

# ASTOUNDING

OCT. '42

*Science-fiction 25c*



## LUNAR LANDING

BY LESTER DEL REY

OCTOBER  
1942

A STREET AND SMITH PUBLICATION

Pityrosporum ovale, the strange "bottle bacillus" regarded by many leading authorities as a causative agent of infectious dandruff.

TELL-TALE FLAKES?

ITCHY SCALP?

UGLY SCALES?

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# ASTOUNDING

## SCIENCE-FICTION

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Contents for October, 1942, Vol. XXX, No. 2

John W. Campbell, Jr., Editor, Catherine Tarrant, Asst. Editor

### Novelettes

- LUNAR LANDING** . . . . . **Lester del Rey** . . . . . 9  
 They set out to rescue the first ship ever to land on the Moon—and found it wasn't the first by a long shot. The Moon seemed, for a while, a pretty busy place—
- ANACHRON, INC.** . . . . . **Malcolm Jameson** . . . . . 56  
 Selling the goods of an overproducing world to all the ages via time machine was a noble idea—but door-to-door salesmen in medieval France had certain difficulties—
- QRM—INTERPLANETARY** . . . . . **George O. Smith** . . . . . 109  
 Interference isn't always electrical in nature, even when it's man-made and interferes with interplanetary radio.

### Short Stories

- WARRIORS' AGE** . . . . . **Peter Risk** . . . . . 32  
 A glimpse into another age—another culture and a deadly way of life.
- THE SECOND SOLUTION** . . . . . **A. E. van Vogt** . . . . . 41  
 If a thing must be invented or discovered, if the knowledge of the race is great enough to do the job—then someone, or perhaps some two, will stumble on it inevitably. One man learned the Ezwals—
- THE WABBLER** . . . . . **Murray Leinster** . . . . . 85  
 Robots are mechanisms capable of carrying out assigned tasks. The Wabblers was one—assigned to the task of committing suicide in a particularly devastating way.
- THE BEAST** . . . . . **L. Ron Hubbard** . . . . . 100  
 There in the jungles of Venus the Beast had to be killed—not only because it murdered, but because it had stolen something he couldn't live without—an intangible, absolutely necessary thing—

### Articles

- THE PARIS GUN** . . . . . **Willy Ley** . . . . . 50  
 The Paris Gun was not the Big Bertha—but it was big, a scientific achievement of the first order—and a military flop of the first rank!
- LATE-MODEL STARS** . . . . . **R. S. Richardson** . . . . . 90  
 You see them every clear night; astronomers study them for a lifetime. And what makes them tick? To date, the guesses are numerous, varied, and not quite satisfying—

### Readers' Departments

- THE EDITOR'S PAGE** . . . . . 6
- THE ANALYTICAL LABORATORY** . . . . . 40  
 An Analysis of Readers' Opinions.
- IN TIMES TO COME** . . . . . 83  
 Department of Prophecy and Future Issues.
- BRASS TACKS** . . . . . 108  
 Concerning Purely Personal Preferences.

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# THE LAST STAND

The current verdict of actions all over the world seems to be that the battleship is doomed, an extinct species headed for the last resting place in history books. The airplane has done the job, has won time after time when the attack has been pressed home without hesitation. (It might be noticed, in passing, that the terrible Nazis had not, in two years of war in narrow waters, succeeded in sinking a single battleship by airplane action. The mighty Luftwaffe fliers could press home the attack without stint when it was against a defenseless town, but seemed to have been decidedly less determined in the face of the vicious defense of a battle fleet.)

The verdict may or may not be final; at present it is unquestionable. As of 1942, the battleship cannot face air attack, if the attackers have the determination necessary. It is only fair to add that, as of 1942, nothing can face air attack if the attackers have the determination necessary—unless the thing is so large that sheer area makes its destruction impracticable. Aircraft carriers, airplanes themselves, cruisers, destroyers, submarines, tanks, field guns and anti-aircraft batteries are all standard targets for planes—and all types have been thoroughly chewed up by planes.

The battleship resembled, to man's military weapons, the status of the elephant in animal life. An elephant was too big, too powerfully armed and armored, for anything but another elephant to attack effectively. Natives killed them by hidden pitfalls, as submarines killed battleships by stealth. The airplane has acted somewhat as a high-power elephant rifle, making size alone of no great aid in defense—even, a positive menace by attracting attention.

But now there is nothing in the armory that can stand up and slug it out with its own kind, unmindful of the buzzing little things about. There is no backbone to modern fleets—the airplane is as vulnerable as its victim; the carrier more fragile by far than the battleship it replaces as capital ship.

Temporarily, the airplane wins. Given an automatically operated gun—trained by electric eyes working through an electric brain to make electric muscles operate—the battleship will be the capital ship again, immune to the attack of airborne midges behind its fly-screen of electrically launched destruction. Whether that automatic gun will be perfected before this war ends, we can't know.

But it makes no difference; the airplane is a fragile, ephemeral thing. This is, perhaps, the Airplane War—the first in which the airplane held total domination in every field—and the last.

The airplane is already approaching its critical point—the speed of sound. The propeller is rapidly losing efficiency as the tips travel near, and beyond the speed with which smooth, orderly airflow is possible. A little more speed and the wings themselves will be involved in air speeds beyond the speed at which air can act as a normal fluid. The plane as a whole doesn't have to reach sound speed for this to happen; the principle of the wing depends on the fact that the air moves faster across the top of the wing than it does across the bottom. That difference in relative speed generates the lift that sustains the plane.

Evidently faster flying machines will have to be something other than airplanes. Jet propulsion, whether true rocket or modified rocket, is rapidly coming into the realm of necessities rather than possibilities. Where the true rocket hurls out an exhaust jet composed entirely and only of the gases generated by the rocket combustion, the modified rocket or jet-propelled type uses largely the surrounding air as a source of exhaust mass. The true rocket uses its own, self-contained mass, violently ejected, to supply the driving kick. The jet, or modified rocket, uses outside mass which it picks up, accelerates, and throws out.

The latter system is useless—impossible—in space, but has very great advantages in an atmosphere. It permits a far more efficient use of fuel, since the fuel need supply only energy, and doesn't have to supply both energy and exhaust mass. If the fuel is forced to supply both, the limitation on the mass the ship can carry means that the ejected mass must be used as efficiently as possible. The kick, the drive, supplied by a rocket is measured by the product of the mass ejected times the velocity of ejection. The faster the exhaust, the less mass you need for a given amount of push. But the energy carried out in the exhaust increases as the *square* of the velocity; the higher the velocity of the exhaust, the less efficient the use of energy. The same amount of energy, used to accelerate more mass to a lower speed, would give equal push—a big amount of mass times a small velocity equaling a small mass times a very high velocity—but, if self-contained mass alone is used, the available supply would be rapidly exhausted.

The jet system picks up local mass—air—and exhausts tons of it at comparatively low velocities. The same formulas apply, but the use of energy is immensely more efficient. In air, a jet-propelled ship could have far greater cruising range than a rocket, and yet have just as great a speed.

Probably the next step in flying-machine design

will abandon the propeller-engine combination as we know it, and as the Wrights knew it. The step after that is abandonment of the wing; it can be replaced by vertically operating jets that have no inherent speed limitations.

The wings will have to remain, perhaps, as stubby balancing and directive fins. At first they may remain as collapsible devices for use in starting the plane off the field; later the jet-lift will have to replace them as higher and higher speeds are demanded.

But this war is the last stand of the winged airplane, the flying machine that, like all early developments of a mechanical nature, is a hard, complicated way of doing a simple thing.

The airplane requires an internal-combustion engine of high efficiency—a device of immense and marvelous complexity that, in cold fact, is the ultimate triumph of a sort of Goldbergian gadgetry. If you think of it a moment—this piston here goes down, and pushes this crank like that, and the crank is geared to this shaft so that when it gets *here*, this cam pushes this rod that works that rocker to push the valve open until the cam turns around to— Pure Goldbergmism. And that doesn't even mention the magneto that generates current to run the spark plugs, or the supercharger, or the—

A jet-propelled plane could, quite literally, be designed to function with a home-style furnace oil burner as the engine. The usual small-home type oil burner, incidentally, is approximately a seventy-horsepower heat engine. Nobody ever really tried to see how light a high-capacity oil burner they could make. I'd imagine a good five-thousand-horsepower burner ought not to weigh much more than two hundred pounds, though. It has so much less tendency toward things going this way so that this can go that way while the other thing opens up here.

Also, the fundamental principle of the jet is immensely simpler than that of the airplane wing. It inherently lends itself to a streamlined shape. And if some real research and study of jet design can't beat the efficiency of internal-combustion engines, man's ingenuity is gone. It was reported here a while back that the exhaust heat of gasoline engines was being used in special duct systems to produce additional thrust by jet action. The present type of engine has a cooling system—one of the severest limitations in gas-engine design, and a magnificent confession of extravagant waste. The gas engine is a heat engine, supposed to convert heat energy into mechanical energy. The cooling system is used to throw away most of the heat the fuel provides for the functioning of the machine.

A jet-system "engine" uses the heat energy in the simplest, most direct way. Since the principle

involves immense dilution of the high-speed, super-heated rocket-type exhaust with huge masses of cold air to produce the final exhaust, practically all the available heat energy can be made to perform useful work.

The jet-propelled plane's "engine" should, theoretically, show an efficiency even higher than that of the turbine. The efficiency is limited by the temperature drop between the heat source and the exhaust—the high-pressure super-heated steam input and the low-temperature, low-pressure exhaust in the case of the turbine. In the jet engine, the starting temperature would be much higher; steam cannot practically be heated to the temperature of a jet of blazing oil. The finishing temperature should not be much above 150° F.

Compare with the exhaust of a gas engine, which comes out so hot the exhaust stacks glow red-hot!

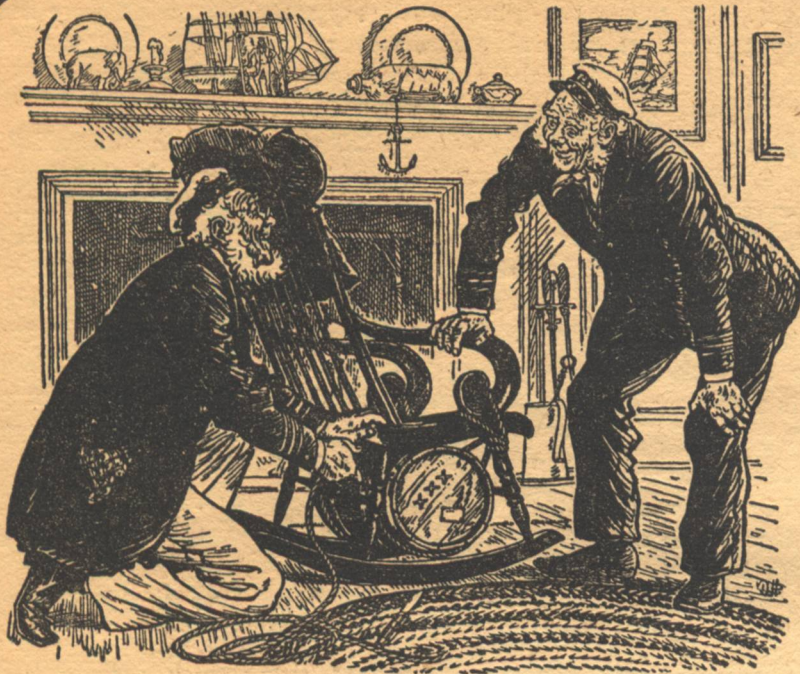
The increased efficiency of the jet-type ship will have another and interesting effect; at lower cruising speeds—down around five hundred m. p. h.—the jet-type ship would be very nearly noiseless, whispering along with not much more than a rustle of wind. Properly designed, with airflow as smooth as ingenuity can devise, the air would make little fuss about its passage. The jet itself, if efficient, is *noiseless*. A rocketship might well take off with a roar; the type is inefficient in an atmosphere and the inefficiency appears as sound.

But at one thousand m. p. h.! Nothing man has ever known could approximate a description of the unholy uproar such a ship would produce unless equipped with something beyond streamlining as now known. Thunder is caused by the air rushing into the partial vacuum created when a bolt of lightning literally blasts a hole through the atmosphere. At one thousand m. p. h., an imperfectly shaped ship would be drilling a hole through the air; behind it would be a nearly total vacuum where the displaced air was unable to fill in the space vacated by the advancing machine. If you can conceive of a continuous one-hundred-mile-long bolt of lightning five to eight feet in diameter passing overhead from one horizon to the other in about three minutes—some vague notion of what a one-thousand-mile-an-hour ship might sound like may be suggested. A machine like that would sort of demand a name—perhaps "The Lightning" or "The Thunderbolt."

Rough calculation suggests it would need some three and a half *million* horsepower to drive it, if it did that, however.

But in any case, as of today, the battle plane has the battleship licked. The battleship, modified and improved, will probably come back. The airplane—the flying machine depending on wings, engines, propellers, the invention of the Wrights—is fighting its last war.

The Editor.



**CAPT. POE (1807 - 88)**, like other old salts, often lashed a keg of whiskey beneath his rocker and rocked it mellow. He recaptured the rolling motion of his ships at sea on which he'd mellowed many casks of whiskey.

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# LUNAR LANDING

By Lester del Rey

● It was to rescue the first man-carrying ship to land on the moon that they'd made the voyage. But, though only one aboard knew it—not at all the ship they thought they were to rescue!

Illustrated by Kolliker

## I.

Grey's body was covered with a cold sweat that trickled down from his armpits and collected in little round drops over his body, and he stirred in his bag, crying out faintly. The sound of his own voice must have wakened him, for he came

out of the dream of falling endlessly, to a growing consciousness. The falling sensation still persisted, and he made an unconscious frantic gesture toward something to stay his fall; then his hands met the loose webbing of the bag, and he grimaced.

Even without the feel of the webbing, the reac-

tion of his motions should have told him where he was, as his body shot back against the opposite surface of the sack; this was space, where gravity had been left far behind, except for the faint fingers of it that now were creeping up from the Moon, and pulling him slowly back to the top of the bag. For a few seconds he lay there, grinning slightly at the thought of the stories he'd read in which lack of gravity had set the heart to pounding wildly, or the stomach to retching. Space wasn't like that, he knew now, and should have known before. It was simply like the first few moments of free fall, before the parachute opened; sort of a peaceful feeling, once you realized fully there was no danger to it. And the heart was freed from some of the effort needed, and adjusted to a calm, easy pumping, while the stomach took it all in stride. It hadn't been absence of gravity, but the shifting of it that made seasickness.

Of course, his ears felt odd—there had been a dizziness that increased slowly as the liquids inside were freed from the downward pull, but the hours in the acclimating chamber had done their work, and it soon passed. Mostly it was a matter of mental adjustment that overcame the old feeling that somewhere had to be down, and recognized that all six walls were the same. After that, space was an entirely pleasant sort of thing.

With loose easiness of motion necessary here, he reached up and unfastened the zipper above him, then wriggled out of his sleeping sack, and pulled himself down to the floor by means of the ropes that were laced along the walls for handholds. The room was small and cramped, heavy with the smell of the human bodies that hung now in other sacks along the sides, and loud with the snores of Wolff and the hiss of the air-conditioning machine.

"Is that you, Grey?" One of the bags opened, and Alice Benson stuck her head out, smiling calmly at him.

Somehow, looking at her, he could never feel the impatience he should; she was too old and fragile to be making such a trip, especially since there seemed neither rhyme nor reason to her presence, and yet the utter normality of her conduct under the conditions was strangely soothing. In the cramped, stinking little cabin of the *Lunar Moth*, she was still possessed of a mellowed gentility of bearing that concealed the air of urgency he'd sometimes suspected.

"Yes, ma'am." Unconsciously, the few manners he'd learned leaped to the surface around her. "Why aren't you asleep?"

She shook her head slowly, the faintest of grimaces showing in the corners of her mouth. "I couldn't, lad. I've been living too many years with something under me to adjust as well as you youngsters do. But, it has its compensations;

I've never rested so well, whether I sleep or not. Would you like some coffee?"

He nodded, pulling himself carefully along the ropes that made handholds while she removed a thermos bottle from a locker and replaced its cork with another that had two straws inserted through it. Above her, Wolff went on snoring in a particularly horrible gargling manner, and she glanced up distastefully at his sack but made no mention of it. Grey took the coffee gratefully, drinking slowly through one straw; cups would have been worse than useless out here, since liquids refused to pour, but chose to coalesce into rounded blobs, held in shape by surface tension.

"Ralston's already gone out to the engines," she answered his glance at the empty sack. "And June's still in the cockpit. The rest are all asleep; I put a sedative in their broth, so they wouldn't be awakened during the landing. I'll take a mild one myself after you start reversing, so you needn't worry about us here."

Grey finished the coffee and handed the bottle back to her, smiling his thanks, then turned down the narrow little shaft that led to the control pit. A pull on the ropes sent him skimming down the shaft, guided by a hand on the walls, before he checked his momentum at the bottom and squeezed open the little door. Inside, he could see June Correy hunched over the observation window, staring down through the small telescope, making notes in a little book, but he slid in silently without disturbing her and settled himself into the padded control seat, pulling out a cigarette.

She glanced up nervously as the first odor of the smoke reached her, and for a brief moment there was more than mere contempt in her eyes. They were nice eyes, too, or could have been if she'd wanted them to be; he'd seen warmth and courage in them when the grueling take-off had unsettled the others. But for him, there was only a look that reminded him pointedly of his eighty pounds and four-feet-ten height. He grinned at her, raking over her own slender five feet and up to the hair with a hint of auburn in it, mentally conceding her beauty while knowing that she was aware of it, and chose to make the fullest use of it to gain her ends. The fact that he was outwardly immune to her charms added nothing to her liking for him.

Now she turned back with a shrug to the observation window, carefully not noticing the smoke that drifted toward her, though the corners of her nose twitched faintly. She'd been used to a full pack a day, and the five rationed out to them here had probably been smoked within as many hours.

"Smoke, Carrots?"

"I don't chisel, Pipsqueak!" But her eyes

turned involuntarily toward the white cylinder he held out.

He tossed it to her. "Landing rations, special to the head pilot. I got a whole pack bonus for the landing, to steady my nerves, if I had any. Technically, you don't rate, but my chivalry won't stand a suffering female. Take it and stop whining."

"Chivalry!" She grunted eloquently, but the cigarette was already glowing, and she settled back, some of the hostility gone from her eyes. "You never found the meaning of the word."

"Maybe not. I never had anything to do with women under sixty before, so I wouldn't know. . . . 'S the truth, don't bug your eyes at me. As long as I can remember, at least, I've been poison to girls, which suited me all right. . . . Nervous?"

"A little." She stared down again through the 'scope. "The Earth doesn't look so friendly down there from this distance. And I can't help remembering that Swanson must have cracked up. Wonder if he's still alive?"

Grey shook his head. This was both an exploring expedition and a rescue party for Swanson and his two men, if any remained alive; but they'd set off the double magnesium-oxygen flare indicating a crack-up almost eighty days before, and their provisions had been good for a month only. "If none of their supplies were injured, perhaps. You can go through a lot of hell if you have to; probably depends on how much faith they had in a rescue whether or not they tried to make out till we reached them. . . . I'm going to reverse now. Staying here?"

She nodded, and he reached for the tinny little phone that connected him to the engine hold. "Ralston? Get set, because time's due for a turn. Gyros ready? And power? O. K., strap in." He was already fastening himself down with webbing straps, while Correy came over beside him and began doing likewise. A final glance at the chronometer, and he reached out for the gyro clutches, throwing them in.

Slowly, the *Moth* heeled, dipping her tail reluctantly, and through the small observation window before him, sighted out along the side of the great rocket tube, the small ball that was Earth slithered away and out of sight. The seconds ticked by slowly as the tiny gyros reacted, one thousand turns or more to make one half turn for the *Moth*, since they were in a ratio of a pound per ton of ship. In space, there was no need for any sudden maneuvering, but the saving of weight was immensely important, even with atomic fuel supplying the energy that activated the tube. Then the rough face of Luna began to peek in at the edge of the window, and Grey snapped off all lights in the cockpit, sighting through the now glowing screen of the telescope. He reached for the gyro controls again, edging

the great ship slowly about until the mark he had selected was squarely in the cross-hairs of the screen. Satisfied, he cut out the clutches.

"Nice work, Half-Pint!" She said it with a grudging tone, but he knew it was justified, and accepted the words at face value. "For delicate work, you're not bad!"

"Uh-huh. Suppose you get on the radio there and call Earth; once I cut in the blast, you won't have a chance, with the field out there fighting your signal. Know what you want to say?"

"After working for the news syndicate five long years? Don't be silly. How long can I take?"

"Ten minutes, about."

"Umm. Got any messages to send yourself? Friends, relatives? I'll bug out a few words for you if you like—square the cigarette!" She was already pushing the key of the bug back and forth, throwing full power through the bank of tubes and out across space on the ultra-short waves that would cut down through the Heaviside on a reasonably tight beam.

"No friends, no relatives, no message. I had a dog once, but he died, so we'll forget him, too." Grey was estimating speeds and distances from the few instruments and the rough guide of the image of the Moon, knowing that the calculations made back on Earth would be far more accurate than anything he could arrive at, but still feeling the need of checking for his own satisfaction.

She glanced up from the bug, a glint of curiosity showing. "You're a queer duck, Grey, but I didn't figure you were a misanthrope."

"Not. People just don't think the same way I do, or something; maybe because nobody wrote anything on my blank pages except what I scribbled myself." He thrust up a hand into the steel-gray hair that bushed up on his head, sweeping it back from cold gray eyes, grinning at the mental picture of himself. Even that didn't fit in with normality, since healthy human skin shouldn't be tanned to a dark-brown that somehow had a gray undertone, making him a complete monotone in harmony with the name he'd chosen for himself. "Don't go asking personal questions, Carrots, because I can't answer 'em any better than you could for me. I'm an amnesiac, had a seventy-year-old psychologist for a mother, an encyclopedia for a father, and the hell of making a living for a school."

He could see nothing of her face, but her voice held none of the expected pity or maudlin slop he'd become used to when the facts were spilled. "Then how'd you ever decide on this?"

"Donno that, even. Hunch, or something. Finished . . . Good, then shut up while I start this thing gentling down. Luna doesn't look pretty down there, but I reckon we'll find a level place somewhere to slap down on our tripod. Ralston, here we go. Keep 'em smooth!"

Grey's long, sensitive fingers went out to the vernier and studs that covered the action of the single tube, cutting in the circuits, letting it warm up, then throwing in the high potential needed to start it before normal action could proceed. A small red button on the panel clicked on, and he dropped back, feeding in power slowly, while the edge of the window nearest the tube took on a faint blue glow, and a slight haze showed up near it. The blue streak of inferno that was the rocket blast was blazing out behind—or ahead, really, since the so-called bottom of the ship was always directed toward the destination when power was on. Rockets at each end, or strung along the sides, would have made the weight unmanageable. The gravitometer needle flickered upward, quarter-gravity deceleration, half, then a full gravity pounding out behind them.

The feeling of weight came back over him, setting his stomach into a belated sickness that he was totally unprepared for, but it was only momentary, and the action of his heart surged up, then settled back into the routine business of fighting to equalize pressure and circulation in spite of the downward pull. He flopped the cigarette package in front of Correy, and she lighted one for him and another for herself; words would have been wasted while the great roar behind filtered in, drumming against their ears. Maybe a theoretically correct rocket should be soundless, but this one certainly wasn't. From now on, until the actual landing began, it was simply a matter of sitting quietly and waiting for the blind rush of the ship to slow down and the distance to diminish, with only a cursory attention from him. He settled back, smoking and thinking idly, stirred again into unemotional memories by Correy's earlier words.

No child grown to manhood could remember its earliest infancy, apparently; but a newborn mind in an adult body might still soak up and remember impressions for which it had no name; the eyes still carried their training at separating objects, the ears knew still how to sort and classify sounds, meaningless though they were. And now, even as if it were but a moment before, he could remember waking there on the strange green meadow and stirring without purpose, called by the unrecognized pangs of hunger. Under him, his legs had stirred, but he'd forgotten how to walk, and had resorted to creeping toward a stream that flowed nearby, the call of thirst stronger than blank memories. The farmer had found him there, half drowning from his clumsiness, and by the time he'd been half carried to the farmhouse, his legs were again learning the difficult work of supporting him, though they had felt weak and shaky.

The doctor had turned him over to a psychiatrist. And then, days later, words began to take

on meanings, and the first sentences became again familiar to him. Oh, he'd learned rapidly—some faint neural paths were still left, easing the job of learning. He'd heard that it was amnesia—not partial, but complete, wiping out all memories with an utter finality; and during the year that followed, he'd stored into his unfilled mind all the information from the libraries at hand, and all the odd relations of mankind he could glean. But in learning so rapidly, he'd had no time for the normal prejudices and devious tricks of the mind. He'd been forced to think in his own way, almost without relation to those about him, and with its own peculiar advantages. But there could be no friendships in that frantic chase after knowledge. He'd never realized, until the psychiatrist died, that he was an object of charity, though he found shortly after that living was done by the sweat of a man's brow.

Well, it hadn't been too hard, all things considered. He'd been analyzed before and told that he had an ability for mechanics, so the job in the airplane factory had followed almost automatically. The other men had stared at his strange little figure, and had laughed in well-meant kidding that turned slowly to a sullen dislike at his lack of response to what he could not understand; but the work had gone well. Then, the call to run these ships he built had grown in him, and the flying school that followed had grudgingly granted his ability. Learning, to him, was the only known pleasure, and he'd tackled all new things with a set purposefulness that brooked no obstacles.

Three years of flying the great ships had won him a certain half-respect, and even an outward familiarity with the other pilots, as well as a reputation for courage which he felt unjustified; it wasn't recklessness, but a lack of any feeling that he had anything to lose. Life was oddly unvaluable, though he reacted automatically to the old law of self-preservation when faced with trouble.

He'd been flying two years when the first news of Swanson's rocket appeared in the papers. There, he'd thought, was something worth trying, and for the first time he'd felt the common stirring of envy; Swanson had been a name to conjure with among flying men, and his selection as pilot by the mysterious company building the rocket had been entirely fair, yet Grey had been almost jealous of the man. There was magic in the idea of sailing out beyond the Earth toward the Moon that stirred odd feelings in him, un-felt except in the fantastic dreams he sometimes had.

And then, when Swanson had set off the two flares to indicate a crack-up, there'd been announcements of a second ship on the ways, which would be used in a gallant, though almost hopeless, attempt to rescue the three men in the first

one. But this time, they had no hand-picked candidate for pilot, and it had been conducted on a severely practical series of competitive tests among the pilots flying commercially or privately who volunteered. In the long run, it was his size and weight, along with the smaller amount of air and food he needed, that had turned the scales in his favor; others were as good pilots, as quick in their reactions, and as clever at learning the new routines. But none had been as economical to ship, and the small balance had gone in his favor, just as the same factor had helped all of the rest of the crew's selection, with the exception of Bruce Kennedy, designer of the *Moth*. He stood almost six feet tall, but of the others, June Correy was the tallest with her exact five feet of height; and even among them, Grey was the smallest.

Not that it bothered him; he was apparently lacking in the normal human self-consciousness about such things, and for the weeks that followed, the grind of preparing himself as best he could for the task ahead was to give him no time for thoughts. Swanson and two men were up there on the Moon, short on food and water and the all-important air needed for life, while the mysterious sponsor of the ships operated through its trust company with a frenzied drive that could rush the *Moth* through in too long a time at best, but had to hope that the men would somehow survive.

It had impressed Grey at the time, the struggle to save those three men who'd already managed to accrue more glory than a normal lifetime could give them. He'd felt more hopeful for this strange mass of humanity. But to him, the important factor was that the *Moth* must get through, since there could be no more—that had been made clear to them; ships cost fortunes, and not all people were willing to spend the money needed. Now, here he was, and under his fingers lay perhaps the future of all space travel; certainly the life of the queer crew with him. Below him, the hungry pits and craters of the satellite seemed to reach out jagged teeth to swallow this presumptuous bug that insisted on daring what men had never been created to try.

"Strange," Grey muttered, leaning forward beyond the screen to stare directly at the black and white selenography under him. "Logically that stuff down there should be queer to me, but it isn't. Not half as strange as old Earth looked the first time I really saw her. I . . . Huh?"

Correy was clutching his shoulder, gripping at him and trying to attract his attention. The ship's combination radioman, reporter, and assistant pilot was indicating his headset, and he grunted, adjusting the ill-fitting thing reluctantly; there was a lot of equipment on the *Moth* that

indicated both the frantic last-minute rush and the depletion of funds, though the important things were well-enough done.

Her voice came driving in through the phones, now that some of the thunder of the tube was muffled out. "Wake up from your dreams, Squirt! Listen to that tube! Hard, it isn't obvious; I'm not sure I hear anything, but I think I do, and don't like it!"

He yanked back one earpiece and listened, screwed up into a small bundle of concentration, but at first there was nothing wrong. The thunder came rushing in like an overgrown bee against a microphone, a tumultuous *Sh-Sh-Sh-Sh*, gradually revolving into something faintly but distinctly different, a slightly changing *Sh-Sh-Zh-Zh-Sh-Sh-Zh-Zh*, almost unnoticeable. That change had no business there. And even as he strained to catch it, it seemed to become more pronounced.

"Damn! I do hear it, Correy! How long's it been going on?"

"I don't know—I only just noticed it, but that was because I was listening deliberately, trying to find some nice description to write up if we ever get back. What is it?"

"Donno, but I've got suspicions. Ralston! Hey, Ralston, cut in! Notice anything funny about the tube sound?"

There was a long pause from the engineer, then a grunt came over the phones, which might have indicated anything. Grey called again, but got no answer, and his skin began to feel tight with the one sensation he could clearly recognize as an emotional response to danger. Correy started to get up from the straps, obviously intending to go in person after little Ralston, but he shook his head, and something about him made her sink back quietly. Finally, a faint noise came over, followed by the boy's excited voice, its normal bitterness washed out.

"Yeah, Grey, something's damned funny. I've checked over everything here, and it isn't in my province. Nothing I can do about it. Motors are feeding perfectly, voltage and amperage aren't off a hair, ionizer's perfect, and the whole hook-up's about as good as anything can be. Any ideas, or you want mine?"

"I've got 'em, but I'm hoping I'm crazy. That tube's control field tested out one hundred percent, didn't it?"

The boy's voice caught faintly. "So you've been thinking the same! Yeah, it tested O. K., and Kennedy told me it was theoretically perfect, but—Grey, do you think that's why Swanson cracked?"

He hadn't thought of it, but it was an idea. "Umm, could be. But look, how can we check on it?"

"We can't. If it gets worse in geometrical progression, then we're right, and ions are eating

through, in spite of the field, working on their own controls, and the more damage they do, the faster it goes. Of course, if you can shut off the rocket, give it time to cool off where there's almost no convection, and let me get out into the tube in a suit; maybe I can fix it, maybe not. I doubt it."

"No use trying. Luna's too close, and we'd hit before you could get inside. Think we could ease up a little? Umm, no. Won't work, same amount of damage in the long run, and we'd have to take a course to make an orbit; that'd give us a longer trip and probably do more harm than good. At this rate, how long should it last?"

"Your guess is as good as mine, Grey, but I'd say about an hour and a half."

June cut in, her voice somewhat relieved. "Then we won't have to worry until we land! We'll be down in half an hour more!"

"At this rate, I said," Grey reminded her brusquely. "If this keeps up, we'll begin to lose efficiency, and fast! Then we'll have to cut in more juice, more damage, more juice, and so on. Right, Ralston?"

"Right! It'll be nip and tuck, though I think you've got leeway. Swanson made it, even if he crashed, and our tube figured against weight and things with a minutely higher safety factor than he had, so we should be good for a little better luck, if that's what failed him. Look, June, you still there? . . . Uh, well, if you can . . . the others—"

Grey chuckled a little, amused at the odd quirks of human thought that could be embarrassed about its other twists, even now, and answered for her. "They'll be all asleep, unless Mrs. Benson's still awake. No use waking them up to worry; nothing they could do. And if you're thinking about Helen Neff, the doctor was snoring a nice soprano when I left. She's as safe as she can be. Go back to your engines and let me worry about the others."

He cut Ralston off, still grinning, and looked across at Correy's frowning face. "Heart's on his sleeve, eh, Carrots? Sometimes I can guess why you women don't like little men—they're too darned intense and obvious. She knows she's got him, so she chases big Bruce Kennedy."

"You're no giant yourself, Pipsqueak," she reminded him absently. "And since when did you take over command of the ship?"

"But I don't feel like a little man—I don't bother thinking one way or the other. That's the difference. As to the command, I took that over when we took off, by my own consent; nobody thought to figure out that somebody had to be boss here, so I'm it. If you've any objections, let's have them, and then I'll forget them."

"You get us down, and I'll argue about it later. Listen, it's worse already."

For a moment, Grey put it down to imagination, but then he realized she was right; it was an obvious wishing now that had no business there, and steadier. He grunted, feeding in slightly more power, and watched while the gravitometer rose back where it should be. The moon-scape on the screen was still too far away to suit him—though it might soon be too close. Be a pity if anything happened to the *Moth*, with all the hopes and dreams that must be in her. Alice Benson's gently faded face with its hidden purpose flashed through his mind, then the perverse warmth he'd seen in June Correy's, but they were less than the ship to him.

He looked again at the screen, then back to the girl. "I'll get us down somehow, June; I give my word on that, if I have to climb out in the tube and swear against gravity."

"Somehow . . . somehow I can picture that right now." She nodded slowly, a puzzled mixture of worry and surprise on her face. "Nemo Grey, I never believed those stories about your rescue of the group in Canada, but I do now. Don't you know what fear is?"

He shook his head slowly. "Not exactly, I guess. But watch it, Carrots, you're getting soft. You'll be clinging on my shoulder in a minute, just another woman trusting in a man. Scared?"

"Yes. That sound out there, getting worse. And then when I look at the screen— Could I have another smoke, Grey?" She took it, sucking in eagerly on it, suffering from too good an imagination, he guessed. But her sudden about-face surprised him, and aroused the ghost of another emotion he couldn't place. Women were a strange species to him, and his little knowledge of them came mostly from books. "You know, right now I *am* just another woman, I guess, and that scrawny shoulder of yours may look pretty good to me, before we land. You seem so damned sure of yourself and so unruffled."

"Cling if you want; I won't hold it against you after we land. But right now, I'd rather you used that telescope and tried to hunt out the wreck of Swanson's ship if you can spot it. Reports of the flare indicate it's about there, I think." He pointed to a dot on the screen, now showing a greatly enlarged version of the Moon's face, or part of it.

She seized on the chance, and more confidence came back to her with something to occupy her mind besides the mental picture of a crash. Grey had his hands full, trying to keep the indicator where it should be, against the slowly tapering-off thrust of the rocket. And they were close enough now that another factor began to enter, one on which he'd counted, but for which no amount of "tank" work could fully prepare him. The ship was top-heavy, its center of gravity located a good many feet above the center of thrust,

and the feeble gravity of the Moon was beginning to act on that; the top showed an alarming tendency to swing over toward the Moon, away from the straight line of fall.

No rocket impulse could be exactly centered or exactly balanced on both sides at all times, and the faintest off-center effect was enough to start a list. He swore, watching the slight movement of the window over the moonscape, working the gyro clutches to correct it and bring them back to dead center. As long as the tilt was only a slight one, the gyros could do it, in spite of their slowness of response, but the moment he let it get beyond a degree or two, they'd be too feeble to do the work, and his only chance would be to cut the rocket and let them work without the thrust; that had happened on the take-off, but there'd been time. Now, with the closeness of the moon and the deterioration of the tube, he'd have no chance to try it successfully.

Again the tube sound was worse, and there was a rise in temperature inside the room, coming from the rocket side that formed one wall; that meant a considerable loss of efficiency. Grey

tenth over one gravity, as corrected against lunar drag by the radio indicator that was now working, giving altitude by signal echo time. Again he had to jerk back to the gyro controls. And the rocket was behaving abominably now, wasting a large part of its energy in fighting itself, while the temperature continued to rise.

June motioned suddenly, switching the scope back to the screen at full amplification, pointing to a tiny spot that gleamed more brightly than the rough ground around it. It was located in the oddly shaped crater to which he was headed, and a careful inspection seemed to show the shape of a broken rocket. "Must be it, don't you think, Grey?"

"Must be. Wrong side of the crater, of course. Damn! Leave the scope on and make sure all your straps are tight. We may hit hard. Umm. Men should have three arms. Yeah, that's it, all right. I caught a gleam of metal that'd been polished then." He bent forward, catching the toggle switch with his teeth. "Ralston, get set. Landing in ten minutes. Tube's raising hades, but I think it'll last."



dropped his hand from the gyro clutch, stepped up the power, and jerked it back, just as the tilt decided to take advantage of the one uncontrolled angle. But he was in time, by a slight margin. Correy's face had jerked from the scope and tightened as she took it in, but she nodded, caught herself, and went back to searching.

His estimate indicated their fall was faster than safe, and he snapped his eye from the window to the gravitometer, setting the thrust up to a

"O. K., Grey." The boy was scared, but determined not to show it. "I'll keep my hand on the main motor switch, try to cut it off as we hit, so that won't get out of control. Luck!"

"Luck, Phil!" The use of the first name was deliberate, since he seldom used them, but it should sound friendlier. He released the toggle again with his teeth, his eyes screwed to close focus on the indicators, then slid back. Slowly, cautiously, he let the ship slip over two degrees

toward the direction of the wreck, and the ground in the window slid sluggishly aside as it drew nearer. But he couldn't keep it up; too much risk of the tilt getting out of hand. He straightened again, and moved the switch over almost full way; now nearly the last amount of available power was coming from the rocket. Suddenly the tendency to list stopped, and a whine growled out from somewhere in the center of the ship.

"God bless Ralston!" Grey realized what had happened; during the trip the boy had been piecing out extra gyros, crude and unsafe, from anything he could lay his hands on, knowing that the regular ones had been almost inadequate for the take-off. Probably they'd burn out his rough bearings, blow up from centrifugal force, or overload their motors in a few minutes, but for the moment they'd work, and it would be long enough. "That's real courage for you, Carrots! The kid's scared sick, but he still bucks it through in time! Well, she's steady, she's pointing to the best spot I can locate, so all I have to fool with is the power control, and I think it'll last. . . . Hey!"

The glance he'd shot at her had spotted her white knuckles and clenched teeth, her eyes set on the screen that showed ground rushing up at them, growing like the face of a monster in the stereoscopic movies, seeming to swallow them up. On an impulse that he recognized as probably normal but still surprising, he reached around her shoulders with his free hand, pulling her over against him, and turning her face from the sight. "Hey, it isn't that bad, Carrots. I said we'd get through, didn't I?"

She nodded, burying her face against him, and her voice was almost too faint to hear. "I'm scared, Grey! I'm scared!" Her arms came around him then, pulling hard at him for the purely animal comfort his solidity could give, and he recognized it as something not related to him personally, but there was an odd pleasure in it, all the same.

He kept his voice level, one hand on the control lever, trying to match the erratic thrust against the gravity, the other patting her shoulder. "Easy, June. It's all right." But he knew it wasn't. An irregular, fading blast was complicating his calculations until a smooth landing would be impossible. Then the ion stream struck the ground below, and the screen became a blue glare. On a guess, he set power to counteract their motion.

For a seemingly endless quarter of a minute or less, he held it there, then jerked his hand away and struck the cut-off switch savagely, just as something caught the tripod landing gear, and his stomach seemed to drop through the seat.

"Landed!" The word leaped through his head as a lance of pain struck and ended in blackness.

## II.

Grey stirred mentally, his hand groping up to the painful lump on his forehead, and his mind straining for something that he couldn't reach; the perversely calm part recognized the impulse and the frustration of it, though. Whenever any shock hit him, he unconsciously expected the amnesia to lift, as it did in the books; but it never happened that way, though it wasn't the first time he'd gone through a mental blackout. A hand brushed the thick hair off his face, and he looked up into the troubled eyes of June Correy.

"Hi, Carrots, you got through?"

"We all did." She'd jerked her hand back, and now something like embarrassment passed over her face. "It wasn't a bad landing, Grey; but the combination of me hanging onto you and your own loose strapping threw you against the control panel. Sorry I got so soft."

"Skip it!" He wasn't sorry.

Alice Benson's frail hands were adjusting a cold compress on the lump that ached, and he looked around then to find himself in the main room of the ship where most of the others were making preparations of some sort. She poured something onto a cut that stung sharply, smiling at him. "It was a very fine landing, lad; we hardly felt it through the springs holding our sacks—just enough to waken the others. Feel better."

"Fine, thanks." His eyes located bitter little Philip Ralston, and he turned to him. "Did you tell the others?"

"Left it to you." The kid's blue eyes flicked away from Helen Neff, then back again, while his hands went on pulling out the spacesuits. "Go ahead and tell them, Grey."

Grey pushed aside the hands of Mrs. Benson, and pulled himself to his feet against the light gravity, surveying the others as they turned to face him, watching their various reactions. "O. K., then, here it is, in a nutshell. We're here, and we spotted the other ship quite a ways off. But right now, I wouldn't risk a ten-foot hop with that tube—it's shot! You might look it over, Kennedy, but I don't think there's much we can do unless there's enough left of Swanson's tube to put the two together and make one good one."

"Shot?" Kennedy scowled, his heavy sullen face looking more aggressive than usual. "Look, Grey, that tube was right—it tested for double the time we took. What'd you do—forget to warm it up? If you ruined it, I'll—"

"Yeah?" Ralston jumped up facing the bigger man, a little blond bantam defying a brunet giant. "You got two to clean up, then, Kennedy. Grey did a damned good job, and it wasn't his fault your theories couldn't take the actual work."



Grey put a hand to the boy's shoulder, pushing him back gently. "It's O. K., Phil, forget it. Kennedy, you know darned well you can't say that tank tests are the same as actual work-outs; anyhow, Swanson cracked up, probably the same way. But we can't stop to fight about it now. We've got to get out there, locate the other ship, and find out whether we can work it up from the two tubes. Otherwise—well, there won't be any otherwise. Now get out and into that tube; find out what happened, and how we can fix it. The rest of you get into space togs so we can start outside. Orders! I'm taking command!"

"By whose consent?" The ship's designer stood rooted, unmoving, his eyes challenging the pilot, and something unpleasant on his face.

Grey grinned, turning toward the others. Correy made a face at him, along with an overly humble bow, but she nodded and stepped to his right, just as Ralston's quick steps carried him to the left. With a little smile, almost of amusement, Mrs. Benson joined them, leaving Neff and Wolff on Kennedy's side.

Ralston jerked his head savagely. "Come over here, Helen, or I'll drag you back with us!"

The sharp-featured doctor opened her enormous eyes in hurt surprise, her hand going to her thin hair. Grey never had seen what attracted the boy to her. She stared at the big man slowly, found him not looking at her, and back to Ralston. Then, like a spoiled child being forced to its duty, she obeyed. The kid should try those tactics more often, maybe.

Wolff was a dwarf. Now he bobbed his immense head, shrugged the shoulders that seemed hunchbacked, and ran his tongue over his thin lips. "I . . . ah . . . of course I side with the others, Mr. Grey. I . . . I'll obey orders, to the letter. But . . . umm . . . I'd rather not go out, if—"

"You'll come. It'll take six of us to carry back the three men out there, if they're still alive. We'll get them first, make a second trip for the tube parts needed. Well, Kennedy?"

Kennedy shrugged, his face expressionless, picked up the suit and began climbing in. Satisfied, Grey reached for his own suit, wondering about Alice Benson. But she was in her cumbersome outfit before any of them, her voice cheerful over the phones as she offered to help Neff. It might have been a pleasant little picnic from her reactions, though there was a suppressed eagerness to her voice that he could not explain. He donned his own outfit, turning to Correy.

"Carrots, what about the radio?"

"Still working, or was, and I sent back a report; but two tubes were weakened and they blew out when I switched over for the acknowledgment—the big special ones for which we only stocked one spare. So that's out now, not that it'd do us

much good. . . . You know, you look almost like a man in a suit, Half-Pint."

He grinned. "So do you, Redhead, so don't count on feminine wiles out there. O. K., let's go. This is serious business, so no foolishness from anyone. Swanson, Englewood, and Marsden may be dying any minute in their ship; and we're looking out for our own lives, too. Take it easy, remember you're dealing with only a sixth-normal gravity here, don't turn on too much oxygen, and stay together. We'll go over your findings when we get back, Kennedy, and report on the other tube. See you."

"Right." The big man had decided to take it with outward pleasantness, at least, and he managed a smile through his suit's helmet. "Luck!"

Grey should have felt strange as the little lock opened finally, and he stepped out, his suit ballooning in the absence of pressure. There was an odd feeling inside, but it was one of homecoming, as near as he could place it. The harsh black shadows and glaring sunlight, with no shadows, looked good to him, and the jagged ground seemed friendly now. He stepped back out of the others' way, and let them climb down carefully, staring with them at the ship and the scene around.

They were in a queer valleylike crater, at one side of which a seemingly topless cliff rose upward, sheer and colossal. The great ship thrust up seventy feet from the floor on its three legs, a pointed cylinder that ended finally in the rocket tube and the observation window. Above, the sky was black with a harsh sun shining at one side, a swollen Earth on the other, glowing by the reflected light. It was beautiful in a coldly impersonal way, and he breathed deeply, relaxing. Then, with a shrug, he turned off toward the spot that had shown on the screen, marking the other ship.

Ralston and Correy were having troubles in adjusting to the light gravity, both putting too much effort into it. They bounded along, struggling to keep their balance, fighting where they should have relaxed, and only slowly gaining a mastery of the situation. Neff minced primly, not efficiently, but with fair success, while Wolff hitched himself over the ground with an apparent expectation of instant death. Alice Benson alone seemed to take it easily, relaxed and quiet, staying at Grey's side. They halted, ahead of the others, and he could see her smiling.

"I like this, Grey. It makes me feel young again to walk without effort and actually see myself making progress instead of creeping along. . . . Where are your shoe plates, lad?"

He looked down quickly, then realized he'd forgotten to put on the heavy lead plates that were to compensate partially for gravity. He

hadn't noticed the lack, though; the feeling of walking here had seemed completely natural to him. "I guess I don't need them; why not take yours off? You've been taking it easy enough to be safe, I think, ma'am."

She put her foot out, and he found himself stooping to remove the plates. Then she tried it, a little uncertain at first, but soon moving easily. "This is lovely, Grey. It's like those dreams of sliding along above the ground without effort. Do you think perhaps men have been here before, leaving the memories with us—that falling dream and this other?"

"Doubt it, ma'am. I'm afraid that's romanticism, though I can't prove they haven't. Next thing you'll be expecting to find people here."

She smiled again, but he wondered if she didn't expect just that. Oddly, it wouldn't have surprised him, either. Then the others were with them, and they began moving down a comparatively gentle slope to the smooth floor of the valley's bottom. Progress was rapid, now that even Wolff was catching the swing of the loose motion needed; they were traveling along at a sort of lope that must have covered ten to twelve miles an hour, and the long decline shortened rapidly.

June tapped on his shoulder and pointed, as they neared the bottom. "Look, Pipsqueak! Is that green down there—growing green?"

He stared. It was green—the same green as grass would have been. But it meant nothing, he knew. There were plenty of rocks that could give the same color, and without an atmosphere, how could chlorophyll-type plants grow? Then out of the corner of his eye, he caught something, and a crazy hunch formed in his mind. "Bet a cigarette against a kiss we find animals, too!"

"Done! Now you're being silly!"

The others had heard, of course, and the stirring of excitement was good for morale, at least. They hurried down, Grey, Correy, and Mrs. Benson in the lead, taking it in long easy jumps of twenty feet at a time, a sort of run that lifted from one foot to the other, as a ballet dancer seems to. A few minutes more found them at the bottom, staring at the ground.

It was covered with domes of some thick Cellophanelike material, varying in size from a few inches to several feet across, and under them, definitely, were plants. "Lichens, highly complicated ones, too," Neff said. "They've adapted somehow."

Grey nodded. "Probably four or five different types of life together, in symbiosis. One must form the dome—that greenish-brown ring they spring from. Another probably cracks raw material from the rocks, another takes energy from sunlight, and so on. Looks to me as if they grow by budding out a small cell from the main one,

and they seem to follow this particular type of rock formation. Carbonates, nitrates, probably gypsum, containing water of crystallization. I suppose they could get all the elements of life that way; the lichens on Earth managed to come out of the water and make soil out of our rocks before the other plants got there. Life insists on going on. Only question is how they evolved to begin with."

He bent down, pricking open the tough skin of one of the smaller domes, watching it deflate rapidly. The air in them was under considerable pressure, probably equal to five or six pounds. "You know what this means, don't you? Well, if worst comes, we could probably pump out a fair quantity of oxygen from these things—there are miles of them. Squeeze water out, too, and maybe they have food value. We couldn't live indefinitely, I feel sure, but they might help."

Wolff stared at them unbelievably, but with a flicker of interest. "Until . . . ah—"

"Yeah." It was foolish. "Until we died, anyway. There'll be no rescue ship for us. Well, Carrots?"

"Animals!" she reminded him, grinning.

"Coming up!" He pointed across the lichen-covered ground toward the motion that had first attracted his attention. At the time it might have been a falling rock, but now, as it approached, it obviously wasn't. Rather it resembled a cross between a kangaroo and a balloonlike bird, two long, heavy legs under it, and an elongated beak in front. "Watch!"

The thing had been traveling at a tremendous rate, sailing in bounds. Now it stopped a few yards in front of them, ducked its beak down into one of the bigger domes, and rooted around, gulping up some of the growth there, while the dome deflated slightly as it took up all but a little of the air, leaving enough, probably, for the lichen to continue, and no more; the creature should have swelled up enormously, but there was no outward difference.

"Must have some tricky way of absorbing the oxygen into a loose chemical compound, unless it's got a magnificent pressure tank inside it somewhere. More likely something like a whale uses to store oxygen in its body for a long trip under water. Notice how he exudes a cement out of that beak as he draws it out—sealing the dome so he won't kill the lichen completely?"

June grunted. "O. K., you win, darn it. Look at him go!"

"Has to—he can't stay on the dark part of the Moon, I'll bet, so he has to travel fast enough to equal the rate of rotation—once around the Moon in a month. It can be done here, rotation, size and gravity considered. The lichens must spore up during the two weeks of night, grow during the day. And probably that dome has

heat-filtering powers, like no-heat glass; he's carrying a bright shell on top to reflect heat, you notice. 'Smatter?'

"I was just thinking of his love life." She giggled again, watching the vanishing ball. "No long courtships there, unless he's like bedbugs—sufficient unto himself."

"Probably is. O. K., gang, we've wasted enough time, though we should make a study of all this. I'll collect later, Carrots!"

They turned on, winding among the domes that were everywhere, bits of conversation going on among the others. The finding of life here had cheered them all, somehow, made them feel that the satellite wasn't as unfriendly as it had seemed. There was a kinship to protoplasmic life, no matter how distant. Grey accepted the fact as a matter of course, wondering if he hadn't expected it, and led on, his eyes peeled for a sight of the other ship.

Mrs. Benson beat him to it, though. She stopped, and pointed to the small part showing, a mere speck across the rough ground. "Grey, June, Philip! See!"

Now their leaps increased, and they staggered out. Correy ripped her plates off, dropped them, and staggered before redoubling her efforts to keep up with Grey. But ahead of them, the seemingly feeble legs of Alice Benson sped along, covering the ground with a fluidity of motion that indicated the dancer she must have been once. There was a faint sound of her voice in the phones, and it sounded oddly like praying, but the words were too muffled for understanding. They stopped as she lifted herself to a slight projection and looked down.

"Bill!" It was a shout and a prayer, and the thinness of her voice was suddenly gone, leaving it strong and young. Grey stared at June, shaking his head. There were no Bills in either his or Swanson's crew. But again the cry came. "Bill! Oh, God!"

Then they were beside her, staring down at the ship lying below, on its side, and Grey caught her as she slumped forward. But he had eyes only for the object ahead. It wasn't Swanson's ship. Thirty feet long, or slightly less, it was an even cylinder, blunt fore and aft, one great rocket at one end, and little muzzles stuck out athwart, somehow fragile, but apparently with no damage. Whoever had set it down had done a magnificent job of space jockeying, coming in at an angle and sliding forward on steel runners, instead of making a tail landing. He glanced at Correy, but her look was as dumfounded as his own.

Mrs. Benson struggled to her feet, a red spot showing under the pallor of her cheeks. "I'm sorry, children, I'm afraid I was overcome for

a minute. You see, I know that ship. I helped build it—thirty years ago!"

"Thirty years—just before the Great War?" June looked at her carefully, searching for hysteria and finding none. "But they didn't have fission motors then, nor ion releases. How—fuel rockets?"

"Bill had a fission motor, June; oh, it wasn't a good one, but it worked. And he wasn't using an ion release. He broke water up into monatomic hydrogen and oxygen, then let them explode again. They worked better than any normal oxy-hydrogen jet could have. Thirty years—and I'm finally here. Now do you see why an old lady forced herself into your crew, lad? Come, let's go down."

They fell in beside her, and now she moved leisurely, telling them the story as she went, while the others caught up. It could have been a colorful story, a great one, but she told it simply, giving only the highlights, and letting them fill in the rest with their imagination.

More than thirty years before, about the time the Great War was starting, when the first uranium fission was discovered, she'd married a boy with a dream. It must have been a wonderful dream, for he wasn't the type, otherwise, to use his wife's fortune, but he'd done so, burning it up carelessly while he applied his own rather remarkable genius toward extracting the elusive U-235 isotope and using it; and he'd succeeded, while others were groping toward the solution. He'd even managed to work out a motor light enough for the dream he had, and to construct two ships, using an adaptation of the monatomic release already known and used in welding, now that he had a reliable source of energy.

"Two?" Grey cut in quickly.

"Two, Grey. He had to." She went on quietly. One ship had been fitted for himself—it was impossible for her to accompany him, though they'd tried to make it that way. The other was radio-controlled. Then he'd taken off in one, secretly at night, and she'd sent the other up near him, up until he could fall into an orbit around the Earth, high enough to have conquered part of the drag of gravity. One ship couldn't hold enough supplies for the voyage. But using his own radio controls, he'd somehow brought the second one beside him, joined them, and transshipped supplies and fuel, released it, and waited until his orbit brought him in position for a try at the Moon. She'd seen his supply ship explode into tiny fragments that could fall back to Earth or drift harmlessly in space, and her watcher in one of the observatories had thought he detected the flare that indicated success where Bill had chosen to land.

"There were two other ships being built," she went on. "I was supposed to follow, and we hoped that from the two, and what fuel was left,

we could escape the Moon's lighter gravity and return, risking a parachute fall in spacesuits to land on Earth; it might have worked. I think it would, since we could bake our needed water out of the gypsum here. But the war came—and metal became harder to get, and finally unavailable. Our helpers went off to fight, mostly, and the months slipped by—”

Hearing her, Grey could imagine the desperate months going, while she fought vainly to go on, stumbling against the impossible, afraid to tell too much and release the horror of atomic energy for war, unable to get supplies or help otherwise. Three years had been spent in a sanitarium, to come out and find fire had destroyed their shops and the notes that had contained Bill's precious secrets. By then, even she knew that saving him was hopeless. But she'd promised to meet him there.

