. This stuff looks like a hen walked across the page, dragging its claws behind it. With that new, semi-slick paper, there's no reason for tolerating scratchy drawings. Why put up with them?

A final word. Couldn't Editor Campbell do something about bringing back Author Stuart? —Murray Lesser, California Institute of Technology, Pasadena, California.

Yes, but who's going to use a slow spaceship if the enemy has fast ones?

Dear Mr. Campbell:

It seems now that the latest vogue in science-fiction stories is that of rocket-racing, and it is only natural that you should secure the best of that type yet published. By this, I refer to the clever and well-written "Habit" by Lester del Rey in the November issue. This excellent little piece has that "certain something" that sets it off as a typically Astounding story. I honestly believe that were I given an armful of untitled, anonymous, and as yet unpublished manuscripts, I could tell within ninety percent or better which would find refuge in Astounding and which would go to your umpteen competitors. It's style, not plot, that makes Astounding the "class magazine" that it is.

May I add a line or two to the rumpus stirred up over the merits of the "General Swamp" serial. To my mind it ranks with the best of any two-part serial yet published. It's handling was so uniquely different that it captivated me from the very start. It was realistic to the point of having me half believe I was reading actual reports and military accounts! Kick on the hard-to-pronounce names? Not me! surrounded as I am by left-over handles of the Indian period—Skowhegan, Messalonskee, Norridgewock, Kennebec, Mooselookmeguntick, Cobbseecontee, et cetera. How does Arkgonactl and Golubhammon compare with these?

Space war articles and letters by Ley and Jameson appeal greatly to me, despite the fact that they hopelessly destroy—and quite logically, too—my pet dreams of flashing ray battles in the void. But wouldn't two ships traveling a parallel course at equal or near equal speeds be visible to one another? Jameson seems to think not. Also comes up again the slow-speed spaceship theory that blasts the seven-mile-per-second principle—page 70 of "Space War Tactics"—off the records. Still, Jameson accepts that, too, . . . ?—James S. Avery, 55 Middle Street, Skowhegan, Maine.

To follow the Skylark tradition, Seaton would have to be made stronger than he already is. Then what danger could menace him?

Dear Mr. Campbell:

Sending letters your way is, I fear, showing signs of developing into a habit. But what can I do? Your own habit of turning out top-notch issues every month is very largely to blame. And the November number is no exception.

Illustrations, first. Rogers' cover definitely rates; far better than his October job—good as that was. With the possible exception of Brown's memorable first cover for "Skylark of Valeron," it is probably the best expression yet of the true power and "feel" of Dr. Smith's epic tales. Schneeman somehow disappoints. I'm still of the opinion that Wesso and Dold are the only black-and-white artists who can really do justice to Dr. Smith. In support of which, I offer Wesso's illustrations for "Galactic Patrol" and "Skylark Three"—remember the fourth-order projector in installment two?—and Dold's for "Skylark of Valeron."

"Gray Lensman." Ultra-super-ultra; and getting better all the way. I wonder if Dr. Smith could be induced to do another Skylark? Or has Seaton really settled down to a stay-at-home existence?

"Space War Tactics." Excellent—but I still like rays.

"Misfit." Somewhat thin, but very well handled.

The remainder run about even; with the exception of "Spacewreck," which didn't quite click with me. I rather doubt the credibility of such drugs as poinaud. But then, there's no accounting for tastes.—A. Arthur Smith, Queen's University, Kingston, Ont., Canada.

Try him out on "If This Goes On—"

Dear Sir:

Being an avid science-fiction fan, for years I have eagerly read every science-fiction magazine on the market and I wish to tell you that Astounding ranks first in my judgment. Your magazine, fortunately, has veered away from the fairy-tale type of story which the other magazines have permitted.

This is my first fan letter, and the reason for it is your new serial "Gray Lensman." Here at last is science-fiction at its best. Here at last is the type of science-fiction story I am not ashamed to show to my skeptical friends. It is well-written and never once departs from the lines of science-fiction into fairy tale.