“Some money remained. And I could remember part of the secrets. New engineers, working from my memory, finally managed the separation of the isotope again, and Wohl perfected the motor for me. After that—well, money wasn't a problem any longer. You see, I own Atomic Power. Nobody knows it, save a few, and Cartwright, who handles it all for me. . . . That's right, Wolff, I'm really your employer, though you didn't know why Mr. Cartwright instructed you to watch over me, as well as report on commercial possibilities, if any. I didn't want it that way, but he insisted, so you know now. . . . Anyway, it took time to work out the problems again, differently this time, but money can hire brains and what has been done can be done again, perhaps better. I wanted to go with Swanson, but it was impossible. Now—” She put out a hand, touching the ship they had reached. “Now, I've kept my promise to Bill, finally. I wish—”

Grey nodded, holding the others back. “Go ahead, ma'am, we'll wait.”

She smiled faintly, thanking him silently, and opened the little lock of the ship that bore her name on its side, her hands fumbling briefly. Then she was inside, and the others clustered around, forgetting for the moment even their own and Swanson's plight.

Wolff stirred, and Grey snapped at him.

“Shut up!”

Alice Benson's low voice came over the phones this time, and the few words should have been consecration enough for even the soul of her Bill. They heard her at the lock again, and she came down, calm and collected, a little book in one hand, a thin sheet of paper in the other.

“His body isn't there. It's all here in his diary, which you can read. Bill waited as long as he could, until he knew something had happened; he never thought we'd failed him! Then he went out

in his suit—he wanted to see this world he'd found. I think we needn't look for him.” She'd labored under no delusions of finding him living, and it had been no shock. Now she shook her white-haired head, and smiled at the crew. “Well, shouldn't we try to find Swanson, Grey? I shouldn't have taken up so much time when they might be dying, and so much depends on our finding the other tube. I'm sorry.”

Grey stirred, such emotions as he had retreating before her self-possession. “Right, Mrs. Benson. But there's no use searching from here—the ship we saw was this one, and we'll have to get up to higher ground to spot the other, so we might as well go back to the *Moth*. From on top of her we should have a fair view of the area nearby. We'd never find the ship in searching around from here.”

She agreed, apparently, and they started back, this time in a solid bunch, exchanging idle comments about the sights around them. By common consent, the story of Alice Benson and her Bill was unmentioned. Slowly, the conversation picked up, mostly in a discussion of the lichens as they came to them again. Others of the bird-like creatures were speeding across the ground now, stopping occasionally, then driving on in their never-ceasing march around the Moon.

Grey caught one, and there was no fear about it, only an impatience to continue. The flesh was abnormally firm, but was obviously protoplasm, covered with some thick, rubbery skin, and it might have weighed forty pounds on earth. He dropped it again, and it went leaping off after its fellows.

“They have sex,” he commented. “Odd, according to our standards, but there are two kinds. See, the females have a pouch, and if you noticed, that one was full. I'd guess they were egg-laying, with the eggs hatching in the pouch. Then the young cling to the little tubes there, drawing air from the mother. She must feed them with lichens drawn from the domes. Nature seems to stick to fairly familiar patterns.”

“Wish I'd brought a camera, at least,” Correy muttered ruefully. There was one in the ship, but the quarrel before leaving must have jostled it out of her mind, or else she'd figured on being unencumbered during the rescue attempt.

Then they were out of the valley of the lichens, going up the slope, and the rocket ship began to show up above it, climbing slowly into view until they could make out the tube, and finally see the tripod resting on the rocks under it, in the little pit the blast had scoured. Grey flipped a switch outside his suit, and pointed the beam antenna toward the *Moth*.

“Come in, Kennedy. Grey calling Kennedy. Come in.”

There was no answer, though he tried again.

It wasn't important, but it was odd. Those radios were supposed to be on at all times, and with full power running through the directional antenna, it should have reached in clearly. Or, if the man was inside the tube, the metal might blanket out the signal. In the ship proper, the outer antenna would have shot it through a speaker; the short-distance tubes had been sturdier than the tricky experimental ones in the space set, and should still be working.

The little company loped up beside the ship, and Ralston slid under the tube, looking up it, and pounding. There was no response, nor could Grey find anything inside when he flashed the beam of his headlight in through the inky blackness of the shadows, here where no air diffused the light.

"Funny, he must be inside, but why doesn't the fool answer a CQ?" Ralston asked.

Helen Neff glared at him resentfully. "Bruce is no fool, Phil Ralston, and he's probably busy fixing that tube of yours. Don't be so aggressive about everything."

"Umm." Grey didn't like it. Kennedy was supposed to answer—that was one of the rules posted, that all sets should be on when anyone was outside, and answers should be prompt. It might mean life or death, and if the designer was taking things into his own hands, there would be an accounting, pronto. "O. K., inside, all of you!"

They climbed the ladder, slipped into the lock, and let air come in, then out of the suits, and removed helmets rapidly. At a gesture from him, they left the suits stacked in the lock, breathing the much fresher oxygen-helium mixture of the ship; here with light gravity demanding smaller energy from them, the ten-pound pressure of the air was ample, though it had seemed thin when he first dropped it in space.

"Kennedy!" The voice boomed through the room, down into the engine well and the cockpit, its echo sounding back metallically. Ralston slid down to the engines, and was up again. "Not there, Grey!"

"Nor in the cockpit," June reported. "Where is the stubborn idiot?"

Alice Benson came back from the hampers, her face tight. "I'm afraid even he doesn't know, now. His suit's in the locker, and he's nowhere in the ship!"

Dumbly, they stared at each other, fear climbing into their faces. The ship had been searched thoroughly, and he wasn't on it. Yet his suit was, and there had been only seven of them, of which six had been used by the rescue gang.

"He couldn't have gotten far enough away from the ship without a suit not to be seen by us. We've got a clear view for hundreds of feet. Phil, get out there and search!" Grey watched Ralston

slide through the lock, his skin tight again, but his mind troubled only by the paradox presented.

The boy was back again in fifteen minutes. "Not there! I scoured the whole area!"

Bruce Kennedy couldn't go a thousand feet without a suit—yet he had. How?

### .III.

They were no nearer a solution as Mrs. Benson and Neff cleared up the food and disposed of the thin paper plates. It couldn't have happened, but it had. Of course, it was conceivable that Kennedy might have rigged a sort of oxygen flask and breathing nozzle and gone out, but it was utterly reasonless, in the actinic glare of the sun; he wouldn't have gotten far, anyway, and there was no use speculating on it.

"Madness," June suggested, not too positively. "There's life here, so there must be bacteria."

Neff shook her head. "Anything that would effect such life as we saw wouldn't be likely to hit at men; too much difference in body organization. Of course, gangrene attacks almost any flesh, but the more complicated diseases are choosy about their hosts."

There was no answer to that, beyond the useless speculation of a possibility among improbabilities. Grey thrust back and shrugged. "O. K., let's face it. Kennedy didn't leave. He was taken!"

"But—"

"No buts. When there's only one simple solution to a problem, that solution is to be taken as the correct one, unless something else comes up. We found life here—plant and animal life. Neither form would have hurt Kennedy, but we don't know what kind we failed to find. Granted, there's still the problem of that life getting into the air locks and finding Kennedy, without the suit—and the answer to that is intelligence, of some sort. So we're dealing with intelligent life—pretty highly intelligent, too—and apparently inimical. We don't have weapons; nobody thought they'd be necessary. Well, we'd all hoped to find intelligent life on Mars, I guess, but we find it here instead."

Wolff licked his thin lips. "When we get back the government's going to hear of thi!"

"Yeah? Why? Ship in a space navy and kill off the natives, I suppose, to pay for Kennedy. What makes you think the government'll be interested?"

"They will. I . . . ah . . . I'm a fair metallurgist, Mr. Grey. There's plenty of raw materials here, just as Mr. Cartwright suspected. These craters and things . . . umm, whatever caused them forced the rarer metals up out of the inner strata; Mr. Cartwright thought it might, even if the Moon is made of much lighter stuff than Earth. We'll tame down these Moon crea-

tures, all right; we'll put 'em to work digging out ore, that's what."

Ralston bristled. "Slavery went out with the Fourteenth Amendment, you slimy snake. Sure there's metal here—I spotted some pretty rare stuff myself, in scouting over nearer the cliffs, but you won't get far in dealing with any natives on that line."

"They're not exactly . . . ah . . . human, you know." Wolff flinched away from the boy's eyes, but held firm. "It isn't exactly slavery to make horses work, is it?"

The boy took a step toward him, to be halted by Grey. "I agree with you, kid, but you can't convince that sort of man; he doesn't know about little things like ideals, such as you have. This whole problem isn't new—Wolff and Kennedy were talking about it back on Earth, and there are plenty who'd agree with them, said plenty having most of the money for something shown commercially worth while. To you and some of the rest of us—perhaps even to me—interplanetary trips are an ideal, sort of a dream; to them, it means money, and it doesn't matter how they get it."

"I'm afraid you're right, lad. Bill used to worry about that, too. . . . Wolff, I'm paying your salary, still. You'll tell no tales of what we find here." Alice Benson gave the order firmly, and the man nodded; but Grey saw the look on his face, and knew how much obedience she could expect. There were people who'd pay for information, and Wolff wanted the money.

"Anyhow, that doesn't settle the problem. Right now, the main thing is to find out where Swanson came down, and try to get out his tube. Ralston, can you make repairs, do you think? Good. Then, suppose you go up to the emergency lock at the top and see if you can spot the other ship from there? We'll hope we don't meet any of these hypothetical natives until we get off this place, and the sooner we do it, the surer we'll be. The rest of you might as well get ready to go out again."

Ralston was already swarming up, a small telescope in his hand. Wolff wriggled in his seat. "I . . . ah . . . don't you think someone should stay here?"

"Smatter, afraid to go out and face those natives you're all set to subdue? Well, Kennedy stayed on the ship. Like the idea?"

"There are locks. I . . . umm . . . that is, if it's locked inside—"

Grey looked at him, and his eyes were colder than usual, but he shrugged. "O. K., stick around and whimper then, and if they do get you, I'll be darned sure nobody looks for you! . . . See anything, Ralston?"

"Spotted it in a few seconds, almost in the shadow of the cliff. Must have been too dark

when we landed to show up in the screen. About three miles off, is all."

That was better luck than Grey had hoped, for a change. He supervised their entry into and out of the lock, listening to Ralston's description of the location, then sent the boy on ahead, holding Correy back. She looked surprised as he moved toward her.

"You owe me something," he reminded, grinning.

"Darn you! I thought you'd have forgotten. The nerveless wonder, eh? O. K." She turned her face around, the expression halfway between a grimace and a smile. "Collect, Shylock!"

He'd never done it before, and his skin was tighter than when finding Kennedy gone, but movies are instructive, if one is curious enough about human habits. Also he found he had instincts that guided his arms and tightened them for him. Her lips were tense at first, but her own instincts softened them, until some of the analytical calm went out of his. Finally, he drew back, to find her face faintly flushed.

"Whoof! For a nerveless guy, you do all right, Pipsqueak! Where'd you hide those muscles, anyway?" She shook back her hair, seemingly surprised at herself. "Now I need that darned cigarette."

"For an encore—" His grin wasn't as mocking as it should have been, he felt. He was growing soft himself. But it was worth it. Afterward, she dragged at the smoke, studying him with an expression he hadn't seen before, then sharing it with him in a hasty consumption of the cigarette. Outside the lock, someone was pounding out a signal for them to come on, and they moved out, both looking foolish. Alice Benson smiled, and the others were grinning, amusement temporarily stronger than their worries. June avoided his glance, and slipped back, leaving the older woman beside him as they started.

It was rougher ground this time, and almost impassable from Earth standards, but they skimmed through easily enough here, leaping over the heavier boulders, or moving from one high spot to another. Going was comparatively slow, since Grey had to pick the trail, but progress was entirely satisfactory. No sign of life showed on any side; there were no trails, no indications of intelligent construction. Only the forbidding cliff loomed up closer, jagged edges of it unshaped by wind or water.

Grey waited for Alice Benson, his eyes admiring her as she made the spring to his side. "I wonder what sort of a girl you were, ma'am? Right now, you're the best man in the bunch!"

"Thank you, Grey. It's nice not to be a nuisance." Then she smiled. "As a matter of fact, I was a little imp. Just about the same sort as

June Correy. That girl's got good stuff in her; all she needs is a bridle!"

June's grunt came in scornfully. "Don't get ideas from her, Half-Pint. It'll take a man to put that bridle on!"

He started to answer, then caught the older woman's warning headshake, and left it to her judgment. The girl looked up, expecting a reply, frowned when none came, and seemed surprised. Mrs. Benson winked at Grey, as they picked up their way again, leaving him wondering why. Maybe he was soft, but he wasn't fool enough to think he'd have a chance with the girl—even if he wanted to.

Finally, the ship became visible, lying close to the cliffs. It had been hard hit, there was no doubt of that; apparently it had landed on only one leg of the tripod, and had been falling too rapidly. The leg had crumpled under it, letting the whole side of the ship slip over, and come crashing down. Where the engines were located, the walls had broken in, though the tripod leg must have soaked up most of the initial shock, leaving a comparatively small blow from the crash.

The fact that the two flares had been set off, however, indicated that the air within must not have been lost; the ships were designed to take a fair blow on their thin outer skin without it breaking the walls of the living quarters. He flipped the switch over, beaming in his call. "Swanson! Englewood! Marsden! Ship *Lunar Moth* calling Spaceship *Delayed Meeting!* Come in!"

They hung waiting for an answer, but none came. It meant nothing, though. Any one of numerous reasons could have existed for the lack of response. The men might be dead, or nearly so. Or the antenna outside the ship might have been broken; more probably, the whole radio outfit was smashed, since no signal had been pushed through to Earth. He shortened the distance in long bounds, until he was directly under it.

As it lay, the air lock was within reach, and he stretched up and twisted at the handle. It came open easily, letting the four climb into the lock behind him, closing smoothly after them with a sudden hiss of air. He flipped open his helmet, sampling it; he'd expected it to be over-used and stale, but beyond the smell of too much passage through the filters, there was nothing wrong, and the others followed his example in taking off his helmet.

Then the inner lock opened to show the living quarters, smaller even than those on the *Moth*, and in wild disarray. Seals had been clamped down over the engine and cockpit tubes, indicating both had lost their air. Inside, there was no one!

Grey shook his head, glancing into the food and water tanks and noting that they were still half full, jerked open the paper drawer, spilled the

log out into his hands, and riffled through its pages quickly. The first entries were about the routine preparations, the take-off, and the coast through space after killing the blast. Then, trouble, just as it had appeared on the *Moth*, but worse.

June 29: Landed somehow last night, expecting the blast to cease entirely every moment. It was crooked, and we tipped sidewise, breaking open the engine room. Poor Englewood didn't have a chance. Buried him today after finding the radio ruined, and setting off our flares; doubt they'll be visible from Earth, but we hope somehow they'll be noticed. Marsden is quite confident of a rescue by the second ship. With two of us, we can hold out some time. First men on the Moon!

That, Grey knew now, was wrong, though Swanson and Marsden had every right to believe it at the time. There followed pages of their estimates, their minor activities in going outside, and a gradually dimming hope as they figured more carefully on the length of time needed to complete the other ship.

July 11: Marsden and I talked it over this morning and decided that one man can easily last until rescue, two almost certainly cannot. We agreed to draw lots tomorrow. Tonight, while the boy's sleeping, I'll go out; I've already seen a fair sample of life, and I'm content. Keep a stiff upperlip, Bob, and when you read this, I hope you'll realize I was right in going.

July 12: Poor Bob Marsden. He must have drugged my food, for I lay down expecting to wait for him to sleep, then slept myself. When I awoke, he was gone, leaving only a note wishing me good luck. I went out of the lock searching for him, but on this ground there is no spoor, and I failed. A fine assistant, a gentleman, and a great guy! God rest his soul. Somehow, I'll last until rescue comes, to make sure he gets the credit he's earned.

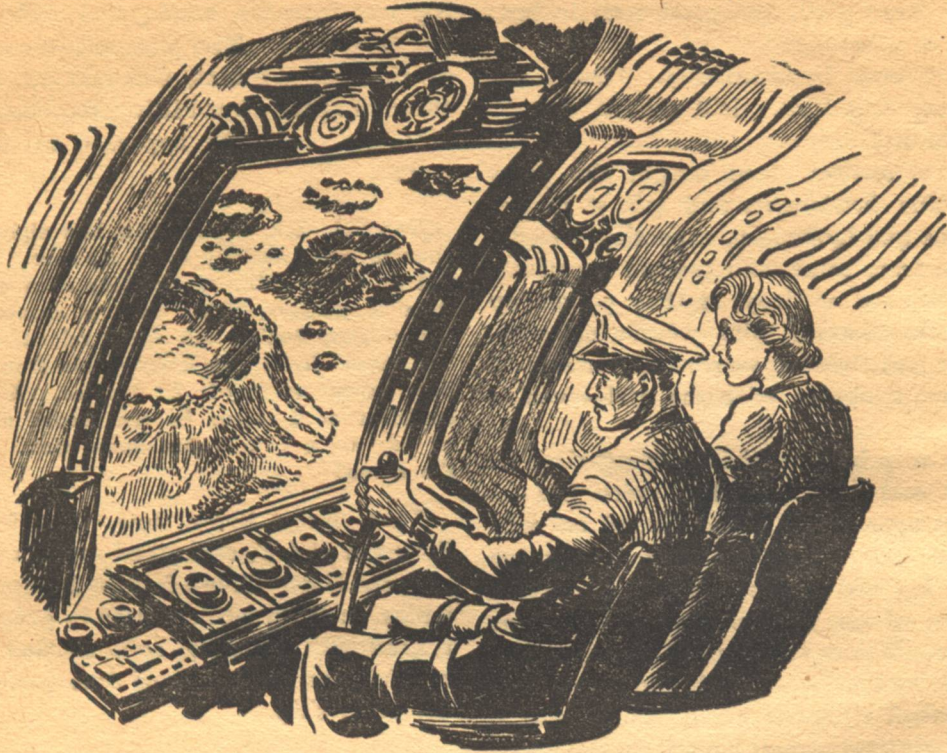
After that, entries became rarer, though they were still hopeful. A stray Biblical quotation showed how Swanson was filling his time. Then Grey came to the last brief entry.

July 23: I miss having someone to talk to, but I'm fairly cheerful. Tomorrow I must clean up the mess I've made of my living quarters. I took some of the litter out and buried it today. My spade turned up gold—a rich vein of it; thank God, it isn't worth carrying back to Earth, or the Moon might see another bloody chaos such as the other gold rushes have been, and the gold reserves be flushed beyond all value as a monetary exchange. I suspect there are more valuable ores, though.

Beyond that there were only blank pages. Grey looked for any small note, but none was present. "Wish I knew how many suits they had."

Mrs. Benson answered. "Two—they were supposed to leave one man inside at all times, so only a pair of suits were provided. You mean—"

"Probably. There's a well-used suit in the locker, and Marsden must have worn the other.



Get all the pictures you can to confirm it, will you, Correy? And we'll take the log along. Something must have taken Swanson out without a suit—again with no sign of a struggle."

He clapped his helmet back on and headed for the lock, out of the way, while she snapped the pictures and pulled the finished negative roll out. Then they filed back again, toward the rear of the *Delayed Meeting*. Neff, he noticed, was shivering and sticking closer to Philip Ralston, who seemed almost glad of the troubles that confronted them. June was frowning, looking to him for instructions.

He had none. Hunting the missing men was worse than senseless. All they could do now was to remove the necessary parts from the big tube, if possible, and proceed back to the *Moth*. He motioned to Ralston, and the two rounded the ship, proceeding to the tube.

Only the shell was left! The lining had been entirely removed, and as he flashed his light inside, he could see that a few bolts were left, all wires and connecting pipes cleanly snapped off. Someone had removed it before them. "God!" Ralston stepped back slowly, his face falling back to its former bitterness. "Now what?"

Grey dropped to the ground beneath, his light on, searching for some faint clue as to the ones who had done it, but there were none; the hard rock held no imprints, and the coating of dust was undisturbed, though there was no wind to blow it about and remove prints. The whole lining would have been a staggering load for all five of them, even here, but there was no sign as to its removal.

"Now, I suppose we go back to the ship empty-handed again! Six of us, left, and with the provisions and air from this ship as well as the *Moth*, we can live for at least two months, by taking it easy; then, or rather before then, we'll have to try getting air and food from the lichens. Maybe those bird-things are edible, too, though I doubt it. Perhaps we can find ores and materials to make a repair on the *Moth* that will work." He looked at the boy, who made no answer; it was just as well, since Grey knew they had no tools for all that work. But it would leave some faint hope for the others, perhaps.

They spread out again, going slowly this time. Grey wondered whether there was any hope of finding the natives, if such they were. If so, they might not be inimical, but only different, and some contact might be made that would enable an understanding. To himself, though, he still doubted the existence of intelligent lunarites; the birds could exist by keeping in motion—but could intelligence appear from such a life? And it would take a pretty fair civilization to reach the stage where they could survive the long night in one place; until that stage was reached, intelligent evolution seemed out of the question, and without intelligence, the stage was impossible.

Correy was beside him, and he noticed her flip her switch, addressing him over a beam that left the others out. "Curtains, do you think? Give it to me straight, Half-Pint!"

He beamed his own answer. "Probably, though we may be able to stave it off for quite a while. And—blooey goes space travel; it was bad with-



out two accidents, but now they'll be surer than ever it won't work! Just the same, we'll try to get back, somehow. Maybe we can get Bill Benson's old machine to working, since it's in good condition, and send one person back with the straight of it, maybe to lead a rescue trip. We've got the fuel he needed, and we can bake out water for his jets. Willing to try it?"

"Me? Chivalry getting the best of you again?" But her eyes carried the same speculative glint he'd seen before. "I'd risk it, if necessary, of course."

"No, but you're the official reporter for this trip, and you've got the connections to put it across; I haven't. The others aren't acceptable, either. That seems like the answer, so far. Anyhow, if I don't get you out from under my feet, I'm likely to find myself beginning to get used to you, sort of. Then you'd probably be insufferable."

"Think so?" He could read nothing in her remark, and put it down to devilishness that wanted to make more of a fool of him. "I'm afraid you'd be, Pipsqueak. I like men, but—"

She snapped back to nondirectional sending, dropping back beside Mrs. Benson and leaving him to lead on alone. But if he was supposed to think about her, she was mistaken. He had other worries, and he turned to them. Right now he'd have been just as happy without the responsibility of the command he'd assumed, though he knew that there was more need of it now than ever. Ahead loomed the *Lunar Moth*, and the best observatory from which to survey the surrounding moonscape for some sign of life.

He leaped ahead of the others, flipping the switch and calling the ship. His fears were justified; there was no response, and Wolff would have been too glad to have them return not to answer. So now Wolff was among the missing! Not that it was any loss, but it added somewhat to the mystery. How did the things know when to strike?

Obviously their method was shaping up. They apparently made no move to seize a group, but chose to pick them off one by one. Bill Benson and Bob Marsden were accounted for. But they'd taken Swanson after waiting—either because of the lock or for reasons of their own—then Kennedy at the first opportunity, and now Wolff. Seemingly, then, if they all stuck together, they might be safe. And again, they might not.

He gripped the outer lock, relieved to find it still unlatched; if they could unfasten it from outside, they could fasten it again—and he had no means of forcing his way in. A relieved look came to the others, who apparently assumed that Wolff had opened it, but Grey said nothing, waiting until he was inside and the facts were confirmed before adding to their troubles. Then his

suit was off and he was pushing open the inner seal to finish inspection.

A gentle snore answered him, and the body of Kennedy rolled back from the door as he pushed it, the man sleeping heavily, but apparently untouched! Wolff was nowhere to be seen, and there was no answer to Grey's shout. Kennedy did not awaken, but went on snoring easily, relaxed, sliding slowly aside as the pilot pushed the lock the rest of the way and stepped into the room.

Neff stared as Grey picked up the big designer and dumped him into a more convenient place, her mouth open and her eyes threatening to pop out of her head. "He's—back!"

"That's right, so he is! Suppose you see why he's still asleep after all the pushing he's just received." Grey made way for her, wondering how such an old-maidish child could ever have decided on a trip like this one, or how she'd ever become a first-class physician with her ideas untouched. "He's either been injured pretty badly or it's drugs."

She began fussing over the man then, and Grey watched, wondering how alien life could know the physiological effect of drugs on a human being, unless they'd decided to give him something harmless, and this had happened. That might possibly account for his return; if they were curious rather than unfriendly, they would have decided to bring back the man to where his own kind could minister to him and correct their unexpected harm. On the other hand, this sleep might be the exhaustion following some peculiar mental torture, and his return be a warning to get away and stay away.

It was up to Neff, now; if she could revive him, they'd soon find the answers from the man himself. Now she was injecting some colorless fluid into him, watching the reaction. Then she turned to the crew. "I'm sure it's drugs. But I can't guess which one would produce this result; those that show so few marked signs—he seems almost normally asleep—shouldn't have such a strong effect. But I think the stimulant I gave should overcome it."

Apparently she was right, for Kennedy began twisting, his mouth working loosely; it wasn't a pretty sight, and the girl turned away, avoiding it. Then he grunted in purely involuntary sounds. She bent again, giving him another shot, and waiting for it to take effect.

The reaction was stronger and faster this time, and the man sat up abruptly, staring at the others. "Uh . . . Grey, Ralston, what we doing here? Won't be take-off for hours. Say, how'd I get here?"

"That's what we want to know. What happened? Did you see the other life, and what's

it like? Any message of any kind sent back with you?"

Kennedy shook his head, puzzled. "I don't know what you're talking about. Say, it feels funny here . . . where the deuce am I, anyway?"

"Still on the Moon, of course; the tube's missing from Swanson's ship—"

"The Moon!" His face contorted, and he looked from one to the other in amazement. "You kidding? . . . No, guess not. It feels like a light-gravity effect should, and things look funny here. How'd we get up here, though? Last I remember, we were told to lie down and to catch up on sleep before the take-off. Don't tell me I slept through the whole thing?"

"Hardly. You were supposed to be fixing the tube, then you were gone when we came back." Grey could make no sense of it; Kennedy had an excellent memory and a clear mind, whatever his faults. "Pull yourself together, will you, and try to recall what happened? There's a lot depending on it, especially since Wolff's gone."

"Uh. I donno. . . . Lord, I'm sleepy!" He was yawning and fell back, his eyes closing. "Can't remember a thing, Grey. Go 'way and lemme sleep. Lemme sleep." The other words that he started to say faded out into an indistinct mumbling, followed by the same even snoring Grey had first heard. Shaking him had no more effect, either.

Neff shrugged thin shoulders. "If he can sleep with all that injection in him, I give up. It might not be safe to wake him again. No drug acts like that! Do you think—"

"I don't think anything. At first, he was clear-headed enough, it seemed, and he didn't remember a darned thing; he wasn't fooling us. Well?"

The others had no suggestions, though they obviously had imaginations that were working overtime. Grey's was quiescent; the facts as he now found them fitted into neither of the possibilities that had occurred to him, and he was no nearer a solution of the intentions of the other life than before.

"Wolff's gone, as you've probably noticed. I can't say I consider it a great loss, but I'd look for him if I had any idea where to search. Until one of you can figure that out, I'm going outside, over to Benson's little ship. I want to look the motor and other things over. The rest of you stay here and keep an eye open for anything suspicious!"

June frowned at him. "You can't go out there alone, Runt! Those things seem to pick out anyone who's by himself, and they're likely to get you. Don't be a fool!"

"Maybe I want them to get me, Carrots." He headed for the lock, screwing on his helmet. "I'll be back when I get here, and if I don't come back, you're no worse off—you've got that much more

provisions to divide among you. See you!"

The inner door closed behind him, and he passed out and down the ladder. Correy's yells had disappeared with the closing lock, and now only the sound of his own feet striking the rocks beneath him reached his ears, carried up through the air inside his suit. If there was life waiting for him, it could approach soundlessly, but he refused to spend his time looking back over his shoulder.

He sped along, through the valley of the lichens, up the rise, and across the rocks to the *Alice*, seeing no hint of life other than what he'd already seen. For a moment, he hesitated, wondering if they had guessed his purpose and were waiting for him inside the ship; then he shrugged and reached up for its tiny lock,

#### IV.

They were eating when he returned, or rather picking at food that had been placed before them, and in the few minutes he'd stood outside the inner seal, he'd heard no words spoken. They jumped as he threw back the door, varied expressions crossing their faces. Ralston mirrored frank relief and admiration, Correy's face lighted momentarily. Grey reached back into the lock.

"Any disturbances while I was gone? Hear anything?"

"Not a sound, Grey. We were peaceful enough, waiting to hear something from you come over the speaker. Another ten minutes and I'd have followed you." The boy was tackling his food now with a much better appetite.

"Umm." Grey drew in the figure of Wolff, flaccid and snoring faintly, dragging it to the middle of the floor. "Little present for you! Found him between the outer and inner seals, just like that. He was quiet enough for you not to hear him, but I can't figure how they pushed open the lock and carried him in without sounds reaching you. Look him over, Neff."

Her diagnosis was rapid this time. "Exactly the same as the other! Do you think I should try to revive him?"

"Don't bother. You'd get the same results. Notice, though, that he isn't wearing a suit of any kind, and that means they either had suits for humans or else they carry their customers in some kind of air-tight vehicle. Nice little game, isn't it? Only it isn't a game . . . there's good sound reason behind this, somewhere; practical jokers don't work that hard. Find the reason and maybe you'll have the clue to them."

They put the sleeping Wolff in his sack, for want of a better place for him, and Grey shook his head as Mrs. Benson began putting down paper dishes for him. "Not now. I'm going up and have a look through the top emergency lock."

"What did you find at the other ship?" Correy asked, still looking at the sacks that held Wolff and Kennedy.

"Guess! I should have expected it, but I didn't."

She glanced around at him, curiosity giving place to sudden suspicion. "The motors had been removed! Is that it?"

"That's it! They've been gone a long time, too. There was still some air in the ship—nice construction there—and the metal was dulled on the bolts, showing the nuts had been removed long before this. No hope there." He pulled down the little ladder leading up to the escape hatch, and began climbing. June brushed back her hair, following him up the long climb, and into the little lock that was just big enough for the two of them. Four little quartz windows gave a view of the crater around them, once the shutters were pulled back; it had been intended as a look-out station as well as an escape.

As he swung the telescope from one side to the other, nearly all of the crater was visible, stretching out to the abrupt horizon on one side and to the towering cliffs on the other. He was looking for a trace of a trail, a cleared section among the rough rocks, or any sign of life, but he found none. No buildings, no piles of trash, not the faintest hint of intelligence; then he caught sight of a long stretch of the bird-creatures hopping into a stream from some point beyond his vision to eat and replenish their air before rushing out of sight again.

"Maybe they don't live here," Correy hazarded. "They could come from some other part, only visiting here to take away or bring back somebody."

"They could, but I don't believe it. They're somewhere near, or they wouldn't be so quick to know when we're all away and spot our weak moment. Well, that leaves only one place—the cliff!" He swung the telescope then, studying the rugged wall, until she took it from his hand and looked herself.

"It doesn't look like home to me, Half-Pint. If people lived here, you'd expect them to have some structure outside their entrance."

"But these aren't necessarily people. They might have different ideas."

"I suppose." She put the telescope down, rubbing her eyes. "I can't see anything, but I'll try again when my eyes clear up—hurts to look too much across this glare. . . . You wouldn't have any of those cigarettes left, would you?"

He grinned, holding up the package that was still half full. "Uh-huh. I'm no pig, Redhead. Look nice? . . . No, now wait a minute—don't get so hurried about it. There should be some kind of a ritual to using this reserve, don't you think? Any suggestions?"

"Darn you, Grey! Keep your cigarettes, then!"

"As you like." He selected one deliberately, running it back and forth over his thumb, tamping down the end, and lighting it. The little end glowed in the semidusk of the cubbyhole, and the thin wash of air that came in through the pipes only served to stir the smoke around, letting it cloud the air before drawing it out. Grey grunted in animal comfort, doubling his legs under him and sprawling out on the floor. "Our favorite brand, too! Seems a pity to think of their being gone so soon."

She held out longer than he'd expected, knowing how thoroughly tied to the habit she was. Then she shrugged and flopped down beside him. "O. K., O. K., be a cad if you want to. What'll you do when they're all gone?"

"Use the two whole cartons left on Swanson's ship—Englewood and Marsden left quite a supply, and Swanson never used them, apparently. Since we're the only ones who smoke on this scow, they should last quite a while. Don't go looking for them, though; they're all locked up in my hamper. Hey!" He sat up, rubbing his face, and grabbed.

She ducked, grinning at him. "You're a rat, Nemo Grey, and you deserve worse. That's the lousiest trick I've heard of!"

"It is," he admitted cheerfully, beginning to understand why men who work under a strain devote so much of their free time to horseplay, partly amused at himself, and partly amazed. "What are you going to do about it, though?"

"Slit your throat when I'm sure there are none left, I suppose. . . . Now, do I get that darned smoke?"

There were four butts on the floor when he finally picked up the telescope again, and he was less amused, more amazed. She brushed her clothes, rising. "This is a lunatic world, all right, Half-Pint. People go crazy here. . . . Did you know that Neff's decided somehow Phil's her heart-throb, after all? Well, she has, and he's half delirious about it; doesn't care whether he gets back or not."

"Donno what he sees in her; he's a swell kid, though, and I'm glad he's happy. . . . Umm! Take a look over there—between the green-black stuff and the crack beyond it. See what I do?"

She looked, her forehead wrinkling. "A hole, maybe? Looks something like one."

"Must be. They have to have some place to live, and I'll bet they're oxygen-breathers. Wish me luck, Red-Top!" Grey caught the rope and was down hand-over-hand, moving toward the lock, with her at his heels. "Uh-huh, you stay here. I think I've spotted their hideout, Ralston, and I'm going scouting. Take command while I'm gone."

Correy caught the inner seal, slid through. "I'm

protecting the cigarette supply, you usurer! You're not running off and leaving me without a smoke. Don't say it! It won't do you any good."

He knew she meant it, and nodded, climbing into his suit and helping her with her own outfit. At that, taking someone along might be a good idea, since at least one of them would stand some chance of getting away and back to the ship with information. They jumped from the lock and went leaping across the rocks, heading toward the cliff, each selecting a path separate from the other, but fairly close. Swanson's ship was half a mile to their right as they passed it, then the ground grew rougher, breaking into jagged gullies and humps of rocks, and they were forced to slow down.

"Plenty of minerals here," he called over the phones. "I'll bet the bottom of that cliff is a treasure house; may even contain radium in fair quantity. Hey, where are you?"

She was out of sight, but her voice came back instantly. "Left, down the gully; it turns and it's narrow, but it looks like the best way. Come on."

He saw the place she meant and headed down after her. Freakishly, the floor was fairly smooth, and his bounds carried him along at a brisk pace. Correy wasn't waiting for him, apparently, satisfied that nothing could jump on them here. Then the crack straightened out and he could see her ahead, passing through the narrowest section. He glanced to his right, wishing he knew something more of metals and their ores, and back in time to see her sprawl forward on her face.

"June!"

"I'm—all right, I guess! Jarred a rock loose, and it hit my back. I . . . Grey! Help! My air tube's cut!" Her voice was frantic, and he could see the suit collapsing. She wriggled, and her voice was sick and weak. "Grey!"

"Steady!" He was leaping toward her now without caution. "Hold your breath, if you can, I'll be there in a second! Don't waste your energy. There." He caught the rock that was still on her, tossing it aside, and looking down at the lacerated tube that led the oxygen into the helmet from the tank. It was short, and normally protected, but a jagged edge had slit it neatly, and the last air rushed out as he watched, faster now that the rock no longer plugged the hole.

With desperate haste he jerked his mittens from his hands, snapping the wrist bands closed to save his air, and his naked fingers swept down onto the scorching metal of the tube, wrapping around it tightly, covering the damaged section. The air rushed back into the suit as he twisted the valve, and he could hear her breath catch. "Take it easy, now. Breathe deeply a few times—empty your lungs after each! That's right. I'll have to take a couple of minutes to screw in the spare one . . . thank the Lord, there is one . . .

and you'll be forced to hold your breath again. Now—a normal breath and hold it!"

The sun had been glaring down on the metal, heating it, though part of the trip had been through pools of shadow. But he had no time to worry about burns as his fumbling fingers screwed out the old tube and fastened in the replacement. The ten pounds of pressure in his body made his hands seem puffy in the vacuum, though it was insufficient to cause serious damage. Finally, though, the new tube was in, and he turned on the valve again, letting oxygen feed in to her.

She came to her feet shakily, looking at his reddened hands, over which he was drawing his mittens. "I'm sorry, Grey. I shouldn't have been so careless. You're—"

"Forget it!" He was breathing heavily himself, ashamed of the shakiness of his legs, and his voice was brusque. "Nothing serious. We stick together hereafter, that's all. Come on!"

"Wait!" It came over the phones, without directional sense, but they both swung around to see Alice Benson coming toward them. "Wait, please. I've had the hardest time following you two from the little I could see of you. You don't mind, do you?"

"Ralston had no business letting you come, ma'am," Grey told her. "Why'd you do it?"

"Because I'm tired of waiting for things to happen, lad. I want to know what's going on, just as much as you do. And here, I'm almost young again, so I didn't think I'd be a nuisance. Besides, what's the difference, really? If you get caught, I'd be stranded here anyway, to die slowly."

"Let her come, Grey?" June asked. He thought it over, briefly, and nodded, starting again toward the cliff.

As she'd said, she was agile enough here to be no handicap, and the chances could be no worse. They slipped through the end of the cut, and were against the bottom of the cliff; above them, the dark circle that must be a hole could be seen clearly, sixty feet up the steep side of the rocks.

He wasted no time in explaining his methods, but made a running leap, rising nearly twenty feet off the ground, and managing to catch an outcropping above the smooth bottom part. Somewhere, his feet found a place to hold on, and he spotted another hold within reach before removing a small coil of rope carefully and lowering it to the other two, who swarmed up quickly and caught the same jagged tooth of rock.

Actually, what had looked hard because of Earth memories proved surprisingly easy, their bodies in the suits weighing less than a quarter Earth weight, and the cliff being covered with sharp, uneroded cracks and projections. There was a little shelf beneath the hole, and they were

standing on it in a matter of seconds, staring into absolute blackness.

"We'll have to feel forward," he ordered. "No lights!"

The utter black was eerie, having none of the usual slight hints of light found in an atmosphere; he tested each step, one hand held to the cold rock wall, the other above and in front to locate something that might bump against his helmet. Foot by foot, they advanced, the breathing of the other two heavy in his phones. Then his hand found a flat obstruction, felt along it, and revealed it as a smooth, rounded end to the tunnel. He put his hands over the light, leaving only a slight hole, and set the beam forward. In front of him, a metal door was set into the rock, a handle projecting from it, and a row of odd characters beside the handle. On the other side, English letters showed whitely: "WELCOME!"

June gasped, but his own mind found a hint of a solution. They'd had Swanson for days now, and some kind of communication might have been set up. Whether the sign was actually a greeting or a trap, he had no way of knowing. Nor could he be sure that its meaning was anything beyond a bit of grim humor on Swanson's part.

He tried the handle, found that it turned easily, and stepped in, a glare of light springing down as he did so. The two women cried out, but followed, and the door closed automatically, while a sudden hiss of air spilled in. Seconds later, another seal opened by itself, leading out into a long, smooth hall of white stone, lighted softly from the sides and ceiling. Grey's skin tightened, but he entered, the others behind him, and the inner seal swung softly shut.

The air, as he tested it, was sharp with the smell of ozone, and slightly thinner than even the mixture in the ship, but it was breathable, and rather pleasant after a minute. He debated leaving his suit on for an emergency escape, then decided against it; those automatic doors could undoubtedly be sealed against him at any time. He was in it now, and had to see it through.

"We might as well be comfortable," he told the others. "Let's take 'em off and go ahead to meet our hosts in suitable style. Wonder why they haven't shown up? Here, Carrots, light up!"

"Thank you, kind sir," she said, mock amazement on her face. "If I didn't see it, I still wouldn't think there weren't strings to the offer somewhere. Where to? Down the hall?"

"All we can do. Want to try it, Mrs. Benson?"

"I do, Grey. People who can design those soft lights and cut such rock to make their walls can't be all bad. This is culture, and a well-developed one, too."

Their steps were muffled by some form of car-

peting on the floor as they passed down the hall and rounded the corner into a room beyond it. Then they stopped, staring.

Bob Marsden tossed aside the strange roll of writing he was studying and bounded forward, a grin on his homely face, with Swanson at his heels. "Earth people, finally! Howdy, folks! I see they didn't bring you in asleep!"

Swanson was pumping Grey's hand, grinning. "So they picked you for this trip, eh? Good. Heard you did better than I did, too. How about introducing the ladies, fellow? . . . Hey, Burin Dator, you've got guests!"

Into the room, a creature walked, resembling a man somewhat in general formation, though only three feet tall and slightly built. The features on the head spread wider apart, the nose lying under the mouth, instead of above, and the skin was thick and leathery, entirely devoid of hair. He resembled a rough rubber caricature of a human being, but his appearance was somehow civilized and pleasant, as any well-formed and graceful animal is pleasant.

"Mike!" It was a low rumbling voice, oddly at variance with his size, but the intonation was hearty and genuinely glad. "Mike, boy, you finally returned. We've missed you around, been wondering why you didn't make the first trip. Swanson here explained you couldn't, so we were pretty sure you'd make the rescue ship, but we didn't get close enough to see you, and the description we wormed out of that man, Kennedy, wasn't exact enough to make us sure. I was just about to go out and meet your gang. . . . Welcome home, boy!"

Burin Dator slid his delicate "hand" into Grey's, his eyes warm, and an expression Grey knew to be meant for a smile on his face. "Sound general assembly! Mike's come home! *Lursk*, some of that synthetic wine! This calls for a celebration!"

## V.

It had been quite a celebration at that, with others of the Martians trooping in and joining quietly, all regarding Grey with the same look of familiarity. Finally Burin Dator shoved back his seat and led them into a comfortable room where padded seats were arranged gracefully along the walls around a low table, his wrinkled face beaming. The Earth trio followed in growing surprise, somewhat annoyed by Swanson and Marsden, who chose to answer no questions; they were still unsure that this was real, eager for explanations that had been hinted at. Grey was clutching his sanity grimly, unconsciously sticking close to June for a straw of normality to cling to.

The little Martian selected a seat leisurely. "Comfortable, everyone? I sincerely regret the

unpleasantness of our first contacts with you, but it was necessary that we find out what type you were. Unfortunately, the two men whom we first obtained were both of a type we've been forced to take measures against, so they were returned in good health, but somewhat restrained."

June stirred. "Just what did you do to them?"

"Nothing permanently unpleasant, I assure you. We removed some of their memories, after determining that their words on your Earth would have had bad results for us—they were filled with a desire to exploit this world, you know. They've forgotten the last few days, with the help of a little surgery, and now are under a drug to keep them from knowing more. We'll give you an antidote to counteract it before landing again. . . . It was rather ticklish work, removing some memory, but leaving all except the very recent events, and I'm a little proud that we didn't have to blank their whole mind."

"Earth surgeons can destroy memory," Grey agreed; he should know something about it, since the whole subject naturally interested him. "But they can't do that, certainly not to another race. You've got good reason to be proud."

"It was difficult. But remember that our hands are somewhat more delicate than yours, and that we've studied the mind of human type with great care, only recently realizing how it sorted its memories, and what nerves controlled them. Also, where your race leads ours immeasurably in mechanics and inventiveness, we are much further advanced in medicine, psychology, and the general study of life-chemistry and thought than you. Swanson wasn't the first, nor Marsden; we met our first Earthman much before that."

Alice Benson leaned forward, her eyes gleaming. "That man, Mr. Dator—was his name Bill Benson?"

"It was, lady. And I gather you're his wife, so we'll turn over his manuscript work to you before you leave. He believed you were dead when you didn't come, not knowing of that War you had, or he would probably have gone back. . . . But, to begin, we on Mars had a better medium of observation than you—our air is thinner, causing less loss of detail in astronomical observation. We saw his flare on the Moon by chance, observed, and analyzed it carefully, and decided that it indicated there was life on your world, and that you had successfully bridged space. At the time, we had completed, by a fortunate coincidence, a spaceship upon which our people—or at least our group—had been working some two hundred of your years; we are slow at such things, as I said. It used a simple oxygen-hydrogen jet, since it was barely possible from our light-gravity to your Moon, and I was fortunate enough to be one of the crew. Then, when we finally located Bill Ben-

son. It took us nearly a month to repair the injuries to his health from his wanderings outside the ship, and his exhausted air. It took time to establish a common understanding, but while our people and yours differ surprisingly, their similarity in social behavior and thought is much more surprising."

The Martian paused, thinking before resuming. "Like you, we have a practical type and an idealistic one. From the former, there could be only trouble in a meeting of races; it would be a struggle for supremacy, and would go ill for the both. Unlike you, our idealists recognized the fact when the first attempts at constructing a rocket were begun, and organized a small, secret group. It is from them that all our people here are drawn, and only that group knows of our success. We are forced to deceive the others. Bill Benson agreed that only the idealists of his race must know, also. You are such, so are we. The two men asleep in your ship are not, and they cannot know, nor must your world."

"Because, this world is rich in things we both need, ores and materials that are immensely precious, even in small loads. World-shaking fortunes are to be made from them, and from the secrets gleaned by each from the other. We've already begun using them—your engines, your gadgets, the other things Bill Benson could describe, and especially your atomic energy, which is the real key. They're infiltrated slowly, outwardly the result of individual luck or skill, and you must do the same."

"What we envision, then, is a small group on each planet, controlling gradually a large amount of that world's wealth, seemingly with no connections here, until such a company holds the balance of power. It would be composed, quite naturally, at the head, of men who know and sympathize. Then, when the idealists have paved the way, we can open the gates between the races, controlling the opinions carefully so the mobs will agree with us. We can never live on your heavy planet, and you would find ours most uninviting, but here—your Moon—we find a common ground for the future of both races. The other way, we fear destruction. Can it be done?"

Grey nodded, his mind filled with that huge plan for a future perhaps centuries later. "It can be done, I think. Certainly the men who control the finance of a nation can do a great deal to shape its thoughts and laws."

"And the nucleus of the company already exists," Mrs. Benson pointed out eagerly. "I own Atomic Power, which itself is a powerful instrument. At the moment, my liquid assets are depleted, but that is only the money; the real wealth is still untouched. Cartwright, who runs it for me, is to be trusted, and he'd know how to organ-

ize better than almost anyone else. If we were to land on a desolate place, damaging our ship afterward and radioing for help, then represent the Moon as completely unprofitable, a dangerous, useless place—"

"Precisely, lady." Burin Dator favored her with another of his toothless grins. Those two men were mentally impaired by some kind of radiation, as you were yourself, of course—only the very young can withstand it—and the others all can be made to show severe suffering, by certain drugs we have. Such pictures as have been taken will show nothing. Then you organize secretly, forming mining companies, small inventive groups, and so forth, and building a very small but efficient fleet of freighters to carry the idealists and the refined metals that are valuable in tiny quantities—jewels, too, to be found in the craters—and we can safely trust the future from there."

Grey could agree with it, and could see how the company could operate quietly, not as one, but as many. It still left the big problem on his hands, however. "How do we get back? Our tube's shot, and you probably use something different that won't fit the *Moth!*"

"We use a type of propulsion similar to yours now, perfected by Bill Benson, and much more efficient; it does not destroy itself, either. One can be fitted easily. We are visionaries, Mike, but not foolish ones."

"What's all this 'Mike' business, anyway? Don't tell me I'm a Martian, transformed somehow?" The calm use of that name was beginning to wear on his nerves, coupled with the fatherly interest shown by the Martians.

Burin Dator laughed, an obvious imitation of Earth emotions, but one that had become natural to him. "Not at all, boy. I said we were far advanced in life-chemistry. When Bill decided to stay here, he wanted a son, if our methods worked as well as we claimed. We made nine failures, and one that was almost a failure, but we learned, and you're our eleventh attempt at exogenesis; I'm afraid it wasn't perfectly adapted for Earth life, since you've always shown some peculiar features, but you're the . . . ah . . . foster son of Mrs. Benson."

"And how'd I come to Earth, then, carrying no memories with me?"

"We'd promised your father before he died that you'd be returned, but we knew it was unsafe to trust a boy who knew nothing of his native planet, so we were forced to remove your memory first. We hoped habits of thought and emotions would develop a similar character in you, and that certain wordless suggestions we planted after the

operation would bring you back, if possible. It seems we were right, fortunately."

"Can you give back the memory, then?"

"No. It is final when performed, though we can show you records of your life from its beginnings that are almost as good." Dator hesitated, glancing from one to the other. "We hope, naturally, that you will remain with us when the others go; they can explain it as lunar madness, how you walked away and were never seen again. Mr. Swanson can pilot the ship back. But we need at least one representative from your planet to remain."

Grey considered it slowly. Earth had never been particularly kind to him, a freak among normal men, and it was only here that he had found friends—Mrs. Benson, Ralston, these Martians; perhaps even June Correy. Back there, they'd be swallowed in their work, and he'd be alone again. But—

June broke in, settling the matter. "Of course we'll stay. It's the only solution."

He jumped at her voice, swinging to study her face, but it remained calm. "We? Naturally, I'm the one to stay, but you—"

"Stick. That is, if you don't mind. I'm being honest, now. Here, you're a man, and one that suits me under these conditions. Size doesn't count. On Earth, I'd be ashamed to walk down the street with you. I'd erase you from my life so fast you'd never know what happened! But I'd rather not do that."

Grey didn't care to think of it himself; maybe it was a lunatic world, but insanity such as this was better than his normal life had been. He'd been afraid to think of such things, even here, but now— "Do the Martians have some ceremony, Dator?"

Dator nodded, beaming. "Indeed yes, or we have a copy of the Earth one. In the morning, then, my engineers will fix your ship, and you can say good-bye to your friends. Tonight, after you phone them to attend, why not the ceremony?"

Alice Benson had eyes that were filled with a hunger that had already accepted Grey as her own son. "That would be kind, Dator. And some day, I'll be back. This is my world. . . . What'll you have for a wedding present, Michael?"

It was his world, too, he knew, the only place where he fitted. But new world or not, his emotions were finally flooding in on him, too new for him to express adequately. It was June who answered, her grin somehow sweet, mocking though it seemed.

"Cigarettes, Mrs. Benson. That boy gets more mileage out of a package than your rocket ever can."

# WARRIOR'S AGE

By Peter Risk

● A moment's glance at a distant age—a different culture—  
and an episode based on a different philosophy of life—

Illustrated by R. Isip

Fresh green shoots were pushing up through dead grass, and gnarled trees were losing their ugliness as tiny leaves shrouded them that spring of 2942, but there was no responding lift in the hearts of Dan O'Keefe, soldier of fortune, and the lithe amazon, Barbara Doone, as they drew rein on the rim of wooded foothills that overlooked savage New York.

The man cast wary glances behind him, his attitude one of listening, then turned troubled gray eyes on the ruined city to the east. A fresh sea breeze, salty and pure, danced on their travel-stained faces.

Their huge horses, slender of shank and sleek of barrel, feeling loose reins, nibbled hungrily at the fresh shoots. O'Keefe, on his chestnut stallion, and Barbara, on her white mare, sat like riders born to the saddle.

"It seems so hopeless," said the girl, her tired brown eyes, in which latent fires blazed, taking in the city's cracked buildings and numerous inhabitants, which moved like ants in the distance. Antique airplanes whirled in the sky.

O'Keefe's lean jaw hardened. Muscles rippled beneath the smooth skin of his face. "We'll get through," he said. "It's taken us almost a month to cross the mountains, and from the looks of things, spring has come early to the coast. The Chicagoans will be closing in on your father almost before Dr. Leering can send reinforcements. We must get to him tonight, Council or no Council."

"But the snowstorms, the wolves, the bears," the girl defended, "we could not help it that our progress was so slow." Her small jaw also set in a hard line. "But we'll make up for it. We'll get to Dr. Leering tonight. We have ten hours before dark." And she added, "After that, the hospital for me."

"Are you hungry?" O'Keefe asked. "I think I see a farmhouse, and a rich-looking one, too, down there behind the trees." His eyes fixed on the white corner of a house.

"I'm not hungry." Resolutely the amazon tightened her metal warrior's belt, swung her cyanide gas gun to readiness on her right hip and straightened her long sword sheath on her left. She clucked to her white mare. "Let's go."

"Barbara!" O'Keefe's voice vibrated with excitement. "That farmhouse! Don't you see men on horseback dashing around it? Hark! I think I hear cries."

The girl's metal-shod sandals raked her horse. "We have troubles of our own. My two missions are near completion, and I will not be turned aside by your chivalry. I don't see why you decided to accompany me from Rogersville in the first place, unless it was to get out before the Chicagoans swooped down. You soldiers of fortune are all alike. You fought with my father while his armies were winning, but after his men were bottled up in Rogersville and we found out the Council was betraying its own people and us, just to sell ammunition and supplies, you decided to come with me."

Laughter rose in O'Keefe's gray eyes. He bided his time.

"Now you see the chance to join some guerilla gang in looting a wealthy farmer and you want to pitch in," the young amazon continued angrily. "You came with me knowing full well that as soon as I delivered father's note to Dr. Leering that I would take the celibacy vows and accept sterilization. What a figure of a man you are—accompanying a girl to her own sterilization!"

"I came with you to stop you," said O'Keefe softly, "if your idealistic little brain can ever be penetrated by love and devotion."

"You've read too many old books!" Barbara snapped. "Why do you suppose women like myself have been accepting sterilization for hundreds of years? In order that men like you could marry other women who would give you male children, and not overrun this country with more of us females! We're trying to change an unnatural population proportion that has existed since those





terrible wars of the twentieth century. And you, the eternal male, seek to dissuade me!"

"How do you know you won't have boys?" O'Keefe put in in his gentle voice.

He was rewarded by sparks from the girl's eyes. Both ducked to avoid tree limbs along the weed-grown path.

"I have no way of knowing whether I'd have sons or daughters," snapped Barbara tartly. "But I do know this—that if there are less women bearing children, there will be less girls. Population will return to normal percentages of male and female as existed before the twentieth century."

O'Keefe turned his head sharply as sounds of fighting from the farmhouse, which Barbara was circling to the left, became louder. Swords clanged on swords, and the desultory pop of the gas guns was heard. Victorious cries arose from wild throats.

The conflict of remaining with the girl or going

to the farmer's assistance was apparent on the soldier of fortune's face. His love of the girl and the sting of the old argument triumphed momentarily.

"You would rob yourself of the joys of a husband, a family and a home to make yourself like these other sexless creatures?" O'Keefe questioned. "What of your old age? Would you shine harness, clean stalls, to keep body and soul together?"

"I always have my sword," the amazon said simply.

"But your wrist will not always be supple—"

"You misunderstand me. My sword has always served me. It will seek my breast, in answer to my bidding, as well as the breast of another."

O'Keefe's gray eyes reflected the horror he felt at that brisk statement.

"An outlaw band might charge on you from ambush," O'Keefe argued. "You'd become the slave of its dirty chieftain."

"That is why sterilization was added to the

celibacy vows. And I have my friend here." She patted her long sword as it swung at her hip.

O'Keefe gritted his teeth. "You have too much faith in your sword."

"It saw me through the mountains.

The soldier was stung to retort: "You got through the mountains because you were with a man who knew every inch of the way. You were going to ride at day, in full view of planes, you and your copper hair on that white horse. I made you ride at night. You were too haughty at first to wade streams to throw the Chicagoan warriors off our trail—until they nearly overhauled us two days out of Rogersville. When that bear rose in your path and you charged it, it was my gas bullet that downed him."

"I would have ran him through."

"You don't know the dexterity of a bear, or its endurance, even after mortally wounded. You trusted your horse to outrun wolf packs, and you never thought of dropping a deer to stop them!"

"My horse can outrun any wolf pack that ever howled."

"For how long? And how many packs? And what condition would that poor horse be in by the time you got to New York?"

Barbara waved an imperious, smoothly muscled arm. "Remember your place, soldier. My father is a chief and you are a hireling. When your talk ceases to be amusing—"

She locked her angry brown eyes with his gray ones in an effort to stare him down, but O'Keefe interrupted her hot flow of words with a question:

"Do you expect to ride into New York as you are now?"

"Certainly, soldier."

They were abreast of the farmhouse, from which the noise of conflict had ceased to emanate. An ominous stillness hung in the warm air.

"Don't you suppose the Chicagoans who lost our trail have sent word ahead to keep you from Dr. Leering?" O'Keefe's voice was cold. "Don't you suppose that the Council's men are already looking for a copper-haired girl on a white horse and her soldier friend on a chestnut stallion? How far would you expect to travel along New York's streets before you were set upon and captured?"

"I have my sword."

"You reckless little vixen, it must be love I have for you, or I'd let you go your way! Could you prevail over a city of traitors? Don't you know the best swordsmen in the country make up the Council's constabulary?"

Slowly, the girl drew rein. "Dan, what are we to do?" she asked.

"So you're sweet again, are you?" O'Keefe stormed. He rapped his metal sandals smartly against his stallion's flanks, and whirled abruptly at right angles toward the farmhouse. "Come, I'll show you."

They peered cautiously out at the thatch-roofed, stone farmhouse, a tall, ivy-grown, two-story affair, from the shelter of a clump of yellow willows.

A lazy curl of blue smoke arose from the straw-brick chimney, but there were no other signs of human life. In the front yard lay motionless bodies of farmhands and hairy guerilla warriors. Two horses stamped at the wide stone steps of the house, and chickens cackled noisily in the bushes.

"Perhaps the others are around to the back," said Barbara.

"We'll take a chance," rapped the soldier. "Ride to the front door."

They crossed the yard without hearing an outcry, their horses' hoofs plopping softly on the grass. The other horses whinnied friendlily as O'Keefe and Barbara tied their horses to the porch rail.

"Mountain horses," whispered O'Keefe.

Barbara nodded.

They stepped softly through the open doors and instantly heard voices.

O'Keefe led the way through the parlor's dainty furnishings, and pushed the curtain aside in the sitting-room doorway. They were transfixed by the scene before them.

Four guerilla warriors in rusty harness were holding a white-haired old servant, a slender youth, a dignified, gray-haired woman and a tall, handsome girl. On the patchwork hide rug lay the body of a well-dressed farmer, blood staining the back of his white blouse.

A fifth guerilla, in captain's harness, looked up as O'Keefe and Barbara pushed aside the curtain.

"Visitors," he grinned, showing yellow teeth. His face was covered with black hair save for a wide blue scar on his left cheek. His eyes were bloodshot. "You are in time to watch how we deal with traitors to the Council."

O'Keefe's eyes fell to the man's harness. He wore the trappings of Richard Shay, a corpulent, grasping councilman who had been elected from New York's West Side when he scattered pennies to the poor.

The tall, handsome girl, with blond hair that cascaded over her smooth shoulders, raised her chin. "We are not traitors. You are. You know we are loyal to Dr. Leering, and so you are afraid we will get word to him of the number of supplies going over the mountains to the Chicagoans. Well, we would have if every way to Dr. Leering's ear had not been blocked by Shay and the other fat rats Dr. Leering suffers to live."

"Hush, hush, girl," said the ruffianly captain, his hot eyes fixed on the girl. "We'll get to the bottom of this business in short order. Bring the servant."

The captain led the way into an adjoining room

to the left, while one of his men pushed the struggling, white-haired servant in after him. A cry followed, and the captain and his companion returned, the captain sheathing his sword.

"He wouldn't talk," said the captain. "Now you, my big heifer." He motioned the man holding the gray-haired woman to lead her to the side room.

O'Keefe stepped forward, hand on sword. "Captain, this is murder. In the name of justice—"

The scarred-faced captain ignored him. "Look behind you," he said.

O'Keefe and Barbara whirled. The doorway behind them had filled with grinning ruffians.

"I'll question the blonde!" a red giant called.

The dignified woman stepped toward the room. "I will show you a brave woman is not afraid to die." She marched into the room, head erect.

The blond girl's eyes were wide with horror and the slender youth sobbed, jerking futilely at the strong hands that held him.

The captain and guerilla returned, the captain again sheathing his sword. There had been no cry.

"Now the girl," he said. "Watch the boy and our two visitors. Here, don't push her into that room. Lead her back this way."

The youth cried and sprang forward. A warrior struck him across the mouth and he collapsed, blood oozing between his lips. The soldier holding him leaped after the men with the girl. The warriors behind O'Keefe and Barbara jostled the two as they surged after the girl and her captors.

Hastily, O'Keefe leaned forward and hoisted the unconscious boy to his shoulder. Brutal laughter came from the rear of the house when a girl's voice screamed in terror.

Despite his burden, O'Keefe bounded for the parlor doorway.

"The girl!" cried Barbara, lingering.

Roughly, O'Keefe grabbed her hand and dragged her after him. "We can be of no help to her," he said grimly.

He threw the youth across the pommel of his horse and leaped up. With white faces they raced their horses across the yard and into the shelter of trees. No shots or cries pursued them. For only a moment they heard the raucous cackling of the chickens.

A mile from the house, O'Keefe drew up where a narrow, pebble-bottomed creek wound through a willow grove. The farm youth was conscious and slipped to the clayey soil. For a moment he stood erect; then, his face in his hands, he shuddered and dropped prostrate to the ground, sobbing tearlessly.

O'Keefe dismounted and bent over him. Barbara was concerned and brought the slender youth water from the brook.

"Go to a farmhouse where you know you will be safe," O'Keefe instructed the lad. "Keep traveling from farmhouse to farmhouse until this blows over."

The boy raised glazed blue eyes. "I wish I were dead, too."

"Here, none of that!" O'Keefe snapped. "You've your own life to live. Your turn will come. But now, son, give this girl your clothes and take her harness. If you don't like her warrior trappings, you can get clothes at the next farmhouse."

Numbly, the boy began to strip himself, and Barbara, quick to understand, stepped behind the boles of a clump of willows and threw her garments to O'Keefe, while he in turn tossed her the long trousers and light-tan blouse of the peasant boy.

The boy's eyes glittered as he stared down at his warrior's harness. Then, poising before flight, he said:

"I'll see if I can get some of the farmers together to follow that band." And he was off, flitting through the brush toward the southeast.

Barbara emerged from the willow clump, holding her steel helmet in one hand and her belt, with its gun, sword and cartridges, in the other. She smiled roguishly at her strange garb.

"What shall I do with these?" she asked. "I don't want to give up my weapons."

"Strap them on," said O'Keefe. "It's not unusual around New York to see armed farmers. But you better smear a little clay on your sheath and belt. Farmers usually don't have their weapons shined for instant use like a professional fighting man."

As the girl bent to scoop up earth, O'Keefe shook his head. "There's a far worse error than that in your make-up, my lissome redhead. Tear off the bottom of that blouse where it tucks into your trousers and tie it around your chest under your blouse."

Barbara straightened angrily. "Make myself flat-chested?" she cried. "Never."

O'Keefe grinned mischievously. "Oh, ho, so the little amazon who is going to acknowledge celibacy is proud of her wares."

The fire in Barbara's brown eyes burst forth and she stormed, "I don't see the reason for disguise anyway. It's sneaking and cowardly to resort to such tactics to carry an honorable message. I'm going to tear these clothes off me."

She grabbed her blouse in strong brown fists, but O'Keefe laughed.

"You haven't any other clothes."

The girl glared at the soldier. "Laugh! Stand there and laugh! I suppose you glory in seeing a chief's daughter attired like a peasant. I suppose you think I'm humbled. I'll show you—"

She was about to yank the blouse apart when O'Keefe reached out and grabbed her. In almost

a single motion he yanked her to him, dropped to one knee and, throwing the girl across it, slapped the bottom of her trousers vigorously.

Barbara struggled and made futile grabs for her weapons. O'Keefe found her slight body was as strong as whipcord. At her first cry of pain, O'Keefe desisted and grabbed her flailing arms.

"Let me up, you coward! Draw your sword!" "This isn't a gentleman's way," gritted O'Keefe as he drew the girl's arms up behind her in a double hammerlock, "but it's effective."

"Fight a warrior like a warrior!" the girl cried. "Ouch! You're breaking my arms."

O'Keefe had no intention of fighting the girl with a warrior's weapons. He had seen her skilled sword arm in play too often not to realize she would be a dangerous antagonist. He didn't doubt that in the end he could defeat her, but probably not before one of them or both were seriously wounded.

He pinioned the amazon's wrists together and held them with his powerful left hand. With his right he pulled out the bottom of the blouse and began tearing off a strip of the silklike spun-glass cloth.

When he had finished, he said to the sullen girl across his knee: "Are you going to bind yourself with this, or are you going to risk having reinforcements sent to your father in order that you can strut down the streets of New York with villainous warriors casting admiring glances at your curves?"

Crying in mortification, the girl twisted and squirmed. "I don't care if men never look at me! You're filthy-minded. I just . . . just . . . don't believe in a sneaking disguise."

"Do you want another paddling?"

The girl squirmed again, then subsided. "I'll tie it on," she snapped.

"Your word of honor?"

"Yes." Her sibilant answer was almost a hiss. "I think you're jealous. I'm glad I'm going to be sterilized if men are like you. 'Joy of a husband, a home!' *Humph!*"

O'Keefe stood up and set the girl on her feet.

Instantly, she whirled, her eyes blazing into O'Keefe's. Her right arm had flicked her long sword from its muddy sheath with unbelievable speed. O'Keefe stared down at the point at his chest.

"Draw your sword, soldier. You'll never humiliate me again."

O'Keefe read murder in the eyes of the chief-tain's daughter. Perhaps he had gone too far. But she had it coming to her, he considered. He made no move to reach for his sword.

Her blade pinked him. "On guard, male!"

O'Keefe turned toward his stallion. "When you get that cloth on, you can pile that wild mess of

copper hair under your helmet and trot after me."

He heard a faint swish, but before he could duck the flat of the amazon's sword struck him across the cheek.

The girl's voice crackled. "I said draw, or do you prefer a coward's death?"

O'Keefe leaped lightly onto his stallion, rubbing his cheek ruefully. "Brat, I don't know that I care to marry you after all."

He had left the brush and was within a stone's throw of the tall city gates, a high cement wall stretching away to north and south, before he heard the rhythmic thud of the white mare's hoofs behind him.

O'Keefe turned and saw a slender but handsome, flat-chested peasant boy drawing abreast, his head incased in a shining steel helmet. A muddy sword and gas gun dangled from his waist.

"How does the outfit feel?" O'Keefe asked.

Barbara stared straight ahead to where a winding line of field workers and scattered travelers was passing through the steel gates. A burly guard eyed each person with raking glance.

"These long trousers itch like the devil," snapped Barbara, "and the helmet and that mop of hair are crushing my brains. I suppose you're happy."

"You pay yourself a compliment," said O'Keefe, spurring forward. "It's best that we don't enter side by side, for our horses might give us away if seen together. I'll go first. You follow that old woman with the bundles of sticks under her arms."

The guard saluted O'Keefe as his stallion shied through, but once inside the gates, O'Keefe turned in his saddle to look back and see how Barbara was faring. Her horse stepped high, avoiding the field workers.

"Hey!" laughed the guard when he spotted the slight youth atop the big white horse. "What's that stick hanging at your side, sonny? And where did you find that helmet? Do you want to alight and exchange a few parries?"

The crowd took up the laughter. The boy raised his small chin and struck his horse's flank with his heels. They passed through quickly.

O'Keefe grinned. The guard would have been surprised if the boy had dismounted and engaged him, O'Keefe thought, for the guard would have encountered a sword arm equal to his own.

At the third intersection, O'Keefe cast anxious eyes north and south along the side street for a livery. His worried eyes relaxed as he saw a huge horseshoe above double doors a half block south.

He motioned the oncoming Barbara to follow.

They rode into the stable together. A small, round-shouldered boy ran forward to grasp the bridles.

Dismounting, O'Keefe instructed the boy: "I

want these horses taken to the stables across from Dr. Leering's palace on West Street. Can you arrange it?"

He dropped a gold coin into the boy's dirty hand. "I'll take them myself, mister," the boy cried.

"And see that good care is taken of them."

"Don't worry about that, mister," the boy piped. "I never saw such beautiful horses. You bet I'll take good care of them. I'll feed 'em and water 'em first. They look like you've rode 'em hard."

As they stepped out into the noon sunlight, Barbara asked: "What's your plan? You must have one, sending the horses on ahead of us."

Like a veteran New Yorker, O'Keefe strode for the nearest eating house.

"I want them handy to the palace in case we have to leave in a hurry," explained O'Keefe. "After we eat, our best bet will be to grab a conveyance of some sort. We can approach the center of town without being seen. Several of the constabulary may remember my last job was with your father."

Before they reached the sidewalk, a crowd of ragged street urchins, some with the accoutrements and cast-off weapons of warriors, swirled about them.

"Look at the helmet that kid's got," cried one. "Ain't that a beauty?"

A hulking youth in his late teens, with dark, beady eyes closely abutting his nose, stepped squarely in Barbara's path and drew a rusty blade.

"Fair fight!" the dirty youth cried to O'Keefe. "Keep out of it. I declare battle with your friend. On guard, Skinny."

The boy at O'Keefe's shoulder looked amused. "Am I supposed to fight him?" Barbara asked O'Keefe.

"Tear into him!" cried O'Keefe in mock anger. "Show him how we do it on the farm."

The urchins jeered. They shouted encouragement to the bully.

"I want that pretty helmet of yours, Skinny, and I want that long sword," the bully said to Barbara. "Don't you know how to draw?"

The steel of Barbara's sword flashed like a ray of light in the sun. The bully's rusty blade leaped from his hand and clattered on the sidewalk. As quickly as it was drawn, Barbara's blade sung back in its scabbard. She pressed on toward the eating house.

O'Keefe looked back. The bully stood with jaw drooping. "Chee! Can that kid fight!" he said.

They chose seats at a small table back from the dusty, cracked window, but where they could see the passing throng of men and women workers, warriors, grizzled strangers from foreign lands, squint-eyed adventurers and people of class. Antique gasoline-motored trucks chugged by on

the street and an occasional ray car, its ray power not yet exhausted, swept through the traffic.

"It's strange our workers haven't been able to recapture the scientific knowledge of the ancients," mused O'Keefe. "When one of those vehicles quits running, there it sits. A few mechanics know how to make the simpler repairs on a gasoline-driven automobile, but none have yet unearthed the power of a ray motor."

"Dr. Leering knows," said Barbara confidently. "Some day when he brings order out of this chaos, you'll see thousands of men and women at work on the things he has rediscovered. I hear he has workshops around his palace now where his men are making great strides in medicine, chemistry—"

A greasy-aproned waiter stood over them. They learned they could have fried potatoes and fried eggs, or fried potatoes and fried fish. O'Keefe caught himself about to order for his companion. The boy picked eggs and so did O'Keefe.

The coffee pleased Barbara. "What is that?" she asked.

"That's coffee," O'Keefe said. "The original coffee. Your people make it by burning berries. This is the stuff that the boats bring from the South."

"There's so much I'd like to see here," Barbara said.

O'Keefe paid the waiter. "How can I get a conveyance?"

"Go out on the street and hail one."

They walked along, jostling with the sidewalk crowds, and watching vehicles hurtle by, but O'Keefe could not tell which were for hire.

At an intersection, he boldly accosted a bearded constable.

"Stand here," said the constable. "I'll signal one for you. Most anybody when they want to go some place rents a horse if he doesn't have his own." His eyes lingered on O'Keefe.

He turned, puzzled, and flung out his hand at a ray car. "Would you take these people where they want to go?" the constable asked the driver. "You can pick up a small piece of change."

The sallow-faced young driver nodded, and wiped a mop of yellow hair from his forehead. "Hop in," he beckoned O'Keefe and Barbara.

The girl was already in the ray car's rear seat and O'Keefe had his foot on the running board when the bearded constable exploded:

"Sure, I know you now." His meaty hand clamped down on O'Keefe's shoulder. "You're Dan O'Keefe, the guy we was told to look out for." His whistle leaped to his lips.

O'Keefe knocked the constable's hand down and drew his sword.

In a movement too quick to follow with the eye, the bearded constable's sword leaped to his hand. "You asked for it, O'Keefe."

Barbara, shrinking in the ray car, remembered O'Keefe's remark that New York constables were the best swordsmen in the world. Suddenly, she realized she would be lost without her companion. What did she know of New York? How could she go about getting to Dr. Leering's presence? From the first she had depended on this hard-bitten soldier of fortune with the immaculate manners. Well, almost immaculate.

She watched each leaping thrust of the constable's sword and marveled that O'Keefe's blade, with slight movements, parried it. O'Keefe was falling back under a relentless assault, but he was not working. It seemed as if he were biding his time. Barbara saw that the callow driver had no intention of driving away. His darting eyes followed the flashing motions of the singing blades. Barbara also realized that the crowd that had collected was cheering O'Keefe. The constables must be unpopular! Perhaps they had killed too many men with their skilled swords.

The constable was grunting with the savagery of his onslaught. He intended to run the warrior through quickly, there was no doubt of that. The more the crowd cheered his opponent, the more desperately the bearded constable lunged.

Barbara relaxed when she saw O'Keefe's eyes flashing up and down the street. He was alert for the constable's reinforcements. He really was waiting, she knew. Then, in a divisionless fraction of a second, his chance came, a chance to beat through the constable's fierce attack. The constable had lunged just a trifle too far forward. He had put his weight momentarily on his toes instead of the balls of his feet. Before he could recover, O'Keefe's blade was protruding from the back of his neck.

O'Keefe leaped into the ray car and the driver swept forward. "Good work!" the callow youth exulted. "Nice job, warrior! Nobody likes those bloody constables. They've done nothing but murder since the Council brought them here from the corners of the earth to enforce their crooked laws."

Through the maze of traffic the car sped. Pursuit was useless unless another ray car were available. With expert ease the driver avoided horses and vehicles.

Barbara saw tall buildings, braced with timbers, on the point of falling. Persons moved by on the streets unheeding. She saw other buildings which had collapsed and were complete ruins, their bricks and mortar and twisted steel covering entire blocks.

Some day, when Dr. Leering had restored a semblance of peace, he would begin the great task of rebuilding New York, she knew. Dr. Leering, a great man, loved and respected by millions, headed the Council, whose depredations he permitted until he was strong enough to crush them. He was a wise man—he didn't expect to change human

nature or his city all at once. When he heard of the Council's supporting the army of Chicagoans advancing East, there would be fireworks. She had heard her father say many times, that he and his people had been supported by Dr. Leering in order that they could form a protective bulwark for New York against the encroachment of wild hordes from the West. She also knew Rogersville, the periled city in which her father had put up for the winter, was the right wing of Dr. Leering's proposed spring drive against the barbarian Chicago army. She sensed that the Council might want the Chicagoans to win, for if and when Dr. Leering created peace, the Council knew its richest days were gone.

She tried to picture the enormous city as it once had been.

Brakes on the ray car screamed as it pulled to the curb on West Street, opposite a magnificent stone palace and brick warehouses, surrounded by a high stone wall.

O'Keefe tossed gold coins to the callow driver and rushed Barbara across the sidewalk and into a livery. A blond giant amazon met them just inside the double doors.

"Here! Where do you think you're going? Oh, it's you, O'Keefe!" The amazon's voice was musical despite the bulk of her body. She wore a red leather harness and smelled of horses.

"Cleo, we've got to get into the palace," O'Keefe said, "and we need you to help us—"

"Why, go right over to the gate and walk in," Cleo pointed. "You know Dr. Leering's policies. The gates are always open to all. He'll stop whatever he's doing to listen to the complaint of even a harness polisher."

O'Keefe was shaking his head. "We can't afford to be seen."

"What's this . . . dirty work?" frowned Cleo. "It doesn't sound like you, O'Keefe. And who's your timorous young friend? A radical?"

"Do you have a room where we can talk?" asked O'Keefe.

Barbara jabbed him with her elbow.

The blond giant led them to a cubicle beneath a ramp, and shoved heavy wooden chairs toward them. An oil lamp flickered on the table.

Despite Barbara's angry glances, O'Keefe explained their mission.

Cleo was indignant. "Doone's army trapped at Rogersville?" Her blue eyes shot fire. "Why, never a word of that got through! And this is Doone's daughter?"

Barbara sat sullen.

"What's your plan?" asked Cleo. "Where do I come in? Mark you, Councilman Shay's behind this. He'll have every gate watched."

"If you can get word to Captain McUlroy in charge of Dr. Leering's horses," said O'Keefe, "he

can let us in through the stable door as soon as it gets dusk. He knows me and hates the Council."

"I'll go over right now," volunteered Cleo. "Meanwhile, there's some wine in that cupboard, and perhaps your pretty friend would like to go up to my room and lie down. You can show her where it is, Dan. When I come back, we'll have a lot to talk over." She headed toward the small door.

"Barbara is getting sterilized tomorrow," said O'Keefe solemnly. "She's in no mood to sleep on the last day of her—"

"Shut up, Dan O'Keefe!" Barbara cried. "Isn't it bad enough without your mocking me?"

The giant amazon turned. "Don't ever sterilize yourself, child. Ten years from now all you'll be fit for is to run a stable, like me. Nobody wants you. Sterilization sounds noble, but it isn't. Other women laugh at you till your dying day. If O'Keefe here had even looked twice at me back in those days, I'd never have gone through with it, but then he was just a punk. Some day he's going to lose something he values above everything else in this world just because he's such a gentleman he won't take what's there for the grabbing."

O'Keefe felt self-conscious. The door closed behind the big woman. Barbara stared at him, eyes blazing.

"Now I know why I don't like you," she said. "That . . . that . . . woman put her finger right on it. I've never once heard you assert yourself except today when I got stubborn out there in the woods. You're a gentleman. You wouldn't pound it into my thick head what a fool I was coming across the mountains, but you waited until I got you mad, then you exploded and told me everything I had done wrong. You wouldn't maneuver that constable close to the ray car in order that I could have stabbed him. No, you fought him fair. You've never tried to kiss me, but always try to argue me out of sterilization. Oh, don't get fancy ideas, Dan O'Keefe—I'll never be slow with my sword again when you're around. I'm just telling you why I don't like you. Now, answer me one more thing, Dan O'Keefe, and don't try to be a gentleman—how do you know where

that . . . that woman's bedroom is?"

O'Keefe felt grossly accused, from the first word of Barbara's harangue until the shocking last. "I can explain—"

"Shut up. You're a fool. I'm going to find that wine."

"Take off your sandals," O'Keefe whispered.

Stooping in the dark stone corridor on the sixth floor of the palace, Barbara obeyed. O'Keefe kicked off his and shoved them into a doorway.

"Can we risk it, rushing into the Council chambers to get to Dr. Leering?" Barbara asked her voice quavering now that the end of her long journey was at hand.

"You heard McUlroy," O'Keefe answered softly. "Tonight is Council meeting night. After that, Dr. Leering gets in the elevator and is whisked to his laboratories where no one can get to him."

Crouching low, they padded along the corridor on bare feet until they drew abreast of the wide double doors of the Council chambers. They were partly ajar and a murmur of voices was audible. Just inside they glimpsed a constable lounging against the door frame.

O'Keefe put his lips to the girl's ear. "I'll throw the doors open and you rush to Dr. Leering. You know him, don't you? Tall, white-haired old man about eighty with a high forehead? He'll be sitting in the center of the table. Leave your weapons here so no one will think you're running toward the doctor to assassinate him. I'll cover you. If Shay or a constable tries to shoot, I'll take care of him."

Deftly, the girl lowered her belt and deposited it and the weapons on the stone corridor floor. She picked a folded note from the gas gun holster and turned to face the door.

O'Keefe stepped toward them, ready to push. He raised his eyebrows and the girl tensed herself and nodded.

The doors flung wide on grating hinges. The constable yelled as a door slammed him against the wall.

Barbara darted in and saw a sea of faces before her, heads turning her way. Then to her right at



the far end of the room she saw a mounted platform. Dodging arms and eluding restraining hands, she raced toward it.

Cries arose. The Council leaped up from its chairs and a tall, white-haired man in the center of the group frowned, motioning other constables forward.

O'Keefe leaped at the girl's heels, sword drawn.

"Dr. Leering!" Barbara cried. "Dr. Leering!"

A constable grabbed for her, but she ducked and he grasped only her steel helmet. Her copper hair poured over her shoulders. She raced on.

With a loud oath, a corpulent man stepped forward. "I know the girl!" he cried. "She's an assassin!"

He raised his gas gun.

"Put it down!" commanded the tall, white-haired man. "We'll see what the girl has to say."

She was almost on top of them. O'Keefe was behind, but he saw the fat councilman, instead of lowering his gun, take careful aim.

O'Keefe's blade whirled from his hand. He had grasped its tip and had thrown it as if it had been a dagger. The sword buried itself to its hilt in the fat man's chest. His gas bullet exploded against the ceiling.

The girl was tripped, but as she fell she threw her arms forward and clung to Dr. Leering's ankles. Constables had swarmed over O'Keefe, overpowering him.

"Up, girl," commanded the doctor, his blue eyes almost black with anger. "What is the meaning of this?" He brushed the constables away despite the attempts of some to stab the prostrate girl.

Barbara got to her knees and extended her father's note. Dr. Leering accepted it gravely and assisted the girl to her feet. "Your face is familiar," he said.

"I'm Barbara Doone," she said. "Please read father's message."

Dr. Leering staggered back against his high-backed chair. "Rogersville surrounded? Girl, why did you bring this note this way? Why didn't you send it by courier?"

Barbara sobbed. Dr. Leering motioned the constables to release O'Keefe.

Explanations were short. The doctor turned and barked orders to an aid. He turned to the girl. "An army leaves at dawn. My next job is to run down the traitors who have prevented word of your father's plight from reaching me. Rest assured, I will be thorough."

Barbara raised haughty eyebrows as she prepared to remove her boy's clothing and step into her bath. O'Keefe, with a wild expression in his gray eyes, stood in the doorway of her bedroom in Dr. Leering's palace.

"Soldier, our associations are through. I thought I thanked you sufficiently and told you father would reward you. Please leave before I summon help."

O'Keefe eased into the room. "Do you need help?" he asked. "I thought you were capable of defending yourself."

"I wouldn't shed blood while I was a guest—"

She got no further. O'Keefe had bounded forward, pinned her arms and throwing her over his shoulder, he raced from the room. The girl shouted and struggled.

O'Keefe swept down a succession of stairs, leaped across a moonlit courtyard into the stables. He passed through a door in the stone wall and sprinted across the street to Cleo's livery.

"You caught me without my sword!" raved Barbara. "Put me down! Do you hear?"

O'Keefe motioned a sleepy-eyed boy to saddle the chestnut stallion and white mare.

As the warrior climbed quickly into the stallion's saddle, throwing the girl carelessly across the pommel, a door opened in the rear of the stables and a rectangle of light silhouetted a big woman.

The blond amazon saw the struggling pair and recognized O'Keefe, leading the white horse.

"Where are you going?" the blond giant called.

"I'm going to take your advice," answered O'Keefe.

The horses clattered across the sidewalk, and their hoofbeats died away in the night on a street toward the hills.

THE END.

## THE ANALYTICAL LABORATORY

This month's issue is "tight"—space is decidedly at a premium. The Lab this time must consist, therefore, of the bare figures—and an apology. The August issue, likewise, was very tight, and the Lab was held waiting for the appearance somewhere of a space to slip it in. The space didn't appear when the proofs came down—and the issue had to be locked up without it. Sorry. Asimov's "Bridle and Saddle" won.

Place	Story	Author	Point score
1.	Waldo	Anson MacDonald	1.1
2.	Jackdaw	Ross Rocklynne	2.9
3.	Impediment	Hal Clement	3.1
4.	Deadlock	Lewis Padgett	4.0
5.	The Link	Cleve Cartmill	4.1

The Editor.





# THE SECOND SOLUTION

By A. E. Van Vogt

● Any fact which is of importance to mankind that is discovered by one man would, almost certainly, be discovered elsewhere, somehow, by another man. One man discovered that the ezvals were intelligent—and nearly lost the knowledge and his life. Another, far away—

Illustrated by Kolliker

The little thin chap with the too-sharp voice was saying:

"My point is, we didn't need Edison, Paladine, Clissler, or any particular scientist. It is the mass mind that moves inevitably in certain direc-

tions. The inventions, the ideas of individuals grow out of that mass; they would occur regardless of the birth or early death of any individual genius, so-called. There's always a second solution."

Somebody disagreed: "Inventions change the

course of history. A new weapon wins a war because it was introduced when it was. A year later would have been too late."

The big man cleared his throat, drawing our attention to him. I had noticed him idle over from the club bar a few minutes earlier, and listen with that bored contempt which deep-space men have for groundlings. He had the tan of space in his hawklike countenance; and it was obvious that this was between voyages for him; and he didn't know what to do with himself.

"I hate to enter an impractical discussion," he said, "but it just happens I can illustrate your argument. You all remember the experience some years ago of Professor Jamieson with a full-grown ezwal in the ocean jungle of Eristan II—how they captured a Rull lifeship intact, and eventually escaped with its secret of perfect anti-gravity, and prevented a revolution and a massacre on Carson's Planet?"

We all recalled it; the big man went on: "Actually, Professor Jamieson had captured two ezwals on that visit of his to Carson's Planet. One was a male, which he took with him on his own ship, and with which he was later wrecked on Eristan II. The other was a female, which he had dispatched to Earth on an earlier ship.

"En route, this female gave birth to a male about as big as a lion. The young one grew about a foot on the trip, but that wouldn't have mattered in itself. What precipitated the whole thing was the anti-gravity converters, the old, imperfect, pre-Rull type—in their fashion, they began to discharge torrents of free energy; and that's where the story begins."

"Does it prove my point or his?" asked the little chap with the sharp voice.

The big man grimaced at him; and silence settled over our little group.

The grim, iron-hard face of Commander McLennan twisted toward the two officers. "Absolutely out of control!" he said from clenched teeth. "The Sparling free energy effect! Ship'll strike Earth in fifteen minutes somewhere in the great Toganna Forest Reserve in northern Canada.

"Carling, get the men into the lifeboats, then make contact with the superintendent of the Reserve. Tell him we've got two ezwals of Carson's Planet aboard, who'll probably live through the crash. Tell him to prepare for any eventualities; and that I'll be down to take charge of the wreck in half an hour. Brenson!"

"Yessir!" The white-faced younger officer sprang to rigid attention as Carling whirled out of the room.

"Go down and kill those two ezwals, mother and son. We can't take a chance on those two beasts getting loose on Earth. They'll murder a thousand people before they can be killed—if they

ever get free! You know what they're like. Anybody who's been to Carson's Planet—" He groaned in fury. "Damn Jamieson for having ezwals brought to Earth. I was against it from the—"

He caught himself: "And Brenson: be at the lifeboats in seven . . . no, make it six minutes for safety. Even if they're not dead! Now, run!"

The young man blanched whiter still. "Yessir!" he breathed again, and was gone, tugging at his gun.

For McLennan there were vital things to do, valuable papers to retrieve; and then the time was up. He plunged through the door of a lifeboat, gasped:

"Brenson here yet?"

"No, sir!"

"WHAT?"

They waited. One minute slipped by. Two. Then it was Carling who whispered:

"We've got to leave, sir. He can use that empty lifeboat, if he comes. We've got to leave."

McLennan looked strangely blank. "He's the son of old Rock Brenson. What'll I tell my old pal?"

Carling made no reply. And McLennan's lips twisted to the shaping of a curse, but no sound came, and no real thought of violent words was in his mind. As he slid the lifeboat smoothly into the safety of space, he heard the fierce whisper of one of the men:

"Mistake . . . send a fool like Brenson down. He's got the killer mind. That's what's holding him. He's got to kill—"

From above him came the terrible snarl of his mother; and then her thoughts, as hard and sharp as crystal:

"Under me for your life! The two-legged one comes to kill!"

Like a streak, he leaped from his end of the cage, five hundred solid pounds of dark, dark-blue monstrosity. Razor-clawed hands rattled metallically on the steel floor, and then he was into blackness under her vast form, pressing into the cave of soft, yielding flesh that she made for him—taking unbreakable holds with his six hands, so that, no matter what the violence of her movements or the fury of her attacks, he would be there safe and sound, snugly deep in the folds between her great belly muscles.

Her thought came again, curt and hard as so many blows: "Remember all the things I've told you. The hope of our race is that men continue to think us beasts. If they suspect our intelligence, we are lost. And someone does suspect it. If that knowledge lives, our people die!"

Faster came her thought: "Remember, your weaknesses in this crisis are those of youth. You love life too much. Fight the resulting fear, for fear it is. Take death if the opportunity comes

to serve your race by so doing."

Her brain slowed, grew cold. He watched with her then, clinging to her mind with his mind as tightly as his body clung to her body.

He saw the pole-thick steel bars of the cage; and, half hidden by their four-inch width, the figure of a man; he saw—the *thoughts* of the man!

"Damn you!" those thoughts came. "If it wasn't for you being on this ship I'd be out of danger now. I—"

The man's hand moved. There was a hard, metallic glint as he pushed the weapon between the bars. It came alive with white fire.

For the briefest moment, the mental contact with his mother blackened. It was his own ears that heard the gasping roar; his own flat nostrils that smelled the odor of burning, cooking flesh; and there was no mistaking the tangible, physical reality of her wild charge straight at the merciless flame gun projecting between the bars.

The fire clicked off. The blackness vanished from his mother's mind; and he saw that the weapon and the man had retreated from the mad, reaching threat of those mighty claws.

"Damn you!" the man flared. "Well, take it from here then!"

There must have been blinding pain, but none of it came through into his brain. His mother's thoughts remained at a mind-shaking pitch of malignance; and not for a single instant did she remain still. She ducked this way, that way; she ran with mad speed, twisting, darting, rolling, sliding, fighting with an almost inconceivable violence for life in the hopelessly narrow confines of the cage.

Like a squirrel she ran twenty feet up the bars of the cage; and then, at the ceiling, she swung along with the agility of a monkey from bar to thick bar. But always, in spite of her vaunting passion, in spite of deadly desperation, a part of her mind remained untouched, unhurried, terrible in its icy ferocity. And always that tearing fire following her, missing her, then hitting her squarely—hitting her so often that finally she could no longer hold back the knowledge that her end was near. And with that thought came another—his first awareness that she had had a purpose in keeping the weapon beyond the bars, and forcing it to follow the swift, darting frenzy of her threshing about.

By following her desperate movements the beam of the flame gun had seared with molten effect across the hard resistance of those thick, steel bars!

"God!" came the man's thoughts. "Won't it ever die? And where is that damned young one? Another minute now, and I'll have to go. I—"

The thought stopped—stopped as sixty-five hundred pounds of the hardest organic body ever

created smashed with pile-driver speed at the weakened bars of the cage. The cub strained with every ounce of tautened muscles against the thrusting compression of that wall of steel-hard tendons surrounding him—and lived because even in that moment of titanic attempt, he felt the distinct effort his mother made to prevent the smashing force of her muscles from squeezing him to jelly.

Beyond the vastness of her body, he heard the harsh grating of ripping metal as mighty bars bent and broke, where the flame had destroyed their tensile strength.

"Good Lord!" the man thought in high dismay.

Strangely, then, the preternatural sharpness of his thoughts weakened, retreated strangely into dimmer forms. The picture of him vanished; and where the mother ezwal's thoughts had been, there was no movement. The ezwal was aware of her lying above him, a great, flabby dead mass, completely covering him.

The reality of her death struck him instantly; and it explained why the man's mind and the picture of him had faded. It was his own weaker powers now that were catching the man's thoughts.

They were queerly distorted, senseless thoughts. The man mumbled: "Only got a minute, only minute . . . then I've got to go . . . get off the ship before—"

He was aware of the man crawling onto his mother's back, and tingled with dismay. It was he who was being searched for now; and if that white flame found him it would deal out equally merciless death. Frantically he pushed deeper into the yielding stomach above him.

And then—all hell broke loose. There was a piercing screaming of air against the freighter's hull. The crash was world-shattering. His six hands were wrenched from their holds. He struck intolerable hardness; and the blackness that came was very real and very personal.

Slowly, the darkness grew alive. Somewhere there was movement, muffled noises, and a confusing sense of many men's thoughts: incredible danger!

Alarm leaped along his nerves, faster, faster; in a spasm of movement, he pressed upward into the saving folds of his mother's flesh; and, as he lay there quiveringly still, deep into her, the world beyond and around her enveloping body began to grow clearer. Thoughts came:

"Never saw such an awful mess!" somebody's mind whispered.

"What could have ailed Brenson?" another groaned. "That fighting instinct of his got him at last, in spite of his love of life. His body's plain jam . . . what did you say, Mr. McLennan?"

"I'm talking to Kelly," came the curt, savage answer. "Kelly, I said—"

"Just a minute, boss. I was getting an important message from the patrol's science headquarters. Guess what? Caleb Carson, Professor Jamieson's second in command here on Earth, is coming by air express to take charge. Carson is the grandson of old Blake Carson, who discovered Carson's Planet. He'll arrive at noon . . . that's two hours and—"

"Oh, he is, is he?" McLennan's answering thought, as it penetrated to the ezwal, was truculent, immeasurably grim. "Well, I don't think he'll be here in time for the kill."

"Kill? What kill?"

"Don't be such a fool, man!" the commander snarled. "We've got a five-hundred-pound ezwal to locate. You don't think a smash-up like this will kill one of those things."

"Lord!"

"It must be alive!" McLennan went on tensely. "And do you know what it means if an ezwal gets loose in this million square miles of wilderness? He'll murder every human being he gets hold of."

"This looks like a hunting party with a vengeance."

"You bet. That's where you come in. Phone down to the reservation superintendent's office, and tell him he's got to round up the biggest, toughest hunting dogs he can get, preferably those who've trailed grizzly bears. Make him realize that this is the most important thing that's ever happened in this forsaken land. Tell him that, on Carson's Planet, where these killers come from, settlers are being massacred in droves, and that men are not even safe in fortified cities. Tell him . . . I don't care what you tell him, but get action! Parker!"

"Shoot, boss!"

"Lower your ship and let down some tackle. I've started the ball rolling for a hunting trip that may be absolutely unnecessary. But never mind that. I believe in planning. And now—I think you've got enough power in that bus to hook into this old scoundrel and turn her over. One of the tricks of this tribe is that the young ones can tangle themselves in their mother's skin, and—"

The ezwal let himself sink slowly through the cave of flesh. His lower, combination-feet-and-hands touched something cold and wet, and he stood there for a moment, trembling. His nose caught a draft of air, and savored the scent of cooked flesh that stank at him from his mother's body; and the memory it brought of fire and agonizing death sent a sick thrill along his nerves.

He forced the fear aside. With a spasmodic effort of his brain, he analyzed his chances. Wilderness, their thoughts had said; and in their minds had been pictures of brush and trees. That meant hiding places. Winter? That was harder to picture because there was only a sense of white

brightness, and somehow it connected with the unfamiliar cold wetness into which his feet were sinking. A sticky, clinging wetness that would slow him in the swift dash he must make through the deep, resisting softness of it.

Above him there was a sudden *brrr* of power; and the weight of his mother seemed to lift from him. Then the weight sagged again.

"Nope!" came a thought.

"Try again!" McLennan replied sharply. "You almost got it. Do a little more horizontal pulling this time—and the rest of you stand back. We may have to shoot fast."

Body taut as a drawn wire, the ezwal poked his square-shaped head out. In one swift flash his three glittering eyes verified the picture he had caught from their minds.

The spaceship had broken into three massive sections. And everywhere lay an appalling litter of twisted steel girders, battered metal and a confusion of smashed cargo. For half a mile in every direction the wreckage sprawled, spotting the snow with splintered wood and miraculously unharmed boxes as well as a vast scatter of dark, chunky things impossible to identify.

And each chunk, each piece of metal, each fragment of cargo offered obstacle to the guns that would be flaming at him in just about—

"*Look!*" Somebody's mind and voice spewed forth the single word.

It was the queerest, most shattering moment in all his world; for the age-long second after that explosive yell, he was aware of the first maddening pang of pain-expectation that he had ever known. Not even when the fire was burning away his mother's life had that stark, terrible realization touched him. But now, abruptly, he knew it was a matter of—given seconds!

He quivered in every shrinking nerve. His impulse was to jerk back into the folding safety, however brief, of his mother's great, comforting mass of body. Then, even as his eyes blazed at the stiffened men, even as he caught the sudden, tremendous strain in their minds, memory came; His mother had said, in effect: Fight fear or it will destroy you!

The thought caught him in a rhythmic, irresistible sweep. His muscles galvanized frantically in enormous effort. He heaved, squeezed prodigiously, and was free of the great, crushing body above him.

Straight ahead was a run-and-hide paradise. But in that part of his brain where fear was already vanquished, the straight-ahead course was instantly dismissed as unutterably the most dangerous. To his left was a clustered group of unarmed workmen, milling in stunned panic at the appearance of an animal as big as a grown lion, and terrifying in the alien, hideous power

suggested by six claw-armed limbs. And to his right—

Like a charging demon, he plunged at the little line of men with guns who were drawn up at his right. Alert guns twisted toward him; and then were fumbled in horrible dismay as the desperate thought leaped through the minds of the wielders that their fire would shear a burning path through the workmen to the left.

"You fools!" came McLennan's wail of thought from behind him. "Scatter—for your lives!"

Too late! Hissing in astounded triumph at the completeness of this opportunity to kill these murderous beings, he crashed into the group. Blood sprayed before the raking ferocity of his claws, as if he had leaped into a pool of the warm, turgid red stuff. He had a wild, desperate impulse to pause and crunch bodies with his teeth, but there was no time.

He was clear of them. The rearing bulk of tattered ship, the harsh cacophony of screaming fell away behind him; and he was running with every ounce of speed that all his six limbs could muster.

A glare of flame from McLennan's gun sizzled in the snow beside him. He dodged, twisted skillfully behind a thick section of shining, bent metal. The beam fought at the metal—and was through, reaching with incandescent violence above him as he dived into a shallow arroyo.

A dark-bluish streak, he hurtled through a spread of bush, whipped along for four hundred yards behind a shielding ledge of rock and snow that extended roughly parallel to the ship. He halted on the rock lip of a valley that curved away below him. There were trees there, and brush and a jagged, rock-strewn land, bright with glaring snow, fading away into the brilliant white haze of distance.

Incredibly, he was safe, untouched, unsinged—and to his brain reached the outer fringe of the raging storm of thoughts from the men beyond the great hind section of ship that hid them from his view:

"—Parker, yours is the fastest plane; get these men to the reservation hospital; there's death here if we don't hurry. Kelly, what about those dogs?"

"The superintendent says he can get ten. They'll have to be flown in, and that'll take about an hour."

"Good! We'll all fly to the reservation, and get started the moment this Caleb Carson arrives. With those dogs to do our hunting, a couple of hours' start won't do that thing any good."

The ezwal slid under spreading bush as the planes soared into the sky. The picture of the dogs was not clear, yet the very blur of it brought a chill. A slave animal that murdered for its killer masters.

He spat with sudden, flaring hate that only partially overcame the sudden, enormous sense of

aloneness in him. He must evade those dogs before he could hope to know even the remotest sense of comfort and security—and there was only one method by which he could do it properly.

Dogs followed trails; that meant they could scent things as easily as he could. That meant the reservation headquarters must be approached upwind, if he ever hoped to kill those dogs—if he could ever find the place.

The planes had certainly gone in this direction—

Planes! One diving leap and he was under cover as a great, silent plane swooped by over his head; there was the briefest blur of a man's thought—Caleb Carson's thought, the assistant of the mysterious Professor Jamieson; and then the long, shining machine settled behind some trees to his left. The village must be there.

He saw the buildings after a moment, considerably to the right of the plane. A dark machine—a car—was pushing along from the village toward the plane . . . and he was upwind . . . and if he could attack the dogs now, before that car brought the man, Carson, back to the village, before the men swarmed out to begin their hunt—

With glowing, coal-dark eyes, he stared down at the ten dogs from his vantage point on the little spread of hill. Ten . . . ten . . . ten . . . too many, many; and they were chained in a bunch, sleeping now in the snow, but they could all attack him at once.

There was a horrible, alien smell from them, but it was good, oh, so good that they were on his side of a large outhouse, that the men were inside other buildings beyond; and that it would take—minutes—before they could come out with their irresistible guns. He—

His thought scattered madly as he saw the car push over a hill a quarter of a mile away, and start along almost straight toward him. Caleb Carson would be able to see his whole attack, and even the snow that slowed the car wouldn't hold it more than two minutes—human time.

Two minutes! Time limit added to all the other things that were against him. Fury pierced him. These merciless human beings with their killer animals. At least they had had to fly the dogs in; and they'd be harder to replace. He'd have time to lose himself in these miles of forest and mountains, and—

The first dog saw him. He caught the startled thought as it lunged to its feet, heard its sharp warning yelp, and felt the blackness snap into its brain as he dealt it one crushing blow.

He whirled; and his jaws swung beautifully into the path of the dog that was charging at his neck. Teeth that could already dent metal clicked in one ferocious, stabbing bite.

Blood gushed into his mouth, stingingly, bit-

terly unpleasant to his taste. He spat it out with a thin snarl as eight shrieking dogs leaped at him. He met the first with a claw-armored forehead upraised.

The wolfish jaws slashed at the blue-dark, descending arm, ravenous to tear it to bits. But in an incredibly swift way, the hand avoided the reaching teeth and caught at the neck. And then, fingers like biting metal clamps gripped deep into the shoulders; and the dog was flung like a shot from a gun to the end of its chain.

The chain snapped from the frightful force, and the dog slid along in the snow and lay still, broken-necked.

The ezwal reared around for an irresistible plunge at the others—and stopped. The dogs were surging away from him, fear thoughts in their minds. He saw that they had caught his unnatural scent for the first time in that one wild rush, and now—

He stood there, quivering with uncertainty. Poised there, exploring the meaning of the madly racing thought forms in the brains of the dogs. Crouched there while the engine of the motor car became a soft, *close* throb, while a veritable fury of men's thoughts approached swiftly.

Seven dogs left—and all scared to death of him. Scornfully, swiftly, he turned; and with a wild dismay saw that the car had stopped less than fifty feet distant, that there was only one man in it. The other man must have stayed behind to watch the plane.

The human being, Caleb Carson, sat in the open door of the car; and he held a long, ugly, shining gun. It pointed at him, straight and unwavering; and then—incredible fact—a thought came from the cool brain behind the weapon; a thought directed at *him!*

"See," it said, "see! I can kill you before you can get to safety. This is an express-flame rifle; and it can blow a crater where you're standing. I can kill you—but I won't.

"Think that over with your best thought. And remember this, even though you escape now, in future you live or die as I will it. Without my help you cannot get away; and my price is high. Now, before the others come—get!"

He plunged over the hill, a startled, amazed, wondering, dismayed six-legged monstrosity. Minutes later, he remembered that those dogs would not dare to pursue him. He sprawled to a sliding stop in the snow.

His brain cooled; jangled emotions straightened; and what had happened began to fit into a coherent piece. Time and again on that trip through space, his mother had told him:

"Man will only accept defeat from one source: blind, natural forces. Because we wanted them to leave our land alone we pretended to be senseless,

ferocious beasts. We knew that if they ever suspected our intelligence, they would declare what they call war on us, and waste all their wealth and millions of lives to destroy us—and now, someone does suspect it. If that knowledge lives, our race dies!"

Someone does suspect! Here in this man Carson was that someone, the most dangerous man in all the world.

The ezwal shivered involuntarily. It had not been his intention to remain near this dangerous camp an instant after the dogs were neutralized. But now—

It was terribly obvious that he must act, no matter what the risk. Caleb Carson must be killed—at once!

"I can't understand those dogs not following that trail!" McLennan's thought came dimly, complainingly, from inside the house. "On Carson's Planet, they use dogs all the time."

"Only dogs that were born there!" came the unemotional reply. And it was the calmness of the mind behind the thought that sent a quiver of hatred through the ezwal, where it crouched under the little berry bush beside the house of the forest-reserve superintendent.

The superlative confidence of this man brought strange fear, unnatural rage. Carson went on curtly:

"That much I gathered for certain from Professor Jamieson's documents. The rest is merely my own deduction, based on my special studies of my grandfather's explorations. When Blake Carson first landed on the planet, the ezwals made no attempt to harm him. It was not until after the colonists began to arrive that the creatures turned so immeasurably murderous.

"Mind you, I didn't see the truth on my own. It was only when I heard yesterday that Professor Jamieson was three . . . four now . . . days overdue at the Eristan I base—"

"Eh! Jamieson missing?"

"Sounds serious, too. Some Rull warships are in the vicinity, and of course no spaceship is big enough to carry the Lixon Communicators that make the interstellar telephone possible; so he couldn't send a warning, unless he was reasonably near some point of transmission. Apparently, he wasn't; so—"

Carson paused; then: "Anyway, I thought his documents might show that he had taken a side trip. And it was in going through them that I found, no suggestion for a side trip, but my first glimpse of the truth. Everything is as vague as possible, but by putting his notes beside my own knowledge, it adds up."

It was all there, the ezwal saw, in Carson's mind. Whether the man called it conjecture, or believed it fully, here was what his mother had feared.

Basically, this man knew everything. And if what they were saying about the master mind, Professor Jamieson, being missing meant what it could mean, then in this house was the only remaining person in the world with *the* knowledge.

And he was telling it. Both men therefore must—

The ezwal's thought scattered as McLennan's mind projected a surprisingly cold, unfriendly thought:

"I hope I'm wrong in what I'm beginning to suspect. Let me tell you that I've been to Carson's Planet half a dozen times. The situation there is so bad that no stay-at-home studying documentary evidence could begin to comprehend the reality. Hundreds of thousands of people have been slaughtered—"

"I won't go into that," said Carson curtly. "The very number of the dead demands an intelligent and swift solution."

"You have not," said McLennan softly, "visited Carson's Planet yourself."

"No!"

"You, the grandson of Blake Carson—" He broke off scathingly: "It's the old story, I see, of subsequent generations sponging off the fame of the great man."

"There's no point in calling names." The younger man was calm.

McLennan's thought was harsh: "Does this truth you say you deduced include keeping this cub ezwal alive?"

"Certainly; it is my duty and your duty to deliver the young one to Professor Jamieson when and if he returns."

"I suppose you realize that it may be some time before this beast is captured, and that meanwhile it will become a killer."

"Because of the danger from the encroaching Rull enemy of man," replied Carson with abrupt chillness that matched McLennan's steel hardness, "because of the importance of finding some answer to the ezwal problem, high government policy requires that all necessary risks be taken."

"Damn government policy!" snarled McLennan. "My opinion of a government that appoints fact-finding commissions at this late date couldn't be properly put into words. A war of systematic extermination must be declared at once—that's the solution—and we'll begin with this scoundrelly little cub."

"That goes double for me!" A harsh thought from a third mind burst forth.

"Carling!" McLennan exclaimed. "Man, get back into bed."

"I'm all right!" the young first officer of the smashed warship replied fiercely. "That freak accident that happened to me when we landed . . . but never mind that. I was lying on the couch

in the next room, and I overheard . . . I tell you, sir!" he blazed at Caleb Carson, "Commander McLennan is right. While you were talking, I was thinking of the dozens of men I've met on various trips to Carson's Planet who've simply vanished. We used to talk about it, we younger officers—"

"There's no use quibbling," said McLennan sharply. "It's an axiom of the service that the man in the field knows best. Unless he deliberately surrenders his power, or unless he receives a direct order from the commander in chief, he can retain his command regardless of the arrival meanwhile of superior officers."

"I shall have the order in an hour!" said Carson bleakly.

"In an hour," McLennan glowed triumphantly, "you won't be able to find me. By the time you do, the ezwal will be dead."

To the ezwal, the words brought an abrupt rebirth of murder purpose, the first realization of the immense opportunity that offered here. Here, under this one roof, were the three men who must be counted in both the immediate and remote sense as the most dangerous of humans to himself and his kind.

There was a door just around the corner. If he could solve its mechanism—to kill them all would be the swift, satisfying solution to his various problems.

Boldly, he glided from his hiding place.

In the hallway, the first stinging sense of personal danger came. He crouched tensely at the foot of the stairs, dismayingly conscious that to go up after the men would leave his way to escape horribly unguarded. And if he were trapped up there after killing them—

A clatter of dishes from the kitchen distracted him. He suppressed the swift and burning impulse to go in and smash the woman who was there. Slowly, he started up the stairs, his purpose cold and unyielding, but his mind clinging now with fascinated intensity to the thoughts that came from the men.

"—Those things read minds!" McLennan was scoffing. He seemed quite prepared to go on talking. There was certain equipment he was waiting for, and every word spoken would delay Carson so much longer from radioing for that vital order. "Professor Jamieson must be crazy."

"I thought," Carling cut in, loyally backing his commander, "that scientists worked by evidence."

"Sometimes," said McLennan, "they get an hypothesis, and regardless of whether half the world is dying as a result of their theory, they go on trying to prove it."

There was an acrid impatience in Carson's thoughts: "I don't say that is Professor Jamie-

son's opinion. I merely drew that conclusion from a number of notes he made, particularly one which was in the form of a question: 'Can civilization exist without cities, farms, science, and what form of communication would be the indispensable minimum?'

"Besides"—his mind was narrowed, the intention to be persuasive strong inside him—"while the existence of intelligence in the ezwal would be wonderful, its absence would not constitute a reason for any of us to nullify Professor Jamieson's plans for keeping this young ezwal alive."

He broke off: "In any event, there's no necessity for you to go after him. He'll starve to death in three weeks on Earth food. It's practically poison, utterly indigestible to him."