You see, my husband has often chided me about my avid interest in science-fiction, and to be truthful I have never dared before ask him to read one of the stories for fear of his contempt and I have been seeking the proper material to present to a "doubter." However, I have found it in the "Gray Lensman," and I feel that after he has read it, he will respect science-fiction, and who knows, maybe some day he will become as bad as I am and read every line, every story, good or bad.—(Mrs.) Blanche Dobrow, 621 West End Ave., New York City.

Which reminds me—the Greek term for a course in mathematics and science was "Music" course.

Dear Mr. Campbell:

The September Astounding was a good issue, combining quality and variety.

As a student of music, both practical and theoretical, I was interested in the allusions in "The Ether Breathers" to five-beat rhythms and quarter-tones. Although such things are not as far in the future as, say, three-color television, the idea of their supplanting present methods of music-making is still questionable. One, two and three beat rhythms seem to come naturally to us; four, six, eight, nine, twelve and sixteen-beat bars are simply built up of them When orchestra men hit a five-beat bar they invariably count it as one group of three beats and one of two, unless they want to lose their place in short order, and spend the rest of the rehearsal trying to find where the rest are. But five-beat has been used; the most celebrated instance is the slow movement from Tschaikowsky's Sixth Symphony, the "Pathetique," and there are few more tuneful or graceful pieces.

Experiments with quarter-tones are discouraging, as a half-tone is about the smallest interval many people can hear—although trained musicians can distinguish tenth- or twentieth-tones. The effects of chords in a quarter-tone scale range from "very beautiful" to "extremely discordant" and many effects are possible with this scale which are not attainable otherwise.—Charles H. Chandler, 920 College Avenue, Wooster, Ohio.

SCIENCE DISCUSSIONS

Experts transposed?

Dear. Mr. Campbell:

That the problems of space war and space war tactics are infested with wide gaps of knowledge and with difficulties of all kinds is proven by one fact: *I* recommend guns, while an old gunnery expert like Malcolm Jameson prefers rocket torpedoes! If it were the other way round, nobody would be surprised.

My reasons for recommending guns were already stated in my article "Space War," the principal one being that guns with ammunition are lighter and less bulky than rocket torpedoes, provided that an appreciable number of rounds is to be carried. And since my comparison was based on rocket torpedoes capable of attaining the same velocity as gun projectiles, I think that the argument is still valid, if the torpedoes were to attain higher speeds they would be still heavier and still bulkier.

Answering first to Mr. Jameson's letter I hasten to assert that I do not think that the weight of large caliber guns could be reduced very much, unless by the use of new alloys. I was speaking of small guns, 75 millimeter and less, and I still hold that I am right. The new anti-tank guns in all armies prove that point; they are much lighter than anything built so far. (I may add that those of the Swiss army are also equipped with a recoil eliminator.) And that they are effective enough has meantime been demonstrated by the new 37-millimeter anti-tank guns of the U. S. army that "disintegrated" 1½-inch steel armor plate at a thousand yards without a moment's hesitation. That 1,000-yard range means, of course, in air —for space conditions it might safely be multiplied by a hundred or even more.

As far as tactics of combat are concerned, I, having neither experience nor theoretical training, have to be quiet. I cannot help but feel, however, that the tactics of sea or aërial combat do not apply to a very great extent. We always have to bear in mind that an orbit in space and a course in air or on the high seas are not exactly the same. Spaceships are not steamers that travel at will, but rather canoes in swift and powerful currents. These canoes have paddles that permit some movement at will and some steering, and if the "currents" were not as regular and as calculable as they are the case would be hopeless.

Spaceships, therefore, will either pass each other in opposite directions and at such relative speeds that hardly anything could be done, or else they will follow about the same course and by necessity have about the same velocity. It is the latter condition I had in mind, and it is in that condition where guns will be advantageous. Mine laying is, of course, a nice idea, but again I do not quite see why mines should be superior to guns, generally speaking. Mr. Jameson is trying to do something that is very hard to do when he proposes that the space mines, or iron pellets, should be "shot out of mine-laying tubes clustered about the main drive jets. They would be shot out at slight angles—and given a velocity exactly equal to the ship's speed, so that they would hang motionless where they were dropped." The latter does not hold true exactly; the pellets would at once start moving in the general direction of the Sun—if they are exactly motionless it would be the exact direction toward the Sun—but since that movement would be very slow at first and the enemy ship reaches the area of the mine field in a few seconds, that factor can be disregarded. What bothers me is the problem how the mines could be shot out with a velocity exactly equal to the ship's speed. That speed is assumed to be about 20—25 miles per second. Muzzle velocities of guns will be between one and—possibly—one and a half miles per second. And even the gas molecules in the rocket exhaust do not travel faster than, say, three miles per second. If a method could be found to shoot the space mines away from the ship with 20—25 miles per second, that method should be applied to throw shells.

Since I have started criticizing other people's ideas, I might as well say a few words about Robert Heinlein's enjoyable story "Misfit." Generally speaking, I think that moving an asteroid for the purpose of using it as a station in space is a very wasteful business. It would take much less fuel to transport building material to the chosen spot in space from Earth or Mars. An asteroid possesses an awful amount of useless mass that has to be transported, and each pound of mass requires so and so much fuel. It is somewhat like moving a large mountain from one continent to another because there is a forest growing on top of the mountain and the larger trees of that forest are to be used to build a raft.

But even if we concede to the waste of fuel to move the asteroid, there is no reason to waste more than half of that fuel in giving "88" "a series of gentle pats, always on the side farthest from the Sun." What has to be accomplished is to slow down the orbital velocity of the asteroid so that the gravitational attraction of the Sun gets the upper hand and draws it closer. Which is done most effectively in setting off the rocket charges in such a way that they point "ahead," at right angles to the line drawn from the asteroid to the Sun. The resulting movement would be along an elliptical curve—somewhat distorted, to be sure—but not a hyperbolic curve. And there is no need for such unnecessary accuracy. If the asteroid should finally possess a few hundred feet of orbital velocity more or less, is really unimportant. It would make a difference of ten or twenty miles—or even fifty or a hundred—in the average distance from the Sun. There is no reason why that should matter, just as it does not matter whether an island in the Atlantic Ocean is half a mile farther west or not; it only matters that captains know where it is. Besides, the orbit of the asteroid could be corrected at any time, if desired. But I wouldn't move asteroids at all.

I wish to say "thank you" to Mr. E. Franklin of Jamaica Plain for his nice and interesting letter in the October issue. The real trouble with articles is that they have to be shorter than the "Gray Lensman."—Willey Ley, 35-33 29th St., Long Island City, N. Y.

Maybe there ARE two moons!

Dear Mr. Campbell:

I have just read Herr Ley's article on the Earth's second moon, if any. As usual with his writings, it is very interesting, but there is an interesting bit of data which he overlooked, or perhaps he just didn't think it was worth using.

In *Popular Astronomy*, vol. 31, p. 362, there is a brief communication by one R. M. Moran, who says that he saw a small black object cross in front of the moon at one time, and he gives certain data concerning it. On page 418 of the same volume W. H. Pickering calculates from the data that the object could be a meteoritic satellite whose distance from the Earth's center is 6,500 miles. Its diameter is 235 feet and its orbital velocity is 3.5 miles per second, which makes its period 180 minutes. Another possibility is a bird at an altitude of 3.25 miles, flying at a velocity of fifteen miles an hour. He seems to incline to this explanation, but Mr. Moran says he has seen lots of birds, but this didn't act in the same way. For my part, I wonder if a bird could exist at such an altitude. Birds have a higher body temperature than humans, and therefore must consume oxygen at a greater rate, yet a man can't get along very well at that altitude, and besides, this "bird" is exercising.

On pages 406-407 of volume 30 of the same publication there is some further circumstantial evidence for a second satellite for the Earth, namely that certain otherwise unexplained spots on the sun seem to be related. Mr. Worthington also points out the curious fact in his article that Jupiter's fifth moon is 2.6 radii from the planet's center; Phobos is 2.76 radii from Mars' center, and the outer edge of Saturn's ring is 2.49 radii from Saturn's center. By analogy the Earth might be expected to have a satellite at a similar distance. If this distance were 2.66 Earth radii, the period would be six hours.—John Davis Buddhue.

Maybe Disney will now introduce Lemuel Locomotive?