Outside the door, the creature quivered with shock. Swift memory came of how bitterly unpleasant the dog's blood had tasted. He cringed; then flaring rage struck through him. At least he could kill these men who had brought such dreadful fate upon him, and there was just a chance that—

With an effort he suppressed the leaping hope that surged, memory of at least one place where food was plentiful. McLennan was saying:

"Men have eaten ezwal's."

"Ah, yes, but they have to treat the meat with chemicals to render it digestible."

"I'm sick of this," McLennan snapped abruptly. "I can see it's no use arguing. So I'm just going to tell you what I've done, and what I'm going to do. A couple of dozen fliivver planes will be arriving in about fifteen minutes. We'll scout every inch of the country this afternoon; and you can't tell me five hundred pounds of dark-blue ezwal can remain hidden, especially as the thing won't know— What the devil are you pointing that gun at the door for?"

Caleb Carson's frigid, steel-hard thoughts came out to the ezwal: "Because just before you came in I saw the ezwal sneaking through the brush. I was sort of expecting him, but I never thought he'd come into the house till I heard claws rattle a few seconds ago. I wouldn't—advise—him—to come—in. Hear that—you!"

One terrible instant, the ezwal froze; then, with a rasp of hatred, he launched himself at the stairs. Out the door, and then off through the brush, darting, twisting, to evade the flame that poured out the second-floor window from McLennan's pistol.

On and on he ran, harder, faster, until he was a great, leaping thing under the trees, over the snow, an incredible, galloping monster—on and on.

Of all his purposes, the only one that remained after his failure to kill, was: He must save his own life. He must have food. And there would be no food unless—

The wreck spread before him, a sprawling, skeleton structure, a vast waste of metal. No sounds, no thought-blurs of life reached out to where he lay vibrantly quiescent, probing with his mind, listening with his ears. One long, tense, straining moment; and then he was leaping forward, racing into the shelter of the deserted, shattered hulk.

Somewhere here was the food that had been brought along for his mother, enough to keep him, if he could hide it, until—

He dared not quite think of what must follow if he really hoped to save his life. There was a plane to steal, to operate, a million facts to learn about this alien civilization, and finally a spaceship—

He saw the shadow of the airplane sweep across the snow to his right—and froze to the ground in one instinctive jerk of interlocking muscles. His brain jangled so horribly it was like a discordant blare of noise. His thoughts disintegrated into one all-powerful half-thought, half-mind-wrecking emotion:

He must appear to be another piece of jetsam, one more shattered box, or chunk of metal. He—

"You needn't try to hide!" came the acrid, directed thought of Caleb Carson. "I knew you'd come up here. Even a full-grown ezwal might have taken the risk. A young one being simple and honest needed only the hint. Well, your hour of decision has come."

Snarling, he watched the plane circle, down, down, till it hovered less than a hundred feet above the ground. In abrupt despair of rage, he reared up toward it like a man on his hind legs, reached up horribly with his forearms, as if he would somehow stretch up to the plane and smash it down beside him. The cold thought came:

"That's right! Stand up and be as much of a man physically as you can. You're going to learn to be a man mentally, or die.

"Know that I have just told McLennan that you're here, and what I expect will happen. He thinks I'm a fool; and he and Carling will be here in five minutes.

"Think of that: five minutes! Five minutes to change your whole attitude toward life. I'm not going to try to pretend that this is a fair choice. Men are not angels, but I must know . . . *men* must know about ezwal intelligence. We are fighting a destroyer race called the Rulls; and we must have Carson's Planet in some form as an advance base against those damnable white worms.

"Remember this, too, it will do you no good to die a martyr. Now that the idea has come of ezwal's possibly having intelligence, we'll start a propaganda campaign along those lines. Everywhere on Carson's Planet men, weary of fighting what they think is a natural force, will brace up with that curious military morale that human



beings can muster in the face of intelligent enemies.

"If you yield, I'll teach you everything that man knows. You'll be the first ezwal scientist. If you can read minds, you'll know that I'm sincere in every word."

He was trapped. The knowledge beat at him, a tearing mixture of fear and—something else! It wasn't that he didn't trust this man's words; it was the sheer tremendousness of the decision.

"The proof of your choice," the cold thought penetrated to him, "will be simplicity itself. In one minute I shall land my plane. It is all-metal construction, divided into two compartments. You cannot possibly smash into my section and kill me.

"But the door of your section will be open. When you enter it will close tight and . . . good Lord, here comes McLennan!"

The big plane almost fell to the ground, so fast did Carson bring it down. It drew up in a spread of clearing a hundred feet away. A door yawned; and the scientist's urgent thought came:

"Make up your mind!"

And still he stood, taut in every nerve. He saw great cities, ships, space liners, with ezwal in command. Then he thought of what his mother had told him and that was abruptly like an immeasurable pain.

"Quick!" came Carson's thought.

Flame seared down where he had been; and there was no time to think, no time for anything but to take the initial chance. The flame missed him again, as he twisted in his swift run; this time it reached deliberately ahead across the tail of Carson's ship.

He caught the deliberateness of that act in McLennan's mind; and then he was inside the now unusable machine. The other plane landed. Two men with guns raced toward him.

He snarled hideously, as he caught their murder intention, and half turned to take his chances outside. The door clicked shut metallicly in his teeth. Trapped.

Or was he? Another door opened. He roared as he leaped into the compartment where the man sat. His whole mind shook with this final, unexpected opportunity to kill this man, as his mother had charged him to do.

It was the steadiness of the other's thought that held him stiff, suppressed the deadly impulse to strike one mighty blow. Caleb Carson said huskily:

"I'm taking this terrible chance because everything you've done so far seems to show that you have intelligence, and that you've understood my thoughts. But we can't take off; McLennan's burned the tail struts. That means we've got to have finally clinching proof. I'm going to open this door that leads away from *them*. You can kill me and, with luck, escape—if you hurry.

"The alternative is to stretch yourself here between my legs, and face them when they come."

With a shuddering movement the ezwal edged forward and stiffly settled down on his long belly. He was only vaguely aware of the cursing wonder of McLennan.

He was suddenly feeling very young and very important and very humble. For there had come to him the first glimpse of the greatness that was to be his in the world of ezwal, in that world of titanic construction, the beginning of dynamic new civilization.

There was silence among us, as the big man finished. Finally, somebody said critically:

"This grandson of the discoverer of Carson's Planet seems a pretty cold-blooded sort of chap."

Somebody else said: "Caleb Carson didn't know that the number of dead on Carson's Planet was actually thirty million, the morale situation proportionately more dangerous. He would never have had a real sense of urgency. His solution would have been too late."

"The point is," said the small thin chap sharply but with satisfaction, "there's always somebody else who, for various reasons, has special insight into a problem. The accumulated thought on Carson's Planet by its discoverer's grandson is what made it possible for him to read between the rather sketchy lines of Professor Jamieson's notes."

Somebody said: "Why didn't we hear about this second solution at the time?"

The sharp voice snapped: "That's obvious. It was the very next day that Professor Jamieson's own experiences and fuller solution captured all the headlines. Incidentally, I read last week that a new co-ordinator has been appointed for Carson's Planet. His name is Caleb Carson."

We grew aware of the big man standing up, just as a boy came over to him. The boy said:

"Commander McLennan, your ship is calling you. You can take the message in the lounge, sir."

We all stared as the giant headed briskly for the lounge-room door. A minute later the argument was waxing as hotly as ever.

THE END.



# THE PARIS GUN

By Willy Ley

● Super-artillery, both super-size and super-range, has been tried. Sometimes, for special occasions, it works. Here's the story of one famous super that didn't prove out—the Paris Gun, of World War I. It was not, incidentally, the Big Bertha—that was a different, and successful, thing, a super-size howitzer of short range but terrific impact.

Illustrated by E. O. Mondorf

It was the 23rd of March, 1918, in France.

The front lines were alive with the thunder of barrage and counterbarrage, the rattle of machine guns and the crash of hand grenades, the bright, sharp crashes of the Allied "pineapples" and the more resounding hard noises of the German "potato mashers." The German offensive had started viciously a few days before that date. The British Fifth Army was in a desperate position and beginning to retreat reluctantly. Its lines were worn to the danger point and the Germans, having most of their troops from the East available, pressed on with utter disregard of losses. The Germans also knew that they had to win that offensive or lose the war. The Allies, on the other hand, knew that American troops would finally save their fate—if they could hold out until enough Americans arrived.

Only one sector seemed fairly quiet by comparison—the portion of the lines near Laon. But it was just in this sector where a new and special kind of warfare started. At four o'clock in the morning an organization woke up somewhere behind the German lines. It was a very thorough organization.

There was a battery of guns hidden in the forest of Crépy behind the German lines, not quite eighty miles from Paris. It was a small battery of guns, designed to shell the French capital from this enormous distance.

The Germans had many hopes attached to these guns. One of their two-hundred-sixty-pound shells might crash into an important section of the French War Ministry. It might destroy important records, or kill important people. Or one of the shells might fall into a railroad yard and blow up a shipload of American munitions. Or it might blow up a French ammunition plant in or near Paris. Continuous hammering from these guns—provided they remained undiscovered—

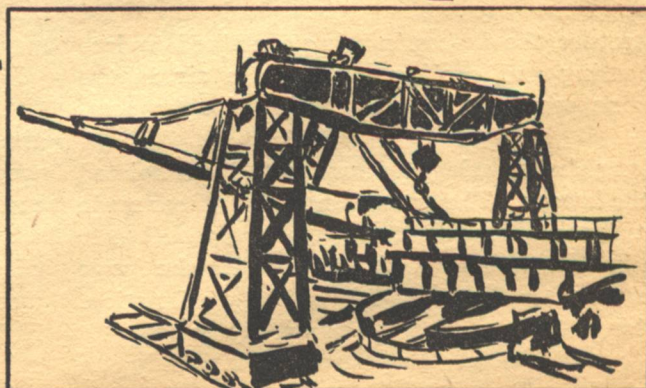
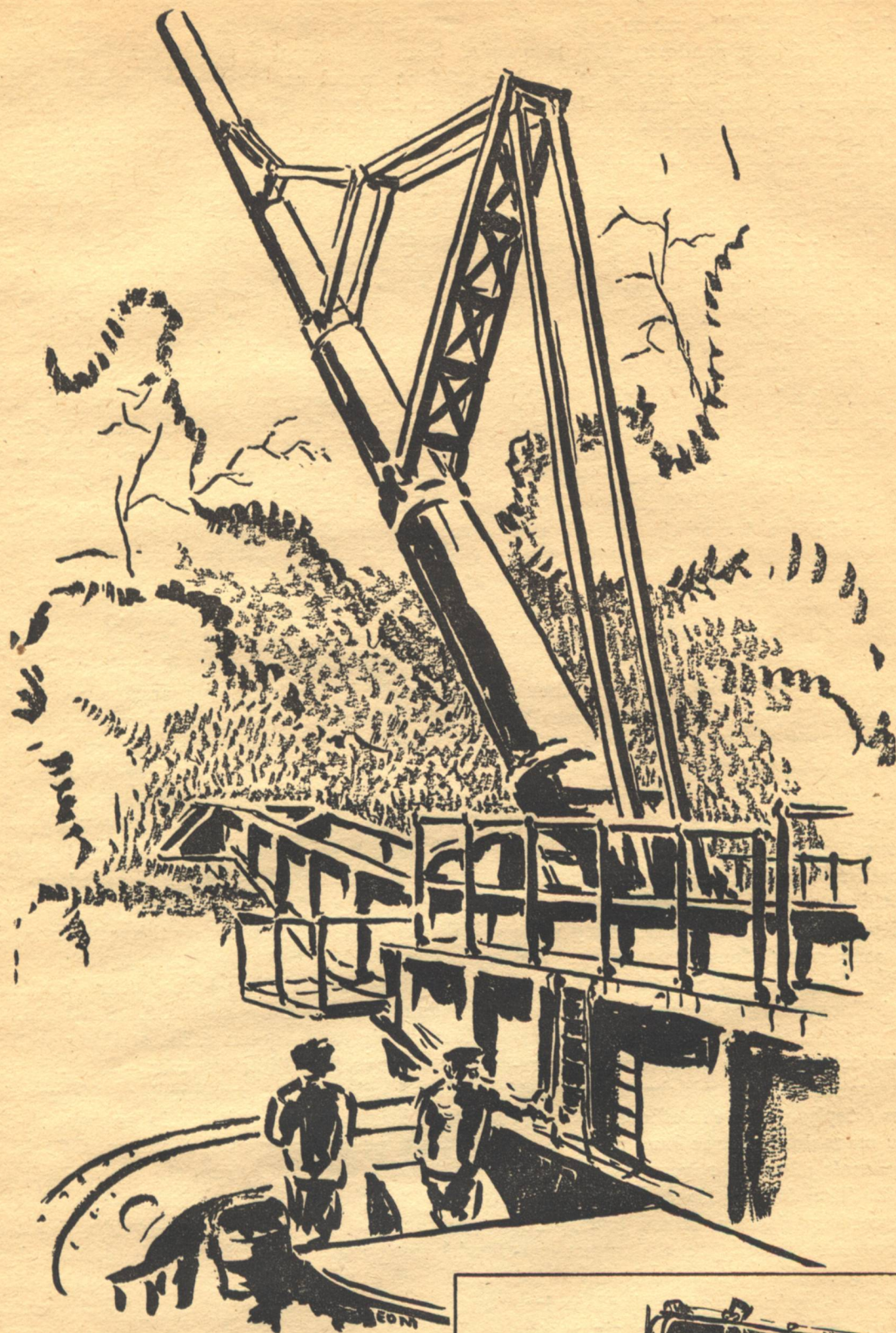
might wreck the nerves of the Allies, or cause a revolution. If nothing else, the presence of these guns and the news of their long-distance activity would improve the morale of the German soldiers. After the war, German socialists often said that this battery was mainly a "shot in the arm" for the tired German army.

All these possibilities, so pleasant for the German General Staff to contemplate, hinged upon two factors. One was that the shells would cover the distance of one hundred twenty kilometers—but two of the greatest ballistic experts of all times, Professors Rausenberger and von Eberhardt vouched for that. The other was that the "Paris Battery" would be able to fire for some length of time, in other words, that it would not be discovered, at least not quickly. This was to be assured by a special organization.

At four o'clock in the morning thirty heavy German batteries, grouped around the forest of Crépy, began to get ready for simultaneous shooting with the hidden battery, or rather one gun of the hidden battery. Ninety heavy shells were ready to be fed into ninety breeches. They were to strike at targets in and behind the Allied lines, while the ninety-first shell traveled through the stratosphere in the direction of Paris. Fired simultaneously, the sound detector units of the Allies would have a hard time untangling the sound and ground vibrations of ninety-one heavy guns in order to find the location of one of them.

One hour later ten field airdromes made ready. Their planes were to prevent Allied aircraft from reconnoitering. The order read: "At any cost." Possibly it would not cost too much for this particular day because there was a sufficiently heavy morning mist to warrant poor visibility.

Four reserve companies were ready to repulse a possible surprise attack. The line of trenches itself had been reinforced and had strict orders to



*The Paris Gun—above, in firing position, with bracing to eliminate or reduce barrel sag. Below, being loaded.*

be as watchful as possible. The minor commanders spent their spare minutes pondering the reason for all this commotion under strictest secrecy. A field weather bureau prepared a sounding balloon and compiled weather reports for the points west of the forest, as far as they were able to obtain them.

At six o'clock there was no mist any more over the forest of Crépy. Therefore forty airplanes took to the air. In a deep concrete dugout near the position of the Paris Battery there was an assembly of officers of high rank, all of them listening very attentively to the utterances of two civilians, Professors Rausenberger and von Eberhardt. Both were held in high esteem by the ordnance department. Professor Rausenberger had been the designer of the gun "Y"—or, as the Germans pronounce that letter, *Ypsilon*—the ultra-heavy 420-mm. howitzer whose shells had smashed the fortifications of Liège during the first days of the war. That was the gun nicknamed "Big Bertha." Professor von Eberhardt, on the other hand, was the discoverer of "stratosphere shooting," which method had made this new monster gun possible. The new gun, the one that was to shell Paris, was officially named Kaiser Wilhelm Geschütz—Kaiser Wilhelm Gun—but was usually referred to as the Paris Gun. It bore no more resemblance to the original Big Bertha than does a hippopotamus to a giraffe. Even theoretically the two guns were as unlike as possible. It is one of the minor mysteries of history why some people insist in calling the Paris Gun "Big Bertha."

Around six-thirty a. m. the last reports came in. To the majority of men who saw them they were useless data concerning density, pressure and humidity of the air at various altitudes. To von Eberhardt and Rausenberger these figures were factors in the formula for the probable air resistance the projectiles of the gun would encounter. Tables were consulted, slide rules pushed. The result was telephoned to the officer in charge of the powder magazine. Three hundred and so and so many pounds of powder were required for the first round. The driving charge looked like long, fat macaroni, packed in silken bags. Together the charge was taller than the tallest cannoneer in the crew. The powder had a specified temperature, the dugout housing contained devices for heating and cooling so that the air in the magazine could be kept at the precise temperature.

A long shell bearing the number "1" was hoisted into the breech. The communications officer made sure that the other ninety guns were loaded, too. Then he telephoned GHQ, stating that the *lange 22.2-centimeter Kanone*—the official designation, "the long 222-mm. cannon—was ready to fire.

At seven five a. m. GHQ answered with only one word: "Fire!"

The first shell ever to be shot over a distance of about eighty miles left the muzzle of its 120-foot barrel at exactly seven nine a. m. on March 23, 1918. The gigantic barrel shook and quivered behind it. If a test gun of the same kind had not behaved the same way on the artillery range at Meppen, the experts would have feared that it might break into pieces. When the huge cloud of orange-red smoke began to dissipate the Paris shell entered the stratosphere, forging ahead with an average velocity of five thousand feet per second. It found little air resistance in the stratosphere, which is what made the extreme range possible. When the other ninety shells had already crashed down on their targets and exploded, the Paris shell was still climbing.

The barrel of the Paris Gun needed not quite two minutes to quiet down. By that time the shell passed the peak of its trajectory, some forty miles from the muzzle and about thirty miles above the ground. It needed, according to the latest calculations, one hundred ninety-nine seconds to arrive at No. 6, *Quai de la Seine*, Paris.

Being not a very heavy shell—weighing some two hundred sixty pounds and having a caliber of about eight inches but a comparatively small high-explosive charge because of the extreme thickness of its walls—it did not cause damage that would be mentioned in a present-day report of bombing.

The second shell arrived at about seven forty a. m., falling about one and a half miles from the *Quai de la Seine* on the *Boulevard de Strasbourg*, near the *Gare de l'Est*, just a hundred feet from the entrance to the *Métro*—the Paris subway. It killed eight people, wounding thirteen more. Shell No. 3 arrived at eight five a. m., exploding inside an unoccupied building in the *Rue de Chateau-Landon* near the *Gare du Nord*. Shell No. 4 arrived at eight seventeen a. m., striking at No. 15 *Rue Charles V*, killing one man.

The bombardment continued at fifteen-minute intervals, the shells striking in an irregular pattern around the geographical center of Paris, each shell about two miles from the point demolished by the preceding shell. There were no duds, the designers had seen to that by providing each shell with two compartments for high-explosive charges and each charge with a separate fuse, but having both compartments connected so that the explosion of one would explode the other. Just the same, the French military authorities needed only a short time to decide the question the Germans had hoped would puzzle them for weeks, whether the fragments were shell or bomb fragments. And while the public was still believing in airplane bombs of some sort and while newspaper commentators were advancing the hypothesis that the Germans had transported a heavy gun piecemeal by air to a forest close to Paris or else that they were firing a loaded gun barrel which discharged itself in

the air, the ordnance experts knew that the bombardment was accomplished by a long-range gun and that the whole secret of the long range was a muzzle velocity of such magnitude that it had hitherto been thought impossible of achievement.

Actually the muzzle velocity of the Paris Gun was about one mile per second and it is now well known how it was done.

But to go on with the story itself.

Shells continued to fall all morning on Saturday, the 23rd of March, 1918. One struck the *Rue François Miron*, another the *Rue de St. Cloud*, one fell south of the Luxembourg Gardens, one in the gardens of the Tuileries, one on the *Place de la République*—that one killed two people and wounded nine—and one on the *Avenue Jean Jaurès*. Shortly after noon the Paris Gun had fired two dozen rounds, killing sixteen people and wounding twenty-nine.

By that time the military authorities had done their utmost in searching for the gun. The dispersion of the shells indicated a line of flight which cut the front lines near Laon. The massing of heavy German batteries near the forest of Crépy was suspicious, but it could have to do with the German offensive. Sound-ranging did not yield useful results, just as the Germans had planned. But the files of aerial routine pictures showed the curves of two railroad tracks leading into the forest of Crépy. The picture had been taken March 6th, so it seemed likely that these were the railroad tracks used to transport material for the position of the gun and the gun itself.

On the map the end of one of the tracks coincided with point 47:23. Several 12-inch and 13½-inch railroad guns were brought into position and were ordered to fire at that point—they opened fire thirty hours after the first shell from the Paris Gun had landed on the *Quai de la Seine*.

The first shell of the second day, Palm Sunday, arrived at six fifty a. m., killing one and wounding fourteen in the *Rue de Meaux*. The second shell, nine minutes later, fell on the *Rue Julien Lacroix*, almost in front of the church *Notre Dame de la Croix*. It exploded in the midst of the crowd going to early mass, killing two and wounding eighty. Two more shells fell far outside the city, but the others—again about two dozen in all—hit the city proper. This time the intervals varied greatly, the longest was fifty-three minutes, the shortest one minute. There was also one two-minute and one five-minute interval that day, evidently the Germans were using two guns, since one gun of such dimensions could at best fire six rounds per hour. For some curious reason of their own the Germans deny to this day that more than one gun was in operation—or even in existence—at any time, but the shell fragments prove that they were fired from different barrels. The

ballistic experts of the Allies could not be fooled in so simple a matter. And they noted another thing, too: The average range of the shells, computed from point 47:23, had been 74.2 miles on Saturday, the average range of Sunday was 71.8 miles. The gun was beginning to show signs of wear.

All heavy guns wear out very quickly; gunnery officers keep careful count of the number of rounds fired for this reason. And when the number of rounds for a heavy gun approaches the two-hundred mark, they begin to get nervous. The Paris Gun was virtually worn out after Round No. 50—it is now known that it was supposed to stand sixty rounds, but did not quite make it.

The first shell of Monday morning arrived at six thirty a. m., the second at seven a. m. It killed one and wounded another Parisian. Then there was silence. Nor were there any shells on Tuesday, Wednesday and Thursday.

The reason, then guessed by some Allied observers, was that Gun No. 1 was worn out. Gun No. 2 was apparently not in position or at any event not ready to be fired and Gun No. 3, which had lobbed three shells on Sunday, had exploded. It exploded when its fourth or fifth round was to be fired, wiping out all but a very few of its crew.

To explain this occurrence the construction of the Paris Gun has to be explained. As I stated earlier, the range of the gun was attained mainly by way of a high muzzle velocity, combined with Professor von Eberhardt's method of stratosphere shooting.

That method utilized the fact that the density of the atmosphere diminishes rapidly above, say, three miles. It is obvious that a gun pointing slightly upward can shoot farther than a gun firing perfectly horizontal. In fact the range—for the same gun, the same projectile and the same propelling charge—increases with the increase in elevation of the barrel—up to an optimal angle. If the barrel is still more elevated above that angle, the range decreases again. The optimum, as an elementary calculation shows, is forty-five degrees, half of a right angle. But Professor von Eberhardt found, partly theoretically, partly by experiment, that that does not hold true for guns with a normally long range. An angle slightly steeper than forty-five degrees tends to shorten the range, but the lessening air resistance encountered along the greater part of the trajectory tends to lengthen the range. Lessening air resistance proves to be more influential and for long-range guns the optimal angle is, therefore, above forty-five degrees.

In the case of the Paris Gun it was fifty-seven degrees; the gun was built to fire at that elevation only. The range then depended only on the muz-

zle velocity which, in turn, depends on the internal pressure in the gun barrel. This could be made to conform to necessity by means of varying the powder charge, something that was necessary also because a hot gun performs different from a cold one. To judge the performance of the gun, a small pressure gauge was inserted into the powder chamber; it consisted essentially of a copper pellet that was deformed by the pressure. If the deformation was great enough, the gunners knew that the shell had had enough muzzle velocity to reach Paris.

But even a large powder charge needs time to act. For this reason, the Paris Gun's barrel was so enormously long, one hundred fifty times the diameter of the bore. (Normal guns are only fifty times as long as their bore or caliber.) It was pieced together, the barrel of a 380-mm. coast defense gun formed the outer cover. A rifled 210-mm. barrel was put inside that outer barrel and the inner barrel was lengthened by another long 210-mm. barrel.

The spiral grooves of the rifled inner barrel cause the spinning motion of the projectile which prevents tumbling while in flight. But in a too-long barrel the rifling can cause trouble. For this reason a long section of the muzzle end of the attached barrel wasn't rifled. It amounted to a full quarter of the total length. Such a long barrel would not remain straight, of course; it was therefore provided with a bridgelike girder construction which supported its weight and kept it straight. But we are not through with the rifling question yet. Slowly the rifling gets spoiled, partly because the copper driving bands of the shell leave copper fragments behind, partly because the steel itself becomes mildly viscous under the enormous pressures that prevail during the instant of firing. To keep such wear to a minimum the shells were grooved beforehand—even so the barrel widened slightly with each round. For this reason each shell was slightly larger than the preceding one. They were numbered and had to be fired in proper sequence.

It seems that the shell loaded into the breech of Gun No. 3 after the third round was not Shell No. 4 for that gun. Nobody can tell, or ever could, whether the shell bore the wrong number, whether a wrong number was loaded or whether the grooves in the barrel and the grooves on the shell were not matched by mistake. The first or second possibilities are the likely ones, the third would not have happened to a well-trained crew which knew what it was doing.

At any event there was no Paris Gun for a few days, but the Germans managed to install a new barrel on Gun No. 1 although they were under heavy Allied fire. The Germans later estimated that the position received five thousand heavy shells; none hit the gun itself, though members

of the crew were killed by splinters from shells bursting nearby.

The shelling of Paris was resumed on Friday afternoon, Good Friday of 1918. The first shell from the new gun dropped at three thirty p. m. in Montrouge, outside the city proper. It was the first of four rounds that were fired that day. The second shell fell at three fifty-five in Chatillon, also outside the city limits. So did the fourth shell at five forty-five; the new gun was overshooting most of the time. While Rounds 1, 2 and 4 did no harm at all, Round 3 was catastrophically effective. It hit the Church of St. Gervais during the afternoon services, smashing through the roof. Even if the shell had buried itself in the floor of the church and exploded there, the loss of life would not have been very large—but it hit a vital supporting pillar and the roof collapsed; eighty-eight dead bodies were recovered from the debris and sixty-eight people were treated for injuries. Probably many more, who received only slight injuries, went home without being counted.

Meanwhile the German offensive had been successful and a new position for the Paris Battery was prepared in the *Bois de Corbie*, not far from Amiens. Some time later in April the Germans moved the undercarriage of the gun. There was no need to move the barrel, they had worn out two more in the meantime. The one firing the Good Friday shells fired a last single shot on April 7th, its forty-eighth round. Six of these forty-eight shells had fallen considerably short; the barrel had not stood up well. Another barrel had lasted for sixty-four rounds, beginning April 11th with six rounds. There was no doubt that the explosion of Gun No. 3 had thrown the Germans off schedule. They had to save barrels and fired only a few rounds each day, a few in the morning and a few in the evening, during the time that would be called the rush hours in New York.

When the position in the forest of Crépy was evacuated, one hundred eighty-three rounds had been fired. The damage done was almost negligible, the loss of life in Paris was slight—but people then did not have the present-day attitude, half a million Parisians had left the city, causing the authorities much worry about the transportation problems they created by their hasty evacuation.

The French railroad battery at Vailly kept pounding the forest of Crépy until May 27, 1918. The Allies did not know that the Germans had evacuated the position, they probably thought that their fire had put the guns out of commission and they maintained the fire to prevent repairs. On May 27th the Germans suddenly advanced in the Laon sector, burying the Vailly batteries under so much gas and high-explosive that the gunners could not withdraw their guns, but had to destroy their precious heavy pieces themselves, lest they

fall into German hands. On the same day the Paris Gun fired fifteen rounds into Paris from its new position in the forest of Corbie. The total toll was four dead and twenty wounded, the first three or four rounds carried too far. The barrels had been re-bored, which brought their caliber to 9.1 inches and the weight of each shell to two hundred seventy-three pounds. But the re-bored gun did not have the full eighty-mile range.

This time the Allies needed several days to find the position. There was such confusion in the front lines that systematic work was temporarily impossible. As soon as the gun's position had been approximately located, several 340-mm. railroad guns were brought into position and began to shell the forest of Corbie. Their heavy shells hit close to the actual position of the gun, but not close enough to damage it or harm its crew.

Then French aviators managed to photograph the forest from the air and to return with the pictures. One of them showed a railroad track and something that looked like a very long gun. Of course it was camouflaged, but trained eyes could distinguish it from its surroundings. The counter battery opened fire—and the Germans felt elated about it. What they had permitted to be photographed from the air was a fake position, especially constructed for this purpose. They had photographed it from the air themselves to ascertain just how deceptive it was. A few days later the 340-mm. guns had to be withdrawn; again the German advance was still successful and the Allies did not want to see a repetition of the fate of the Vailly batteries. The Paris Gun, which always formed a nucleus for a separate war, was again moved closer to Paris. Finally it had to bridge a distance of "only" fifty-six miles.

But then the tide turned. The German offensive was stopped, the German armies were thrown back. The Allies almost captured the Paris Gun, then, but, somehow, the gunners managed to get the one hundred fifty-four tons of gun and the twenty-six tons of cradle out of a dangerous pocket, only a few hours before the weakening German lines collapsed. At one of its former positions the gun was assembled again and fired forty-seven rounds, during the interval from August 5th—7th. Then the barrel was worn out—it had stood sixty-one rounds—and the gun was dismantled. The German lines were pushed back some more.

The shells fired on August 7th were the last. All in all the long-range guns had thrown three hundred sixty-seven shells into Paris, one hundred two of them of the larger 9.1-inch caliber. The total toll of life from the four shellings barely exceeded the two-hundred-fifty mark. Not counting the destruction of the church hit on Good Friday no important damage had been done.

The German command made a few half-hearted attempts to use the gun again—fact is that it stayed dismantled. It would have been possible to bring it back to Crépy, but there were only re-bored barrels available, which did not have the full eighty-mile range. It was finally brought back to the Krupp Works and destroyed.

The design and the construction of the Paris Gun was an experiment that was and still is most interesting from a scientific point of view. An examination, even a simple recounting of the difficulties encountered by the designers, teaches more about the principles and troubles of ballistics than a ponderous theoretical dissertation. All the minor factors, like the "drooping" of the muzzle of a long gun, the rotation of the Earth while the shell is in flight, the difference between the curvature of the actual surface of the Earth and the plane surface always assumed in calculations, the influence of the temperature of the propelling charge—and the consequent "hot-gun correction"—and, most important of all, the influence of diminishing air resistance at high altitudes—all these minor factors grew into major factors by the very exaggeration of that gun. The difference between "plane surface" and actual surface, for example, amounted to half a mile. Astronomers had to be called in to compute the influence of the rotation of the Earth and the so-called equator-ward deflection. They even calculated, it is reported, whether the influence of the attraction of the Moon on the shell, while it was in flight, would be large enough to need taking into consideration. Incidentally, it wasn't—but it was a question that had to be checked.

For these reasons, purely scientific and theoretical, the Paris Gun experiment is still interesting. From the military point of view it was almost worthless, save for the initial surprise effect which did not warrant the expense of the guns, estimated at fifteen million dollars. The shells could not be very heavy, consequently they could not do much damage. A modern 660-pound dive-bomber bomb has more effect, not as much power of penetration, but a much larger high-explosive charge.

It can be said without hesitation that the ordnance experts of any country could design such a gun nowadays and it would, in all probability, be less cumbersome than the original Paris Gun. But its shells would probably be not much heavier, nor would it be possible to hit anything smaller than a city over a range exceeding fifty miles. Since even very haphazard bombing could achieve the same result, at much less cost, at much longer range and without the need for all the camouflaging required to hide the battery, there is every reason to believe that the experiment will not be repeated.

# ANACHRON, INC.

By Malcolm Jameson

● **Anachron, Inc. were merchants, not missionaries. They were traders whose outposts and trading stations were established across time from Egypt's glory to Modern America. But Barry's station was medieval France, and his goods were umbrellas and—miracles to order!**

Illustrated by Orban

Six o'clock came and a squad of Civic Guards came out and started breaking up the line. The local placement bureau was closing for the day. Ted Barry cursed wearily under his breath and turned away. For the last hour he had been anxiously watching the descending sun and counting the men ahead. Fifty-four, fifty-three . . . forty . . . thirty . . . now twenty-eight! That close, and it all had to be done over again. He had been standing there since early dawn hoping against hope that he would get in that day, but it was not to be.

He walked down the street, thankful that he could at least do that—not shuffle along in the dispirited fashion of his mates. For most of the other men seeking occupation were still in uniform as he himself, though his distinctive uniform of a major of Commandos set him a cut above the majority. Not that having been a major was much help—not even a Commando major; ex-majors were a dime a thousand.

He took the nearest cross street that was fairly clear. The labor gangs were just knocking off for the day, and he saw that their job had been well done. The street was lined with gaping ruins, but the rubble in it had all been carted away and the bomb craters neatly leveled off and filled. Beyond he could see a block of buildings that had come through the war unscathed except for the loss of glass and the scarring of the lower walls by fragments. Directly facing them the walls of the elaborate new Museum of Art were rising—one of the many projects of made work instituted by the Commonwealth of America to take up the slack of unemployment. It was that that he hoped to be assigned to, yet he wondered bitterly what was the good of it all. What would they fill it with when it was done? For there was no more art. The savage Kultur raids of the mid-forties, unleashed by the frantic successors of the suicide madman Hitler, had seen to that.

Their systematic devastation of culture centers—and also the equally savage reprisal raids of the United Nations—had left the world without an art gallery, a museum, a college or school, church or palace. The incidental destruction of most private homes had taken care of the pitiful little household collections of pictures and books. Virtually nothing remained.

Again Ted Barry cursed, but it was a thing that had to be accepted. He made his way into the public chow hall and grabbed a tray and the necessary utensils. Then he made his way along the electric tables, picking out what he wanted to eat. Thank God, at least food was plentiful. Too plentiful. The unfillable maw of war had forced an unprecedented overproduction—to sweeten the oceans with sunken sugar cargoes, to furnish fuel for the flaming warehouses smitten from the sky, as well as to feed the hungry billions who fought, or tended the war production machines.

As he munched his food he thought gloomily over his life and the hard luck that was his in being born at the particular time he was. Born on the eve of what was then fatuously regarded as the greatest depression of all time, he had emerged from it only to be snatched into the vortex of the horrible War of Survival. And now, in the evil year 1956, he had been mustered out—two years late, for, except for the final mopping up by the Commandos, the Axis had been crushed several years before—only to find himself in a depression that might better be described as a bottomless pit. Literally thousands of square miles of useless war plants existed, tooled for planes, tanks, ships and guns; aluminum, now made by a cheap process from common clay, was a drug on the market at ten dollars a ton. Except for certain selected industries, such as textiles, staple foods, petroleum and the like, equally swollen, every other kind of plant had long since been converted to war uses or else fed into the insatiable





steel furnaces as scrap. Not many had been rehabilitated. Coupled with the imbalance of production was the existence of hordes of demobilized soldiery and discharged workers. The outlook was gloomy, despite the vigorous efforts of the various commonwealths of the Federated States of the World.

Barry rose, reached into his pocket for the penny that was the nominal price of the meal—a face-saving device that kept it from being a handout—and started for the cashier's desk. He noticed a man standing by the wall who seemed to be studying the eaters; he was a well-dressed man in civilian clothes, and had a sleek, smug look about him that was slightly irritating to Barry.

As Barry brushed by the man on his way out, the fellow handed him a folded piece of paper. "This ought to interest you, buddy," said he. "I think you're just the type. Save it, it's valuable."

Barry's impulse was to shove the hand aside and pass on; it probably was one of the many come-on gags worked on the innocent veterans. But the man was in his way, and now there was an earnestness in his expression that might mean

something. So, to avoid a scene, Barry mumbled something and pocketed the paper without looking at it. Then he deposited his penny at the desk and made for the door. A receptacle for trash was near it, and his eye caught sight of a complete newspaper tossed in on top the other rubbish. Its title was not alluring—*The Weekly Financial Digest*—but at least it was reading matter, and anything to read in the dreary little cave he lived in was an item to be prized.

He turned east in the gathering gloom and followed the littered street across town to the burrow he had made for himself in the ruins of a gutted building. It was not palatial, but better than many foxholes he had known, and in it he was king. He had a small reserve store of eatables, but above all he had independence and privacy. It was a dark hole, but that did not matter. His service "juicer," or super-battery, no bigger than a half-pint flask, still contained thousands of amperes, enough light for him for many weeks. He took off his uniform and laid it neatly away. Then he rigged the light for better reading, and settled down for a quiet evening. Idly he glanced at the dodger handed him by the man of the eating place. It proved to be a printed circular, and

he wondered that a man of such well-fed appearance should be handing them out. It said,

### QUALIFIED MEN WANTED

We can use a limited number of agents for our "foreign" department, but they must be wiry, active, of unusually sound constitution, and familiar with the use of all types of weapons. They MUST be resourceful, of quick decision, tact and of proven courage, as they may be called upon to work in difficult and dangerous situations without guidance or supervision. Previous experience in purchasing or sales work desirable but not necessary. EX-COMMANDO MEN usually do well with us.

Application should be made at the east door of Anachron Building, 6 Wall Street. Do not apply unless you have all the above qualifications.

Well, thought Barry, that's a little better than most. Here was a firm that actually *wanted* Commandos! Every other prospective employer had turned him down. "Sorry," ran the formula, "but we're afraid of you. You fellows are too damned independent—too used to being on your own. Our men have to do what we tell them."

He laid it aside and took up the financial paper. It was dismal reading. He waded through page after page of the wails of frustrated brokers and the gloomy forecasts of economic commentators. Then he turned the page and came upon the feature article of the issue. Among all that crepe and sounding dirges there was at least one hopeful item. Rows of big black type proclaimed:

### ANACHRON BOOMING

**Orders mount—Stock soars—Directors optimistic**

Barry's growing drowsiness was instantly overcome. Why, it was the man from Anachron who had handed him the circular! He must find out more about the company, since it appeared now to be genuine and on the upgrade. He read eagerly that Anachron Common had jumped that day from eight hundred sixty to two thousand sixty on the strength of an earlier announcement of a special cash dividend of forty percent and a stock dividend of one hundred percent; that the company was rapidly expanding its "foreign" business and had already taken thirty million bushels of wheat, sixty million tons of steel and much other surplus material off the market; that its profits on the sale of these commodities had been enormous; and that the company was contemplating vast expansion.

The article went on to say:

The activities of Anachron may be regarded as the most bullish factor in the world today. It is an open secret that since their acquisition of the Gildersleeve patents under special charter from the Federated Government, they have been utilizing the Gildersleeve Heavy-duty Time Shuttle for intertemporal commerce. Thus all the wheat, steel, aluminum, textiles and so forth that they export is definitely removed from today's glut-

ted world markets. Not only that, but we are receiving in return increasing quantities of such priceless items as books, old paintings, musical instruments, and many other things we have grown accustomed to doing without.

Uneasiness has been expressed in some quarters lest this traffic with the past ages have serious repercussions in our own, but we are assured by Mr. Otis P. Snoodington, Executive Vice President of Anachron, that the fears are baseless. He states that the most careful control is exercised over the activities of their field men in order that the economic and social life of the older civilizations is not upset unduly. Inventions too advanced for their ready comprehension are strictly withheld. Our readers in the steel industry, remembering some of the amusing orders they have received, will know what we mean.

Barry folded the paper, closed his eyes and rested for a moment. His mind was in a state of wild ferment. The amazing thing he had just read sounded like a piece of wild fantasy; yet there it was, in an unemotional business paper—a fact, apparently. Barry was quite prepared for the concept of time travel—he had been a science-fiction fan in the days before the war, and had read many yarns playing with the idea, beginning with the classic one by H. G. Wells and including many of its successors. The only real surprise he felt was that the fantasy had at last become cold reality. He liked the idea of participating in it. He also needed a job.

Barry shot a quick glance at his wrist watch. It was later than he thought—past midnight. He got up and opened his kit and took from it an atomizer. He carefully sprayed his uniform with the dirt-removing substance, and when the liquid had evaporated, taking the grease stains with it, he plugged in his little flatiron and did a neat pressing job. An hour later, shaved, shined, pressed and glittering, and with three rows of medal ribbons spread across his chest, he was on his way through the dark ruins to the canyons of rebuilt Wall Street. However soiled a Commando might be from his task, it was the iron rule that when he appeared in public he must be as if on parade.

It was four when he reached the towering building that housed the head offices of Anachron, Inc., but already there were hundreds huddled before the side entrance where applicants were received. Most were derelicts, old men still hopeful, but there were many youngsters amongst them as well, chiefly from the ranks of the unrated discharges. Barry could see only four men in the Commando uniform, and they were close to the door.

"Come on up, major," called one. "We rate these bums. You're number five."

He joined them and discovered that one was Billy Maverick who had served with him in the Hokkaido shebang. After that they swapped yarns until night paled to the pearl of dawn and

that in turn gave way to full day. During that time nine others of their kind had joined them. Promptly at eight o'clock the doors were opened and they were allowed to go in. Barry glanced up at the company's trade-mark over the portal. It was an overflowing cornucopia about which fluttered a ribbon bearing the legend "Merchants, Not Missionaries." He was to see later that the same emblem appeared over the door of every office of the far-flung system. Before long he was to learn its meaning.

The preliminary interviews did not last long and they were authorized to go ahead for the physical check-up. That was grueling, including severe strength and agility tests. Five of the candidates had to drop out at that point. They had all passed the I. Q. standard, but special aptitude tests took a toll of four more. At length Barry, Maverick and a fellow named Latham were accepted, the other two candidates being deferred for reasons unstated. The three were sent to the office of Director of Personnel where they were told to sign contracts agreeing to "perform such duties as may hereafter be assigned and for such remuneration as the company may deem proper, for the period of at least one lustrum—or longer, at the option of the company—subject to prior dismissal at the discretion of the company."

"Phew!" whistled Latham. "It reads like the Nazi draft of treaty!"

But Barry signed without comment. He had had a taste of what the cold outside was like and how bleak the prospects. Moreover, his imagination had been fired by the reading of the article. Maverick likewise signed, and the vocal member followed suit.

The personnel man grinned. He knew a Com-mando couldn't be held by a contract if he didn't want to be held; he also knew that no employee had ever wanted to quit. He tossed the papers into a basket and issued three cards.

"Take these down to Basement A and show them to the guard. He'll put you into a bus that will take you to the barracks."

"Then what?"

"You'll be given a room and bed, and get your basic training. We can't send you foreign as dumb as you are now."

"Oh, yeah?" said the incorrigible Latham. "Well, listen, brother, we've had all the basic training there is, *plus* advanced, *plus* expert, *plus* practice. And if there's any place foreign between the poles that we haven't taken apart, I'd like to know what it is."

"Uh-huh," said the personnel man, nonchalantly, "maybe. But were you ever sent to snare a papa Brontosaurus and a lady Brontosaurus on the hoof? I understand the new zoo has ordered some. And how fast can you load and fire a flint-lock? How good are you at mounting and dis-

mounting horses with sixty pounds of plate armor around your carcass? You ain't seen nothing, kid. You may be sent anywhere—and *anywhen*. After you've been told to sell Prester John ten carloads of apples or else, you'll know what we mean when we say 'foreign.'"

"Oh," murmured Latham, meekly, "I hadn't thought of that angle."

They found their bus and were whisked away uptown to the indoctrination center. It was a superbly fitted barracks, the chow was good, but they were disappointed to find themselves in a reception ward in which there were no old-timers except their trainers. Those wouldn't talk. "A step at a time, laddies," was all the grizzled top-kick would say. "If you show you can take it, you'll learn the rest, fast enough. If not, you get the gate with a month's pay for trying."

"How much is that?" Maverick wanted to know. He, alone of all of them, had found surviving relatives on his return.

"Two hundred trade-smackers, base. When you go active the sky's the limit, what with commissions, graft, bonuses and things."

"Did you say graft?" asked Barry, sharply. The word had an ugly sound.

"Skip it," shrugged the top. "Call it side lines, if the word smells better to you. The company doesn't mind, so long as they get theirs and you don't run foul of the Control Board. There's one of you fellows, a Billy Tolton, that has the sweetest little side racket you ever heard of—he's stationed at Rome in Diocletian's time . . . but say, I'm not supposed to tell you guys these things, you have to find 'em out for yourselves."

Maverick snickered and Barry couldn't repress a smile. They both knew Tolton. He was as square as they make them, but a slick barracks lawyer with it. He was famous for his escapades, but somehow he managed always to be safely just inside the rules. They wondered what he had slipped across the Romans, but the sergeant would say no more, and there was nothing left but to turn in. Barry went to sleep in a little glow of triumph. He was off the streets and out of the endless queues of the unemployed. Shortly he would be traveling throughout the past, not sight-seeing or adventuring, but engaged in legitimate business.

The drudgery of the next three months came as a rude shock, but the day came when Barry and Maverick were called up and graduated ahead of the remainder of the class. The Foreign Department was shorthanded and rushing men into the field the moment they were qualified. Barry was still a little dubious as to his qualifications, for so many questions still remained unanswered. The fatal paradox of time commerce troubled him unduly, though his instructors evaded his questions

as not being in their province. He could not see why tinkering with the past would not have terrific consequences in the future that was to be founded on it, which in turn meant this present.

They packed their bags and left the school without regrets. The course had been half lectures, and half martial and marine exercises. In the mornings they listened to talks on the commerce of the past peoples, from far Cathay to the cliff dwellers of the Southwest. Otherwise they became familiar with antique arms and modes of transportation. All were good rough-and-tumble fighters, but they added the crossbow and the blunderbuss to their repertory of arms, not to mention the catapult, Greek fire, and the handling of scythed chariots. Two days a week they spent at the ship basin where they were told about carracks, galleys, junks, cogs, praus, galleons and triremes. They served carronades and the heavier muzzle loaders of later days. From quarterstaves they graduated to broadsword play.

"What gets me," remarked Maverick, as they climbed into the taxi that was to take them back to the head office, "is why they give us all this military stuff when they say it's against the rules to do any fighting except in self-defense."

"Dunno," said Barry, "unless it's to help us take care of ourselves on the road. There were plenty of corsairs and highwaymen in the old days."

They got a thrill on arriving at the downtown building. This time they went in through the great main portal, already thronged with businessmen coming for their share of Anachron's bounteous orders. The two fresh-hatched apprentice traders did not know the curious specifications that accompanied many of the contracts, but they had an inkling from snatches of conversation overheard in the elevator. "I hear Western Spring Steel got the order for fifty thousand Mark III all-metal bows, I'm trying to snag off part of that duraluminum arrow allotment. . . . Oh, sure, our Toledo factory is working nights on palanquins and sedan chairs. . . . I hear wallpaper is going good all over the Renaissance."

The Outside Sales, Purchasing and Contract departments were all on the first twenty floors, above which only certified company employees could go. By the time Barry and Maverick reached the thirtieth floor, they were alone except for the guide who accompanied them. They started down a long corridor marked "Foreign Trade," noticing with interest that each of the many suboffices was marked with its specialty, such as "Scandinavia: Vikings to Gustavus Adolphus," "Old American, Mayan, Aztec, Inca, Et Cetera."

The guide halted them and called attention to an alcove that was guarded by a swinging chain. A sign said, "Keep Clear, Landing for Trader

Shuttles." A red light was blinking and a small gong tapped out an additional warning.

"Some fellow must be in a jam and is coming in to see the boss," said the guide, indicating that they might pause and see the time shuttle land.

In a couple of seconds it did, though it was more a matter of materialization than a landing. The alcove seemed to fill with shadowy outlines, then suddenly a solid platform appeared. The operator of the shuttle stood in a little pulpit at one end, operating its controls. A single passenger slumped morosely in the center of the vehicle, leaning on a gleaming two-handed sword that had a heavily bejeweled hilt. He was dressed in flowing garments which Barry's unpracticed eye could not positively identify, but which he took to be those of a medieval Spanish merchant. The trader was of dark complexion, with a heavy beaked nose, though it was hard to say just what he did look like, for he was wearing in addition a watery black eye, a badly cut nether lip and many minor contusions. His robes were torn and bespattered with mud and overripe eggs. Altogether he seemed to be quite unhappy.

He glared at them briefly, then without a word ducked under the chain and limped off down the hall, carrying his gigantic sword with him. The shuttle faded from sight, and the trio continued their trip on down the corridor. The bedraggled figure before them turned into an office marked "Western Europe—Medieval."

"He's one of your gang," remarked the guide. "That is where you are going."

By the time they reached the office, the trader from the shuttle had laid the sword across the assistant sales manager's desk, and was talking rapidly and agitatedly with many furious gestures.

"But, damn it all, Mr. Kilmer," he wailed, "I *did* tell 'em! I sent a sword—King Richard's own personal snickersnee. I sent sketches; I sent along the exact specifications. I told 'em why. What more could a man do?"

"Keep your shirt on, Jakie," sighed Mr. Kilmer, a thin, harried-looking man with a perpetual furrow between his brows. "If anyone up here slipped, you're in the clear—"

"Me in the clear!" screamed Jakie. "Of course I'm in the clear. But does saying so write off those ten thousand swords and the beating up I got? Lissen! This guy Richard says the swords are no good—not fit for knights. So he won't pay, and he won't give 'em back. He issued 'em to his men-at-arms. What's more, he had me whipped around Westminster at the tail of a cart and then stuck me in the pillory where those mugs rocked me all day. Look, I lost four teeth, see? And that ain't half of it. The hangman grabs my notebooks, order books and all my kit material and

burns them in the square. A years work shot, and am I sore!"

Mr. Kilmer glanced up sadly at Barry and Maverick who were standing silently in the background, waiting to present themselves. But he said nothing for a long time, and then he addressed himself to the outraged Jakie.

"Right or wrong, this tears it," said the morose Kilmer, dragging the heavy sword to him and standing it point down beside his chair while he fiddled with a crystalline knob at the end of its hilt. "Your pal Richard the Lion Heart is just one more pain in the neck to me. Credit put in a bad report and insists on cutting the rest of the order down and demanding half cash for what we do deliver. It seems that they sent their own men to check up on your report and they came back and said that Richard was already hocked up to his eyes. What's more, Prophecy says that even with the better equipment you're trying to get him, the Third Crusade is likely to be a flop. All it accomplished along our own time line was the taking of Acre and Cyprus, and he had to split the take four ways at that. Then he got captured on the way home and his ransom broke the kingdom. I'm afraid, Jakie, that you'd better forget Richard First of England and hunt up a better prospect. And don't be so damn gullible next time."

Jakie uttered wild and sizzling words for a good five minutes, beating his breast and tearing his hair, but all he got further from the boss was the mild order to go down to the gym and get out of his make-up and have the doctors rub liniment on him. Jakie limped out of the office still smoldering. After which Mr. Kilmer turned his mournful mien on his newest traders. Both stepped forward, and he sighed heavily as he regarded them.

"New, eh?" he said, with a notable absence of enthusiasm. Barry waited. "Maybe what you just overheard was as good a start-off as any—gives you an idea why we're all graying grouches up here at home office. Stick around and I'll tell you what it's all about."

For a few minutes he was busy dialing inter-office numbers—Design, Specifications and Contracts, finally the Chief of Inspectors. Presently a messenger appeared with a roll of blueprints, copies of contracts, and another sword of similar design to the one beside the desk. Except that that one was black and pitted and crudely made by hand, whereas the new one was of the best molybdenum stainless steel. Kilmer handed both swords over for inspection, remarking that the dazzling new one was superior to anything Toledo or Damascus had ever produced. Hefting each and noting the superior balance of the dazzling Anachron product, Barry wondered how any sane

warrior could reject the later model.

Kilmer took the older sword and unscrewed the crystal set in its top. Underneath was a small receptacle of about the capacity of a thimble, hollowed out of the handle. The crystal atop the other sword would not come away until forcible prying got it off. Beneath was only the cement that had held the bauble.

"Knights," explained the sales manager, in his lugubrious tones, "especially crusaders, make the vanquished swear on the hilts of their swords to pay ransom, or to reform, or to render fealty or what not. You'd think that the crosslike shape of the sticker would serve, but it isn't good enough to suit a crusader. Oh, no. They've got to have this hallowed place to carry a few saint's relics in—you know, nail parings, a few hairs, dandruff or what have you. Somehow, it makes the oath more binding. Well, we ordered a lot of ten thousand forged, and now you know what happened. That Richard is a tough egg and I don't hold with him as a rule, but in this thing he's right."

The three of them together looked at the blueprints. The receptacle was clearly shown. It was mentioned in the specifications, and in the contract with Cumberland Steel, who made the swords. An inspection report was among the papers, stating the swords were as ordered. Mr. Kilmer picked up the phone again.

"Here's where a crooked inspector gets fired," he said, dialing the Chief Inspector, "and where Cumberland gets sued. It's the doggonedest thing to make these manufacturers realize that when we specify some wacky thing, we have a reason for it. They thought the receptacle idea was silly, and it saved them a couple of operations to skip it. Now everybody loses."

He swept papers off his desk and hurled the two swords to the floor, and scowled a moment at his new employees.

"You give credit to these . . . er . . . foreigners?" asked Barry, amazed.

"When we have to," admitted Kilmer, glumly. "Many of the things we value the most are locked up in palaces, cathedrals, or the treasure hordes of Hindu princes. They are not for sale. So we look along our own history line and find out when a particular place is to be besieged and sacked, then we contact the fellow who is going to do the sacking and make a deal with him. Usually by staking him to up-to-the-next-century high-grade siege equipment. Then we split the loot. Most times he prefers cash, which we have too much of, and we prefer the goods, which he is unable to transport."

"What about the ethics of that, and the effect on the future?" asked Barry, still hammering away at his pet question.

"Oh, that? So you're the worrying kind, huh?"



glared Mr. Kilmer. "Take my advice and forget it. If Projects passes it; if Philosophy, Ethics and Prophecy give it the go-ahead, and if Budget and Research says O. K. and the Control Board says hop to it, you can bank on it it's being ethical. We've had more damn deals upset because some moony old coot in Ethics or some crapehanger in Prophecy claims the effects might be unjust."

Kilmer mopped his brow indignantly.

"Not long ago," he said, "I doped out a plan to sell Jeff Davis a lot of modern ammunition—I was in North American Recent then—but Ethics and Prophecy knocked it in the head. They said that the prognosis following a Confederate victory was not good and that we have to assume the moral responsibility for the sort of futures we set up in these branch time-tracks we generate, even if they have no effect on us. Well, you can see what a hole I was in—I could have unloaded thousands

of tons of stuff. So I proposed selling to Lincoln and Staunton. But no, they said, that was just as bad. The computers took the land-grabbing tendencies displayed by the Republicans in the decades right after the Civil War and forecast the effect of an easy victory with weapons superior to anything else on Earth at that time. The prognosis of that was bad, too. Prophecy opined that the United States would embark on a spree of conquest that would ruin them in the end. Tough, you see?"

"Not quite," said Barry. The application of ethics to probable alternate time-track seemed a bit involved.

"Oh, bother," exclaimed Mr. Kilmer. "Take the rest of the day off and get that stuff out of your system. Go up to Philosophy, or if they're thinking and won't talk to you, go into Public Relations and ask them for the low-down. Find out all you can, because tomorrow I'm shipping you

off to Thirteenth Century France for a shake-down run."

"Hell, I can't speak Old French," said Maverick.

"You'll be speaking it tomorrow," said Mr. Kilmer, cryptically, and pressed a button for a messenger, "but get out now and leave me with my headaches. I've got to tell a guy in the Projects section why we can't spare a man to get the thousand pairs of dodos the Zoo Commission is yelling for. The boy will take you to the places you want to go."

"Takes things hard, doesn't he?" grinned Maverick, once they were out in the hall. Barry grinned back.

"You know, fellow, I think we're going to enjoy this job," he said, quite irrelevantly. And then they took the elevator to the lair of the philosophers.

The philosophers' room was an astonishing place. It was a dimly lit but richly furnished library, about which lounged or paced the floor with knitted brows more than a dozen men. Few would have been taken for philosophers on the streets; several were bearded and bespectacled and had a musty, scholarly look, but for the most part they looked as if they might as well be engineers or salesmen. But all had one thing in common, a deep immersion in profound thought.

"Sh-h," cautioned the messenger, "don't speak until you are spoken to. They get awfully sore if you snap 'em out of it."

The first of the savants to show signs of life was an immensely corpulent gentleman sprawled in an easy-chair. His eyes were tightly closed and his face puckered into an intense frown that seemed strangely infantile in view of his shiny bald pate and the multiple chins beneath. But at length he gurgled faintly and the lines of his face relaxed into a placid smile. Then, quite slowly, he opened his pale-blue goggle eyes and steadied his gaze on Barry, who was standing in front of him respectfully waiting.

"A question?" asked the philosopher, after an expressionless scrutiny.

Barry started to state the doubts that troubled him, but the wise man seemed to divine the tenor of them after the first four words, for he at once closed his eyes again and began talking in a dull monotone.

"No reconciliation of the supposed time paradox is necessary," he droned, "for no paradox exists. For every possible past there exists an infinity of possible futures of which a certain number may be considered probable. But once a complete past has occurred, there is but one resultant future, and both it and its past are facts and immutable. Through the manipulation of certain ultradimensions by the application of gravitic and temporal fields of force, we know that we

may inject extraneous incident into our past at will. But every such innovation, however slight, can have no subsequent effect along our own proper time-track. At the very instant of intrusion a new time-track is set up which will branch off and thereafter develop toward its own discreet future. Is that clear?"

"Approximately," answered Barry, though still a bit dubious. "But if these are divergent and independent branches, how does one get back—"

"As one gets off a railroad siding. By backing down to the switch point and then resuming the main line. At the moment, I was considering a means to cross these lines at right angles, especially since there may be independent time lines parallel to us of which we do not dream. For the present we must be content with shuttling back and forward over the well-worn track. But you tire me. One more question only; I have patience for no more."

"What about the effect we have on the futures of the new branch lines?" was Barry's final question.

"Bah!" snorted the philosopher. "What have I to do with such trivia? We deal here with the larger aspects. Go ask Ethics your other questions."

Before Barry or Maverick could mutter a word of thanks, the man had screwed his face back into its former expression of rapt concentration and forgotten them. The messenger crooked a finger and the three tiptoed out into the corridor.

They visited a number of other departments before the day was over, though not all of Anachron's many subdivisions by any means. The order in which they made the rounds was somewhat haphazard, but by midafternoon Barry began to have some notion of how the wheels of Anachron went round, at least in the Foreign Department.

First, there was the requisition room, where orders poured in from all parts of the home world. The variety of things asked for was incredible and the quantities demanded immense. On the cultural side, where the universities, libraries and museums of the world were being rebuilt and stocked, there was demand for books of all kinds—not only the rare and priceless major documents of the past, but ordinary books for circulating libraries and for sale to homes. The demand for paintings, sculpture, laces and embroideries, and handicrafts of every sort was insatiable. The reconstituted zoos were planning prehistoric sections for which they wanted living specimens of all the animals since creation. On the industrial side there were many and varied demands, such as that for genuine silk, old cheeses and wines and many others.

Services had been requested, too. The geologists had asked for surveys to be made of the

world at various wide intervals in the past; societies for the prevention of this or the promotion of that would petition to have their pet cause of the past assisted. Some wanted to turn modern knowledge over to the ancient Greeks without reserve, so that the Roman Empire could never come into being, while others favored the strengthening of the hands of the Bourbons to prevent the French Revolution and the Reign of Terror from happening. The files or the order room were crammed with proposed Utopias.

Needless to say, but a fraction of the orders could be filled. The more feasible of the lot were culled out and sent to the Planning Section. It was there that the motto "Merchants, Not Missionaries" came first into play, for Anachron was a commercial organization having the double purpose of acquiring valued products from the past and disposing of the unwieldy surpluses of home production. Any other consideration was secondary, and the possible moral effects of any of its acts worried the planners very slightly.

What they approved went to Projects, for preparation and estimates. Then Prophecy had a look at it, and referred its findings to Ethics. If the projects survived that gantlet, it went to the Control Board for authorization.

Barry and Maverick soon became lost in the maze of operations that followed that, especially after the secretary in Control had given them a *Field Man's Manual*. Somewhere along the line one or more of the many Research Bureaus put a finger in the pie; then there was Design, Contracts, Credit and all the rest. They even learned there existed an office of Intertemporal Exchange, where excess byzants, ducats, lacs of rupees, talents and pieces-of-eight could be turned in for appropriate credit. They found that out when they reported back to Kilmer and he sent them to the office with an order for three bags of coins to cover the initial expenses of their trip. That night they opened one of the bags and found it to contain many deniers and obols, as well as gold coins from the Levant.

The following morning Mr. Kilmer seemed a mite less dismal, but he explained that by saying it was early yet and he had not opened his mail. And he shot the basket of incoming memoranda a glance that would have served equally as acknowledgment of the presence of a king cobra.

A new face was present. He was an undersized chap with beady jet-black eyes, and a fidgety, nervous manner. His name was Nelden, but what his nationality was was undeterminable. His title was "Advance Man," and it appeared he had completed the preliminary field arrangements for the execution of the newest project. Barry and Maverick learned to their consternation that as soon as he had conducted them to the spot and

assisted in breaking the ice, they were going to be left alone and in full charge. Anachron believed in bringing up its field men the hard way.

"You'll do well if you get off by four, Nelly," said Kilmer, glancing at his watch. "You have to take these boys by and have them psychohyped and costumed first, so you'd better get going."

"Where are you going to send me when I come back, boss?" asked Nelden, anxiously.

Mr. Kilmer ruffled orders stuck on a hook.

"St. Petersburg, I think. Peter the Great is starting a big building project there, and it's a good spot for your construction gang now that you're finished in the Scillies."

"Yes, sir," said Nelden, with a dirty sidelong look at the two who were about to supplant him. They took it he was not overfond of medieval Russians.

They walked away, Nelden leading sulkily. Far down the corridor he turned and said, "Pretty soft for you guys. I do all the dirty work, case the joint, unscramble the dizzy calendar they use and work out the geo position. Then I get a concession for a castle and build it for you. Then I stock it with trade goods, train a lot of dumb marines how to find the way. After that I have to hand it to you birds on a silver platter. And I get a lousy salary while you fellows lap up the commissions!"

"Why don't you change your rate?" asked Barry, mildly.

"Too uncertain. And too damn risky," snorted the disgruntled advance man.

They turned into one of the interminable research wings until they came to the section they were after. Four or five men sat around a table, poring over antique tomes and manuscripts. In the corner a phonograph was rattling off fast dialogue in some foreign tongue.

"These fellows," explained Nelly, "bone up on local customs, lingo and all that. When I do my scouting I bring back records to show them how the stuff sounds when the natives sling it. There isn't any French or English or Spanish where you're going. Only dialects, and they change every fifty miles. Latin and Lingua Franca is about all you can really sink your teeth into."

"These the men?" asked a man wearing a doctor's smock, who had just come in, nodding in the direction of Barry and Maverick.

"Yeah. Hype 'em."

The doctor arranged a few chairs, set the novices down in two of them and several of the scholars and Nelly took the others. A dazzling little light appeared as if by magic in the ceiling, and the doctor directed them all to study it closely. Barry felt a momentary queasiness and promptly lost all sense of time. At x hours later he was aware of the chairs being pushed back and someone saying to him, "O. K., you've got it."



Without understanding quite how, he knew that he was passably fluent in several French dialects, church Latin, with smatterings of Flemish, Cornish, Navarrese and Arabic thrown in. Then he realized he had been hypnotized and while under had been pumped full of the acquired knowledge of the others. Vague memories of monasteries and castles he had never seen were faintly troublesome, but he supposed that was to enable him to recognize them when he saw them.

"Where's the bird?" asked Nelden, looking around. Then his eye lit on a cage in the corner in which a big green parrot was preening itself. "O. K.?"

"Hope so," shrugged the head language student.

Nelden unhooked the cage and made for the door, Barry and Maverick following. When they stepped out of the elevator at the ground floor, it was into a taxi bearing the company's trademark. "Freight Export," snapped Nelden, "and step on it." He planted the parrot cage squarely on Barry's lap and began jerking out hasty phrases:

"Bit of foresight . . . might get you out of a jam . . . barons are nuts about queer birds, like falcons, eagles . . . they never saw a parrot . . . this one curses fluently in Basque and Walloon . . . and prays interminably in bad Latin . . . ought to make a hit."

He caught a breath as the machine lurched around a corner and climbed a mound of fallen brickwork. "'n lissen . . . I'm taking a couple of days off . . . no sense in going down with you . . . everything's set. Gotta charter from the Duke of Cornwall, tribute one gold bar and three fine cows a year . . . base castle's on one of the Scillies . . . partly stocked and with four good cogs. You open up France . . . establish a fair . . . hire peddlers . . . get a stand-in with the nobility and church. And watch your step. Don't get into fights. Don't get burned at the stake for heresy. Or sorcery . . . that's worst. Don't waste sympathy on the serfs, they're a bunch of ignorant bums. Merchants, not missionaries, you know. And the key word is mass sales. Rockefeller made more millions selling quarts of gasoline than Tiffany ever did with diamond necklaces. And don't forget . . . if you don't show a profit by the end of six months . . . bam . . . you're out on your ear."

He shut up with a snap of the mouth and stared out the window, while Barry and Maverick exchanged blank looks. This was being put on their own with a vengeance! Then Barry's face broke into a grin, which gave way to a hearty laugh. No wonder they insisted on ex-Commandos!

The freight export building occupied most of the site formerly taken up by Greenwich Village. Elevated railroad spurs ran through the lower floors of the vast pile of buildings which rose

above them for many stories of blind warehouse walls. Once inside they were whisked aloft and stepped out into a room of astronomical dimensions. Barry had time only to glimpse the heaps of merchandise of every description that stood about the floor. Bronze spears were stacked up like cordwood, flanked by hoes, rakes, plows and reapers. Elsewhere there were bags of sugar and flour, crates of grapefruit and other foodstuffs. Literally thousands of crates of unknown content were on every hand. Then they came to a machine such as they had seen Jakie arrive on, except this one was as large as a harbor lighter and was already piled high with boxes, bags and barrels.

"Your shuttle," said Nelden. "Runs nonstop between here and your castle. It's the only way you can get down or up—those one-man shuttles are only for special duty. Don't ever lose touch with the castle, or you're sunk. S'long. Good luck."

He herded them onto the shuttle, and before they knew what was happening a gong was clanging and they felt a queer vibration. After that they seemed to sleep awhile when a series of mild jars brought them back to full consciousness. They were in a different place. It was a huge vaulted room—or cavern—aglow with floodlights, and the shuttle was nested between a pair of unloading platforms. At the blast of a mouth whistle, two gangs of gigantic Nubian laborers sprang forward and commenced snaking the cargo out. A gangling redhead strolled over, dressed in immaculate whites and Barry saw that he had a good old Colt strapped to his hip.

"Hi," greeted the fellow, "welcome to Isla Occidentalis. Suppose you're the traders. The cogs are loaded and ready—when do you want to shove off?"

"When we get our breaths," answered Barry, marveling now at his recent impatience with the slow pace of the indoctrinational school. Anachron may have been slow on the uptake, but they made up for it in the field. Then, feeling a few amenities were in order, he introduced Maverick and himself.

The supervisor of the unloading said his name was Clarkson. "I'm slavemaster and storekeeper," he added.

"Slaves!" exclaimed Maverick, horrified. He had just finished fighting a war for freedom.

"Why not?" countered Clarkson. "You're in 1240 now. These fellows are happy as larks and better off than they ever were in their lives. We got 'em from a rock quarry of the Carthaginians in the course of a trade, and they can't be disposed of up home. So we use 'em here to cut down the overhead. You'll find 'em handy; we've taught 'em all sorts of things—to cook, tap dance, play swing. The trades, too. The company won't send down

anybody but people like us. We have to make out with local talent as best we can."

Barry grunted, and proceeded to inspect the castle. *Isla Occidentalis* was a glorified warehouse built in castle form. It occupied the whole of a tiny rocky island off the tip of Cornwall and its concrete walls rose sheer from the foamy breakers that pounded their foundations. Except for a water gate that admitted the clumsy cogs to the inner basin, there was no opening in the walls. Even that was guarded by an Anachron-designed portcullis sliding in well-greased guides. In that day of timid mariners and knights who feared the sea, the place was impregnable and needed no more than an occasional electric eye for guards.

Clarkson, they learned, was the chatelain, and was aided by a squad of six marines who saw that the slaves kept to their assigned quarters when not otherwise engaged. In addition there were quarters for such cog captains as happened to be at base, and accommodations for the traders and home-office visitors. All the rest of the structure was filled with storerooms, some of which were refrigerated. The place was full of flagrant anachronisms, but it did not matter, as no one belonging to the contemporary age was permitted to enter. It had been designed as a handy central shipping depot for the crew of other traders yet to come—men who were to work Granada and Moorish Spain, England and the Low Countries, and the Baltic ports. The name, *Isla Occidentalis*, was beautifully vague, meaning a land somewhere west of Ireland.

"I'd hate to be in your shoes," was Clarkson's remark over their nightcap later. "We've got a hellish overhead here, what with interest, amortization and all, and we understand that Audits & Accounts have been burning up Sales about it. Kilmer stays in a state of frenzy all the time. After four guys took a fling at that St. Denys fair he's so anxious to crack, only to bust at it, he's been hard to live with. He tried to sell

Nelden the idea of taking over, but *he* wouldn't touch it. So—"

"So he picked a pair of greenhorns," Barry finished for him. "I get it. Oh, well. We'll have a look. By the way, what cargo have those cogs got in 'em?"

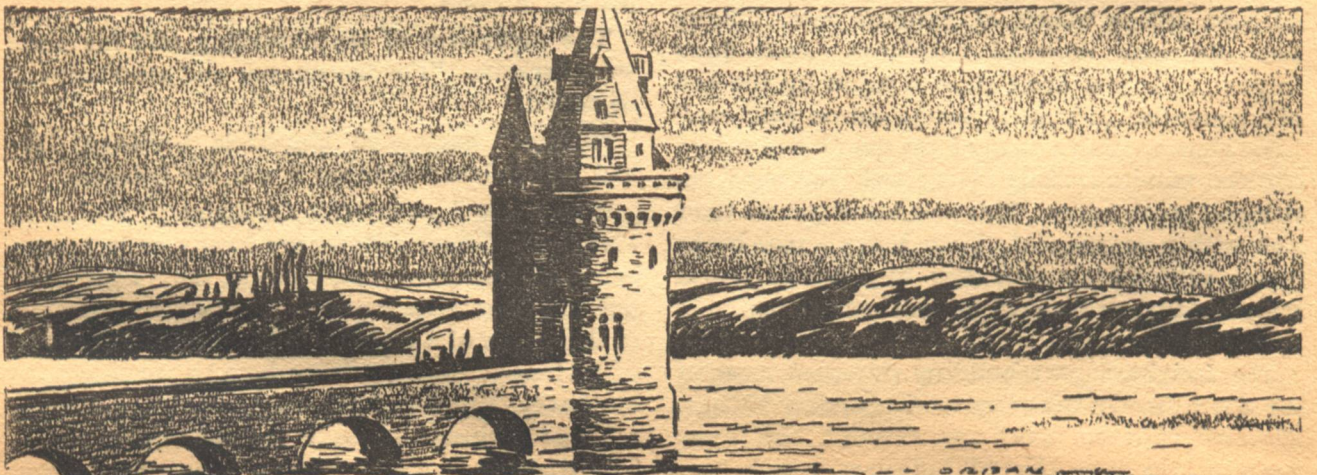
"Everything but the kitchen stove. Your flagship's chock-full of miscellaneous what-have-you; the other assorted livestock. It's up to you how to use it."

The week's voyage to the mouth of the Seine was not hard to take. Parker, ex-commander of a submarine, was flotilla captain, and delighted in pointing out the innovations he had made on the tublike vessels. To the eye they looked like any other merchant ship of the age, except they were fitted with rudders instead of steering oars. But aerodynamics engineers had reset their masts and redesigned the running gear, while the underwater lines had been altered for the better. Under a secret deck auxiliary Diesels pushed them along, wind or no wind, and there were refrigeration machines for their perishables. That was a surprising discovery, as Barry had been told that both internal combustion engines and ice machines were forbidden to the Middle Ages as being too far advanced for them.

"How would you keep that stuff secret if a war galley boarded you?" he asked of Parker.

"They wouldn't board us. We've got an ace in the hole. There is a submerged torpedo tube in the bow; it shoots the cutest little dummy torpedo you ever saw. The thing is only six inches in diameter and is electric-driven so it doesn't leave a wake, but it packs a wallop good enough to go right through anything now afloat. They'd simply sink and wonder what kind of sea varmint did it to them."

"Oh," said Barry. He was getting a better idea of how you did things when the rule book made you pull all your best punches. Then, seeing the coast of France growing more distinct by the



hour, he went down to dress and help Maverick with his costume. In his hurry to shove them off, Nelden had failed to take them to the make-up place, so they had looted their hold and found something that would do. The best description of what they ultimately decked themselves out in is that the foundation garments were silver embroidered Mexican vaquero suits, except that trench caps were substituted for the sombreros. As a concession to the contemporary taste for draperies, they topped the whole ensemble with Japanese kimonos worn open in front. Each tucked a bowie knife in his belt, a blackjack, and set of chain twisters—just in case.

As the low banks of the Seine narrowed on either side of them, their hypnotically acquired memory of the place refreshed. They knew without being told that they were approaching the first of a dozen tax- and toll-collecting stations that separated them from their goal, for a line of obstructions blocked the river, forcing them into a little channel close under the south bank. There stood a formidable stone tower, and on the bank a number of crossbowmen and archers led by a man in chain mail. The latter was beckoning the ship to come to him.

"This bandit takes an eighth of all you've got," growled Parker, telling the Nubian steersman to put over the wheel. "I wish they'd let us work on him like we worked on those Japs up the Yangtze—"

Just then Barry's ring finger began to burn. Anachron used the same type of self-contained midget radio sets as the Commandos had. Barry kept his eyes on the approaching beach, but his attention was on the succession of prickling dots and dashes that his finger felt. The message was being relayed from the Isla.

Kilmer to Barry: Ten days and no report of sales. Wake up and get busy. Quit paying out all the profits in tolls and start merchandise moving. Must have ample booth space at Lagny or St. Denys fairs by Monday, your time. Acknowledge.

The tingling stopped. The first ship was already easing up to the bank where the big bearded gorilla in armor strutted impatiently. The cattle ship was hove to downstream, waiting. Barry had no time to analyze the disconcertingly peremptory message or reply, so he gave the stone in the outer ring a half turn and pressed out the code symbol for "acknowledge." By then they were bumping against the quay and the toll collector sprang aboard.

"Unload your wares on the dock," he bellowed, "that I may select that which is the lawful due of my noble master, the duke."

Barry thought of the heterogeneous cargo below and shuddered. Half choking he said, "If the noble master provost will deign, I will give him refreshment in the cabin below. There is a flask of the superwine made for sovereigns, and presents worthy of the honorable provost's fair lady. It will do no harm to let these villains and slaves wait while we parley. Unloading is so noisy, you know."

"Umph," grunted the brute in hardware, thrusting out a bulldog jaw. He was not too intelligent and he feared trickery. On the other hand, he had a keen nose for a hidden bribe and he, somehow, thought he sniffed one. He barked an order to his men and clanked into the cabin. Barry followed and tapped a little silver gong, whereupon a giant Nubian appeared, slickly black and nude except for a brilliantly spotted leopard skin about his middle.

"The goblets, Sambo, and the bottles—all of them."

He set out two massive silvery goblets whose handles were formed of elephant heads from which trunks curled down to rejoin the stem. They were rather impressive-looking ornaments to the table. The provost fingered his, then lifted it with a jerk of the arm that almost hurled it over his head.

"*Mon Dieu!*" he exclaimed, with his eyes popping, "what manner of silver is this?"



"The quintessence of silver, excellency, from which the base dross of lead has been distilled by silversmiths of far Occidentalis," said Barry. As for himself, he preferred less capacious vessels, preferably of glass, not aluminum, when he went in for a friendly snort. But he was in an experimental mood, and Kilmer's testy message had aggravated it. So something had to be done about river tolls, eh? Well! Barry pretended nonchalance as the messboy stood a row of bottles along the table top. Rye, Scotch, tequila and good red rum were there, and the boy had thoughtfully added a half gallon Mason jar full of yellowish, pure, fresh West Virginia moonshine.

"Precious and potent vintages these," said Barry, respectfully pouring out a beaker of Scotch for his guest, "fit only for warriors. A lowly merchant such as I needs content himself with ordinary wine. A lemon squash, please, Sambo, for me."

The provost started with an exploratory sip, then drained the cup at one gulp. There were tears in his eyes for a moment, for nothing stronger than a few drops of his master's new "medicine," or the recently invented crude brandy, had ever passed his lips before. But he mastered his tears and looked speculatively at the other bottles. The clear glass of the bottles and their perfect symmetry were marvels enough, but their contents surpassed them. He tried a shot of rum.

From then on the conversation ran smoothly. It was chiefly monologue, devoted to the prowess in love and in battle of François Grosplied, the worthy but ill-rewarded provost of a grasping duke. He reproached the duke bitterly for having exacted too high a price for farming out the river rights. "But," he assured, with an owlish wink, "I get mine, at that."

"I'm sure you do," agreed Barry, and crooked a finger for Sambo. To him he said in an aside, "See that the boys outside have something—the mountain dew will do; let 'em have a five-gallon jug."

Things looked better. Barry bethought himself of the present he had promised for the little wife, so he stepped to a cupboard and pulled out a box of assorted rayon stockings. It was a shotgun package, of various sizes and colors. He handed over a sheeny pair of brilliant green and one of hectic red, leaving the less passionate colors in plain sight in the box.

The bleary Grosplied held up a pair, then held them up again, with colors mixed that time. "Marry," he said, "a sweet combination, eh?"

"Mix 'em any way you like," said Barry. "The box is yours."

"My frien'," assured Grosplied, near to complete unbending. He missed Barry completely in the affectionate sweep of his arm, but fetched up

against Sambo, snatching the leopard skin away in his clumsiness. His eyes bugged again, for the absent hide revealed a pair of purple velvet tights, glittering with spangles and held up by a belt of brilliants. It was an idea of Clarkson's, that little sop to his slaves' innocent vanity. Whatever the intent, its effect on Grosplied was profound. He had to have another drink. Barry suggested okolehau, which up to that time had not been sampled.

A little later, when the genial Grosplied lay slumbering on the deck, Barry stole out onto the deck. Parker was leaning on the rail thoughtfully regarding the sprawled bodies of the duke's henchmen. The upended jug told the tale.

"For Pete's sake," said Parker, "what did you give 'em—Mickey Finns?"

"The next thing," grinned Barry. "But say, didn't you tell me that you had a special typewriter packed away in the event we should ever fall in with a cardinal?"

"Yeah. I'll have it broken out for you if you want it. There's a box of initial blocks and a pad that goes with it, too, and assorted sealing wax."

"Swell," said Barry, and he began trying to recall all the legal phrases he knew.

A little later he was sitting in the cabin again, pecking at a monstrous oversized typewriter that wrote in black Gothic letters an inch high. He carefully left a large space where the initial letter should be, and then wrote on without it, using the best grade imitation parchment he had on board. It was an agreement between one F. Grosplied, provost of the duke, and hence the king, and one Anachron, Inc., ambassador Occidentalis, granting—by right of Grosplied's farmer-generalship—the perpetual free use of the river up as far as the confluence of the Oise. He stuck in carbons and made four copies. Then he surveyed his work.

Barry scrutinized the last line, "*transito sano hoc flumen in perpetuam*," and wrinkled his nose a little. Considered as Latin it probably stank, but what the hell! He selected the correct block to supply the omitted initial and stamped on an ornate one picturing a knight on a rearing horse sticking a groveling dragon. It was in a bright vermilion. Barry chose a stick of dainty pink from the box of sealing waxes, and another of baby blue. Then after lighting a candle, he went at the dirty work of getting the party of the first part, the aforesaid F. Grosplied, to his feet. It couldn't be done. The gentleman was out. So Barry gently abstracted his signet ring and sealed all five copies with the pink, after which he restored the ring. Then he sealed for his own part, pressing the blue wax with a Chinese coin he carried as a pocket piece. Two of the documents were for the principals, the copies were for duke, king and pope respectively. Barry wanted no

misunderstandings. So he tucked Gros-pied's and the duke's copies inside the slumbering provost's belt. After that he had Sambo and the cook carry him back to his men.

"Rather unmilitary looking, don't you think?" asked Parker, apparently fascinated by the proceedings, but referring to the haphazard arrangement of the snoring forms on the shore. Their dignity had not been enhanced by the addition of their chieftain, for Barry had kept the faith. An irregular pyramid of mingled-colored stockings surmounted the sleeping warrior's chest and rose and fell with every labored breath.

"Uh, yes," agreed Barry. "Let's have 'em straightened out in rows. And to avoid hard feelings later, I guess we'd better leave another jug of lightning for consolation when they wake up."

When he went to borrow Gros-pied's standard, which had been left leaning against the castle wall, he relented further. He drew the corks part-way in half a dozen bottles of good rye, and stood them, together with the rare goblet, alongside his erstwhile guest. After that he had the Gros-pied banner hoisted to his cog's peak to serve as notice to all upstream that the ships were under ducal protection.

"Let's go," he said, and then relayed the message to Maverick, who still hovered anxiously off shore, wondering what it was all about.

"Aw-r-rk," squawked the parrot, unexpectedly, from its perch on the poop. "A king's ransom, egad! Ora pro nobis. Ora, ora, orra!"

Progress up the Seine was slow, for its lower courses were sinuous and during many hours each day the tide was against them. They would have made faster progress had they been free to use their kickers, but for fear of stampeding the plodding serfs along the bank—none of whom could probably stomach the sight of a ship of the sea gliding along against both wind and tide as fast as man might walk—they had to use the auxiliaries sparingly. In places there were stretches of tow-paths, and whenever they came to one of these, Barry would put squads of Nubians ashore and give them the end of towropes. Many a doughty knight must have gasped in admiration for those black giants at seeing them trotting gayly along, dragging the heavy vessels after them with such careless ease. In fact, the slaves towed with such ease that Parker felt compelled to ring down a few revs—to avoid the occasional embarrassing moments when the trotting blacks couldn't keep ahead of the slack.

They passed many towers where *rivage* was collected, but their borrowed banner protected them from molestation. Barry computed that if he had paid an average toll of three percent at each of them, together with the future taxes of every kind

that lay ahead, he would arrive at Paris with empty holds. He understood then why the previous expeditions had failed. His coup over Gros-pied was a pretty good victory at that, and the thought of it bucked him up when next he answered Kilmer's daily "hurry-up" demand.

Have a heart, boss. Sure, we've been two weeks on the voyage—you can't fly from the Scillies to Paris. We're nearly there; our cargo is intact; we've spent no money; and we've got a perpetual free pass to the lower river—and that ain't hay.

The boss snapped back:

No, it ain't hay, but breaking even ain't making profits, either. And wait until you knock their eye out at St. Denys or Lagny before you get fresh, young man.

"The dope," muttered Maverick. "Why don't *he* go down to Research and get a hype, too. He keeps yelping about St. Denys and Lagny, when all these shindigs are seasonal affairs. Lagny closed up shop for the year in February; St. Denys is a fall show. This is June. How could we sell out at either by last Monday?"

"Oh, well," shrugged Barry, indifferently, "let him rave. All he wants is sales, and if he's like the breed I used to know, he don't care when or how we get 'em—"

"I didn't know you'd ever sold," said Maverick.

"Sure. Before the war, when I was a kid. Vacuum cleaners, cemetery lots, grand pianos—"

"Ouch! O. K., buddy. You're chief from now on. Anybody who can sell cemetery lots is a better man than I am."

Barry was about to admit he hadn't actually sold many when the vessel went round a sharp bend and there was another castle barring the way. This one flaunted the white banner of the King of Ile-de-France. An arbalest quarrel zipped through the rigging, signifying that the colors of Gros-pied didn't mean a thing to them. Barry groaned.

"The jig is up. This must be France."

For several days they had been running through the hazy zone that was either English or French, depending upon how you looked at it. Its suzerain was the Duke of Normandy, a French duke, and therefore a vassal of the French crown. Yet that same duke was likewise King of England, and therefore no man's vassal. Try as they might, the boys could not unravel the intricacies of jurisdiction. So they meekly halted their ships and commenced the haggling over the amount of douane they should pay. The tariff to be paid at the border of a kingdom was over and above any river or road tolls. The provost's deputy was both a stupid and greedy man. A dozen golden livres satisfied him, and he let them go. After that, they found, they would have to pay the river tolls above.

They cast off and stood upstream. Then they held a council of war.

Someone, probably Dilly, captain of the cattle boat, suggested that to avoid the heavy *rivage* it would be better to tie up somewhere and proceed further by land. At once a howl from the others arose. They had an idea of what land travel was, moreover, they didn't have to live on a ship with bawling cows and clucking fowls.

"That's worse," ruled Barry, finally. "You pay a transit tax to every castle or monastery you pass, plus extra for the use of fords and bridges. Every baron has his hand out for the *telsonia*, which is the land equivalent of the river tolls. That's not all. The roads are trails—quagmires when it rains; there are bandits everywhere, and sneak thieves galore. What's worse, we'd need scores of mules to carry our cargo, and we haven't that many. No, that's out. We'll stick to the river."

It was a noble resolution, but destined to be broken. They stuck, but "in," not "to." A day later, two toll stations up, they were scarcely two hours past their last big castle when the leading cog poked her nose in a submerged mud bank and stayed there. The other sheered out into what looked like better water; and it stuck hard and fast. As far as they were concerned, they were at the head of navigation.

"Shucks," muttered Barry, as he hung over the taffrail watching the seething mud kicked up astern by the struggling little propeller.

It was midafternoon when they got off, and night was falling when they got back to the nearest castle. They obtained permission—by shelling out a handful of silver deniers—to tie up to the funny little quay beside the toll tower at the river's edge. It was a detached outwork, for the castle itself stood on a low plateau inland about half a mile and some several hundred feet above the water. Tomorrow they would have to beard its baron in his den and induce him to be their patron. Somewhere, sometime, they would inevitably have to have a terminal where they could erect a warehouse. It seemed that this was the place, and the time was now. There was no choice about it.

The four ate their supper in a subdued mood, each thinking in his own fashion of the changed situation that lay ahead. It was not that they were downhearted, for men of their breed seldom get that way. They were merely thoughtful. After the coffee, Barry broke out the bottles and quietly filled the glasses around.

"Oh, well," he said, "here we are. Now, let's see—"

It was pitch dark outside by then, and the black mass of turreted Capdur chateau loomed unblink-

ing on the hill above them. In its age people went to bed at darkfall and arose at the crack of dawn. Tomorrow they would visit the castle—and be received, for baronial hospitality was the universal custom. Man of whatever degree was welcome, each according to his rank. But baronial hospitality expected something in return, again according to rank—from the villein, labor; from the wandering jongleur, a few entertaining tricks; from merchants, samples of their wares; from the nobility, presents appropriate to their stations.

"We are merchant princes," announced Barry, gravely, "trot out the invoices and let's see what we have to give. First impressions, you know—"

It was near midnight when the last item had been jotted down on the list, and it was a faintly hilarious party that bade each other good night and went severally to their bunks. And it was near to nine in the morning when the last box came out of the hold and was strapped to the packsaddle of one of the three sturdy she-asses selected for the parade. The ten Nubians chosen to go along were resplendently dressed. Their bodies were oiled to glistening blackness, and in addition to their beloved spangled tights, they wore beaded Indian moccasins and the full-feathered war bonnets of Sioux chieftains. Barry and Maverick mounted the two smart mules that had been saddled for them, and the cavalcade set out up the winding road that would take them to the castle.

They presented an eye-filling spectacle indeed, as attested by the excitement of the native children who ran along beside them, shouting and pointing. Villeins who happened to be along the road stepped respectfully to one side and watched with mouths agape as they went by. By the time they reached the summit of the hill and turned toward the castle on the plain ahead, they saw that a great crowd, warned by the runners who had dashed on ahead, had gathered by the gate in the barbican to await their coming.

The weird, outlandish procession was headed by Barry and Maverick, riding abreast, flanked on either side by a giant Nubian. The Nubians carried what to local inhabitants were queerly bent tubes of shiny gold having some resemblance to their hunting horns. After the leaders came the three pack animals, each loaded to capacity, the last one bearing panniers from which protruded strange comestibles—loaves of bread, corn pone, stalks of celery, and other things. Behind them came three more of the Nubian musicians, again walking abreast, the middle one having a horn stranger even than the others, shaped like a malformed gourd, and cluttered with silver wires and disks. The one on the right carried several barbaric drums slung on a rope about his neck, while the left-hand man bore a Gargantuan viol on his back. Last of all came another black leading a

magnificent Hereford steer, the like of which no Frenchman had ever seen, since it was taller and fatter by far than the best of their own scrawny breeds. And alongside him marched the ultimate Nubian, whose studied dignity was considerably impaired by having to break ranks from time to time to bring back to the fold one or the other of the three stately turkey gobblers he was shepherding.

Thirty paces before the gate, the procession halted. Barry lifted a finger and the two foremost musicians stepped forward and raised their bizarre instruments to their lips. They sounded a wondrous fanfare, shifting uncannily from key to key in flat defiance of all known laws of hornry. Just before the final grand flourish, the trumpeter sang out a long, sustained thin note while his squirming mate ripped off a sequence of rasping trombone tears. If Old French lacked the equivalent of the word "wow" until then, those present invented it on the spot. Never had there been such trumpeters; not even had the king himself had such, when he came to Capdur two years before.

The fanfares over, the procession moved on. The crowd at the gate opened a lane for them, and since no one impeded, they went on through. Barry glanced at the crude stockade of pointed tree trunks and made the mental note that its purpose would be served as well or better by cyclone fencing. He must order a few thousand lineal feet of it. And then, as they crossed the tilting ground, he studied the battlements of the outer wall of the castle with a professional eye. He looked at the towers and their embrasures and the moat of stinking, stagnant water that made them hard to get at. Instantly he conceived the proper mode of attack. Instead of the cumbersome *beffroi* towers which besiegers built and pushed forward in order to top the walls and span the moat, he would employ a modified version of the standard hook-and-ladder fire wagon. An armored cowl would do the trick, with a hatch in the carapace through which a swiftly extensible ladder could be upreared. It would be a cinch to get a foothold on the walls with a few such vehicles.

The drawbridge was down, the portcullis up, and the gates open. So they clattered across the bridge and under the gloomy arch. Again Barry's inventive mind was running away with him. Instead of the clumsy timbers of the bridge, suspended by heavy, rusty chains, he would substitute a light bascule span of duraluminum, counterweighted so that a boy could operate it by grinding a crank. He wondered whether there was any chance of selling the medievals the idea of standardized sizes. At any rate, his next requisition on Kilmer would contain a number of curious recommendations.

They merged into the bailey, or outer ward, a huge courtyard bustling with activity. It stank of manure, unwashed humanity and the smell of burning wood—a not altogether unpleasant combination, for in addition to the stables and blacksmith shop and the mews where the hawks and falcons were kept, there was a big communal oven and an open ditch filled with fire over which the spltted carcasses of pigs and sheep were being roasted. Chickens and peacocks and hogs roamed the inclosure, pecking or rooting among the ordure piles; naked children played amongst them, stopping only long enough to stare with their amazed elders at the strange procession passing through.

Barry led on, since still no one had appeared to greet them or to bar their way. The farther wall of the bailey was the outer wall of the castle proper, higher and stronger than the first wall and better turreted. It, too, was guarded by a moat, but again the drawbridge was down and the way open. The surly porter lounged against the stone portal, but made no move to stop them. So they entered the great paved court of the castle, mules, steer, turkeys and all. And there they were met by a flustered squire. His master wanted to know the meaning of the astonishing fanfare of trumpets that had heralded their approach. Were they, perchance, gentry incog, or the mere merchants they seemed to be?

"Both," said Barry, calmly, with a touch of hauteur. "In the land of Terra Occidentalis the merchants are the gentry. We are skilled in the arts and sciences and the use of weapons, and are not to be treated lightly. But we are come as friends, to pay our respects to the baron, and we have gifts for him, his lady, and his household. Pray inform him."

The squire surveyed the halted cavalcade and looked troubled. It was something for which there lacked precedent. So he bowed stiffly and begged them to remain where they were; then scurried away to fetch the baron in person. Barry and Maverick dismounted, as etiquette demanded, to await their host.

The Sieur de Capdur was a mountain of a man, of dark complexion and beetling brow, but though he had the arrogance born of a lifetime of undisputed command, there was a rough-and-ready joviality about him that was appealing. He brushed away the formalities of greetings with a brusque question.

"You have presents for me?" he asked, getting straight to business; "fine," and he looked appraisingly at the laden donkeys. His lady, the slender and fair Yvonne, joined him with a group of maids, and in his train had come the gaunt old seneschal, his marshal of horse, his provost, and other officials of the house. They gathered eagerly about the newcomers in a semicircle, backed by

the small fry of the chateau who had crowded in from the bailey and were craning from behind. Merchants from afar did not often stop at Capdur; it promised to be a gala day.

"O. K.," said Barry, "I'll be Santa Claus," and he began undoing bundles. Meanwhile the Nubians in the rear had brought up the animals, which Maverick presented with a flourish. The steer received unstinted admiration, but it was the gobblers that aroused the greatest delight.

"What bee-yootiful pheasants!" chortled Lady Yvonne, as one of the creatures strutted past, ruffling its tail and grumbling in its craw.

"Turkeys, lady," corrected Maverick, "and they're good to eat. We brought along our chef and the fixin's so you won't go wrong on how to do them." Whereupon the herders of the beef and turkeys, and the leader of the third ass, at a signal from Maverick, made off toward the bailey to prepare the evening meal. They had, in addi-

tion to the materials for stuffing, cleavers, roasters, grills and other accessories.

The ceremony of presentation took up the whole of the morning. Both Barry and Maverick were busy dishing out the gifts, and demonstrating their uses when necessary. They dealt them out in fair rotation, allowing each givee ample time to play with his new acquisition before swamping him with another, but the distribution ran so:

To the Sieur de Capdur: a pair of ten-power, prismatic binoculars in a handsome carrying case; the mate to friend Gropied's drinking mug; a roulette wheel and folding layout, together with an adequate supply of chips; two bottles of Bacardi rum with silver-handled corkscrew; and lastly but not least, a homemade slot machine built by Parker to while the time away. It was a thing not on the Control Board's approved list, but the Sieur de Capdur didn't know that. For





his part, all barriers were down when he learned that a quarter of the take went to the house.

"Zounds!" he roared, "my fief holders wail about the taxes. We shall have their taxes, O wise merchant, and place one of these machines in every hamlet of our domain. 'Twill have the same effect, or better, if I know the varlets, and reduce the volume of their bellyaching."

"Truly," said Barry, winking knowingly, and then went on with his distribution of gifts.

To the Lady Yvonne, who had had a chair brought, and was sitting among a cluster of twittering donnelles, he presented first a five-pound box of assorted chocolates and bon-bons. She fondled the glistening box uncertainly, until he rudely broke the precious cellophane wrappings and exposed the contents. Amid a chorus of oohing and aahing they sampled them. Chocolates and cocoanut were unknown to them, and sugar only as a novelty, horribly expensive and in crude lump form, as brought back from the Levant by the crusaders. When the excitement over that died down, Barry passed out hand mirrors—a tremendous advance over the polished bits of silver they had been using—lipstick, rice powder, and perfumes in crazy little ornate bottles. To the maids in waiting Barry gave quantities of costume jewelry of the five-and-ten grade, but enormously attractive, nevertheless.

There were presents for all. The Quixotish seneschal, a hungry-looking seven-footer with a drooping mustache and limp beard, and who was charged with the defense of the castle, received a brace of Pyrene fire extinguishers and a super-arbalest. It was an improved crossbow of Anachron design, whose bow was a piece of high-grade spring steel and whose spring was fine piano wire, jerked into firing position by a single motion of the cocking lever. It far surpassed the slow and clumsy jacks of the contemporary arbalest. The baron had an oaken target set up and Barry clumped eight bolts into the bull's-eye within the space of a minute.

"Marry," exclaimed the Sieur de Capdur, "and had we twelve score of those we would soon drive the accursed English into the sea."

"Did you say twelve score, sir?" asked Maverick, whipping out his order book. "A livre each is the price, sir, which includes a bag of fifty quarrels."

Barry ignored the sideplay and went ahead with his Santa Claus act. The chaplain was looking on with a hungry air, so to him he gave a folding reed organ for his chapel, and a ream of good bond paper with pen and ink and blotter. To the marshal he gave a currycomb; to the provost a pair of adjustable handcuffs with key. The latter gift created quite a stir, since the provost promptly went out into the gaping crowd and began trying them on villeins of various size. His

guinea pigs were nervous at first, but as they were released, one by one, they broke into loud guffaws. It was a grand idea and all approved. Not a few of them had seen fetters put on hot and hammered to fit the wrist by the blacksmith with his maul. From any point of view, lockable ratchet handcuffs were the thing—swift, sure, and painless.

There were a multitude of minor presents—hoes and rakes for the gardener; a breast drill and bits for the armorer; a set of silver—including forks—for the chateau table; an acetylene bicycle lamp for the warder making his rounds; a pair of clippers for the barber. There was a gross of paraffin candles, and a few cartons of matches. A box of assorted ground spices were for the kitchen, including curry and chile powder as well as the rare spices already known, such as pepper and cinnamon.

The baron melted. Had he the possession of Aladdin's lamp he could not have wished for such treasures. The Lady Yvonne was in the seventh heaven. In addition to the gewgaws and confections earlier presented, she now had a bolt of cotton sheeting, and many ten-yard strips of print fabric in a variety of colors and designs—not to mention the gorgeous pair of rayon pajamas of orchid hue.

"Ho! Enough!" bellowed the baron, wheeling and raising his hand. "Summon my trumpeters, summon my couriers, saddle the horses. Hear ye!"

Messengers scurried from the court, the rabble gathered up closer. Something was in the air. Barry wondered what.

"Master Provost," roared the Sieur de Capdur, "notify all my gentry and fiefs, and the neighboring abbots as well, that I, the lord of Capdur, have as my protégé the veritable prince of merchants. We shall hold festival here for the week to come, and thereafter go in state to our market town of St. Guy du Nord and there hold market until it is our pleasure to cease. Tell the knights of the manor also that they shall furnish such asses, mules and other animals as these, my friends, shall find needful to convey their wares to St. Guy, and that without fee or charge. It is in *my* service. You have heard. Let it be so done."

Barry sighed a deep sigh of relief. It was done. He had a market, transportation, protection, and a noble's favor. Then he saw the beetle-browed baron bearing down on him, scowling fiercely.

"That's that," growled the baron. "Let's eat."

Throughout the remainder of that hectic day, Barry and Maverick maintained their composure. They got through the midday meal somehow. It was Barry's fate to be seated beside a gay little donnelle and share her plate with her. He taught her the technique of the fork, but found her odor strangely disturbing. At length he reached into his pocket and produced an oval cake of scented

soap—an act that might have given offense in a more sophisticated age—and handed it to her. She bit at it tentatively, but he stopped her and assured her it was not the confection it appeared to be, and told her of its proper applications. She was most grateful.

The Nubian quintette had sounded off. They had been fed earlier and were in fine fettle. During the meal they restrained themselves admirably, but the moment it was over and the novel candies had been passed around, they cut loose. From dreamy waltzes they sheered suddenly to improvisations of their own. It wasn't jazz, nor yet swing or blues, but it partook of all of them. The day being warm, the meal had been served in the court, and shortly all hands were up and gambling about to the ravishing strains of the music. And as the towering black slapped his doghouse and the sax artist went to town, the denizens of the castle let go. From lady to scullion they pranced on the flags, squirming in utter abandon. The knights and squires were not so quick to catch the idea, but once they got it they went all out and capered to the throbbing tempo of the drums and sobbing sax in a manner appropriate to its wild rhythm. It was, in short, a riot.

But it could not go on forever, for all hands were anxious to gloat over their treasures. The *Sieur de Capdur* dragged Barry up the tortuous and tricky steps of the inner keep for a view of the countryside through his miraculous binoculars. The seneschal and the provost came too, but the latter soon went bounding the stairs, yelling for his horse and men-at-arms. They had spotted a gang of rogues squatting about a fire in a copse on a hilltop a couple of miles away. *Capdur* was enormously pleased, and promised Barry a good show as an added reward—a mass hanging. On the way down he showed him his prison cells in the basement of the tower, where a handful of emaciated wretches languished in their fetters. The stench of the place was terrible, especially near the black hole that gave access to the oubliette. A few barrels of chloride of lime would help, Barry decided, and promised the hangman—who had been previously overlooked—that they would be sent up on the morrow.

The remainder of the day was spent in demonstrating the gentle game of roulette, which *Maverick* banked. *Capdur* was a little crestfallen at seeing the livres and deniers being raked away to fall into a foreign purse, but he consoled himself with the thought that hereafter the privilege of banker would be his. The mathematics of the double-zero wheel were not clear to him, but the practical results were. He must entertain oftener hereafter.

Supper was held within the great hall of the baron's residence, and proved to be the biggest event of the day. There was roast turkey, a la

*Occidentale*; and the prize beef, instead of being barbecued in hunks, had been neatly dissected into sirloins and porterhouses and roasts of manageable size. Later, they passed around the candy, bananas, oranges and rum, and sat until dark warned them that it was bedtime. The traders, having seen the musty feather mattresses between pairs of which the castle people slept four in a bed, declined the invitation to spend the night. Back aboard their cog, *Maverick* spilled a small mountain of coins on the cabin table.

"Not bad," he murmured. "Let's see . . . our presents invoiced three hundred odd trade-dollars . . . this stuff comes to over five . . . two hundred net profit in cash."

"Plus favors," added Barry, yawning. Then he sent off a crisp report to *Kilmer*, ordered two more cog loads of stuff from *Isla Occidentalis*, and went to bed.

The period of festivities passed rapidly. Barry set up a booth on the jousting field and sold to all comers at prices as high as the traffic would bear. The amount of money they took in was embarrassing, since it was not money they wanted, but select produce of the times. However, they managed to pull several bits of good barter—Barry traded a second pair of binoculars to the *Comte de Boisblanc* for a good Ceylon ruby, a string of pearls, and a richly ornamented and bejeweled scimitar that was a trophy of the last crusade. The women were glad to swap their crude handmade laces for the niftier rayon from *Occidentalis*, while old paintings and bits of wood carving were considered cheap pay for the marvelous aluminum pots and pans. The biggest coup of the week occurred when Barry induced three impoverished knights to form a well-drilling company. To them he rented the single mule-powered drill rig he had, and sold them a quantity of pipe and a stock farm windmill, easily assembled. They planned to drill their initial well in the inner court of *Capdur*—which had been taken in siege once due to the exhaustion of its water supply—and to mount the windmill atop the keep. Barry showed them how to use a walking beam to offset the pumping rod's action.

Toward the expiration of the time, Barry left *Maverick* to mop up at the castle, while he set out for *St. Guy* with a train of twenty mules and a group of their slaves. He wanted to have his booths installed before the party of nobility arrived.

*St. Guy* was but thirty miles away, but it took him four days to make it, cursing the so-called road fervently at every slogging step. It chanced to rain the night before his departure, and the rough trail was a bottomless slough of mud. Often they had to strip the nearby woods of branches and corduroy the road to keep the mules

from miring up to their bellies. Having made but five miles the first day, Barry sent off a message to Clarkson asking for a heavy road plow, a grader, ten scrapers, and all the vitrified pipe he had on hand. If St. Guy was to be their future market place, it must have negotiable roads leading to it.

By the third day the roads had dried except for an occasional hog wallow in the flats. Barry was riding along, deeply immersed in thought and not even heeding the raucous chatter of the parrot which hung in its cage from his saddle bow. Suddenly, before he was aware of danger, a rough-looking gang of men, garbed as friars, but armed with quarter staves, spears and swords, sprang out of the brush. The caravan was outnumbered and surrounded. The big ruffian who headed them brandished a wicked battle-ax and informed Barry in a hoarse voice that he was come to collect toll for the bishop of—mumbled—diocese.

Barry dismounted cautiously, planning to spring the jujitsu trick the occasion called for, when he thought of the bird.

"Sick 'em, Polly," he hissed, knowing something would result, though not exactly what.

Polly responded nobly. She had spent the afternoon rattling off her repertoire, including the new sequences of barker spiels Barry had taught her for use at the fair, and had come to the end of her list of beneficent prayers. Now she launched into invective, and it was not the invective of corsairs, but of the cloth.

"Avaunt, fiends and impostors!" she screamed, ruffling her feathers and beating on the bars with her wings. "Back to the gloomy depths of hell whence you come—" and then poured forth the sonorous Latin phrases for the exorcism of evil spirits, winding up with an all-embracing, awe-inspiring curse that worked backward and forward unto the *n*th generation. It invoked leprosy, boils, the choicest samples of the hangman's art of torture, starvation, thirst and eventual hopeless damnation. And as the last withering words hurtled forth, the bandits tore their false frocks from them and fell beseechingly on their faces. It was a fearful portent when a bird of the air spoke with the tongue of priests.

"Ye have heard," said Barry sternly. "Begone and repent, lest the curse come true to the uttermost word."

Then there was a flash of pink as the hoodlums vanished into the thicket, and the placed Nubians began picking up their discarded clothes and weapons.

"Good Polly," murmured Barry, and jogged his mount into motion with a dig of the heels.

St. Guy was a bitter disappointment. It was a walled town of five thousand souls, but so closely built that it was scarcely a thousand paces from wall to wall. Except for the church, which sat

in a central square, the tall houses were of timber and built close together. Between ran dark, noisome alleys, forever a mass of gooey mud, for they were unpaved and the sunlight rarely reached them as each successive upper floor of the houses stuck out beyond those below until the uppermost floors almost touched across the lane. It was not needful that there be rain to keep them muddy, for the downpour of slops from upper windows supplied abundant moisture.

"Damn," yelled Barry, as he turned into the tortuous canyon that led to the clothmakers' guild. Someone above had dumped a gallon of dishwater, and most of it went down his neck. He stopped his string of animals in their tracks and put the Nubians to breaking open a box. Then they proceeded, everyone more secure under the shelter of his dollar-grade umbrella. Barry had planned to sell them at twelve deniers each, but now he knew that he could get at least a livre for them from the approaching silk-clad nobility.

If his reception had been dank and cheerless, he quickly found there was worse to come. St. Guy was a market town, not a fair town, and as such was ruled by the guilds, each fiercely jealous of each other and all outsiders. There was not a foot of space in the town for rent or sale, so that he had perforce to deal with the guilds. And they not only collected what amounted to blackmail for the use of their stalls, but forced him to scatter his exhibits. Only ironware could be sold in the blacksmiths' quarter; only silk, cotton, linen and woolen goods in the clothiers' district. Cattle had to be sold in the cattle market outside the town, while the bulk of his wares defied classification. His aluminum kitchen utensils, for example, were denied by the smiths, who said they were of precious metal and could only be sold by silversmiths. But the head of the goldsmiths' guild hefted the pans and ponderously announced that no metal so light could possibly be precious. They were barred, that was all; they did not fit the traditions of St. Guy, and St. Guy was a place of venerable traditions.

Barry had other bad news. Though St. Guy had been founded by a charter granted by an ancestor of the present Sleur de Capdur, it had fallen under the iron hand of the abbot of the neighboring monastery of St. Guy du Nord. It was he—the pious elder known as the Incorruptible—who collected the grievous taxes on all commodities sold, and those were in addition to the exactions of the guilds themselves. Barry saw his profits go aglimmering, and was further enraged to learn that friars and monks of any order, whether local or otherwise, were tax exempt throughout the land. And since the many transit taxes amounted to most of the value of the goods, that alone put him at a terrific disadvantage. His

plans for setting up a central depot at St. Guy were knocked in the head, for Capdur's favor extended no farther than the borders of his domain.

He pondered those considerations, and the additional fact that of the army of peddlers who volunteered to vend his wares throughout the kingdoms of Europe, with few exceptions appeared to be shifty-eyed rascals whom he dared not trust out of his sight. He shuddered to think of what Credit would say should he hand over thousands of trade-dollars' worth of merchandise to them to vend on no more than their bare promise to come back some day and split the profits. There were no bonding companies in that good year, and what references were offered were oral, vague, and invariably referred to some obscure nobleman on the other side of Christendom. Barry was wrestling with the problem while he stood over the counter in the leather goods quarter; buffalo robes and coonskin coats were going big, and were showing a big profit despite handicaps—for the buffalo hides had been bought by Anachron at half a dollar each by a buyer sent to Fort Dodge of the '70s for the express purpose. The knights gladly exchanged their commonplace ermines and sables for the novel furs. And as he wrestled, he became aware of a commotion in the crowd and saw Maverick approaching. His pal looked rather the worse for wear, since his face was a mass of scratches and he carried one arm in a sling and walked with a pronounced limp.

"Now what?" was Barry's greeting.

"I got trampled," said Maverick, with a little foolish smile. "We went hunting."

"Huh?"