Dear Mr. Campbell:

I attended a lecture on the "vocoder" the other night—that being the name for the gadget described in a recent filler in Astounding. I thought you might be interested. Your filler didn't cover the half of its possibilities—particularly its possibilies for radio and movie sound tricks.

Basically, as the filler explained, the vocoder is a voder plus an automatic analyzer to operate it. The voder being an electrical equivalent of the voice mechanism of a human being, the "coder" part might be compared to the nerves which activate the mechanical voice system the human uses. Notice it still lacks a brain, which leaves room for the robot specialists.

The human voice system involves a power source (compressed air from the lungs), a tone-

producer (the vocal cords) and a buzz-hiss producer (the tongue and teeth), and finally, a series of resonators (the cavities of the mouth and nasal chambers). Step for step, the voder corresponds: a power source (electric in this case), a tone producer (an oscillator tube), and buzz-hiss producer (a trick electrical circuit involving more radio-type tubes) and a series of resonators—electrical tuned circuits.

The vocoder adds mechanisms that break down an electrical voice—voice picked up by a microphone, in other words—into the elements it's made of, meters these components, and stimulates the voice mechanism of the voder part of the apparatus to reproduce them. Being considerably more potent and diversified than a human's voice system, the voder can, when activated by a vocoder system, reproduce not only the human voice to a high degree of perfection, but can, all by itself, produce a whole chorus of voices, and even render an excellent reproduction of a pipe organ or an orchestra, which is somewhat beyond the abilities of the best trick voice artists.

So much for the straight stuff; the fun really begins when you start letting the "nervous system" go haywire—let the "nerves" from the vocoder part to the voder—the speaking part—get somewhat crossed in transit. Of course, you could simply upset them, so that where a buzz should be a tone appeared, and where a tone should be, a buzz appeared. That's too scrambled to be at all intelligible. It's more fun to simply shift the voice up or down the scale. A normal male voice works around 125 cycles; a terrific basso-sub-profundo would go down to perhaps 50 cycles. The voder considers that something of a prissy falsetto, and comes forth with something that would do credit to a loquacious mountain; 25 cycles.

On the other hand, by crossing the "nerves" the other way, the normal male voice can be bounced up to, say, 525 cycles—which is really a remarkable sort of voice to hear apparently issuing from a man. A small child with an unusually high falsetto might get somewhere near there.

Also, they can put a ripple in the voice. A six-cycles-per-second ripple turns a normal baritone voice into a pleasantly rippling baritone voice. Boost the frequency to ten a second, and, lo! it's an old man's quaver.

But there are other tricks, too. For instance, a phonograph record can be used to supply the sound energy and the tone, while, by speaking into a microphone, a man's voice can be used to control the resonance and modulation of the sound supplied by the record. Examples: The chuff-*chuff-CHUFF* of a locomotive is modulated by the man's voice to: "Hhhi'm hha traihn." The effect is that the locomotive speaks with a locomotive's natural voice! The zooming roar of a diving plane is modulated to produce a zooming cry of "Look out below—I'm going to CRASH!" The dull, monotone hum of a generator mumbles and mutters in a deep, droning voice: "I am the voice of poooooower—I am the pooower that gives you liiiiights and heeeaat—"

Most effective and almost equally incredible, Walt Disney will undoubtedly have no end of fun making locomotives, airplanes, clocks, automobiles, anything that makes a noise of any kind, start talking with that noise. Also, since the same trick can be used to modulate the sound of a pipe organ, a singer can be given a whole pipe organ in the back of his throat to sing with. The possibilities of combining pure and beautiful tones with modulations impressed by human voices open out fields for unique and incredibly effective singing. Imagine the pure, liquid tones of a marimba or zylophone given voice!

Then, too, of course, a voice proportionately squeaky for one of Disney's insects, or from the sub-basement of tonal range, proper for a mountain or cave can be manufactured. Bees, mosquitoes, and such noisy insects will, of course, talk with their natural voices, however.

And, besides its entertainment features, there is the communications system possible by its use, as the filler in Astounding explained.—Arthur McCann, 761 Scotland Road, Orange, N. J.

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