"It was this way. A few nights ago the baron pulled a big party, and had me provide the eats, drinks, and noisemakers. We had some, you know—ratchets, whistles, tin horns, all that New Year's Eve stuff—and I threw in a pair of hand-operated Klaxons, and a few of those siren howlers that Clarkson told us had been designed for ancient war chariots. Well, they made a hit. Brother Capdur got high and spent most of the evening grinding the crank on the siren he had. It almost got him excommunicated, 'cause the people outside the castle heard it and ran off to the nearest sanctuary swearing the devil and all his fiends had taken over and were holding high jinks inside."

"That's bad," said Barry, but he grinned, nevertheless. "Go on."

"Well, the next morning the baron had a brain-throb. He has a hunting preserve up in the hills, and complained his beaters were a lazy, rascally lot and rarely made enough noise to scare out more than one boar and a stag or so on even the biggest hunts. He wanted to know why the sirens wouldn't jump up more game. So I sold him all we had, and they sent the beaters off with them."

"Did it work?" asked Barry grimly, looking at his bunged-up partner.

"Lissen. We were strung out along the edge of the woods; all the knights and squires and their ladies were there, and their retainers. They had spears and swords and bows and arrows, and also hawks and falcons. They were ready for anything. Almost, that is. Well, the howling got louder, and we could hear plenty of crashing in the brush. Then things began coming out—"

"What kind of things?"

"Oh, *everything*—woodchoppers, boars, game wardens, stags and does, snakes, wild cats, poachers, pheasants, rabbits . . . you know, just about all the fauna there was in there. They kept coming, wave on wave, and then—"

"Yes, yes! And then?"

"That's all, I guess," said Maverick ruefully. "I got trampled, I tell you. It was about dark when I came to and helped some of the others home. Yvonne is in bed, and pretty sore, and as for the baron . . . well, the hunt was pretty much of a flop in some respects." After that he added hopefully, "We did turn out the game, though, didn't we? That's what he said he wanted."

Barry snorted. Things weren't getting better fast. He saw clearly then that he would never get anywhere unless he made a deal with the Church, and since the incorruptible abbot of St. Guy du Nord showed no sign of coming to him, and it was now impossible to send Maverick, he must go to the monastery himself. So he turned the local business over to Maverick, and set out across the valley to where the castlelike convent stood.

He paused for a short time at the north gate of the town, where comestibles were being sold by one of his subcontractors, a young squire named Phillipe. Business in that quarter was excellent, for the hamburger and hotdog stand was surrounded by deep ranks of clamoring burghers. Hot roasted peanuts and buttered popcorn, pink lemonade and orange juice were going well. The cook, looking strangely unknightly in his high white chef's bonnet, told him that the last of the canned goods had gone the day before. Once the barons understood their nature, they bought them by the score of mule loads, stocking their donjons against the days of siege. Barry requisitioned from him the six fat Jersey cows that had been keeping the soda fountain supplied, and added them to his mule train of things designed to impress the crusty old abbot. The convent of St. Guy was noted for its cheeses—among other things—and Barry was convinced that his six cows would out-produce all its skinny herds.

As he rode through the monastery lands, he was struck by the superior condition of the fields, and noted that the monks were far better laborers than



the baronial serfs. He already knew that they were excellent traders. So, with strengthened resolve, he went on.

Once he was within the grim outer walls, having passed the inevitable moat and drawbridge, the place looked more like the cloisters it was than a military stronghold, though the prior who met him bore himself like a soldier and wore the scars of battle. Barry was interested to learn that he was a veteran of a number of campaigns, his favorite weapon being a heavy mace.

"I like the mace," he explained, "and it gets around the cardinal's order that we live not by the sword. When you swat a knight with an iron club, you don't kill him as a rule—you just knock him cold. And a vanquished knight is worth more alive than dead. We've expanded our holdings a great deal by taking lands for ransom."

"Neat," complimented Barry. He examined the prior's battle club and decided that not even Anachron could improve on it. He thought tenta-

tively of selling a batch of tear gas as an unlethal means of conquest, but on reflection decided to postpone that. There was always the Control Board to think of, and Barry figured he had trouble enough without running foul of them. Indeed, he had the uneasy feeling that he had already cut a few corners—like that slot machine and Maverick's weird boar hunt.

He had his mules unpacked and spread the wares out. The cows were to be presents, but the rest of the material was for sale, though at not unreasonable prices. There was a steel plow and harvesting machine, a blacksmith's forge with hand-operated blower, together with four bags of coke. The choicest bit of merchandise he had along was a pedal-operated job press, complete with ink, suitable fonts of type and other printer's accessories. Two mule loads of good paper completed the cargo. The prior's eyes widened when the press was set up and put to work.

"Verily," he exclaimed. "'Twill seem a miracle

when we send out many copies of surpassing evenness and each as like the other as grains of wheat. I must bring the abbot. He will reward you as befitting, without a doubt."

The interview with the abbot dashed all Barry's hopes. He was an old man—incredibly old and lank—with piercing blue eyes and imperious hawked nose. His attitude was one of cold sourness, and he spoke in biting monosyllables, the commonest of which was the little word "no." When the Incorruptible uttered it, it had a chill finality that was unchallengeable. The substance of the talk ran thus:

"Yes, the cows were fine animals, comely and milksome . . . but St. Guy accepted favors from no man, only the tithes and just taxes that were its due . . . the cows would be paid for in their own weight in cheeses of Brie and the finer ones of St. Guy. The book-copying machine was welcome, as was the fine paper that came with it, but it, too, would be paid for, and justly. So, likewise, for the farm implements. No, the abbot could not countenance his monks engaging in common trade, nor would he grant a charter for a storehouse in his domain."

The vinegary old man rose and abruptly left the room. His prior smiled sadly, then sent lesser monks scurrying to find the wherewithal to pay for the new treasures. In time they returned, lugging carved statues, delicately embroidered altar cloths of fine linen, and delightfully wrought silver basins and ewers. Leathern flasks containing a "tonic" brewed from herbs were brought. The rolled bundles they carried proved to be tapestries of rare workmanship, the largest of them six feet wide and nearly a hundred feet in length. Barry gazed upon them with no show of enthusiasm, though he knew they would be appraised high up in the thousands up home. Any mule load that he might take away from the convent was worth the cargo of a cog, and he should have been well content with the deal. But what rankled was that what he wanted was to establish a year-round fair run on department-store lines, under his own exclusive direction so that he could provide a secret direct shuttle terminus in an inner compartment to take part of the load off the slow cogs. He also wanted to recruit a host of wandering salesmen wearing the smocks of friars in order to escape the crushing burden of taxation at every turn. None of that he got.

"Too bad," commiserated the prior, whom Barry was beginning to perceive was a man of parts, "but that's what comes of being incorruptible. It makes one hard to deal with. My most reverend superior is quite convinced of his incorruptibility. So much so that he has had a special chapel built to house his remains after his soul has departed this flesh. Lately he has had visions

to that effect, and he spends all his time these days mooning about the cloisters, thinking of the miracle that will come about when the yokels perform their pilgrimage to look upon him and see that he rotteth not. It will insure his beatification, and . . . uh . . . put St. Guy's on the map, as it were."

"Hm-m-m," mused Barry, thoughtfully, "maybe you've got something there. Is the old boy in good health?"

"No. He has flutterings in the breast, great pain, and at such times he falls as if dead. He may be taken to his Maker on any day. Then we shall see whether he is truly incorruptible." The prior sighed. It was quite evident that his piety did not include so embracing a miracle. He had seen many men die in his long and busy life, and not all of them were bad men. Not one had been incorruptible in the fleshly sense. Neither maggots nor carrion crows were respecters of their clay. Dead men had best be buried.

"Ah," pursued Barry. "If his stuffiness kicks the bucket and the miracle doesn't come off, that leaves you holding the bag as his successor—the abbot of a third-rate monastery and the goat for a miracle that misfired."

"Something like that," said the prior morosely. Then he studied Barry with greater interest. "Four of our brothers returned yesterday from Capdur, where they saw matters of your contrivance that smack of miracles. Or perchance, of wizardry, though I would prefer not to raise that question in an hour of trial. A practical abbot will not look a gift miracle in the mouth, if you know what I mean, providing his face is saved. We have to think of form, after all. Now, touching upon your request for a charter for a trading guild to employ those of our cloth who yearn for pilgrimages to far markets, would it be possible for you—in the event of the calamity of our worthy superior's death, and in the event that the heralded miracle did not take place—"

"Would I step in and make it so?" laughed Barry. "I wouldn't know offhand; 'tis a matter for contemplation and the searching for guidance. In Occidentalis we deal neither with true miracles nor yet sorcery. Our god is Science, whose ways are plainly understandable to the initiated—"

"Yes, yes, I know," remarked the prior irritably, "spare me your sophistries. We are both men acquainted with inner mysteries, and methinks need not spar with one another, howe'er much we cozen our flocks. Now, as I was saying—if the unto-ward events I fear come to pass, would you help me? We sorely need a fresh miracle hereabouts, and I am not unmindful of the strange lamp you gave the seneschal of Capdur which burns with a hot white fire from wetted gray rocks. Nor forgetful of the marvelous moon metal that looks like silver but is light as air, nor the other mar-

vels of your bringing. We have both much to gain by working together."

"I'll see what Science can do," promised Barry, with considerable mental reservation. He *knew* that Science could do the trick. What he didn't know was what the Control Board would do about it. Or rather, he was quite certain Control would slap him down, for the rule book said definitely that certain things were not available for the Middle Ages. Belief in the supernatural was too strong to hope to explain some things away by pure reason.

Barry made his departure and went back to the town. As he rode, he made up his mind what to do. There was so much to be gained by helping the prior in his coming dilemma, that he felt justified in going out on the limb all the way. So he twisted his ring and sent off a message to Clarkson at the base.

Rush me by fastest vessel the glass case you keep fresh fish in; also the refrigeration unit that goes with it. Must have it for coffin of saint elect.

Barry was in town and bringing Maverick up to date on events when the tingling of his finger apprised him that Clarkson's answer was coming through. But the message was not from the island storekeeper; it was from Kilmer himself, hot and to the point. Clarkson must have had a chill in the feet and referred the latest order upstairs. Kilmer's message ran:

You're fired. Turn management over to Maverick and return at once with what merchandise you have acquired. I am a patient man, but too much is too much. We want a depot established and a native sales force; instead you've been having a swell time playing miracle man.  
Nuts.  
Kilmer.

"Nuts to you," muttered Barry. Then the vision of the inhospitable wastes of New York flashed upon him, and the endless queues of jobseekers and the other dreary features of being unemployed. He didn't mind being hauled onto the carpet for insubordination and taking a chance—or wouldn't have, if the chance had worked out. What burned him up was that his scheme was nipped in the bud. If only Clarkson had been good sport enough to ship the butcher's showcase, and the pious galoot styling himself the Incorruptible had died promptly—then he would have had the local trade situation by the tail. As matters stood, he was being tossed out for incompetence—the one accusation that Barry could not stand.

"Well, Mav, it looks as if she's all yours," he said with a bleak smile. "I'll toddle along back to the ships—then home to get the ax."

"S'long, kid," said Maverick, shaking hands, "but don't take it hard. I have a hunch I'll be only a week or so behind you. Good luck."

The road back to Capdur was dreary. Barry did not take the same interest he took on the other journey. On those first days he had been keenly absorbed in planning how to lift it over the flats, stick culverts under, and ditch along the sides. But that dirt work would probably never be done now, though his road-making machines were on order. And the Capdur-St. Guy road was to have been but a beginning, a pilot road, so to speak. It was his intention to organize a company to spread the gospel, much along the lines of his well-drilling crew. All shot!

The road wound closer to the fields of the convent of St. Guy du Nord than he had remembered. He glimpsed its gray walls once, through a rift in the trees, and his ear caught the dull clang of tolling bells. He noticed then that the fields were deserted, and wondered if the Incorruptible had died. And then a couple of solemn-faced friars, riding asses, came out of an abutting lane and asked if they might join his company. He said they might, and asked the news.

"Alas, the good abbot of St. Guy is dead, though we who are left to carry on should rejoice, for we carry news abroad of the great miracle that has come to pass. His prior has assumed the abbotship and laid the Incorruptible in the chapel builded for his resting place. Even now the new abbot is kneeling in supplication to our patron saint, the good St. Guy of the Northland, to invoke his assistance in the matter."

"I can well believe it," remarked Barry, dryly, remembering that the same prior had only the day before made similar supplication to him. "But tell me, who was St. Guy du Nord and what was he famous for? Martyrdom of sore sort, I presume, since I have noticed that the various statues of him always lack hands and feet."

"For an unbeliever from the mythical land across the sea," answered the monk, "you are observant above the run. The holy man was indeed a martyr—a stern one, and his intercession is not lightly obtained."

Barry rode on in silence, listening with bowed head while the more talkative of the pair of monks unreeled the long-winded tale of the doings of their patron. Guy was a poor parish priest of a hamlet near the Seine, several centuries before. One year the Norse Vikings came to ravish the country, and when they went away, they carried off many prisoners and hostages. Guy was among them. But Guy was a man who knew not surrender. He preached the doctrines for which he stood throughout the North Countries with the result that he brought many of the fair-haired barbarians around to seeing the light. He lived to a ripe old age; long enough to see many tribes converted to his creed. But the cost was the loss of his hands and feet. The bitter winters of Lapland took their toll in frostbite. In that, and in

his long exile, lay the basis of his martyrdom.

"Hm-m-m," murmured Barry. And his mind slipped out of the grinding low gear it had been turning over sluggishly in and slipped into high. He thought fast and hard. A little later he was stabbing at his ring, having set the power to short-distance transmission only, trying to tune in on Maverick. At the same time he whipped up his mules.

Go over to the monastery tomorrow afternoon and have a sniff at the late abbot. I'm curious.

And having sent that, he forced his train into the best speed it could maintain. By nightfall the next day he was wending his way past Capdur's gates and down the hill to where the ships of Anachron lay. It was then that Maverick's answer bit him in the knuckle.

It's hot. *Phew!* Likewise *phew!*—the late lamented's virtues appear to have been exaggerated. Prior worried. Keeps asking for you. What do?

Barry back to Maverick:

*Shu-ush!* Not a word of this goes higher, but tell the new abbot to hang on and have faith. I'm working on it. Don't worry about being canned. I'll take the rap for both of us.

Maverick to Barry:

Who's worried? If you can't talk yourself back onto the job, they can have mine, too—to hell with 'em. Your pal.

Over supper that night Barry and Parker talked ways and means. Parker had been around longer than Barry had and was deferred to in some of his opinions.

"I think," said the young mariner, scratching his head, "that you're plain crazy—and that abbot, too. Control is right; these old dodos that run this country can't savvy modern refrigeration. You'd better call all bets off and go up home and try to square yourself with Kilmer. Even if he cans you like he says, it won't be as hard to take as being burned at the stake. And don't forget, if they roast you, they'll likely roast the lot of us."

There followed half an hour of impassioned plea by Barry before Parker finally could be brought to see things his way. Then, with happy grins, they went about their nefarious work. It was a night of feverish activity, and five of the Nubians were kept up to do the heavy lifting and packing.

The first task was performed below the holds, under the false deck that hid the forbidden things. Barry ripped the big refrigerator apart and spread its innards out for examination. Swiftly he took measurements here and there, and made sketches and fast computations. The plate-glass panels

of the doors were removed and carefully packed for muleback transportation, while in another box a number of the enameled white plates and fastenings were put. The tubing and refrigeration units were also packed, together with spare lengths and fittings. After that Barry found some brass sheets, selected a small hammer, and then went topside to the cabin. For some hours thereafter the ship resounded with the steady tapping of the hammer.

It was near to dawn when Barry found time to go out onto the quay and examine the loads he had brought down with him the night before. One box was of about the dimensions of a coffin, and that one he robbed of its lid. Inside it was a stiff figure carved from solid oak, a bit of the handiwork of the monks of St. Guy—it was no other than an effigy of the holy man himself. Barry lifted it from its container and carried it inside. Thereafter a listener might have heard the sound of steel bits gnawing into wood and then another shower of hammer taps. After that all the noises were stilled except those made by the Nubian crew as they nailed up the final boxes and fastened them to the packsaddles.

Barry chose Dilly to captain him home, leaving the empty cattleboat to the protection of their patron Capdur. He wanted Parker, who alone knew all the details of the plan, to carry the miracle-making equipment to Maverick. So Parker departed at dawn, shepherding a train of sturdy mules, and Barry waited on the quay while the blacks stowed his plunder aboard. There were bags of coins, most of them gold; priceless tapestries, ecclesiastical statuary, and many other items of value to the home world, but Barry knew that they were not enough. Anachron wanted things done on a big scale. And then the ship cast off and slipped down the river. Barry ate a belated breakfast, after which he sent a curt message to Kilmer that he was on the way.

A week later, having had favoring winds all the way, the cog lifted the snowy walls of Isla Occidentalis. Only one message had come from Maverick during that time, and that but an hour before. It was laconic to the point of exasperation:

Everything lovely so far. Pilgrims flocking here, many converts. A cardinal, two archbishops, and a whole flock of bishops on the way to check on authenticity. Keep your fingers crossed.

By midafternoon the clumsy vessel had negotiated the last of the tortuous channels among the foaming rocks about the castle, and slid under the lifted portcullis into the quiet basin within. Clarkson was there to meet them, but he showed no joy at the reunion. Beside him stood a heavy-set man with a bulldog jaw and a roving eye. The stranger wore a blue uniform and the badge "Marine Inspector." As the ship sidled into the dock, he



stepped on board with a curt nod for Dilly and a savage glare for Barry. Then he ducked below, where they could hear him prowling about, ejaculating snarls and muttered curses. Presently he returned to deck and made furious entries in a little black notebook.

"The fat's in the fire," he hurled at Clarkson. "They did it anyway." Then he marched off to the waiting shuttle cave.

"Well, you've played hell," remarked Clarkson, coldly, "but at least I had sense enough not to get messed up with you. I was bright. I covered."

"Yeah?" snapped Barry with bitter scorn. "So it takes brains to cover?"

He spat, and turned his back. And there he waited while his cargo was being transferred to the freight shuttle. With the aid of the big stevedoring gang of the castle the job did not take long. When his own bag came along, Barry followed it inside.

"I'll be seeing you," said Barry to Clarkson with more the air of threat than happy anticipation.

"Not if I know Anachron," replied Clarkson grimly. Then the shuttle operator closed the switch.

The powers that be kept him cooling his heels for another solid week before they saw fit to hale him before them. He was cooped up in barracks on the top floor of the freight export building, along with other field men who had come in for some reason or other. But they were a taciturn lot and Barry learned nothing from them. He fretted the days away, since they not only treated him as a prisoner, but had also taken his radio ring away. He had no idea how Maverick was doing or what the eventual payoff was on the miracle of St. Guy.

On the eighth day the summons came. A messenger appeared and called out Barry's name. They went in a company car to the home office in Wall Street, and there Barry was conducted to the antechamber of Kilmer's office. He saw at once that he was not to be the only one to grace the carpet that day, for a sullen, dark-complexioned

trader he had seen at the barracks was also there, frowning and registering a curious mixture of annoyance and worry. Then Barry was aware that Kilmer was having one of his customary fights with someone over the phone.

"Can't I get anything through your thick head?" the sales manager was asking wearily. "We don't care what the blasted machine cost—I said I'd already sent a chit to transfer the charge from their account to ours. That washes the transaction out. What more do you penpushers in Accounting want? This would be a better world if there wasn't a scrap of paper in it—"

There came a click and a frying sound accompanied by sputtering. Whoever had been at the other end of the line had hung up and Kilmer didn't like it. Then he calmed himself to some degree and bawled out for Mobberley. The dark trader beside Barry jumped to his feet and went up to the desk. Kilmer favored him with a fishy stare, then shook his head sadly.

"You fellows are so dumb," said Kilmer, pityingly. Barry expected him to squeeze out a tear. "I talk and I talk and no one listens. I send you to Seventeenth Century Spain; we wanted olives, sherry, cork—we also wanted Inca and Aztec trophies, ornamented gold trinkets or featherwork. And you come back with tons and tons of gold ingots! What is gold good for nowadays? Intertemporal exchange is swamped with it, and every dumbbell in the field keeps sending more—"

"Y-y-you can buy things with it in any age," stammered the unhappy Mobberley.

"We don't want to buy; we want to trade," wailed Kilmer, tearing his hair. "Our charter requires that we export ton for ton what we import so as to help get rid of our surpluses—"

"Can I say a word?" ventured Barry, coming over to join the fray. Since he was about to be canned he figured he might as well, not that he wished to help Anachron, but he was willing to give a fallen brother a helping hand.

Kilmer looked at him and grunted, "O. K. . . . hope it makes sense."

"If there was ever a time when gold was in demand," Barry said, "it was in 1932. People were

NO FINER DRINK... for Salesgirl—or Sailor



clamoring for it, making runs on the banks, hoarding yellow paper money, selling anything they had for a song so long as they could get the price in hard money—”

“Bah!” snorted Kilmer. “Who wants what they had? Their art was lousy and there’s nothing their industries put out that we can’t do better and cheaper today. Just tell me one thing they had that we can use—”

“I can tell you a dozen, but one will do,” answered Barry quietly. “There’s a requisition downstairs for ten thousand complete public libraries, but no project. In ’32 the publishers were sitting on their hands, weeping like orphans, paper mills were folding up overnight, printers were selling apples on the street, while Hoover was worrying himself into the fantods on account of the vanishing gold reserve. That’s the spot for your gold. They’d sell their souls for it.”

“My, my,” said Kilmer, brightening perceptibly, “perhaps you’re right. I’ll take it up at conference this afternoon. Thank you, Mobberley, that will be all for today.”

Mobberley went, but slightly baffled. It might be a reprieve; it might not. Then Barry sat down while Kilmer dug into his desk drawer and produced a squat bottle of black glass with the remnants of heavy sealing wax about its neck. He poured two slender wine glasses full of a pale violet liqueur and offered one to his trader. The bottle was labeled in antique script “Liqueur Guyesque—Seven Hundred Years Old.” Barry tasted it and found it delicious, resembling Benedictine and Chartreuse, but differing from both in color and tang.

“Quite a find, that,” said Kilmer, and Barry sensed that he was being congratulated, though he did not know for what. It was a cinch that he had never seen or tasted the stuff before. Then he waited cagily for what else Kilmer might say.

“You sent up a number of flasks of tonic from that monastery down there. It was mildly alcoholic, but far too bitter for beverage use and Research said it had slight medicinal value. So we tried smoothing it by adding a heavy sugar sirup and stepping up the alcohol content. This is the answer.”

He sipped his drink and so did Barry, but Barry still didn’t know what his boss was driving at.

“We haven’t enough yet to put on general sale, but we sent samples of our own bottling to directors of the company and also the members of the Control Board. They were delighted. And . . . er . . . rather better disposed toward you.”

“Uh-huh, I daresay,” said Barry, and waited.

“We want you to take over at ancient Rome . . . the fellow there had made a hash of things and we want a man of resource and talent. Now, while your work in France was not altogether—”

“Not altogether what?” demanded Barry, bristling. He didn’t like being played like a cat’s mouse, first hot, then cold.

“Completed, I was about to say,” said Kilmer, and then hastily interposed, “Oh, don’t worry, you’ll be allowed the customary overwriting on all subsequent sales there. But about Rome—”

“Say,” said Barry rising, “come clean, won’t you? You wire me I’m fired and you haul me up here and keep me incommunicado for a week. Now you pat me on the back. Am I in Dutch, the fair-haired boy, or what?”

“Well, yes and no,” said Kilmer in his maddening fashion. But he refilled the glasses and again settled comfortably back in his chair. “It must be admitted that there was a minor infraction of the rules on your part, but it’s no worse than the run of my daily headaches. It will be ironed out shortly. It appears that you robbed one of our trading cogs of its refrigerating equipment and the Custodian of Marine Equipage has raised a holy stink about it. However, I’ve made good their loss by transfer of funds.”

“I take that to be the ‘yes’ part of the answer. What’s the ‘no’?” Barry had not yet made up his mind whether he liked his boss or not. Sometimes Kilmer got in his hair.

“I admit there was apprehension here for a time concerning your proposed sale of a cooling unit to the monastery of St. Guy,” said Kilmer. “We were afraid of unfortunate repercussions. You may not remember, but you are insured, and our Insurance Division hates like the dickens to pay out claims on fool traders who get themselves crucified and what not. There are few things more dangerous than peddling miracles in the Middle Ages. Unless you have just the right touch . . . well!

“However, your assistant, Maverick, assures us that our part in the miracle at St. Guy was . . . well . . . negligible. He says the highest ranking ecclesiastics of France have viewed it and pronounced it authentic and wholly commendable. He states that if it were not for the piety and zeal of the multitude of pilgrims who are now pouring in, it could not be maintained at all. His only part is the supplying of a candle booth in the vicinity, for which, incidentally, he has ordered ten thousand of our best candles.”

“Really?” Now Barry let a faint smile drift onto his face. The plot was beginning to thicken. Kilmer filled the glasses again; he was not done.

“What bothers a few of us here in Sales,” pursued the sales manager, “is how you got away with it. Confidentially, of course. But what is the lowdown?”

Barry threw back his head and laughed. He understood the lay of the land now. It was just like being in the army. If you stuck to the book, you

might or might not get anything done; if you departed from it the penalty was disgrace or fame, depending on the outcome. He had taken a long shot and put it over. He was being forgiven. So he told briefly the story of a French priest who converted the Vikings and of what befell him in the Northland. He also described his next to the latest successor, not forgetting to mention his inordinate pride in his incorruptibility. He wound up with the tale of the predicament his successor found himself in, and the concessions he was willing to make for an out.

"The problem," Barry concluded, "was how to mask the workings of the miracle so as not to raise embarrassing questions. Our clue came from the attributes of the martyr himself. His chief sufferings had been from cold, so that it was a humane and Christian act to alleviate that cold. The deceased abbot, if he was to maintain his title, was desperately in need of cold to pull him through the summer. We rigged things in such a manner that the pilgrims could arrange the transfer from him that had too much to him that had too little. It was as simple as that."

"Please, Barry," pleaded Mr. Kilmer, "we're friends; don't you understand? *Give!*"

"Well, we tore down a refrigerator and made a glass bier for His Nibs. Then we took a statue

of the saint and drilled holes through it for our ducts. We supplied the effigy with brass hands and feet and sat him on a stump with his limbs outstretched in an attitude of benediction. And that we placed alongside the tomb. The rest was up to the faithful pilgrims."

Kilmer scratched his head. He felt he ought to get it, but something was missing. How could Maverick have concealed the compressor and motor so that the inspecting bishops failed to see them? What was the source of power? It was unthinkable that the traders would have been rash enough to risk that secret. So Kilmer asked the questions.

"Power?" said Barry, and grinned from ear to ear. "You forget. We might have had an awkward time with Clarkson's machine, but the one we swiped from the cog was different. It was built along the lines of the early Electrolux and powered by an oil flame. We ran the tubing through the arms and legs of the wooden figure of St. Guy and planted candlesticks beneath. What you can do with oil or gas flames, you can do with candles."

"Ah," murmured Mr. Kilmer. Then he raised his own glass and tinkled it against Barry's, winking profoundly with the gesture.

"To success in Rome," he said.

THE END.

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## IN TIMES TO COME

Crowded out of the Analytical Laboratory where it really belongs, the story of the August Probability Zero department appears herewith. First place—and twenty dollars—goes to "Time Marches On," by Ted Carnell. L. Sprague de Camp's tale of the financial difficulties of Drink-whiskey Institute, the Negative Wugug and Lichtenstein took second place. Joseph Gilbert collects the five-dollar third prize for Uncle Louie's misfortunes.

Next month's lead novel is by Cleve Cartmill—an interesting speculation on the possibilities of city-States in a highly evolved technological culture such as ours seems headed for. America four hundred years hence, when cities are States, and they're named for their chief industries—Power Center, Food Center, Plastic Center—And

Duval of the Outlaws, with fixed ideas on the subject of general disruption. Makes a good yarn of the situation which results when the chief of the Plastic Center police is turned out as a treasonous spy. Point being, he wasn't, a point which makes one highly trained and competent man who's mad at everybody—the Centers, the Outlaws, the whole darned system—

Probability Zero should have been with us this month. The stories are on hand. But the magazine, a jigsaw puzzle of inelastic type and a firm determination not to butcher stories to make room for something, refused to go together in any form but the one you see. The yarns are on hand; the Liars' Roost will be returned next issue if I have to eject a short story and run six pages of lies. 'Sa promise!

The Editor.

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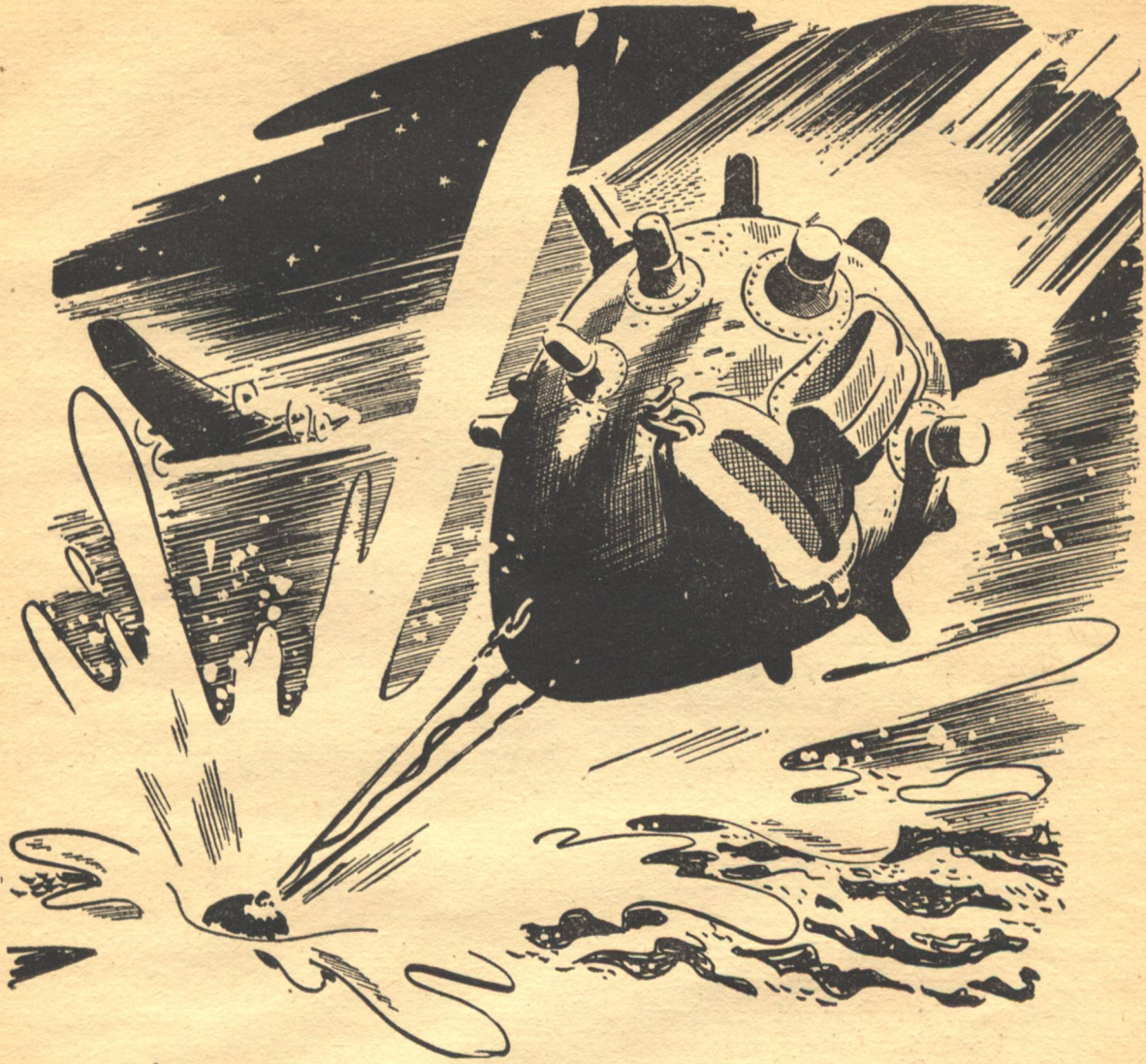
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# THE WABBLER

By Murray Leinster

● An old favorite of science-fiction returns—with a tale of a robot that had patience, a brain adequate to its task, and a slow-working, patient urge to self-destruction.

Illustrated by M. Isip

The Wabbler went westward, with a dozen of its fellows, by night and in the belly of a sleek, swift-flying thing. There were no lights anywhere save the stars overhead. There was a sustained, furious roaring noise, which was the sound the sleek thing made in flying. The Wabbler lay in its place, with its ten-foot tail coiled neatly about its lower end, and waited with a sort of deadly pa-

tience for the accomplishment of its destiny. It and all its brothers were pear-shaped, with absurdly huge and blunt-ended horns, and with small round holes where eyes might have been, and shielded vents where they might have had mouths. They looked chinless, somehow. They also looked alive, and inhuman, and filled with a sort of passionless hate. They seemed like bodiless demons

out of some metallic hell. It was not possible to feel any affection for them. Even the men who handled them felt only a sort of vengeful hope in their capacities.

The Wabblers squatted in their racks for long hours. It was very cold, but they gave no sign. The sleek, swift-flying thing roared on and roared on. The Wabblers waited. Men moved somewhere in the flying thing, but they did not come where the Wabblers were until the very end. But somehow, when a man came and inspected each one of them very carefully and poked experimentally about the bottoms of the racks in which the Wabblers lay, they knew that the time had come.

The man went away. The sleek thing tilted a little. It seemed to climb. The air grew colder, but the Wabblers—all of them—were indifferent. Air was not their element. Then, when it was very, very cold indeed, the roaring noise of the flying thing ceased abruptly. The cessation of the noise was startling. Presently little whistling, whispering noises took the place of the roar, as hearing adjusted to a new level of sound. That whistling and whining noise was wind, flowing past the wings of the flying thing. Presently the air was a little warmer—but still very cold. The flying thing was gliding, motors off, and descending at a very gradual slant.

The Wabblers were the fourth in the row of its brothers on the port side of the flying thing. It did not stir, of course, but it felt an atmosphere of grim and savage anticipation. It seemed that all the brothers coldly exchanged greetings and farewell. The time had definitely come.

The flying thing leveled out. Levers and rods moved in the darkness of its belly. The feeling of anticipation increased. Then, suddenly, there were only eleven of the Wabblers. Wind roared where the twelfth had been. There were ten. There were nine, eight, seven, six—

The Wabblers hurtled downward through blackness. There were clouds overhead, now. In all the world there was no speck of actual light. But below there was a faint luminosity. The Wabblers' tail uncurled and writhed flexibly behind it. Wind screamed past its ungainly form. It went plunging down and down and down, its round holes—which looked so much like eyes—seeming incurious and utterly impassive. The luminosity underneath separated into streaks of bluish glow, which were phosphorescences given off by the curling tips of waves. Off to westward there was a brighter streak of such luminosity. It was surf.

*Splash!* The Wabblers plunged into the water with a flare of luminescence and a thirty-foot spout of spume and spray rising where it struck. But then that spouting ceased, and the Wabblers were safely under water. It dived swiftly for twenty feet. Perhaps thirty. Then its falling checked.

It swung about, and its writhing tail settled down below it. For a little while it seemed almost to intend to swim back to the surface. But bubbles came from the shielded opening which seemed to be a mouth. It hung there in the darkness of the sea—but now and then there were little fiery streaks of light as natives of the ocean swam about it—and then slowly, slowly, slowly it settled downward. Its ten-foot tail seemed to waver a little, as if groping.

Presently it touched. Ooze. Black ooze. Sea bottom. Sixty feet overhead the waves marched to and fro in darkness. Somehow, through the stilly silence, there came a muffled vibration. That was the distant surf, beating upon a shore. The Wabblers hung for an instant with the very tip of its tail barely touching the bottom. Then it made small sounds inside itself. More bubbles came from the round place like a mouth. It settled one foot; two feet; three. Three feet of its tail rested on the soft ooze. It hung, pear-shaped, some seven feet above the ocean bottom, with the very tip of its horns no more than four feet higher yet. There was fifty feet of empty sea above it. This was not its destiny. It waited passionlessly for what was to happen.

There was silence save for the faint vibration from the distant surf. But there was an infinitesimal noise, also, within the Wabblers' bulk. A rhythmic, insistent, hurried *tick-tick-tick-tick*—It was the Wabblers' brain in action.

Time passed. Above the sea the sleek, swift-flying thing bellowed suddenly, far away. It swerved, and went roaring back in the direction from which it had come. Its belly was empty, now, and somewhere in the heaving sea there were other Wabblers, each one now waiting as the fourth Wabblers did, for the thing that its brain expected. Minutes and minutes passed. The seas marched to and fro. The faraway surf rumbled and roared against the shore. And higher yet, above the clouds, a low-hanging and invisible moon dipped down toward a horizon which did not show anywhere. But the Wabblers waited.

The tide came. Here, so far from the pounding surf, the stirring of the lower levels of the sea was slight indeed. But the tide moved in toward the land. Slowly, the pressure of water against one of the Wabblers' sides became evident. The Wabblers leaned infinitesimally toward the shore. Presently its flexible tail ceased to be curved where it lay upon the ooze. It straightened out. There were little bluish glows where it stirred the phosphorescent mud. Then the Wabblers moved. Shoreward. It trailed its tail behind it and left a little glowing track of ghostly light.

Fish swam about it. Once there was a furry purring sound, and propellers pushed an invisible

floating thing across the surface of the sea. But it was far away and the Wabblor was impassive. The tide flowed. The Wabblor moved in little jerks. Sometimes three feet or four, and sometimes eight or ten. Once, where the sea bottom slanted downward for a space, it moved steadily for almost a hundred yards. It came to rest, then, swaying a little. Presently it jerked onward once more. Somewhere an indefinite distance away were its brothers, moving in the same fashion. The Wabblor went on and on, purposefully, moved by the tide.

Before the tide turned, the Wabblor had moved two miles nearer to the land. But it did not move in a straight line. Its trailing, flexible tail kept it in the deepest water and the strongest current. It moved very deliberately and almost always in small jerks, and it followed the current. The current was strongest where it moved toward a harbor entrance. In moving two miles shoreward, the Wabblor also moved more than two miles nearer to a harbor.

There came a time, though, when the tide slackened. The Wabblor ceased to move. For half an hour it hung quite still, swaying a little and progressing not at all, while the *tick-tick-tick-tick* of its brain measured patience against intent. At the end of the half-hour there were small clanking noises within its body. Its shielded mouth emitted bubbles. It sank, and checked, and gave off more bubbles, and sank again. It eased itself very cautiously and very gently into the ooze. Then it gave off more bubbles and lay at rest.

It waited there, its brain ticking restlessly within it, but with its appearance of eyes impassive. It lay in the darkness like some creature from another world, awaiting a foreordained event.

For hours it lay still with no sign of any activity at all. Toward the end of those hours, a very faint graying of the upper sea became manifest. It was very dim indeed. It was not enough, in all likelihood, for even the Wabblor to detect the slight movement of semifloating objects along the sea floor, moved by the ebb tide. But there came a time when even such movements ceased. Again the sea was still. It was full ebb. And now the Wabblor stirred.

It clanked gently, and wavered where it lay in the ooze. There was a cloud of stirred-up mud, as if it had emitted jets of water from its under parts. It wobbled to one side and the other, straining, and presently its body was free, and a foot or two and then four or five feet of its tail—but it still writhed and wobbled spasmodically—and then suddenly it left the sea floor and floated free.

But only for a moment. Almost immediately its tail swung free, the Wabblor spat out bubbles and descended gently to the bottom again. It rested

upon the tip of its tail. It spat more bubbles. One—two—three feet of its tail rested on the mud. It waited. Presently the flood tide moved it again.

It floated always with the current. Once it came to a curve in the deeper channel to which it had found its way, and the tide tended to sweep it up and out beyond the channel. But its tail resisted the attempt. In the end, the Wabblor swam grandly back to the deeper water. The current was stronger there. It went on and on at a magnificent two knots.

But when the current slowed again as the time of tide-change neared, the Wabblor stopped again. It swung above the yard-length of its tail upon the mud. Its brain went *tick-tick-tick-tick* and it made noises. It dribbled bubbles. It sank, and checked, and dribbled more bubbles, and sank cautiously again— It came cautiously to rest in the mud.

During this time of waiting, the Wabblor heard many sounds. Many times during slack tide, and during ebb tide, too, the water brought humming, purring noises of engines. Once a boat came very near. There was a curious hissing sound in the water. Something—a long line—passed very close overhead. A mine-sweeper and a mine-sweep patrolled the sea, striving to detect and uproot submarine mines. But the Wabblor had no anchor cable for the sweep to catch. It lay impassively upon the bottom. But its eyes stared upward with a deadly calm until the mine-sweeper passed on its way.

Once more during the light hours the Wabblor shook itself free of the bottom ooze and swam on with the tide. And once more—with another wait on the mud while the tide flowed out—at night. But day and night meant little to the Wabblor. Its ticking brain went on tirelessly. It rested, and swam, and swam, and rested, with a machinelike and impassive pertinacity, and always it moved toward places where the tide moved faster and with channels more distinct.

At last it came to a place where the water was no more than forty feet deep, and a distinct, greenish-blue light came down from the surface sunshine. In that light the Wabblor was plainly visible. It had acquired a coating of seaweed and slime which seemed to form a sort of aura of wavering greenish tentacles. Its seeming of eyes appeared now to be small and snakelike and very wise and venomous. It was still chinless, and its trailing tail made it seem more than ever like some bodiless demon out of a metallic hell. And now it came to a place where for a moment its tail caught in some minor obstruction, and as it tugged at the catch, one of its brothers floated by. It passed within twenty feet of the fourth Wabblor, and they could see each other clearly. But the fourth Wabblor was trapped. It wavered back and forth

in the flood tide, trying to pull free, as its fellow swam silently and implacably onward.

Some twenty minutes after that passage there was a colossal explosion somewhere, and after that very many fuzzy, purring noises in the sea. The Wabblers may have known what had happened, or it may not. A submarine net across a harbor entrance is not a thing of which most creatures have knowledge, but it was a part of the Wabblers' environment. Its *tick-tick-ticking* brain may have interpreted the explosion quite correctly as the destiny of its brother encountering that barrier. It is more likely that the brain only noted with relief that the concussion had broken the grip of the obstruction in the mud. The Wabblers went onward in the wake of its fellow. It went sedately, and solemnly, and with a sort of unholy purposefulness, following the tidal current. Presently there was a great net that stretched across the channel, far beyond any distance that the Wabblers could be expected to see. But right where the Wabblers would pass, there was a monstrous gaping hole in that net. Off to one side there was the tail of another Wabblers, shattered away from that other Wabblers's bulk.

The fourth Wabblers went through the hole. It was very simple indeed. Its tail scraped for a moment, and then it was inside the harbor. And then the *tick-tick-ticking* of the Wabblers' brain was very crisp and incisive indeed, because this was its chance for the accomplishment of its destiny. It listened for sounds of engines, estimating their loudness with an uncanny precision, and within its rounded brainpan it measured things as abstract as variations in the vertical component of terrestrial magnetism. There were many sounds and many variations to note, too, because surface craft swarmed about the scene of a recent violent explosion. Their engines purred and rumbled, and their steel hulls made marked local changes in magnetic force. But none of them came quite close enough to the Wabblers to constitute its destiny.

It went on and on as the flood tide swept in. The harbor was a busy one, with many small craft moving about, and more than once in these daylight hours flying things alighted upon the water and took off again. But it happened that none came sufficiently near. An hour after its entrance into the harbor the Wabblers was in a sort of eddy, in a basin, and it made four slow, hitching circuits about the same spot—during one of which it came near to serried ranks of piling—before the time of slack water. But even here the Wabblers, after swaying a little without making progress for perhaps twenty minutes, made little clanking noises inside itself and dribbled out bubbles and eased itself down in the mud to wait.

It lay there, canted a little and staring up with

its small round, seeming eyes with a look of unimpassioned expectancy. Small boats roved overhead. Once engines rumbled, and a wooden-hulled craft swam on the surface of the water to the very dock whose pilings the Wabblers had seen. Then creaking sounds emanated from those pilings. The Wabblers may have known that unloading-cranes were at work. But this was not its destiny, either.

There came other sounds of greater import. Clankings of gears. A definite, burbling rush of water. It continued and continued. The Wabblers could not possibly be expected to understand, of course, that such burbling underwater sounds are typical of a drydock being filled—the filling beginning near low tide when a great ship is to leave at high. Especially, perhaps, the Wabblers could not be expected to know that a great warship had occupied a vastly important drydock and that its return to active service would restore much power to an enemy fleet. Certainly it could not know that another great warship waited impatiently to be repaired in the same basin. But the restless *tick-tick-tick-tick* which was the Wabblers' brain was remarkably crisp and incisive.

When flood tide began once more, the Wabblers jetted water and wobbled to and fro until it broke free of the bottom. It hung with a seeming impatience—wreathed in seaweed and coated with greenish slime—above the tail which dangled down to the harbor mud. It looked alive, and inhuman, and chinless, and it looked passionately demoniac, and it looked like something out of a submarine Gehenna. And presently, when the flood tide began to flow and the eddy about the docks and the drydock gates began, the Wabblers inched as if purposefully toward the place where water bubbled through flooding valves.

Sounds in the air did not reach the Wabblers. Sounds under water did. It heard the grinding rumble of steam winches, and it heard the screeching sound as the drydock gates swung open. They were huge gates, and they made a considerable eddy of their own. The Wabblers swam to the very center of that eddy and hung there, waiting. Now, for the first time, it seemed excited. It seemed to quiver a little. Once when it seemed that the eddy might bring it to the surface, it bubbled impatiently from the vent which appeared to be a mouth. And its brain went *tick-tick-tick-tick* within it, and inside its brainpan it measured variations in the vertical component of terrestrial magnetism, and among such measurements it noted the effect of small tugs which came near but did not enter the drydock. They only sent lines within, so they could haul the warship out. But the tugs were not the Wabblers' destiny, either.

It heard their propellers thrashing, and they made, to be sure, a very fine noise. But the Wab-



bler quivered with eagerness as somewhere within itself it noted a vast variation in the vertical magnetic component, which increased and increased steadily. That was the warship moving very slowly out of its place in the drydock. It moved very slowly but very directly toward the Wabblor, and the Wabblor knew that its destiny was near.

Somewhere very far away there was the dull, racking sound of an explosion. The Wabblor may have realized that another of its brothers had achieved its destiny, but paid no heed. Its own destiny approached. The steel prow of the battleship drew nearer and nearer, and then the bow plates were overhead, and something made a tiny click inside the Wabblor. Destiny was certain, now. It waited, quivering. The mass of steel within the range of its senses grew greater and greater. The strain of restraint grew more intense. The *tick-tick-ticking* of the Wabblor's brain seemed to accelerate to a frantic—to an intolerable—pace. And then—

The Wabblor achieved its destiny. It turned into a flaming ball of incandescent gasses—three hundred pounds of detonated high explosive—squarely under the keel of a thirty-five-thousand-ton battleship which at the moment was only half-way out of a drydock. The watertight doors of the battleship were open, and its auxiliary power was off, so they could not be closed. There was much need for this drydock, and repairs were not completed in it. But it was the Wabblor's destiny to end all that. In three minutes the battleship was lying crazily on the harbor bottom, half in and half out of the drydock. She careened as she sank, and her masts and fighting tops demolished sheds by the drydock walls. Battleship and dock alike were out of action for the duration of the war.

And the Wabblor—

A long, long time afterward—years afterward—salvage divers finished cutting up the sunken warship for scrap. The last irregularly cut mass of metal went up on the salvage slings. The last diver down went stumbling about the muddy harbor water. His heavy, weighted shoes kicked up something. He fumbled to see if anything remained to be salvaged. He found a ten-foot, still-flexible tail of metal. The rest of the Wabblor had ceased to exist. Chronometer, tide-time gear, valves, compressed-air tanks, and all the balance of its intricate inwards had been blown to atoms when the Wabblor achieved its destiny. Only the flexible metal tail remained intact.

The salvage diver considered that it was not worth sending the sling down for, again. He dropped it in the mud and jerked on the life line to be hauled up to the surface.

THE END.



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# LATE-MODEL STARS

By R. S. Richardson

● There's a ban on new model cars, but the astronomers go on working out new model stars right along. They don't make 'em, of course—but they do try to figure out how they were made, what makes them tick, and why.

Like to see some late-model stars? Fancy jobs that are the last word in energy generation and proton-proton reactions. Or perhaps you were looking for a good reconditioned model that has been rendering faithful service for the last twenty years. And did you have some particular type in mind? A red giant? A superluminous B? Could I demonstrate how smoothly our white dwarfs run this year?

Designing stars is the chief occupation of a small but prolific group of men who have charge of the section listed in the index as "Stellar Interiors." Strictly desk astronomers, they can tell at great length just what makes a star tick, yet never bother to look at one through a telescope, or examine their spectra, or even know how to locate them in the sky. They fill the pages of the *Astrophysical Journal* and the *Monthly Notices of the Royal Society* and the *Zeitschrift fur Astrophysik*—now defunct—with their formulas for polytropic gaseous spheres and the settling in of "degeneracy" in dense matter. For model-star builders in addition to having exceptional ability as mathematicians, seem also born with a gift for self-expression which enables them to turn out papers, books, and essays with apparently no effort at all. Little trifles like a five-hundred-page monograph entitled "An Introduction to the Study of Stellar Structure," for example.

Right now there is a boom on in this field and developments are coming so fast that anything written way back in 1936 is as dated as a silent motion picture. For a long time stellar construction was stalled by the lack of a dependable power supply. Then in 1937 came the discovery of the energy available from thermo-nuclear reactions and the bottleneck was broken. With plenty of fuel on hand, theoretical astrophysicists are really getting into production. Blueprints for stars are pouring from colleges and observatories in a steady stream. There is no priority on hydrogen.

In the light of our present knowledge of stars and atoms, it is incredible how little was known about them less than half a century ago. Looking through old textbooks we find serious discussions

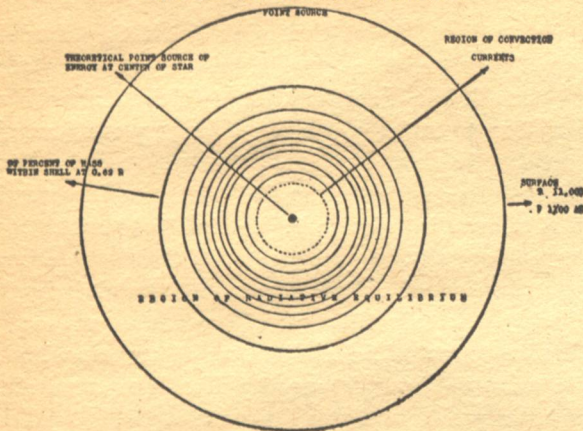
of whether stars are liquid or gaseous at the surface. Some even had crusts forming over them. Thus the irregular flare-ups of the red variables were attributed to the release of pressure when a weak spot gave way and the fire and brimstone below came shooting out.

Now we know that a comparatively dense star like the Sun would seem to be practically all atmosphere if we could view it from sufficiently close range. The trouble is we have never gotten in the habit of thinking about the Sun in the same realistic way that we do the planets. Landing on Mars or Venus has been vividly described so many times that each of us has a pretty definite mental picture of what our sensations would be when we get off the ship. But even science-fictionists have generally shied away from Man-Goes-To-Betelgeuse, although I suppose it has been done. The extraordinary fact that emerges from a realistic approach to the Sun is that it immediately becomes a totally different kind of body from the one shown in the prints taken from some observatory's stock supply. That solid surface, the sharp edge, and the inky black spots turn into filmy intangible things that vanish if you get too close to them. If some clumsy giant from hyperspace should grasp the Sun, he would be surprised to find his hand closing over a little ball about half the size he anticipated with the rest of it sticking out between his fingers. For ninety per cent of the mass of the Sun is contained within half of its radius.

It is not too difficult to assemble a star that will demonstrate these points provided we don't ask too much of it in the way of performance. One of the simplest models that is still giving good service after twenty years is the old Eddington "Standard." A thoroughly dependable star, it keeps on shining steadily and is guaranteed against sudden collapse or explosion. Regular equipment includes a handy set of formulas for finding the luminosity and diameter and there is no extra charge for tables that show the temperature and pressure at all points. Subsequent stream-

EDDINGTON'S POINT SOURCE MODEL

THE EQUAL STARS IN MASS  
 THE POINT SOURCE MODEL IS NOT QUITE SO CONCENTRATED TOWARD THE CENTER  
 AS THE STANDARD MODEL BEING TO POWERFUL BLAST OF ENERGY FROM

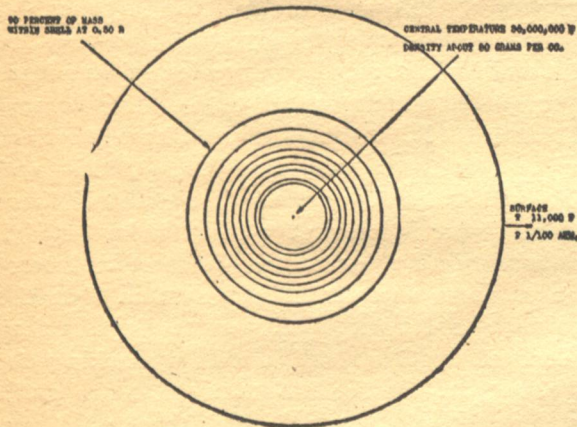


EDDINGTON'S MEDIUM SOURCE MODEL

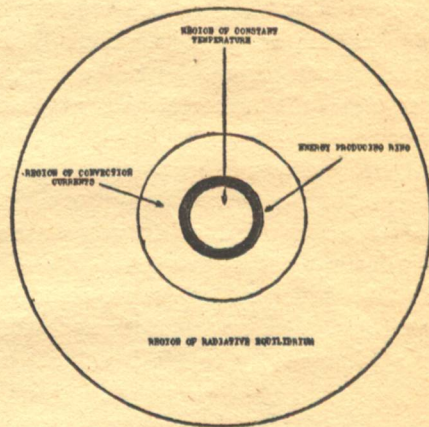
"STAR" CONSISTS OF RADIANT MATTER  
 CREATED FROM PROTONS, VERY LITTLE ORDINARY MATTER  
 IN VAST ATMOSPHERIC SHELL



EDDINGTON'S STANDARD MODEL  
 ENERGY IS PRODUCED UNIFORMLY THROUGHOUT STAR  
 THE EQUAL STARS IN MASS



THE GARDY RING-SHELL MODEL



lining has altered but not profoundly changed Eddington's original design. Recent years have seen the hydrogen content greatly increased and the central temperature lowered by a half. But taking it all in all, the Standard is a first-rate, general-purpose star.

To build a star the size of the Sun we shall need the following raw materials, given in terms of the Earth's mass as unity (E is  $2.2 \times 10^{27}$  tons).

HYDROGEN .....	116,200 E
OXYGEN .....	107,900 E
SODIUM AND MAGNESIUM.....	53,950 E
IRON .....	28,054 E
SILICON .....	12,948 E
POTASSIUM AND CALCIUM.....	12,948 E

The seven heavy elements when used in the proportions given above are known as "Russell's Mixture" and come already made up for convenient astrophysical use. This famous compound

was first given to the world by Professor Henry Norris Russell of Princeton University from his assay of the relative abundance of elements in the solar atmosphere, and is now recognized over the entire astronomical world. By making a star of thirty-five percent hydrogen and sixty-five percent Russell's Mixture we get the closest approximation possible to the exact constitution of the stars.

If this material is removed from the disturbing effect of other large masses, it will eventually settle down under the influence of its own gravitational attraction into the form of a sphere. To insure that the star is at all times under proper control we impose upon it the principle of mechanical equilibrium, which in plain words means that the pull inward at any point must balance the pressure outward. The moment this law goes into effect the gas can be treated by simple relations among pressure, temperature, and density familiar to every engineer.

Our job is far from complete, however. The trouble is we have something more than merely a ball of gas. IT SHINES! The temperature becomes terrific inside so massive a sphere and this complicates matters tremendously for it means we have to contend with a formidable new quantity—radiation pressure. It blows through the star like a mighty wind helping the gas pressure to keep the material extended against gravity. The more massive the star the more powerful the pressure of radiation. In a small star such as the Sun it bears about ten percent of the load. But for a star of mass 100 S radiation pressure builds up to eighty-five percent of the total pressure and stars much more massive than this would be in constant danger of disruption. Which probably is the reason why stars of mass 1000 S have never been found.

To determine the structure of a star taking radiation pressure into account is extremely laborious, involving the necessity of working outward step by step keeping track of the weight of successive layers as you go. Since the mass of the star is known from the beginning, the problem is to dole the material out in precisely the right amounts so that the demands of pressure, temperature, and gravity are all satisfied at once. If you run out of material before the surface layer has been applied or if you finish the star and then discover there are 10,000 E's of hydrogen and Russell's Mixture left over, something is obviously wrong. It then becomes necessary to start all over again and try to hit it a little closer this time.

If we are allowed to build one very special kind

of a star, however, everything is much easier—a star that generates energy per unit mass at the same rate from center to surface. In 1916 when Eddington first began tinkering with this model no one knew how a star managed to generate energy at all, but it seemed like a fairly reasonable assumption to make and a lot of stars were turned out on that basis.

The interior of the Sun built on the Standard plan is shown in Figure 1. In order to make its inner workings more vivid, let us consider it from the standpoint of a being whose natural habitat is at a layer within the Sun where the density has attained a value of 5.5 times that of water, which is the average density for the Earth as a whole. This density is found at a distance of 164,000 miles or 0.39 of a solar radius (0.39 R) from the center. The temperature at this depth is 15,100,000 F. Let us suppose that the Helioid feels as comfortable at this temperature as we do when the temperature is 71 F, which is about right for most of us. In order to fix the extreme limits of his environment corresponding to our frigid and torrid zones, let us assume further that they are proportional to the lowest and highest man has experienced in nature and survived, which would make them around -70 F and 140 F, respectively. The equivalent solar temperatures are then 11,160,000 F and 17,100,000 F. Since the temperature at any distance from the center is known for the Standard model, these immediately locate the greatest and least distances from the center of the Sun that the Helioid may safely venture. In the diagram they are denoted by S' and S'' with Sn marking the normal region. In the following table are given the values for other quantities at these positions.

#### CONTRASTING CONDITIONS IN TERROID AND HELIROID EXISTENCE

	TERROID		HELIROID	
	Normal	Min.	Normal	Max.
Position on globe	Surface (1.0 R)	0.49 R	0.39 R	0.34 R
Force of gravity	1.0 G	100 G	132 G	151 G
Pressure in atmospheres	1.0	60,000,000	300,000,000	600,000,000
Density of environment in grams/cc.	0.0013 (air) 1.0 (water)	1.5	5.5	9.1
Temperature	71 F	11,160,000 F	15,100,000 F	17,100,000 F
Main type of radiation to which exposed	Visual rays Near ultraviolet	At these temperatures radiation consists mostly of soft X rays		
Substance available for food, air, et cetera	Compounds of carbon, oxygen, nitrogen, hydro- gen, et cetera	Electrons, Protons, Stripped atoms, Photons		

We begin our investigation of the Sun by taking the Helioid out of his nice warm shell and bringing him up to the region of the inner corona, first taking care that he is properly equipped to withstand conditions there. A Helioid would feel much more lonely and out of place in the upper solar atmosphere than a man would in the stratosphere. It would be a portion of the Sun invaded only by intrepid explorers seeking data for scientific research or purposes of defense. The intense cold of 7000 F would be a severe menace to the Helian. Equally dangerous would be the necessity of moving about in almost total darkness aided by the feeble glow from the few X rays emitted by the photosphere. He would have considerably more ease of motion, however, owing to the drop in gravitational attraction from 132 G to 27 G. Probably the greatest threat would be from the nearly perfect vacuum that prevails everywhere. The minute quantities of electrons and protons that are available would be rendered useless as food owing to contamination from foreign substances such as iron, silicon, oxygen, calcium and others. There also would be icy molecular particles of CH, NH and CN.

His scientific tests completed, he plunges down into the photosphere glad to leave this inhospitable land. The temperature rises rapidly although he is scarcely aware of so small a difference as 10,000 degrees. Strange to say, the density, after a slight initial rise, suddenly begins to drop at a depth of one hundred miles. This means that he has entered the layer where hydrogen is undergoing ionization into electrons and protons. Over a very limited thickness it causes the peculiar condition to exist that once a current of gas is started circulating it does not tend to die out but may continue indefinitely. The Helian barely escaped from one of these ascending columns rushing toward the surface where it spreads out and congeals into a sunspot. But he has soon penetrated the layer of hydrogen ionization and breathes more freely again in a pure atmosphere of electrons, protons, and stripped atoms.

He hurries onward toward the solar core for even at 0.8 R the temperature remains down to 2,500,000 F and is unbearable without artificial protection. He feels little or no resistance from the medium as yet for the density is scarcely one-twentieth that of water, and many tens of thousands of miles must be left above before he begins to approach the real solar globe.

The way grows lighter as the temperature reaches 5,400,000 F and the surrounding radiation grows richer in X rays. But at the most he cannot see more than a few yards ahead for the gas is so hazy from electron absorptions that it is worse than a heavy ground fog. He pauses for another density measurement. Hooray! He is at the halfway post. The density is now one gram

per cubic centimeter, the density of water.

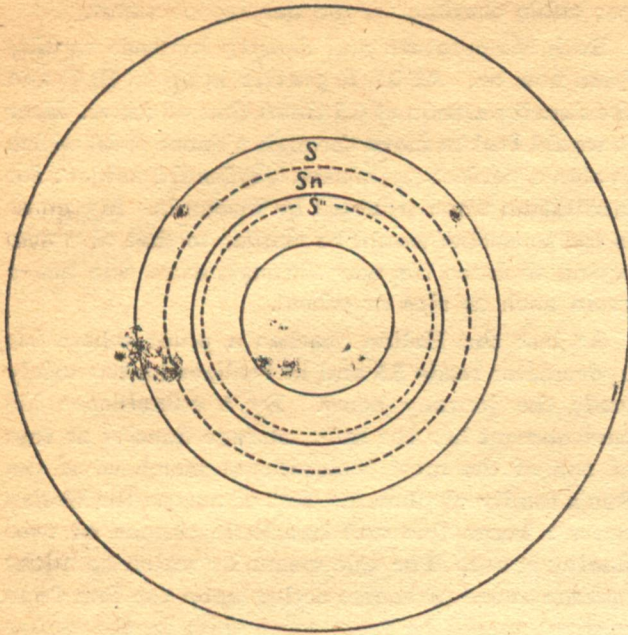
Both temperature and density increase rapidly from now on. At 0.6 R gravity is up to 70 G and the density stands at 4.5 times that of water. How it would feel to move through a dense fluid which is also a perfect gas makes a splendid subject for meditation when troubled by insomnia. My guess is the sensation would be similar to that of a man trying to force his way through some fine heavy grain such as rice or wheat.

At last the Helian reaches a point where his hydrometer reads 5.5 and he realizes he has safely made the journey home. By a coincidence his environment has the same average density as that of one of the most insignificant members of the Sun's family of planets. But of course the Helian doesn't know this and has little chance of ever finding it out. The sole means by which he might become aware of bodies acting upon the Sun from without would be from some shift in the center of mass due to tidal disturbances.

The most disagreeable thing about living inside a star is that nothing ever happens! The climate would be monotonous beyond endurance. If the average temperature in a space the size of a box car underwent a drop of 0.001 of a degree, it would be more remarkable than a killing frost sweeping over Death Valley on a sunny afternoon in August. No insulation devised by man could ever hope to be half so good as the luminous walls of star gas. Two points a yard apart are as isolated as our polar regions.

One of the original strong points in favor of the Standard Model was that it gave a ready explanation of the observed fact that the more massive stars are the brightest, which stated mathematically is Eddington's renowned Mass-Luminosity law. But slowly the truth began to dawn that perhaps it wasn't so remarkable after all. Astrophysicists working with other models discovered that it didn't seem to make much difference what kind you used, you still got a pretty fair relation between mass and luminosity. Also the Standard model had a serious defect in that stars built according to this plan invariably came out too bright and it was hard to see how anything could be done about it.

After trying several remedies, with negligible results, Eddington finally decided upon a daring innovation in stellar structure. Instead of a model which generated energy throughout its whole mass the source of supply was to be concentrated into a single point at the center. By thus forcing the radiation to struggle to the surface from the greatest depth possible he hoped to reduce the brightness and obtain results in better agreement with observations. Of course no real star was supposed to function in this man-



Outermost circle shows depth at which density is equal to that of water. Dotted circles  $S'$  and  $S''$  show limits of Helioid's environment within which he could find existence possible, corresponding to our frigid and torrid zones, respectively.  $S_n$  marks most comfortable region or temperate zone. Inner circle shows depth at which Sun's density reaches that of platinum. Density at center about five times that of platinum. For other data at  $S'$ ,  $S_n$ , and  $S''$  see table.

ner; he simply went the limit for all stars built along this general line. Eddington called it the Point-Source model.

Considering the basic distinction between the Standard and Point-Source models, it is surprising how closely the two resemble each other. The principal difference is that the Point-Source model is more distended than the Standard due to the terrific blast of radiation pressure at its center which drives everything before it for some distance. This causes the star's density to increase inward in the usual way up to a certain point when it suddenly drops to zero. Another interesting feature is that within a radius of 0.17  $R$  energy is transported principally by what seems like the clumsy method of convection currents rather than by radiation. That is, the region near the Point-Source is kept continually stirred up by ascending and descending columns of gas.

As a device for cutting down the luminosity, transferring the source of energy to a point at the center was of little help. Capella as a Point-Source star came out only a magnitude fainter than Capella on the Standard plan. Since the model failed of its purpose it might be supposed that it would have been junked long ago, forgotten by those who were once its warmest admirers. Quite the contrary, the Point-Source model today is believed to give the closest approximation to

the actual conditions in stellar interiors. For owing to the fact that the rate of energy generation from thermo-nuclear reactions increases rapidly as the temperature rises, most of the energy will therefore be released near the center of the star where the temperature is highest. Which is essentially the Point-Source model again. A star that succeeded in spite of itself!

Regardless of how much we may think we know about the *inside* of a star, one fact remains certain: we are never going to see anything but the *outside* of them. We are comparatively ignorant concerning the deep interior of the Earth. How futile to imagine that any analytical boring machine however keen can reveal to us the inner workings of a star.

About a decade ago Professor E. A. Milne of Oxford came to the conclusion that if we expect to make any progress in the study of stellar constitution we must begin operations at the surface and work down, instead of boring from within as Eddington had done. The outer layers of the stars are observed to be in the state of a rarefied gas at temperatures ranging from 4000 F to 40,000 F. That much we know. Hence we solve the problem by starting at the boundary and progressing steadily inward, assuming that the ordinary gas laws hold until conditions become so extreme they are no longer valid. We then change over to a new set of laws and continue as before. This procedure is followed until we arrive at the center of the star.

Milne's researches led to the result that practically *all* of the mass of an ordinary star is packed into a tiny central nucleus with a density thousands of times that of water and at a temperature estimated at one hundred billion degrees. He next assumed that because protons and electrons could unite to form photons—radiation—then the reverse must be true and photons can generate matter. From Milne's point of view a star is merely a sort of thermodynamic inclosure with a leak at the center from which radiant energy is pouring. As the radiation is converted into matter a vast extended atmosphere of the utmost tenuity is formed around the condensed luminous core. Thus most of the matter that we see in a star is really radiation; only a mere sprinkling of what might be called bona fide matter is present.

The Dense-Core model received what among newspaper men is known as a decidedly bad press and in the lengthy discussions that ensued barrage after barrage of mathematical formulas were hurled back and forth between Milne and his critics. It is often hard for many to comprehend how individuals of more than average intelligence can become so aroused over an abstract scientific theory. The point is that the theory has come to

mean far more to its originator than a mere theory. It is a creation of his very own, which he has nursed along and petted and probably sworn at during long hours of doubt and vexation until at long last it develops into his strong, beautiful brain child. And then when others not only fail completely to see its many virtues but critically attack it instead, he leaps to the rescue as if a trusted neighbor had given his dog a particularly vicious kick in the stomach.

Lest it be thought that technical literature is all dry reading—which it mostly is—an excerpt is quoted below from one of Milne's papers in the *Observatory* for November, 1930, in which he replies to a criticism by Eddington.

In that celebrated treatise "Flatland, by a Square," the two dimensional inhabitants are completely incapable of realizing a third dimension. Similarly, Sir Arthur Eddington, shackled by his mass-luminosity-opacity relation, with only two degrees of freedom, has hitherto shown himself totally unconscious of the power which results from a third degree of freedom. The third degree allows us to see right through to the center of the star.

I recognize that Sir Arthur Eddington has dug a most valuable trench into unknown territory. But he has encountered a rocky obstacle which he cannot get around. If he would make the mental effort to scramble up the sides of the trench, he would find the surrounding country totally different from what he has imagined and the obstacle entirely an underground one."

By 1932 it was increasingly evident that no real advance could be made in stellar morphology until more was known about the process of energy generation. It must not be supposed that there was any perceptible falling off in publications on this account, papers continuing to appear at the usual rate, but they consisted mostly of a rehash of previous material or minor improvements on existing models. When five years later the energy from internuclear reactions was tapped, whereby hydrogen is changed to helium with the liberation of energy through a chain of reactions with carbon and nitrogen, the whole theory of stellar interiors and the probable course of stellar evolution could be investigated with much more assurance.

Among recent models, one of the most interesting and ingenious is the Shell-Source model advanced by G. Gamov. It came about through an effort to account for the high power output of red giant stars by thermo-nuclear reactions alone. The central temperature of a red giant as given by the Point-Source model is 9,000,000 F as compared with 36,000,000 F for a yellow dwarf like the Sun. Since the energy obtainable from internuclear reactions would be quite small at so low

a temperature one would expect the red giants to be comparatively faint stars. But it has long been known that they are intensely luminous objects with a total rate of energy production a hundred times greater than the Sun.

The Shell-Source model is built upon the foundation that the rate of energy production from various nuclear reactions has a maximum value for a certain particular temperature. That is, somewhere within the star is a temperature which corresponds to the *resonance value* of the nuclear reaction chiefly responsible for the energy output of the star. By penetrating far enough we will eventually reach a depth where the temperature is exceptionally favorable to energy generation. For temperatures either lower or higher than this critical value the rate of energy generation falls off sharply. As a consequence, in place of a Point-Source, the great bulk of radiant energy within a star is liberated from a thin central Shell-Source.

The unique feature of the Shell-Source model is that it can be made to yield a high rate of energy even at the low temperatures of the red giants. As time goes on the shell slowly expands while the temperature and luminosity of the star remain almost unchanged. But when its supply of hydrogen is consumed the star begins to contract rapidly and soon reaches the dense white dwarf stage. Eventually it ceases to shine en-

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tirely and degenerates into a nonluminous body or black dwarf.

So far we have inspected models suitable only for the great run of common stable stars. (Stars lacking stability such as pulsating Cepheids, novae, long-period variables, et cetera, are as hard to handle as unstable people.) But now let us see how stellar engineers proceed to satisfy the demands for one special kind of star—a custom-built job, so to speak. The method is somewhat similar to the reconstruction of a skeleton from a few miscellaneous bones. The astrophysicist gathers up whatever fragmentary data are available and tries to fit them together and fill in the blank spots until the model is complete with no pieces left over and no gaps remaining. Often thousands of observation man-hours will go into a single detail of design.

There is a project in the constellation of Auriga that has been under way for over a century and although some sections are nearly finished the final stamp of approval must be withheld. This is the eclipsing binary system of Epsilon Aurigae. One component is a brilliant super-giant of type F2. When you look at the constellation of Auriga this is the one you see. About three degrees south of Capella is a little isosceles triangle of third magnitude stars easily recognized if you are at all familiar with the heavens. Epsilon is the one at the apex and nearest to Capella. The tireless Schmidt recorded the brightness of Epsilon Aurigae five thousand times from 1843 to 1884 up to the very night of his death. Take a good look at it yourself. Do you notice a curious tingling sensation creeping up and down your spine? That is because you are gazing at one of the weirdest bodies known to science, so close to Epsilon no telescope can ever begin to separate the two stars. It is the dark component of the system of Epsilon Aurigae. Our knowledge of its constitution has been derived entirely from inference, for no one has ever seen or photographed it. We know that it regularly eclipses the bright star, that it must be of enormous extent, and that its temperature is very low. But no one can hope to get a glimpse of it through the most powerful telescope although like yourself they may be gazing directly at it.

Before somebody else gets the same idea, the writer would like to propose the name of "Gray Ghosts" for stars of this type. With an abundance of dwarfs and giants of various shades already in the literature there is no need to apologize for so fantastic a title. These huge phantom stars which may be more numerous than we imagine seem to be things set apart from the other inhabitants of the sky. Faint—intangible—only dimly perceptible to us under the most favorable conditions—the Gray Ghosts of space.

Progress on the system of Epsilon Aurigae has been necessarily slow owing to the great interval between eclipses of 9890 days or 27.1 years, the longest on record. When the eclipse does finally begin, it is tantalizingly slow. For six months the light gradually declines until the star is about half as bright as at the beginning. For nearly a year the light stays constant at this level; that is, the light curve has a long flat minimum—an important point to keep in mind. At the end of a year the star begins to brighten slowly and for the next six months the previous decline is exactly repeated in reverse order. So far there have been but two opportunities to spectrograph the system during an eclipse: the first in 1901-02 when photography was just coming into general use in astronomy, and in 1928-29.

The very first series of spectra taken in 1901 revealed at once that here was no ordinary binary. From the long records of visual observations it was already known that the light curve was flat during minimum which meant that the eclipse was complete. The bright component was then obviously moving in back of the fainter star so that its light was entirely cut off. At any rate that was what everyone naturally supposed had happened. But the spectrograms showed that the bright component remained clearly visible throughout the whole year of minimum light. Never at any time did the spectrum lines indicate the slightest trace of a second body. Yet all the other observations were in excellent agreement with the eclipse theory.

Now came the first crude sketch of the Gray Ghost, the earliest attempt to rough in a model that would account for the facts of observation. It was suggested that the fainter star was in reality a long narrow string of dense meteoric material revolving about the bright star. As the stream started to pass between the star and Earth the light declined until about half was intercepted. A year was required for the main body of the stream to pass by. Then it began to thin out until transmission was complete again and the star regained its original brightness.

Results so completely out of harmony with all the current notions concerning eclipsing pairs spurred on the variable star men to greater efforts. Epsilon Aurigae became a star suspect, an object to be kept under the closest surveillance at all times. It was put on the regular program of several large observatories and its most insignificant fluctuation in brightness received immediate attention.

Between eclipses astronomers did not cease to cast about for a better model than a string of meteors. As they pondered the evidence from different angles the form of the Gray Ghost began slowly to materialize, its general outline and the



more important properties it must have gradually came into sharper focus. They shaped up about as follows:

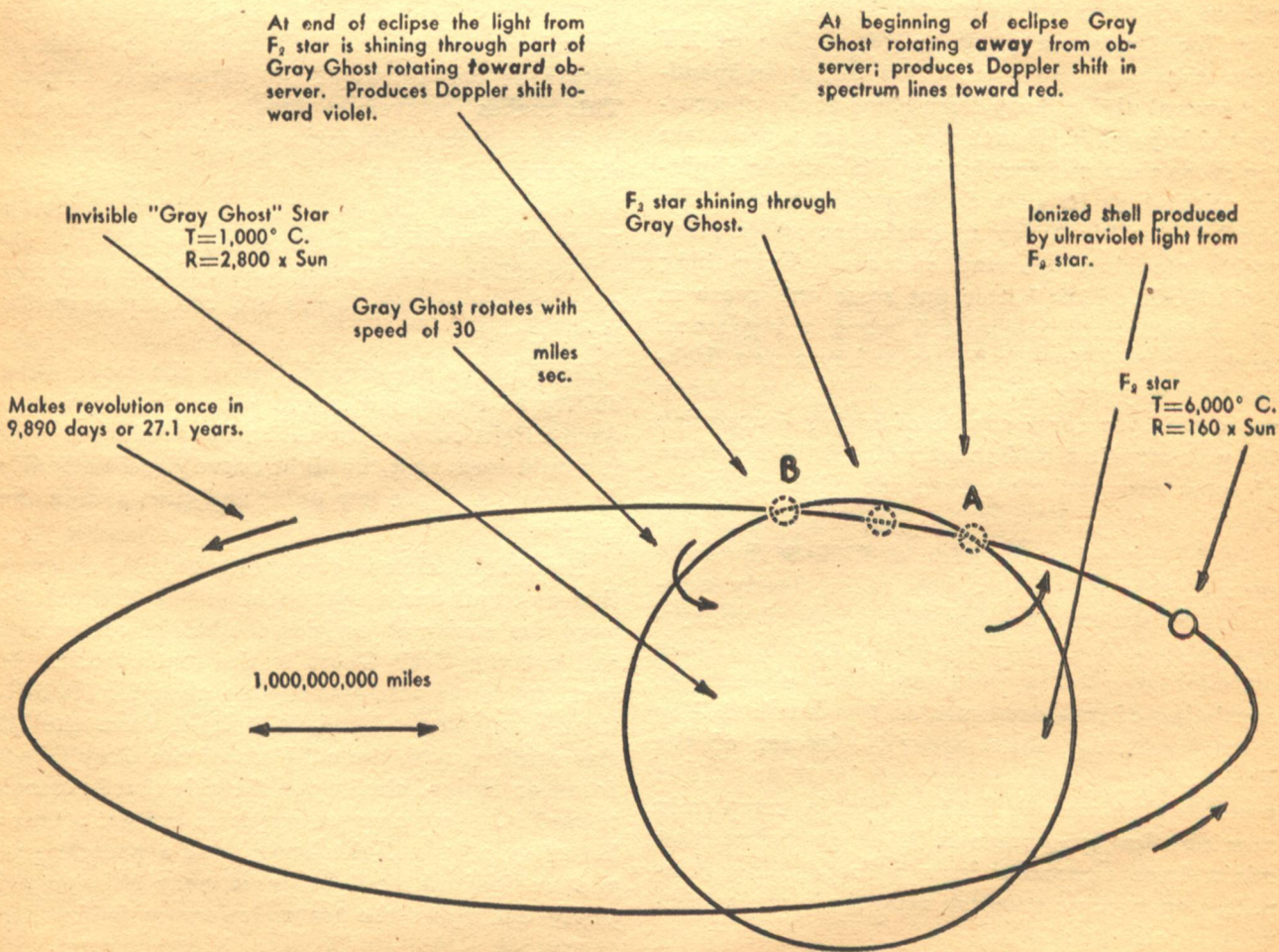
During total eclipse the brightness is fifty percent below normal. Hence the two stars must be about equally luminous. But when an orbit is computed on this basis the size of the fainter component is found to be simply astounding. The first bold investigators hinted it might be so large as to extend to the orbit of Jupiter. Thus although the *total* radiation emitted by the two stars was equal, it was spread out so thin over the vast surface of the secondary that it hardly seemed to shine at all. In addition, its density came out one-millionth of an atmosphere, something unheard of at that time (1912).

This led to the second model. The Gray Ghost was regarded as being not exactly a star but more in the nature of a globular nebula. The nebulosity was semitransparent so that light from the bright star shone right through it. As the eclipse was coming on and going off the variations were gradual as the rays passed through layers of different thickness but during totality the transmission settled down to a steady value of one half.

The theory received a little support by the fact that similar objects were not unknown, as for example the dark nebulosity surrounding Rho Ophiuchi.

The model left much to be desired, however. Thus we would expect at least *some* change in the beam from the bright star after penetrating all that cold gas of the Gray Ghost. When the Sun is very low atmospheric absorption is so intense that even an experienced observer can scarcely recognize certain regions of the solar spectrum. With a high sun the solar spectrum in the yellow is dominated by the two powerful lines of sodium vapor called Fraunhofer's D lines. But as sunset approaches strong black bands due to water vapor in our atmosphere begin to strengthen until the sodium lines produced in the solar atmosphere are nearly obliterated. In addition scattering by the air molecules eliminates much more of the blue from sunlight than the red. About an hour before sunset the violet part of the solar spectrum suddenly vanishes as abruptly as if someone had pulled a switch.

By every rhyme or reason the Gray Ghost should have acted upon the light shining through



MODEL OF SYSTEM OF EPSILON AURIGAE AS SEEN FROM EARTH

it in a good deal the same way. Instead the light from Epsilon Aurigae was practically identical during eclipse as it was before and after. Not *quite* the same, to be exact. Going into eclipse certain strong spectrum lines of ionized metals show a slight increase in strength on their red side; coming out of eclipse the lines are widened toward the violet. During totality the lines are symmetrical. A small technical point, perhaps, but one not to be overlooked.

To make sense out of this observational hodge-podge more data were needed and this meant waiting until the next eclipse. An interval of twenty-seven years is so long that each one is greeted by a new set of astronomers armed with more sensitive instruments and better theoretical knowledge than their predecessors. True to schedule, Epsilon Aurigae began to show signs of weakening by May or June of 1928, which is about as close as this eclipse can be detected.

Our faith in the infallibility of the law of universal gravitation rests in the minute agreement between the observed and predicted motions of the heavenly bodies. No more convincing illustration could be found than in the homely preparations astronomers make to photograph the eclipse of some spectroscopic binary. Suppose that Joe Stellafane wants to get a plate of XY Cass at its next minimum. This will mean spending several nights away from home at the observatory thirty miles distant perched on a mountain top seven thousand feet high. Without the slightest misgivings he goes about getting ready. He checks over his heavy underclothes and woolen socks, stocking cap and mittens. Everything looks O. K. Now better put some antifreeze in the radiator; never can tell when a big storm might hit us. Mustn't forget to buy a new flashlight battery this trip. And see if Aunt Lucy can come over for a couple of nights—sure wish the wife wasn't afraid to stay alone. All because of some star you can't even see without a telescope!

In the intensive campaign of 1928-29 the presence of the Gray Ghost was again clearly demonstrated but its true character remained as mysterious as before. After discussing all the existing material on the system of Epsilon Aurigae consisting of measurements on two hundred fifty spectograms, Dr. Otto Struve, Director of the Yerkes Observatory, announced in 1930: "It is possible that we are dealing with a completely new physical phenomenon."\* A statement that might have emanated from a fact-finding committee on psychic research after a violent session with a poltergeist.

A few years ago the material was subjected to

another rigorous third-degree process along slightly different lines than those used before. The scheme consisted substantially in treating the model to a sort of mathematical molding process. A table was drawn up containing all the requirements that must be met. Then different models were examined to see if they could be made or modified into meeting the requirements of the table. Many were found that fulfilled them partially but led to contradictory results elsewhere. For example, certain orbits had to be ruled out because the stars approached so close that giant tides would have made the system unstable. Another orbit was satisfactory except for a single flaw: it failed to produce an eclipse. This was remedied by enlarging the Gray Ghost considerably. But now it was swollen until at periastron the bright component was forced either to plow directly through it or by-pass it in some way, which was awkward. Other orbits avoided these pitfalls but raised the luminosity of the primary until it was up in the nova class. Gradually these bugs were eliminated one by one until finally the smooth consistent model described below emerged.

The bright component has a mass of 32 S and would fill a space out to the orbit of Venus.

The Gray Ghost has a mass of 23 S and would extend out to one and a third times the orbit of Saturn or two thirds of the distance to Uranus. This makes its average density one-millionth of an atmosphere or hundreds of times less than the ordinary red giants.

The surface temperature of the F2 star is 10,900 F; that of the Gray Ghost is 1800 F.

The eclipse is a grazing one, which means that only the outermost layers are concerned in the light changes.

Here comes the crucial test of the model—the ability to show how a grazing eclipse can produce a light curve with a long flat minimum. For it would seem that the light curve should steadily decline to a single low point and then rise in the same way.

The whole trick is revealed when we discover that as usual our attention has been directed toward the wrong object, for the bright component and not the Gray Ghost is the real culprit. In fact, the latter acts as a mere screen for its brilliant companion. Ultraviolet light from the F2 star shining upon the cold gas of the Gray Ghost forms an ionized shell upon the side that is turned toward it. Now charged particles can get a much better grip on a light beam than a neutral gas, and an ionized shell—even if very thin—could easily cut down the transmission by half. The remainder would go on through practically unaffected since the Gray Ghost is almost perfectly transparent. Furthermore, an ionized shell gives

\**Astrophysical Journal*, 71, 149, 1930.

a natural explanation of why the violet and red light are transmitted equally. It is true that uncharged particles such as those that constitute the great bulk of the Earth's atmosphere scatter violet light out of a beam much more powerfully than red. But *charged particles* play no favorites—they scatter all colors the same.

The ionized shell hypothesis also includes an explanation of the curious widening of the spectrum lines at the beginning and end of the eclipse. It is significant that the effect is most conspicuous for lines of ionized iron and titanium. Astronomers early recognized that the widening could be caused by the rotation of the secondary provided its atmosphere contained atoms of ionized elements. For suppose at the beginning of the eclipse the side of the Gray Ghost cutting into the light from the bright star is rotating away from the Earth. Then superimposed on the strong lines of ionized iron and titanium in the spectrum of the bright star will be faint lines due to the Gray Ghost, only displaced slightly to the red owing to the Doppler shift resulting from the rotation. Similarly, at the end of the eclipse the light will be shining through the opposite side of the Gray Ghost turning toward the Earth and the lines will be strengthened on the violet side. From the amount of displacements the Gray Ghost was estimated to be rotating at the rate of thirty miles per second, or twenty-five times as fast as the Sun. In the past the trouble has always been to figure out how a star at a very low temperature could have any legitimate ionized atoms in its atmosphere. The answer is that it doesn't. They are put there by the other star.

The foregoing sketch roughly indicates the present status of the model system of Epsilon Aurigae. Undoubtedly many adjustments and finishing touches will be added in the future. Possibly something totally unexpected may be found at the next eclipse in 1945-46 that will make many radical changes necessary.

A government spokesman recently recommended that one of the best antidotes for headline jitters and war nerves in general is a lively interest in some good hobby. If identifying bird calls or making shadow pictures leaves you cold, why not try your hand at building stellar models?

**Author's Note:**

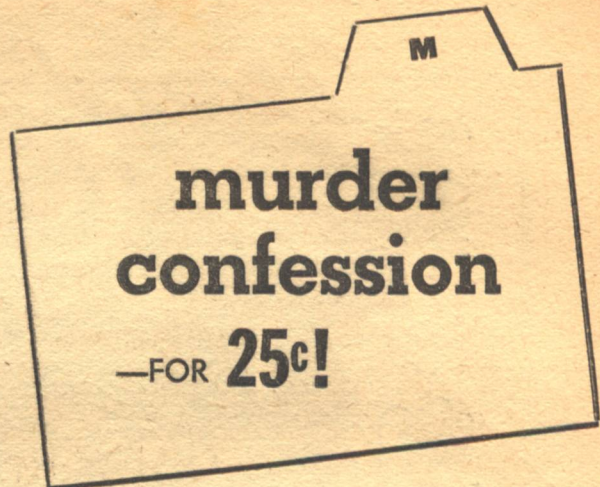
According to the latest calculations which did not come to the writer's attention until after this manuscript had been mailed to the editor, the figures for the Point-Convective model should be modified slightly. It now appears that a hydrogen content of thirty-five percent by weight and sixty-five percent Russell's Mixture gives the best results and that the inner convective core extends outward to twelve percent of the star's radius instead of seventeen percent. The central temperature comes out about 46,000,000 F. and the central density 110 grams per cc., slightly higher than those adopted before. On the basis of this model the central convective core contributes ninety-eight percent of the star's total luminosity.

This is considered the best model available at present but there are still many uncertainties so that all figures are subject to change without notice. For example, for reasons of simplicity helium was neglected entirely in this model. The introduction of helium would tend to lower the central temperature considerably.

R. S. Richardson.

**THE END.**

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# THE BEAST

By L. Ron Hubbard

● He was a professional Government hunter, and he had to get that strange beast—not simply because it was his ordinary duty, but because it had stolen from him something without which life was impossible—

Illustrated by Kolliker

The crash and the scream which reverberated through the stinking gloom of the Venusian night brought Ginger Cranston to a startled halt upon the trail, held there for an instant by the swirl of panicked blues which made up the *safari* of the white hunter.

Something had happened to the head of the line, something sudden, inexplicable in this foggy blackness.

Ginger Cranston did not long remain motionless for the blues had dumped their packages and had vanished, leaving the narrow trail, which

wandered aimlessly through the giant trees, clear of men.

He took one step forward, gun balanced at ready in the crook of his arm and then the thing happened to him which would make his life a nightmare.

From above and behind something struck him, struck him with a fury and a savageness which sent him flat into the muck, which began to claw and rake and beat at him with a singleness of intent which would have no ending short of death.

The white hunter rolled in the slime and beat back with futile fists, kicking out with his heavy boots, smothering under the gagging odor of a wild animal, so strong that it penetrated through the filters of his swamp mask, the only thing which was saving his face from the sabers this thing had for claws.

Fighting it back, the hunter's hands could find no grip upon the slimy fur; he could see nothing of it because of the dark and the fact that the blues had dropped their torches to a man. Ginger luridly cursed the blues, cursed this thing, cursed the muck and the agony which was being hammered into him.

He lurched to his knees, striking out blindly with all his might. The thing was driven back from him for an instant and Ginger's hands raked the mud around him for some weapon, preferably his lost gun. When he could not find it he leaped all the way to his feet and ripped away the swamp mask. He could not see. He could hear the snarling grunts of the thing as it gathered itself for a second charge.

Something in the unexpectedness of the attack, something in the ferocity of the beast, shook Ginger's courage, a courage which was a byword where hunters gathered. For a moment he could think of nothing but trying to escape this death which would again be upon him in an instant. He whirled and fumbled his way through the trees. If he could find some place where he could make a stand, if he could grasp a precious instant to get out and unclasp his knife—

There was a roaring sound hard by, the sound of battered water. Ginger knew this continent better than to go so far off a trail and he knew he must here make that stand. He gathered his courage about him like armor. He unclasped the knife. He could feel the beast not two yards away from him but in the dense gloom he could not see anything but the vague shapes of trees.

It struck. It struck from behind with a strength which brought them crashing into the mud and branches. One cruel paw was crooked to feel out with its sabers the eyes of its victim, the others scored Ginger's back and side.

Rolling in a red agony, strong beyond any past strength, Ginger tried to slam his assailant back

against a tree. He could not grip the slimy, elusive paw but he could brace it away from him with his forearm.

A roaring sound was loud in Ginger's ears and before he could halt the last roll he had managed, beast and hunter were over the lip and into black and greedy space. A shattering cry came from the beast as it fell away.

Ginger tried to see, tried to twist in the air and then he was gagged by the thick sirup of the depths and twisted like a chip in the strength of a whirlpool. He struck upward and then could not orient himself. His lungs began to burn and the sirup of the river seared his throat. The whirlpool flung him out, battered him against a rock and then left him to crawl, stunned and aching, from the stream.

He lay on the rocks, deafened by the roar of the water, trying to find strength enough to scan the space around him in search of the beast.

Two hours later the frightened blues, grouped in a hollow ring for security, found the white hunter by the river and placed him in a sling. One of the trackers nervously examined a nearby track and then cried, "Da juju! Da juju!" Hastily the carriers lifted the sling and bore its inert burden back to the trail and along it to the village which had been Ginger Cranston's goal.

Ginger Cranston woke slowly into the oppressive odor of a blue village from the tangled terror of his dreams. The heated ink of the Venusian night eddied through his tent, clung clammy to his face, smothered the native fires which burned across the clearing. Ginger Cranston woke into a new sensation, a feeling of loss, and for a little while could not bring organization into thought. It was hard for him to bring back the successive shocks which had placed him here, helpless in this bed, and he began to know things which it had never before occurred to him that it would be important to know.

He had always been a brave man. As government hunter of this continent, relentlessly wiping out the ponderous and stupid game which threatened the settlements and their crops, he had been considered all about as a man without peer in the lists of courage. So certain had he been in his possession of this confidence that he had never wondered about fear, had found only contempt for those who were so weak as to feel that lowly emotion.

And now Ginger Cranston woke up afraid.

The shocks, wreaked upon another, would have brought madness. To have been struck twice from behind by a raging beast, to have tasted death between the claws of such fury, would have wrecked the usual nervous system. But Ginger Cranston was not a usual person and, never hav-

ing been other than his gay, confident self, he had no standards.

He had lost his courage.

In its place was a sick nausea.

And Ginger Cranston, out of shame, was no help to himself but stood away from his battered body and gazed with lip-curved contempt upon this sniveling hulk which shook at the brink of recalling that which had brought this about. He had no sympathy for himself and had no reasons with which to excuse his state.

He was ill and his spirits, as in anyone ill, were low. He had been expecting the same stupid, many-tonned brutes which he had thought to constitute the only game of this continent. He had been set upon by a thing wholly unknown to him at a time when he had expected nothing and he had been mauled badly in the process. But he offered himself none of these. He was afraid, afraid of an unknown, cunning something, the memory of which was real in this dark tent.

"Ambu!" he yelled.

A Venusian of wary step and worried eyes slunk into the tent. Ambu had done his bungling best with these wounds, hurling the offer of help back into the teeth of the village doctor—a person who preferred a ghost rattle to a bottle of iodine. Ambu was of uncertain age, uncertain bearing. He was half in and half out of two worlds—that of the whites in Yorkville on the coast, that of the blues in the somber depths of this continent. He believed in ghosts. But he knew that iodine prevented infection. He belonged to a white, had been indifferently schooled by the whites. But he was a blue.

Ambu hung the lantern on the pole of the tent and looked uneasily at his white man. He was not encouraged by that strange expression in the hunter's eyes, but the fact that Lord Ginger had come back to consciousness was cheering.

Ginger was feeling a strange relief at having light. He smiled unconvincingly. When he spoke his voice was carefully controlled.

"Well, Ambu! I'm not dead yet, you see."

"Ambu is very happy, Lord Ginger." He looked worried.

"What . . . er . . . what happened out there when . . . well, what happened?" said Ginger with another smile.

Ambu looked into the dark corners of the tent, looked out into the compound and then sank on his dull haunches at the side of the cot.

"Devils," said Ambu.

"Nonsense," said Ginger in careful carelessness.

"Devils," said Ambu. "There was a pit. I have never before seen such a pit. It was dug deep with claw marks on the digging. It was covered over with branches and mud like a roof; when the trackers stepped upon it they fell through.

There were sharpened stakes at the bottom to receive them. They do not live, Lord Ginger."

"A deadfall?" gaped Ginger. And then, because there was a resulting emotion which clamored to be felt, he spoke swiftly, carelessly, and smothered it. "Nonsense. There's nothing like a deadfall in the arts of the blues. There have been no hostile blues for thirty years or more."

"Devils," said Ambu. "Devils of the dark, not blues. I have never seen nor heard of such a trap, Lord Ginger."

"I'll have to see it before I believe it," said Ginger. "Er . . . Ambu, bring me a drink."

Ambu was perceptive. He knew Lord Ginger did not mean water even though Lord Ginger never drank except to be polite or when ill with fever. He poured from a flat metal bottle into a metal cup and the two chattered together.

"Very cold tonight," said Ambu, sweating.

"Very cold," said Ginger, drinking quickly.

The beasts of this continent weighed many tons. They were of many kinds, some of them carnivorous, all of them stupid, slothful swamp creatures which did damage because they were clumsy not because they were vicious. It was a government hunter's job to kill them because a man had to be skilled to rend apart enough flesh and muscle and bone to keep the brutes from traveling. There were no small animals like leopards or lynxes. On all Venus there was nothing which weighed four hundred pounds and had claws, was cloaked in slimy fur—

"It *knew*," said Ambu. "It knew Lord Ginger would stop in just that place when the line halted. And it was on a tree limb above Lord Ginger waiting for him to stop. It *knew*."

"Rot and nonsense," grinned Ginger carefully. "I have never heard of a beast with that much intelligence."

"No beast," said Ambu with rare conviction for him. "Probably devil. No doubt devil. Forest devil. Drink again, Lord Ginger?"

Ginger drank again and some of the numb horror began to retreat before the warmth of the liquor. "Well, maybe we'll take a crack at hunting it when we've disposed of this 'juju' thing the village is troubled about."

"The devil is 'da juju'," said Ambu. "That is the thing for which they wanted Lord Ginger. That was 'da juju'!"

"The white lord is well?" said a new voice, a tired and hopeless voice, in the entrance to the tent.

Ambu started up guiltily and began to protest to the chief in blue that the white lord was well enough but would talk to no one.

"Never mind, Ambu. Invite him in," said Ginger. He knew he would get the full impact of this thing now, would remember all about it, would

receive the hopelessness of this gloomy forest chief like one receives an immersion in ink. "Greetings," said Ginger in blue.

"Greetings to the white lord," said the chief tiredly. "He lives and the village Tohyvo is happy that he lives. The white hunter is great and his fame is mighty. He comes and all things flee in horror before him. The blues beat their heads against the earth in submission and hide their eyes before the dazzling brilliance of the mighty lord." He sighed and sank upon an ammunition box.

"Greetings to the star of his people," said Ginger, mechanically. "His name carries the storms of his wrath across the jungle and his power is as the raging torrent. A flash of his glance is the lightning across the storm." He took a cup of liquor from Ambu and handed it to the dispirited, sodden little chief.

"You met da juju," said the chief.

"We did," said Ginger with a timed smile. "On the next meeting da juju will be dead."

"Ah," said the chief.

"You have had some trouble with this thing?" said Ginger.

"My best warriors are gutted and mangled corpses in the forest depths. Women going to the river have never returned. Children are snatched from play. And always the dark swallows this thing, always there is only the silent forest to mock. In my long life I have never heard of such a beast. But you have said it will be killed. It is good. It is ended. The mighty hunter gives me back my sleep."

"Wait," said Ginger. "You say it makes raids on your village?"

"Yes, mighty warrior."

"How does it do this?"

"It rides down from the sky. It vanishes back into the sky."

"You mean the trees," said Ginger.

"It is the same," sighed the chief, eyeing the liquor bottle.

"How do your warriors die?"

The chief squirmed. "They fall into pits cunningly placed on the trail and covered over. They are attacked from behind and torn to bits. Da juju has even been known to wrest from their hands their spears and knives and transfix them with their own weapons."

Ambu was shivering. He stood on one foot, then on the other. He scratched his back nervously and in the next second scratched his head. His eyes, flicking back and forth from the chief to the white hunter were like a prisoner's under torture.

"Maybe devils," said Ambu.

"Devils," muttered the old chief. "The mighty white warrior has come. All will be well. All will be well." He looked dispiritedly at Ginger

and crept out of the tent.

Ambu pointed to a case which contained a radio-telephone. "Lord Ginger talk Yorkville and ask for men?"

Ginger startled himself by almost agreeing. He had never asked for help. He was Ginger Cranston. He looked at the radio case like a desert-stranded man might gaze thirstily at a cup of water before he did the incredible thing of pouring it out on the ground.

"We won't need any help," said Ginger with a smile. "All I need is a night's sleep. Have the chief throw out beaters in the morning and pick up the beast's track. Meantime, good night. NO!" he added quickly and then calmed his voice. "No, leave the lantern there, Ambu. I . . . I have some notes to make."

Ambu looked uncertainly at his white master and then sidled from the tent.

The giant trees stood an infinity into the sky, tops lost in the gray dark of swirling vapors. Great tendrils of fog crept ghostily, low past the trunks, to blot with their evil odor of sulphur and rot what visibility the faint light might have permitted. It was an atmosphere in which men unconsciously speak in whispers and look cautiously around each bend before venturing farther along the trail.

The beaters had come back with news that da juju had left tracks in a clearing two kilometers from the village and they added to it the usual blue exaggeration that it was certain da juju was wounded from his encounter with the mighty white hunter.

The party stepped cautiously past an open space where some wrecked and forgotten space liner, which furnished the natives with metal, showed a series of battered ports through the swirling gloom, a ship to be avoided since its dryness offered refuge to snakes.

Weak and feverish, Ginger occasionally stopped and leaned against a tree. He would have liked the help of Ambu's arm, but could not, in his present agitated state, bring himself to ask for it.

Step by step, turn by turn of the trail, a thing was growing inside Ginger Cranston, a thing which was like a lash upon his nerves. His back was slashed with the wounds he had received and the wounds burned, burned with memory.

His back was cringing away from the thing it had experienced and as the minutes went the feeling increased. At each or any instant he expected to have upon him once again the shock of attack, from behind, fraught with agony and terror. He tried to sweep it from him. He tried to reassure himself by inspecting the low-hanging limbs under which they passed; but the memory was there. He told himself that if it did happen he would not scream. He would whirl and begin

to shoot. He would smash the thing against a tree trunk and shatter it with flame and copper.

He was being careful to discount any tendency toward weakness and when, on a halt, he had found that each time he had pressed his back solidly against a tree he thereafter turned his back to the trail and faced the tree.

Ambu was worried. He padded beside Lord Ginger, carrying the spare gun, wanting to offer his help, wanting to somehow comfort this huge man who was now so changed.

"Hot, eh?" said Ginger with a smile.

"Hot," said Ambu.

"Ask the trackers if we are almost there."

Ambu chattered to the men ahead and then shrugged. "They say a little way now."

"Good," said Ginger, carefully careless.

The trail began to widen and the river of sirup which ran in it began to shoal. The clearing was about them before they could see that it was and then the only sign was a certain lightness to the fog.

"Tracks!" cried the blue in advance.

Ginger went up to him. He wiped his face beneath his swamp mask and put the handkerchief carefully away. He knelt casually, taking care that his thigh boots did not ship mud and water over their tops. Impersonally he regarded the tracks.

There were six of them in sets of two. The first were clearly claws; two and a half feet behind them the second set showed no claws; two and a half feet back from these the third and last set showed claws again. The weight of the thing must be less than three hundred pounds.

A prickle of knowing went up the back of Ginger's spine. These tracks were perfect. They had been placed in a spot where they would retain their impressions. And from here they led away into the trees; but to this place they did not exist.

"Devil," chattered Ambu.

A devil was very nearly an acceptable explanation to Ginger. No six-tracked animal was known to him, either on this planet or any other.

Suddenly he stood up, no longer able to bear the feeling of attack from behind. He turned slowly. The dark vapors curled and drifted like veils through the clearing.

"Get on the track of it," said Ginger in blue.

The trackers trotted out, too swiftly for Ginger to keep up without extreme effort, but Ginger made no protest.

He told himself that the fever made him this way; but he had had fever before. Deep within he knew that the beast had a thing which belonged to Ginger, a thing which Ginger had never imagined could be stolen. And until he met that

beast and killed that beast, he would not recover his own.

The tracks led on a broad way, clear in the mud, with a straight course. Uneasily, Ginger watched behind him, recalling the words of the chief that the thing often backtracked. But there were no overhanging branches in this part and that gave some relief for they had come up a gradual grade and the trail was flanked with tall, limber trees which barred no light. Here the ground was more solid even if covered with thick masses of rot and the combination of greater light and better footing caused a weight to gradually lift from Ginger's back.

And then it happened. There was a swishing, swooping sound and a scream from Ambu! Ginger spun about to scan the back trail—and to find nothing. Ambu was gone.

Ginger looked up. In a cunningly manufactured sling, not unlike a rabbit snare, held by one foot, was Ambu, thirty feet from the ground, obviously dead, his head smashed in from its contact with the trunk of the tree which, springing upright, had lifted him.

After a few moments Ginger said in a controlled voice, "Cut him down."

And some hours later the group crawled back into the compound, carrying Ambu, Ginger still walking by himself despite the grayness of his face and the strange tightness about his mouth.

With each passing day the lines on Ginger Cranston's face deepened and the hollows beneath his eyes grew darker. It was harder now to bring a proper note of cheerfulness into his commands, to reassure when all chances of success diminished with each casualty to the hunting party.

There came, one dull, drab day the final break with the blues. Ginger Cranston had seen it coming, had known that his own power had grown less and less in their eyes, that their faith in the great white hunter had slimmed to a hopeless dejection. Da juju had sapped the bulwark of morale and now the battlement came sliding down like a bank of soupy, Venusian mud. Ginger Cranston woke to empty tents. The villagers said nothing for there was nothing to say. The great white hunter was defeated. It was inevitable that the remainder of his crew would desert and it was not necessary that the way of their going be told, for the blazing mouths of guns could not have driven them back. Seven had died. Five remained to flee and the five had fled.

"Bring me trackers," said the haggard white man.

The chief looked at the mud and regarded it with intensity. He looked at a pegunt rooting there as though he had seen such an animal for



the first time. He looked at a tree with searching interest.

"I said trackers!" said Ginger Cranston.

The chief scratched himself and began to sidle away, still without meeting the eyes of the white man.

Ginger struck out and the chief crumpled into a muddy, moaning pile.

"TRACKERS!" said Ginger.

The chief turned his face into the slime and whimpered. In all the village not one blue could be observed, but one felt that all the village had seen and now dispiritedly sank into a dull apathy as though this act of brutality, borne out of temper, was not a thing to be blamed but merely a thing which proved that the great white hunter was no longer great. With all the rest, da juju had him, had his heart and soul, which was far worse than merely having his life.

Ginger turned away, ashamed and shaken. He pushed his way into his tent and mechanically wiped the rain from his face, discovering abruptly that he wept. He could not now gain back the thing which da juju had. His means were gone with his men. He could hear the chief whimpering out there in the mud, could hear a wind in the great trees all around the place, mixed with the toneless mutter of the drizzle upon the canvas.

In the metal mirror which hung on the pole, steamed though it was, Ginger caught a glimpse of his countenance. He started, for that which he saw was not in the least Ginger Cranston; it was as though even the bone structure had somehow shifted to complete another identity. He had no impulse to strike the mirror down—he was tired, aching, horribly tired. He wanted to crawl into his bed and lie there with his face to the blank wall of canvas and never move again.

Shame was the only active emotion now, shame for the thing he had done just now, for the chief hardly came to his shoulder and the mud-colored body was twisted by accident and illness into a caricature of a blue. Ginger took a bottle from a case and went out again into the rain.

He knelt beside the chief and sought to turn him over and make him look. But the resistless shoulder was a thing which could not be turned and the low, moaning whimper was not a thing which would stop.

"I am sorry," said Ginger.

But there was no change. Ginger set the bottle down in the mud beside the head and went back into his tent.

Slowly, soddenly, he sank upon the rubber cover of his bunk looking fixedly and unseeingly at his fouled boots. Da juju. The devil, Ambu had called him. Had not Ambu been right? For what animal could do these things and remain out of the range of a hunter's guns? Da juju—

There was a slithering, harsh sound and Ginger, blenched white, came shaking to his feet, his light gun swinging toward the movement, sweat starting from him. But there was no target. The thrown-back flap of his tent had slipped into place, moved by the wind.

He was nauseated and for seconds the feeling of claws digging into his back would not abate. He struggled with his pent sanity, sought nervously for the key of control which, more and more, was ever beyond the reach of mental fingers. The scream died unvoiced, the gun slipped to the bunk and lay there with its muzzle like a fixed, accusing eye. Hypnotically, Ginger Cranston looked at that muzzle. It threw a twenty-millimeter slug and would tear half a head from a Mamodon bull; the bullet came out when the trigger was pressed, came out with a roar of savage flame, came out with oblivion as its command. Limply Ginger regarded it. He knew very little about death, he a hunter who should have known so much. Was death a quiet and untroubled sleep which went on forever or was death a passing to another existence? Would the wings of death carry something that was really Ginger Cranston out of this compound, away from these trees, this fog, this constant rain, this . . . this beast?

Funny he had never before considered death, odd how little he knew, he who had been so sure and proud of knowing so very much.

Death was a final conclusion—or was it a beginning? And if he took it now— Suddenly he saw where his thought led him and drew back in terror from the lip of the chasm. Then, as one wonders how far he would have fallen had he slipped, he crept cautiously back and thoughtfully regarded the bottomless, unknowable deep, finding within himself at this strange moment a power to regard such a thing with a detached attitude, to dispassionately weigh a thing which he believed it to be in his hand to choose.

He seemed to fall away from himself in body and yet stand there, an untouchable, uncaring personality who had but to extend a crooking finger and call unto himself all there was to know. Suspended in time, in action, in human thought, he regarded all he was, had been, would be. There were no words to express this identity, this timelessness, only a feeling of actually existing for the first time; layer upon layer of a nameless something had been peeled away to leave a naked, knowing thing; a mask was gone from his eyes. But when he again came to himself, still standing beside his bed, still staring at the gun, he was muddy, weary Ginger Cranston once again who could feel that something had happened but could not express even in nebulous thought any part of the occurrence. Something had changed. A decision had been born. A plan of action, a somber, solemn plan was his.

About his waist he buckled a flame pistol and into that belt he thrust a short skinning knife. He pulled up his collar and strapped his swamp mask to it. He picked up his gun and looked into its magazine.

When Ginger stepped from the tent the chief was gone but the bottle sat upright in the mud, untouched, a reproof which would have reached Ginger a few minutes before but which could not touch him now. For perhaps an hour, even a day, nothing could touch him, neither sadness nor triumph. He was still within himself, waiting for a thing he knew would come, a thing much greater than shame or sorrow. He had chosen his death for he had found it to be within his realm of choice and having chosen it he was dead. It mattered little what happened now. It mattered much that da juju would end. But it did not matter emotionally. It was a clear concern, undiluted by self.

Walking quietly through the mud he came to the trail which led upward to the series of knolls where the trees were thinner and the ground a degree more solid. This time he was not tracking. He gave no heed to the ground for he was within the role of the hunted, not that of the hunter. He knew with a clarity not born of reason that he would be found.

Along the crest of a small hill, looking out across the foggy depths of the forest, touched faintly by the gloomy sun, he walked and knew he could be seen against the sky. He stopped a little while and dispassionately regarded the forest tops again, noting for the first time that gray was not the color there as he had always supposed but drab green rust red, dark blue and smoky yellow. It was a little thing to notice but it seemed important. He turned and walked slowly back along the crest, gun held in the crook of his arm, his body relaxed. From this end he could see the impression of the village, a vacant space in the trees, a small knoll itself, wrapped in blue-yellow cotton batting which restively shifted pattern.

About him the clouds thickened blindingly and the lenses of his swamp mask fogged. For a brief instant terror was in him before he pressed it gently down, out of sight, and buried it somewhere within him once more. The cloud lifted and curved easily away. For a little while then the sun was almost bright and it was this time upon which he had counted. He could be seen for a kilometer or more against the sky, blackly etched, motionless, waiting.

The atmosphere thickened, darkened, grew soggy with spurts of rain; the sun and any trace of it vanished even to Ginger's shadow. The time was here. He would walk slowly, leaving deep tracks, putting aside any impulse to step on stone and so break his trail. He knew it would follow.

He took his time, now and then pausing to arrange some imagined opening in his coat or his mask, occasionally pulling off the mask altogether and lighting his pipe, to sit on a rotten log until the tobacco was wholly burned.

He had no plan of walking save that he stayed in the trees where the great branches leaned out above him like grasping hands, only half seen in the gloom.

When the dark began to settle he did not return to the village, but kept upon his circuitous way, vaguely aware that the compound was somewhere upon his right, caring very little about it.

When he could no longer see clearly he groped to the base of a great tree; he could sit here now, waiting with dull patience for the thing to happen. From his pocket he took his pipe and pouch. From his face he pulled the swamp mask. Steadying his gun against the trunk beside him he proceeded to prepare his smoke.

It happened suddenly, silently, efficiently. The vine-woven net dropped soundlessly over his head, slithered to his feet and then with swift ferocity, yanked tight and brought him with a crash into the mud!

There was a scurrying about him as though something leaped up and down, darted back and forth to swiftly study the situation so as to require a minimum of effort in the final kill.

Ginger's right hand sought to grip the flame pistol at his thigh, but he could not bend his arm; his left hand clawed insensately at the net and a scream of terror welled up in his throat. He stilled the beating of the hand. He pressed back the scream. He reached to his belt and drew the knife with a deliberate swiftness and an economy of effort. The keen edge bit into the tough fibers of the vine, cleared it away from half his side, began to slice it off his ankles. And then the thing struck!

The foul animal smell of it assailed him, more acute than the bite of the claws which went through his jacket and into his side like a set of bayonets.

He sensed the downward drive of the other claws and caught a blurred glimpse of the thing. The slimy fur of the leg was in his fingers and the striking paw missed his face.

Ginger jabbed upward with the knife and felt it saw vainly into the thing. With a scream the beast twisted away and with it went the knife.

There was a brief interval before the next, more savage attack, and in that space Ginger cleared his feet of the net. When it struck him again, like a battering-ram with force enough to smash in his ribs, he was able to come to his knees and fumble for his flame pistol while fending with his left arm. He had no more than drawn the gun

when a scrambling kick sent it flying into the mud, far from reach.

A cold piece of metal banged Ginger in the mouth and he snatched hungrily for the haft of his flesh-imbedded knife. Slippery as his fingers were, he retained it, drew it forth. He kicked out with his feet and then drove the keen steel deep into the body of the thing!

With a shudder it fell back, a claw weakly seeking to strike again and then falling away. There was a threshing, rattling sound and Ginger drew away, trying to clear his sight, fumbling with the other hand for his gun which he knew had been at the base of the tree. He had the weapon in his hand before he could see. There was water in a footprint which his hand had touched and he quickly bathed his eyes.

The light was faint, too faint to show more than a dark blob stretched in the muck, a blob which didn't move now. Ginger warily skirted it, keeping it covered, fumbling for a flash inside his waterproof coat.

The cold, impersonal beam played upon the object, raked it from end to end and then strayed uncertainly back to the head.

Ginger knelt and unfastened the straps of the frayed, worn leatherlike suit that clothed the corpse and laboriously turned it over. Metal-tipped space gloves clicked as the arms flopped against each other. There was an almost illegible trace of lettering on the back, fouled with mud and blood, torn in spots. "SP—E SHII—" it said, before a gouge tore out the ship's name. Below, "Spacepo—Lowry, U-A."

It stank with dried and rotted blood and meat of long-gone kills, and the unwashed body of its occupant.

Ginger turned it back and looked again at the face. Identification was hopeless. The disastrous landing had gouged and torn the face half away; there was a deep dent in the forehead where the skull had been broken inward, and an angry, seamed and cross-seamed welt told of slow healing without the slightest rudiments of attention.

Ginger straightened slowly, gathered his things from the ground, and squelched off on his back-trail. Native bearers would have to carry that beast home. The beast some unknown and probably unknowable crash of a small tramp spacer had made from a man. A ruthless, pure animal—with all the cunning of human intelligence still left in the damaged brain.

Ginger swung along the trail in the long, easy strides of a huntsman of standing. There were bruises, and certain scratches that twinged a bit, but that sort of damage was of no importance. The great thing was—a thing Ginger now scarcely realized—that he had recaptured that quite intangible reality that had been stolen from him.

THE END.



**"IT" was hidden in the vault —  
but Doc didn't have a vault**

A little man in a green hat came up to Doc Savage. He offered to save Doc's friends. All the members of his group had been kidnaped!

But the little man insisted that first Doc Savage turn over something that was hidden in a vault. And Doc didn't have the slightest idea what he was talking about.

All of which gave rise to thrills and excitement . . . a better-than-ever Doc Savage story, **THE LAUGH OF DEATH** in the October

# DOC SAVAGE

10c A COPY

AT ALL NEWSSTANDS



# BRASS TACKS

*So that's who Jules got hooked by!*

Dear John:

Regarding the question of Harold Shea's status, raised by Mr. Carter in the August Astounding: Pratt and I haven't been able to keep in close touch with Harold lately, but the last we heard he was teaching his young son to speak archaic Japanese, so he could go back to twelfth-century Japan and scotch the Son of Heaven's family at the source.

Harold admits he had a lively time in Hubbard's University of the Unholy Names, but claims that he got off easy compared to Hubbard's hero. The unfortunate Riley, you will remember, ended up married to one Megaera, who, as everybody but poor Jules knew, is one of the Erinyes, or Furies!—L. Sprague de Camp.

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*I've seen Kodachrome color photographs taken by long exposure to moonlight. They do not look like moonlight because they are colorful. Some slight color vision remains, but so little as to be almost useless.*

Dear Mr. Campbell:

"The Birth of a Superstition," by Willy Ley, in the May, 1942, issue of Astounding Science-Fiction seems to prove that the color blindness of the ancient Greeks was just a myth. There is another myth that is even more prevalent, and much easier to prove wrong. In the September, 1941, issue of Astounding, the editor's article, "Optical Instruments," states that moonlight scenes are actually colorless, and that all color seen is from memory. I have read this elsewhere, also.

However, on trying it, the color looked too real to be just memory, so I made some tests on some color charts and some pictures colored in a way so that no normal pictures were ever colored. While some of the colors did not look normal, most of them had enough color to be recognizable. The tests were made after midnight to be sure that no daylight remained. Perhaps the moon is brighter here in Colorado.

I hope you will try it, and prove to yourself that colors can be seen by moonlight, and explode another myth.—F. H. Sweany, Henderson, Colorado.

*Maybe he's got something there—*

Dear Mr. Campbell:

There is one thing I have to get off my chest before I go completely mad. How can the modern science-fiction writers of today have such incredible lack of foresight as to picture humanity decades from now still wearing the convention-bound and uncomfortable clothes of this period? Can it be that this race of two-legged mammals, after advancing to such a degree that they can span the voids between stars, pull planets out of their courses, explore and exploit the fourth dimension, and colonize the planets, still be wearing tight-fitting pistons of cloth around their legs? Impossible! For example: let us look back two thousand years when science still thought that there were four elements that made up this world. They had the good sense to wear loose-fitting togas that bound no part of the body and permitted free motion of the limbs when your life depended upon a quick start and continued speed. Whereas John Q. Public goes blithely along still wearing the styles that grandfather set. (The first hundred years, et cetera, et cetera.) And another thing. This picturization of the spaceman of the future wearing boots, tight-fitting riding pants, a long cloak, a sword, and enough gold braid to sink a battleship. Especially the sword. What possible use could a sword be in space? More useless junk is being carried on by custom than warts on a wart hog. But perhaps I had better stop now before I start yelling and really begin to talk about flaws in the set-up.

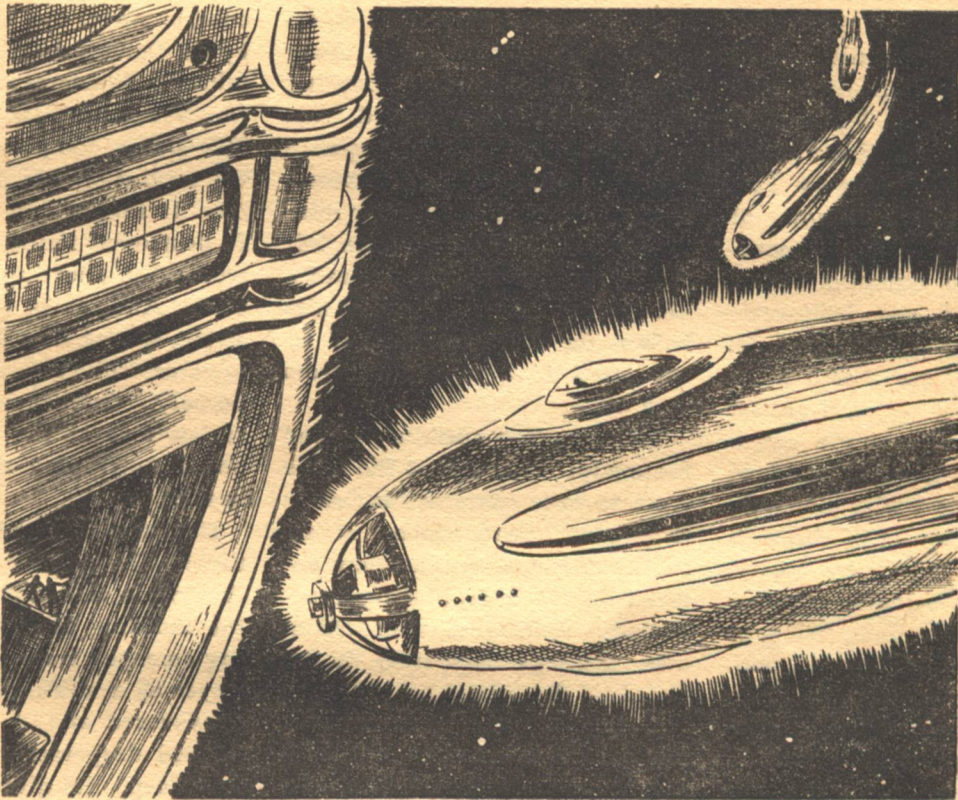
About the magazine itself. Now, there are stories and stories, but, as far as I am concerned, your magazine has the best. The cover was good, but who cares? What difference does it make what kind of paper the magazine is printed on, and whether or not there are any pictures? As far as I am concerned, you could print it on cheesecloth and sell it by the foot.

I ran across de Camp's "Lest Darkness Fall" in our station library. Good idea, that. It gives the bookworm a chance to see what science-fiction can do in the way of entertainment.

By the way, do you plan to give Asimov's "Foundation," a sequel? Seems to me that would be a good idea. I'm all agog to find out if the plan will work.—Bruce Massey.

# QRM—INTERPLANETARY

By George O. Smith



● QRM is the radio ham's designation of man-made interference—and while it wasn't the ordinary kind of static that practically ruined interplanetary communications, it definitely was man made, and interference of the worst order!

Illustrated by Kolliker

*QRM—International code signal meaning "Interference" of controllable nature, such as man-made static, cross modulation from another channel adjoining or willful obliteration of signals by an interfering source.*

*Interference not of natural sources (designated by International code as QRN), such as electrical storms, common static, et cetera.*

—*Handbook, Interplanetary Amateur Radio League.*

Korvus, the Magnificent, Ni-

lamo of Yoralen, picked up the telephone in his palace and said: "I want to talk to Wilneda. He is at the International Hotel in Detroit, Michigan."

"I'm sorry, sir," came the voice of the operator. "Talking is not possible, due to the fifteen-minute transmission lag between here and Terra. Interplanetary Communications will not permit audio. However, teletype messages are welcome."

Her voice originated fifteen hundred miles north of Yoralen,

but it sounded as though she might be in the next room. Korvus thought for a moment and then said: "Take this message: 'Wilneda: Add to order for mining machinery one type 56-XXD flier to replace washed-out model. And remember, tobacco and sublevel energy will not mix!' Sign that *Korvus*."

"Yes, Mr. Korvus."

"Not *mister!*" yelled the monarch. "I am Korvus, the Magnificent! I am Nilamo of Yoralen!"

"Yes, your magnificence," said the operator humbly. It was more than possible that she was stifling a laugh, which knowledge made the little man of Venus squirm in wrath. But there was nothing that he could do about it, television still being distant by the same five years that it was behind in 1929.

To give Korvus credit, he was not a pompous little man. He was large—for a Venusian—which made him small according to the standards set up by Terrestrials. He, as Nilamo of Yoralen, had extended the once-small kingdom outward to include most of the Palanortis Country which extended from about 23.0 degrees North Latitude to 61.7 degrees, and almost across the whole, single continent that was the dry land of Venus. He was a wily monarch, making his conquest of the wild and lawless country by treaty, and by double-double-crossing those who might have tried to double-cross him. Armed conquest was scorned, but armed defense was desirable in the Palanortis Country—and Korvus had defended himself up and down the inhabitable Northern portion of the planet. His conquest had been a blessing to civilization, and though publicly denounced, it was privately commended. Those who could have stopped it did all they could to delay and intercept any proceedings that would have caused the conquest of Korvus' intended country any trouble.

Korvus' message to Terra zoomed across the fifteen hundred rocky miles of Palanortis to Northern Landing. It passed high across the thousand-foot-high trees and over the mountain ranges. It swept over open patches of water, and across intervening cities and towns. It went with the speed of light and in a tight beam from Yoralen to Northern Landing, straight as a die and with person-to-person clarity. The operator in the city that lay across the North Pole

of Venus clicked on a teletype, reading back the message as it was written.

Korvus told him: "That is correct."

"The message will be in the hands of your representative Wilneda within the hour!"

The punched tape from Operator No. 7's machine slid along the line. It entered a coupling machine and was stripped from the tape and repunched upon a tape that was operating at better than a thousand words per minute. Operator 7's tape then left the machine to be rolled into a file roll and placed in the vaults below the city. It was of no use save as a reference from now on.

The coupling machine worked furiously. It accepted the tapes from seventy operators as fast as they could write them. It selected the messages as they entered the machine, placing a mechanical preference upon whichever message happened to be ahead of the others on the moving tapes. The master tape moved continuously at eleven hundred words per minute, taking teletype messages from everywhere in the Northern Hemisphere of Venus to any of the other planets in the Solar System. It was a busy machine, for even at eleven hundred words per minute, it often got hours behind.

The synchronous-keyed signal from the coupling machine left the operating room and went to the transmission room. It was amplified and hurled out of the city to a small, squat building at the outskirts of Northern Landing.

Here it was impressed upon a carrier wave and flung at the sky.

But not alone. Not unguarded. The upper half of the building carried a monstrous parabolic reflector, mounted on gimbals. The signal was focused into a beam. The beam was made of two components. The center component was a circularly po-

larized, ultra-high frequency wave of five centimeter waves, modulated with the keying signals of the teletype coupling machine. The outer component was a radially polarized wave of one centimeter waves. A radio frequency armor.

It was hurled at the sky, a concentric wave, out of a reflector, by a thousand kilowatt transmitter. The wave seared against the Venusian Heaviside Layer. The outer component bored at the ionization. It chewed and it bit. It fought and it struggled. It destroyed ionization by electronically shorting the ionization. And, as is the case with strife, it lost heavily in the encounter. The beam was resisted fiercely. Infiltrations of ionization tore at the central component, stripping and trying to beat it down.

But man triumphed over nature! The megawatt of energy that came in a tight beam from the building at Northern Landing emerged from the Heaviside Layer as a weak, piffling signal. It wavered and it crackled. It wanted desperately to lie down and sleep. Its directional qualities were impaired, and it wobbled badly. It arrived at the relay station tired and worn.

One million watts of ultra-high frequency energy at the start, it was measurable in microvolts when it reached the relay station, only five hundred miles above the city of Northern Landing.

The signal, as weak and as wobbly as it was, was taken in by eager receptors. It was amplified. It was dehashed, de-statted, and deloused. And once again, one hundred decibels stronger and infinitely cleaner, the signal was hurled out on a tight beam from a gigantic parabolic reflector.

Across sixty-seven million miles of space went the signal. Across the orbit of Venus it went in a vast chord. It arrived at the Venus Equilateral Station with less trouble than the origi-

nal transmission through the Heaviside Layer. The signal was amplified and demodulated. It went into a decoupler machine where the messages were sorted mechanically and sent, each to the proper channel, into other coupler machines. Beams from Venus Equilateral were directed at Mars and at Terra.

The Terra beam ended at Luna. Here it again was placed in the two-component beam and from Luna it punched down at Terra's Layer. It emerged into the atmosphere of Terra, as weak and as tired as it had been when it had come out of the Venus Layer. It entered a station in the Bahamas, was stripped of the interference, and put upon the land beams. It entered decoupling machines that sorted the messages as to destination. These various beams spread out across the face of Terra, the one carrying Korvus' message finally coming into a station at Ten Mile Road and Woodward. From this station at the outskirts of Detroit, it went upon land wires downtown to the International Hotel.

The teletype machine in the office of the hotel began to click rapidly. The message to Wilneda was arriving.

And fifty-five minutes after the operator told Korvus that less than an hour would ensue, Wilneda was saying, humorously, "So, Korvus was drunk again last night—"

Completion of Korvus' message to Wilneda completes also one phase of the tale at hand. It is not important. There were a hundred and fifty other messages that might have been accompanied in the same manner, each as interesting to the person who likes the explanation of the interplanetary communication service. But this is not a technical journal. A more complete explanation of the various phases that a message goes through in leaving a city on Venus to go to Terra may be found

in the Communications Technical Review, Volume XXVII, Number 8, pages 411 to 716. Readers more interested in the technical aspects are referred to the article.

But it so happens that Korvus' message was picked out of a hundred-odd messages because of one thing only. At the time that Korvus' message was in transit through the decoupler machines at Venus Equilateral Relay Station, something of a material nature was entering the air lock of the station.

It was an unexpected visit.

Don Channing looked up at the indicator panel in his office and frowned in puzzlement. He punched a buzzer and spoke into the communicator on his desk.

"Find out who that is, will you, Arden?"

"He isn't expected," came back the voice of Arden Westland.

"I know that. But I've been expecting someone ever since John Walters retired last week. You know why."

"You hope to get his job," said the girl in an amused voice. "I hope you do. So that someone else will sit around all day trying to make you retire so that he can have your job!"

"Now look, Arden, 'I've never tried to make Walters retire.'"

"No, but when the word came that he was thinking of it, you began to think about taking over. Don't worry, I don't blame you." There was quite a protracted silence, and then her voice returned. "The visitor is a gentleman by the name of Francis Burbank. He came out in a flitter with a chauffeur and all."

"Big shot, hey?"

"Take it easy. He's coming up the office now."

"I gather that he desires audience with me?" asked Don.

"I think that he is here to lay down the law! You'll have to get out of Walters' office, if his appearance is any guide."

There was some more silence. The communicator was turned

off at the other end, which made Channing fume. He would have preferred to hear the interchange of words between his secretary and the newcomer. Then, instead of having the man announced, the door opened abruptly and the stranger entered. He came to the point immediately.

"You're Don Channing? Acting Director of Interplanetary Communications?"

"I am."

"Then I have some news for you, Dr. Channing. I have been appointed Director by the Interplanetary Communications Commission. You are to resume your position as Electronics Engineer."

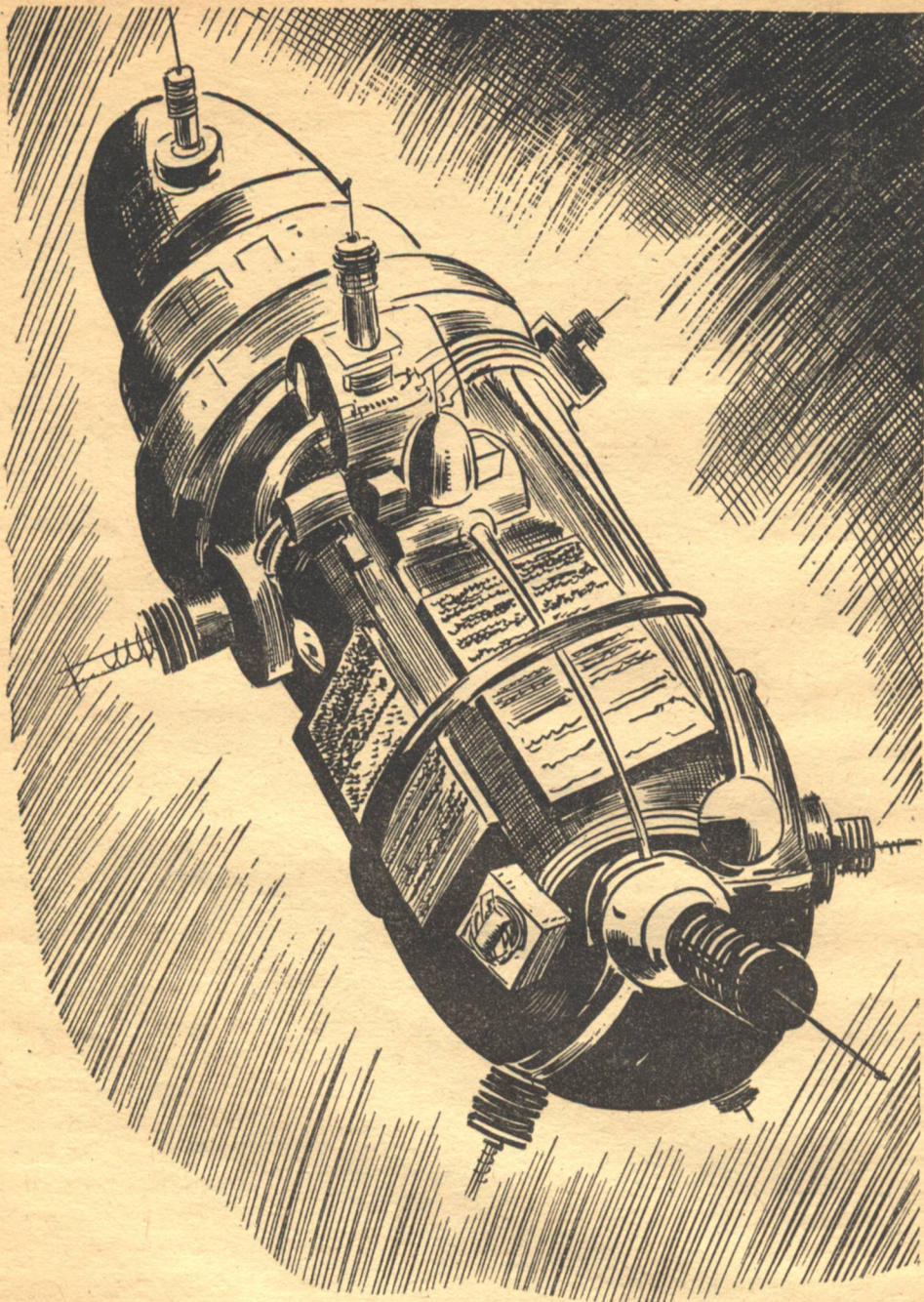
"Oh?" said Channing. His face fell. "I sort of believed that I would be offered that position."

"There was a discussion of that procedure. However, the Commission decided that a man of more commercial training would better fill the position. The Communications Division has been operating at too small a profit. They felt that a man of commercial experience could cut expenses and so on to good effect. You understand their reasoning, of course," said Burbank.

"Not exactly."

"Well, it is like this. They know that a scientist is not usually a man to consider the cost of experimentation. They build thousand-ton cyclotrons to convert a penny's worth of lead into one and one-tenth cents' worth of lead and gold. And they use three hundred dollars' worth of power and a million-dollar machine to do it with.

"They feel that a man with training like that will not know the real meaning of the phrase, 'cutting expenses.' A new broom sweeps clean, Dr. Channing. There must be many places where a man of commercial experience can cut expenses. I, as Director, shall do so."



"I wish you luck," said Channing.

"Then there is no hard feeling?"

"I can't say that. It is probably not your fault. I cannot feel against you, but I do feel sort of let down at the decision of the Commission. I have had experience in this job."

"The Commission may appoint you to follow me. If your work shows a grasp of commercial operations, I shall so recommend."

"Thanks," said Channing

dryly. "May I buy you a drink?"

"I never drink. And I do not believe in it. If it were mine to say, I'd prohibit liquor from the premises. Venus equilateral would be better off without it."

Don Channing snapped the communicator. "Miss Westland, will you come in?"

She entered, puzzlement on her face.

"This is Mr. Burbank. His position places him in control of this office. You will, in the future, report to him directly. The report on the operations, engi-

neering projects, and so on that I was to send in to the Commission this morning will, therefore, be placed in Mr. Burbank's hands as soon as possible."

"Yes, Dr. Channing." Her eyes held a twinkle, but there was concern and sympathy in them, too. "Shall I get them immediately?"

"They are ready?"

"I was about to put them on the tape when you called."

"Then give them to Mr. Burbank." Channing turned to Burbank. "Miss Westland will hand



you the reports I mentioned. They are complete and precise. A perusal of them will put you in grasp of the situation here at Venus Equilateral better than will an all-afternoon conference. I'll have Miss Westland haul my junk out of here. You may consider this as your office, it having been used by Walters. And, in the meantime, I've got to check up on some experiments down on the ninth level." Channing paused, "You'll excuse me?"

"Yes, if Miss Westland knows where to find you."

"She will. I'll inform her of my whereabouts."

"I may want to consult you after I read the reports."

"That will be all right. The autocall can find me anywhere on Venus Equilateral, if I'm not at the place Miss Westland calls."

Don Channing stopped at Arden's desk. "I'm booted," he told her.

"Leaving Venus Equilateral?" she asked with concern.

"No, blond and beautiful, I'm just shunted back to my own office."

"Can't I go with you?" pleaded the girl.

"Nope. You are to stay here and be a nice, good-looking Mata Hari. This bird seems to think that he can run Interplanetary Communications like a bus or a factory. I know the type, and the first thing he'll do is to run Interplanetary Communications into a snarl. Keep me informed of anything complicated, will you?"

"Sure. And where are you going now?"

"I'm going down and get Walt Franks. We're going to inspect the transparency of a new type of glass."

"I didn't know that optical investigations come under your jurisdiction."

"This investigation will consist of a visit to the ninth level."

"Can't you take me along?"

"Not today," he grinned. "Your new boss does not believe in the evils of looking through the bottom of a glass. We must behave with decor. We must forget fun. We are now operating under a man who will commercialize electronics to a fine art."

"Don't get stewed. He may want to know where the electrons are kept."

"I'm not going to drink that much. Walt and I need a discussion," he said. "And in the meantime, haul my spinach out of the office, will you, and take it back to the electronics office. I'll be needing it back there."

"O. K., Don," she said. "I'll see you later."

Channing left to go to the ninth level. He stopped long enough to collect Walt Franks.

Over a tall glass of beer, Channing told Franks of Burbank's visit. And why.

Only one thing stuck in Frank's mind. "Did you say that he might close Joe's?" asked Franks.

"He said that if it were in his power to do so, he would."

"Heaven forbid. Where will we go to be alone?"

"Alone?" snorted Channing. The barroom was half filled with people, being the only drinking establishment for sixty-odd million miles.

"Well, you know what I mean."

"I could smuggle in a few cases of beer," suggested Don.

"Couldn't we smuggle him out?"

"That would be desirable. But I think he is here to stay. Darn it all, why do they have to appoint some confounded political pal to a job like this? I'm telling you, Walt, he must weigh two hundred if he weighs a pound. He holds his stomach on his lap when he sits down."

Walt looked up and down Channing's slender figure. "Well, he won't be holding Westland on his lap if it is filled with stomach."

"I never hold Westland on my lap—"

"No?"

"—during working hours!" finished Channing. He grinned at Franks and ordered another beer. "And how is the Office of Beam Control going to make out under the new regime?"

"I'll answer that after I see how the new regime treats the Office of Beam Control," answered Franks. "I doubt that he can do much to bugger things up in my office. There aren't many cheaper ways to direct a beam, you know."

"Yeah. You're safe."

"But what I can't understand is why they didn't continue you in that job. You've been handling the business ever since last December when Walters got sick. You've been doing all right."

"Doing all right just means that I've been carrying over Walters' methods and ideas. What the Commission wants, apparently, is something new. Ergo the new broom."

"Personally, I like that one about the old shoes being more comfortable," said Franks. "If you say the word, Don, I'll slip him a dose of high voltage. That should fix him."

"I think that the better way would be to work for the bird. Then when he goes, I'll have his recommendation."

"Phooey," snorted Franks. "They'll just appoint another political pal. They've tried it before and they'll try it again. I wonder what precinct he carries."

The telephone rang in the bar, and the bartender, after answering, motioned to Walt Franks. "You're wanted in your office," said the bartender. "And besides," he told Channing, "if I'm going to get lunch for three thousand people, you'd better trot along, too. It's nearly eleven o'clock, you know, and the first batch of five hundred will be coming in."

He wasn't quite accurate as to the figures. The complement of Venus Equilateral was just shy of twenty-seven hundred. They worked in three eight-hour shifts, about nine hundred to a shift. They had their lunch and dinner hours staggered so that at no time was there more than about two hundred people in the big lunchroom. The bar, it may be mentioned, was in a smaller room at one end of the much larger cafeteria.

Venus Equilateral Relay Station was a modern miracle of engineering if you liked to believe the books. Actually, Venus Equilateral was an asteroid that had been shoved into its orbit about the Sun, forming a practical demonstration of the equilateral triangle solution of the Three Moving Bodies. It was a long cylinder, about three miles in length by about a mile in diameter.

There was little of the original asteroid. At the present time, most of the original rock had been discarded to make room for the ever-growing personnel and material that were needed to operate the relay station. What had been an asteroid with machinery was now a huge pile of machinery with people. The insides, formerly of spongy rock, were now neatly cubed off into offices, rooms, hallways, and so on, divided by sheets of steel. The outer surface, once rugged and forbidding, was now almost all shiny steel. The small asteroid, a tiny thing, was far smaller than the present relay station, the station having overflowed the asteroid soon after men found that uninterrupted communication was possible between the worlds.

Now, the man-made asteroid carried twenty-seven hundred people. There were stores, offices, places of recreation, churches, marriages, deaths, and everything but taxes. Judging by its population, it was a small town.

Venus Equilateral rotated

about its axis. On the inner surface of the shell were the homes of the people—not cottages, but apartmental cubicles, one, two, three, six rooms. The rotation made a little more than one Earth G of artificial gravity. Above this outer shell of apartments, the offices began. Offices, recreation centers, and so on. Up in the central portion where the gravity was nil or near-nil, the automatic machinery was placed. The gyroscopes and the beam finders, the storerooms, the air plants, the hydroponic farms, and all other things that needed little or no gravity for well-being.

This was the Venus Equilateral Relay Station, sixty degrees ahead of the planet Venus, on Venus' orbit. Often closer to Terra than Venus, the relay station offered a perfect place to relay messages through whenever Mars or Terra were on the other side of the Sun. It was seldom idle, for it was seldom that both Mars and Terra were in such position that direct communication between the three planets was possible.

This was the center of Interplanetary Communications. This was the main office. It was the heart of the system's communication line, and as such, it was well manned. Orders for everything emanated from Venus Equilateral. It was a delicate proposition, Venus Equilateral was, and hence the present-on-all-occasions official capacities and office staff.

This was the organization that Don Channing hoped to direct. A closed corporation with one purpose in mind, interplanetary communication!

Channing wondered if the summons for Walt Franks was an official one. Returning to the electronics office, Don punched the communicator and asked: "Is Walt in there?"

Arden's voice came back: "No, but Burbank is in Franks' office. Wanna listen?"

"Eavesdropper! Using the communicator?"

"Sure."

"Better shut it off," warned Don. Burbank isn't foolish, you know, and there are pilot lights and warning flags on those things to tell if someone has the key open. I wouldn't want to see you fired for listening-in."

"All right, but it was getting interesting."

"If I'm betting on the right horse," said Channing, "this will be interesting for all before it is finished!"

Seven days went by in monotonous procession. Seven days in a world of constant climate. One week marked only by the changing of work shifts and the clocks that marked off the eight-hour periods. Seven days unmarred by rain or cold or heat. Seven days of uninterrupted sunshine that flickered in and out of the sealed viewports with eye-searing brilliance, coming and going as the station rotated.

But in the front offices, things were not as serene. No monotony to become irksome. Not that monotony ever set in seriously in the engineering department, but that sacred sanctum of all-things - that - didn't - behave - as-they-should found that even their usual turmoil was worse. There was nothing that a person could set his finger on directly. It was more of a quiet, undercover nature. On Monday Burbank sent around a communique removing the option of free messages for the personnel. On Tuesday he remanded the years-long custom of permitting the supply ships to carry, free, packages from friends at home. On Wednesday, Francis Burbank decided that there should be a curfew on the one and only beer emporium. That was made after he found that curtailing all sorts of alcoholics might easily lead to a more moral problem; there being little enough to do with one's spare time. On Thursday, he set up a stiff-necked staff of

censors for the moving picture house. On Friday, he put a tax on cigarettes and candy. On Saturday, he installed time clocks in all the laboratories and professional offices, where previous to his coming, men had come for work a half hour late and worked an hour overtime at night.

On Sunday, he ran into trouble!

Don Channing stormed into the Director's office with a scowl on his face.

"Look," he said, "for years and years we have felt that any man, woman, or child that was willing to come out here was worth all the freedom and consideration that we could give them. What about this damned tax on cigarettes? And candy? And who told you to stop our folks from telling their folks that they are still in good health? And why stop them from sending packages of candy, cake, mementoes, clothing, soap, mosquito dope, liquor, or anything else? Why shut off our beer half the day? Did you ever think that a curfew is something that can be applied only when time is one and the same for all? On Venus Equilateral, Mr. Burbank, six o'clock in the evening is two hours after dinner for one group, two hours after going to work for the second group, and mid-sleep for the third. Then this matter of cutting all love scenes, drinking, female vampires, banditry, bedroom items, murders, and sweater girls out of the movies? We are a selected group and well prepared to take care of our morality. Any man or woman going offside would be heaved out quick. Why, after years of personal freedom, do we find ourselves under the authority of a veritable dictatorship?"

Francis Burbank was not touched. "I'll trouble you to keep to your own laboratory," he told Channing. "Perhaps your own laxity in matters of this sort is the reason why the Commission preferred someone bet-

ter prepared. You speak of many things. There will be more to come. I'll answer some of your questions. Why should we permit our profits to be eaten up by people sending messages, cost-free, to their acquaintances all over the minor planets? Why should valuable space for valuable supplies be taken up with personal favors between friends? And if the personnel wants to smoke and drink, let them pay for the privilege! It will help to pay for the high price of shipping the useless items out from the nearest planet—as well as saving of precious storage space!"

"But you're breeding ill will among the employees," objected Channing.

"Any that prefer to do so may leave!" snapped Burbank.

"You may find it difficult to hire people to spend their lives in a place that offers no sight of a sky or a breath of fresh air. The people here may go home to their own planets to find that the smell of fresh, spring air is more desirable than a climate that never varies from the personal optimum. I wonder, occasionally, if it might not be possible to instigate some sort of cold snap or a rainy season just for the purpose of bringing to the members of Venus Equilateral some of the surprises that are to be found in Chicago or New York. Hell, even Canalopolis has an occasional rain-storm!"

"Return to your laboratory," said Burbank coldly. "And let me run the station. Why should we spend useless money to pamper people? I don't care if Canalopolis does have an occasional storm, we are not on Mars, we are in Venus Equilateral. You tend to your end of the business and I'll do as I deem fitting for the station!"

Channing mentally threw up his hands and literally stalked out of the office. Here was a close-knit organization being

shot full of holes by a screwball. He stamped down to the ninth level and beat upon the closed door of Joe's. The door remained closed.

Channing beat with his knuckles until they bled. Finally a door popped open down the hallway fifty yards and a man looked out. His head popped in again, and within thirty seconds the door to Joe's opened and admitted Channing.

Joe slapped the door shut behind Channing quickly.

"Whatinhell are you operating, Joe—a speakeasy?"

"The next time you want in," Joe informed him, knock on 902 twice, 914 once, and then here four times. We'll let you in. And now, don't say anything too loud." Joe put a finger to his lips and winked broadly. "Even the walls listen," he said in a stage whisper.

He led Channing into the room and put on the light. There was a flurry of people who tried to hide their glasses under the table. "Never mind," called Joe. "It's only Dr. Channing."

The room relaxed.

"I want something stiff," Channing told Joe. "I've just gone three rounds with His Nibs and came out cold."

Some people within earshot asked about it. Channing explained what had transpired. The people seemed satisfied that Channing had done his best for them. The room relaxed into routine.

The signal knock came on the door and was opened to admit Walt Franks and Arden Westland. Franks looked as though he had been given a stiff workout in a cement mixer.

"Scotch," said Arden. "And a glass of brew for the lady."

"What happened to him?"

"He's been trying to keep to Burbank's latest suggestions."

"You've been working too hard," Channing chided him gently. "This is the wrong time to mention it, I suppose, but did that beam slippage have any-

thing to do with your condition—or was it vice versa?"

"You know that I haven't anything to do with the beam controls personally," said Franks. He straightened up and faced Channing defiantly.

"Don't get mad. What was it?"

"Mastermind, up there, called me in to see if there were some manner or means of tightening the beam. I told him, sure, we could hold the beam to practically nothing. He asked me why we didn't hold the beam to a parallel and save the dispersed power. He claimed that we could reduce power by two to one if more of it came into the station instead of being smeared all over the firmament. I, foolishly, agreed with him. He's right. You could. But only if everything is immobilized. I've been trying to work out some means of controlling the beam magnetically so that it would compensate for the normal variations due to magnetic influences. So far I've failed."

"It can't be done. I know, because I worked on the problem for three years with some of the best brains in the system. To date, it is impossible."

A click attracted their attention. It was the pneumatic tube. A cylinder dropped out of the tube, and Joe opened it and handed the enclosed paper to Franks.

He read:

Walt: I'm sending this to you at Joe's because I know that is where you are and I think that you should get this real quick. Helen S.

Walt smiled wearily and said: "A good secretary is a thing of beauty. A thing of beauty is admired and is a joy forever. Helen is both. She is a jewel."

"Yeah, we know. What does the letter say?"

"It is another communique from our doting boss. He is removing from my control the odd three hundred men I've got

working on Beam Control. He is to assume the responsibility for them himself. I'm practically out of a job!"

"Make that two Scotches," Channing told Joe.

"Make it three," chimed in Arden. "I've got to work for him, too!"

"Is that so bad?" asked Channing. "All you've got to do is to listen carefully and do as you're told. We have to answer to the bird, too."

"Yeah," said Arden, "but you fellows don't have to listen to a dopey guy ask foolish questions all day. It's driving me silly."

"What I'd like to know," murmured Franks, "is what is the idea of pulling me off the job? Nuts, I've been on Beam Control for years. I've got the finest crew of men anywhere. They can actually foresee a shift and compensate for it, I think. I picked 'em myself and I've been proud of my outfit. Now," he said brokenly, "I've got no outfit. In fact, I have darned little crew left at all. Only my dozen lab members. I'll have to go back to swinging a meter myself before this is over."

It was quite a comedown. From the master of over three hundred highly paid, highly prized, intelligent technicians, Walt Franks was now the superintendent of one dozen laboratory technicians. It was a definite cut in his status with Communications.

Channing finished his drink and, seeing that Franks' attention was elsewhere, he told Arden: "Thanks for taking care of him, but don't use all your sympathy on him. I feel that I'm going to need your shoulder to cry on before long."

"Any time you want a soft shoulder," said Arden generously, "let me know. I'll come a-running."

Channing went out. He roamed nervously all the rest of the day. He visited the bar several times, but the general air of the place depressed him. From

a place of recreation, laughter, and pleasantries, Joe's place had changed to a room for reminiscences and remorse, a place to drown one's troubles—or poison them—or to preserve them in alcohol.

He went to see the local moving picture, a piece advertised as being one of the best mystery thrillers since DeMille. He found that all of the interesting parts were cut out and that the only thing that remained was a rather disjointed portrayal of a portly detective finding meaningless clues and ultimately the criminal. There was a suggestion at the end, that the detective and the criminal had fought it out, but whether it was with pistols, field pieces, knives, cream puffs, or words was left up to the imagination. It was also to be assumed that he and the heroine, who went into a partial blackout every time she sat down, finally got acquainted enough to hold hands after the picture.

Channing stormed out of the theater after seeing the above and finding that the only cartoon had been barred because it showed an innocuous cow without benefit of shorts.

He troubled Joe for a bottle of the best and took to his apartment in disappointment. By eight o'clock in the evening, Don Channing was asleep with all of his clothing on. The bed rolled and refused to stay on an even keel, but Channing found a necktie and tied himself securely in the bed and died off in a beautiful, boiled cloud.

He awoke to the tune of a beautiful hangover. He gulped seven glasses of water and staggered to the shower. Fifteen minutes of iced needles, and come coffee brought him part way back to his own, cheerful self. He headed down the hall toward the elevator.

He found a note in his office directing him to appear at a con-

ference in Burbank's office. Groaning in anguish, Don went to the Director's office expecting the worst.

It was bad. In fact, it was enough to drive everyone in the conference to drink. Burbank asked opinions on everything, and then tore the opinions apart with little regard to their validity. He expressed his own opinion many times, which was a disgusted sense of the personnel's inability to do anything of real value.

"Certainly," he stormed, "I

know you are operating. But have there been any new developments coming out of your laboratory, Mr. Channing?"

Someone was about to tell Burbank that Channing had a doctor's degree, but Don shook his head.

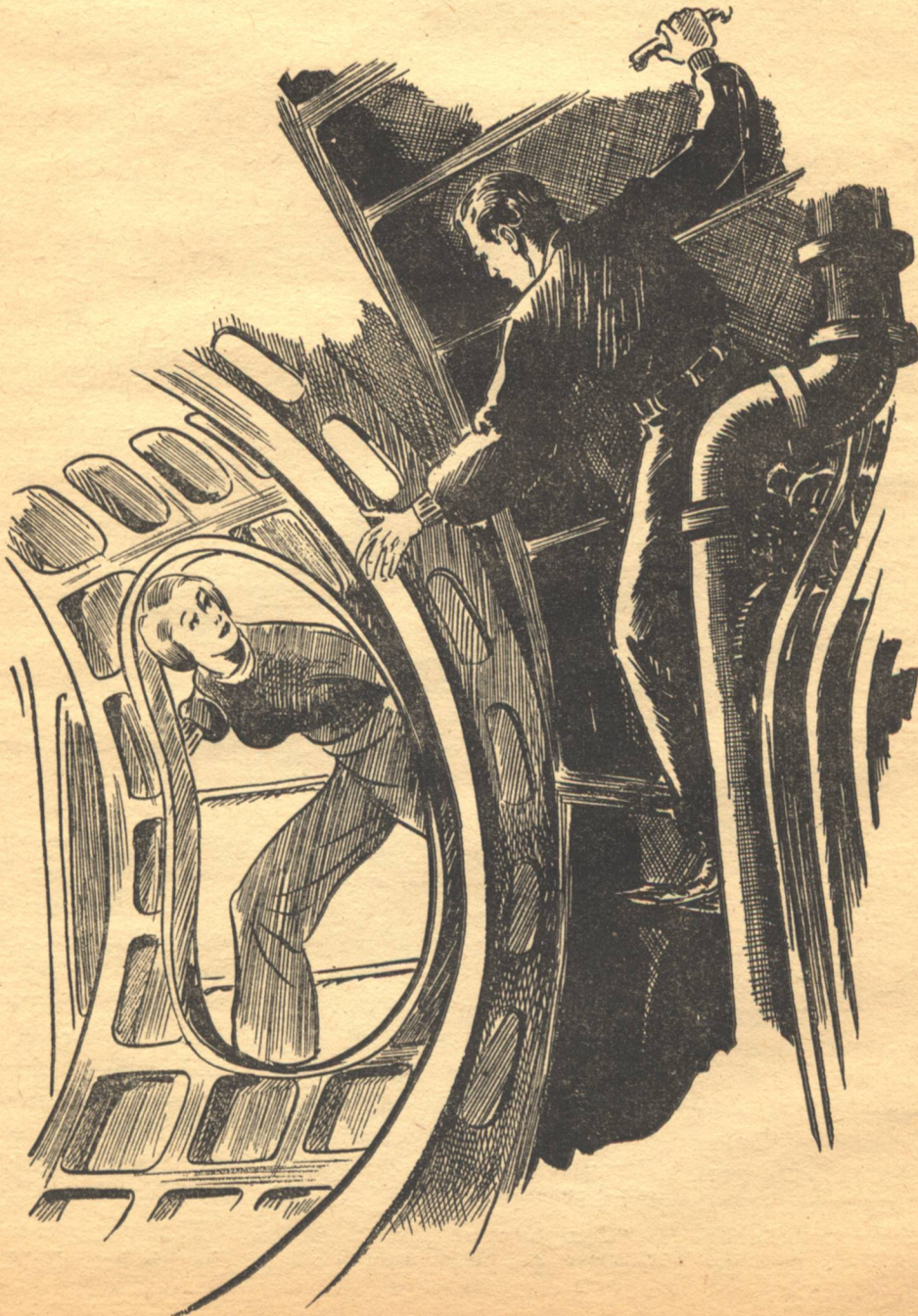
"We've been working on a lot of small items," said Channing. "I cannot say whether there has been any one big thing that we could point to. As we make developments, we put them into service. Added together, they make quite an honest effort."

"What, for instance?" stormed Burbank.

"The last one was the coupler machine improvement that permitted better than a thousand words per minute."

"Up to that time the best wordage was something like eight hundred words," said Burbank. "I think that you have been resting too long on your laurels. Unless you can bring me something big enough to advertise, I shall have to take measures."

"Now you, Mr. Warren," con-



tinued Burbank. "You are the man who is supposed to be superintendent of maintenance. May I ask why the outer hull is not painted?"

"Because it would be a waste of paint," said Warren. "Figure out the acreage of a surface of a cylinder three miles long and a mile in diameter. It is almost eleven square miles! Eleven square miles to paint from scaffolding hung from the outside itself."

"Use bos'n's chairs," snapped Burbank.

"A bos'n's chair would be worthless," Warren informed Burbank. "You must remember that to anyone trying to operate on the outer hull, the outer hull is a ceiling and directly overhead."

"Another thing," said Warren, "you paint that hull and you'll run this station by yourself. Why d'ye think we have it shiny?"

"If we paint the hull," persisted Burbank, "it will be more presentable than that nondescript steel color."

"That steel color is as shiny as we could make it," growled Warren. "We want to get rid of as much radiated heat as we can. You slap a coat of any kind of paint on that hull and you'll have plenty of heat in here."

"Ah, that sounds interesting. We'll save heating costs—"

"You idiot," snapped Warren. "You fool. Sure we'll have heat in here. We'll save some heating costs. But do you realize that we'd have no opportunity to control it? We're on a safe margin now. We radiate just a little more than we receive. We make up the rest by artificial heating. But there have been occasions when it became necessary to dissipate a lot of energy in here for one reason or another, and then we've had to shut off the fires. What would happen if we couldn't cool the damned coffee can? We'd roast the first time that we got a new employee with

a body temperature a half degree above normal!"

"You're being openly rebellious," Burbank warned him.

"So I am. And if you persist in your attempt to make this place presentable, you'll find me and my gang outright mutinous! Good day, sir!"

He stormed out of the office and slammed the door.

"Take a note, Miss Westland. Interplanetary Communications Commission, Terra. Gentlemen: Michael Warren, superintendent of maintenance at Venus Equilateral, has proven to be unresponsive to certain suggestions as to the appearance and/or operation of Venus Equilateral. It is my request that he be replaced immediately. Signed, Francis Burbank, Director." He paused to see what effect that message had upon the faces of the men around the table. "Send that by special delivery!"

Johnny Billings opened his mouth to say something, but shut it with a snap. Westland looked up at Burbank, but she said nothing. Arden gave Channing a sly smile, and Channing smiled back. There were grins about the table, too, for everyone recognized the boner. Burbank had just sent a letter from the interworld communications relay station by special delivery *mail*. It would not get to Terra for better than two weeks; a use of the station's facilities would have the message in the hands of the Commission within the hour.

"That will be all, gentlemen." Burbank smiled smugly. "Our next conference will be next Monday morning!"

"Mr. Channing," chortled the pleasant voice of Arden Westland. "Now that the trifling influence of the boss versus secretary taboo is off, will you have the pleasure of buying me a drink?"

"Can you repeat that word for word and explain it?" grinned Don.

"A man isn't supposed to make eyes at his secretary. A gal ain't supposed to seduce her boss. Now that you are no longer Acting Director, and I no longer your stenog, how about some sociability?"

"I never thought that I'd be propositioned by a typewriter jockey," said Channing, "but I'll do it. What time is it? Do we do it openly, or must we sneak over to the apartment and snaffle a snort on the sly?"

"We snaffle. That is, if you trust me in your apartment."

"I'm scared to death," Channing informed her. "But if I should fail to defend my honor, we must remember that it is no true failure if I try and fail!"

"That sounds like a nice alibi," said Arden with a smile. "Or a come-on. I don't know which. Or, Mr. Channing, am I being told that my advances might not be welcome?"

"We shall see," Channing said. "We'll have to make a careful study of the matter. I cannot make any statements without first making a thorough investigation under all sorts of conditions. Here we are. You will precede me through the door, please."

"Why?" asked Arden.

"So that you cannot back out at the last possible moment. Once I get you inside, I'll think about keeping you there!"

"As long as you have some illegal fluid, I'll stay." She tried to leer at Don but failed because she had had all too little experience in leering. Bring it on!"

"Here's to the good old days," toasted Don as the drinks were raised.

"Nope. Here's to the future," proposed Arden. "Those good old days—all they were was old. If you were back in them, you'd still have to have the pleasure of meeting Burbank."

"Grrrr," growled Channing. "That name is never mentioned in this household."

"You haven't a pix of the old

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bird turned to the wall, have you?" asked Arden.

"I tossed it out."

"We'll drink to that." They drained glasses. "And we'll have another!"

"I need another," said Channing. "Can you imagine that buzzard asking me to invent something big in seven days?"

"Sure. By the same reasoning that he uses to send a letter from Equilateral Station instead of just slipping it in on the Terra beam. Faulty."

"Phony."

The door opened abruptly and Walt Franks entered. "D'ja hear the latest?" he asked breathlessly.

"No," said Channing. He was reaching for another glass automatically. He poured, and Walt watched the amber fluid creep up the glass, led by a sheet of white foam.

"Then look!" Walt handed Channing an official envelope. It was a regular notice to the effect that there had been eleven failures of service through Venus Equilateral.

"Eleven! What makes?"

"Mastermind."

"What's he done?"

"Remember the removal of my jurisdiction over the beam control operators? Well, in the last ten days, Burbank has installed some new features to cut expenses. I think that he hopes to lay off a couple of hundred men."

"What's he doing, do you know?"

"He's shortening the dispersion. He intends to cut the power by slamming more of the widespread beam into the receptor. The tighter beam makes aiming more difficult, you know, because at seventy million miles, every time little Joey on Mars swings his toy horseshoe magnet on the end of his string, the beam wobbles. And at seventy million miles, how much wobbling does it take to send a narrow beam clear off the target?"

"The normal dispersion of the

beam from Venus is over a thousand miles wide. It gyrates and wobbles through most of that arc. That is why we picked that particular dispersion. If we could have pointed the thing like an arrow, we'd have kept the dispersion down."

"Right. And he's tightened the beam to less than a hundred miles dispersion. Now, every time that a sunspot gets hit amidships with a lady sunspot, the beam goes off on a tangent. We've lost the beam eleven times in a week. That's more times than I've lost it in three years!"

"O. K., said Channing. "So what? Mastermind is responsible. We'll sit tight and wait for developments. In any display of abilities, we can spike Mr. Burbank. Have another drink?"

"Got any more? If you're out, I've got a couple of cases cached underneath the bed in my apartment."

"I've plenty," said Channing. "And I'll need plenty. I have exactly twenty-two hours left in which to produce something comparable to the telephone, the electric light, the airplane, or the expanding Universe! Phooey. Pour me another, Arden."

A knock at the door; a feminine voice interrupted simultaneously. "May I come in?"

It was Walt's secretary. She looked worried. In one hand she waved another letter.

"Another communique?" asked Channing.

"Worse. Notice that for the last three hours, there have been less than twelve percent of messages relayed!"

"Five minutes' operation out of an hour," said Channing. "Where's that from?"

"Came out on the Terra beam. It's marked number seventeen, so I guess that sixteen other tries have been made."

"What has Mastermind tried this time?" stormed Channing. He tore out of the room and

headed for the Director's office on a dead run. On the way, he hit his shoulder on the door, caromed off the opposite wall, righted himself, and was gone in a flurry of flying feet. Three heads popped out of doors to see who was making the noise.

Channing skidded into Burbank's office on his heels. "What gives?" he snapped. "D'ye realize that we've lost the beam? What have you been doing?"

"It is a minor difficulty," said Burbank calmly. "We will iron it out presently."

"Presently! Our charter doesn't permit interruptions of service of this magnitude. I ask again: What are you doing?"

"You, as electronics engineer, have no right to question me. I repeat, we shall iron out the difficulty presently."

Channing snorted and tore out of Burbank's office. He headed for the Office of Beam Control, turned the corner on one foot, and slammed the door in roughly.

"Chuck!" he yelled. "Chuck Thomas! Where are you?"

No answer. Channing left the beam office and headed for the master control panels, out near the air lock end of Venus Equilateral. He found Thomas stewing over a complicated piece of apparatus.

"Chuck, for the love of Michael, what in the devil is going on?"

"Thought you knew," answered Thomas. "Burbank had the crew install photoelectric mosaic banks. Instead of having a crew of beam-control operators, he intends to use the photomosaics to keep Venus, Terra, and Mars on the beam."

"Great sniveling Scott. They tried that in the last century and tossed it out three days later. Where's the crew now?"

"Packing for home. They've been laid off!"

"Get 'em back! Put 'em to work. Turn off those darned photomosaics and use the man-



ual again. We've lost every beam we ever had."

A sarcastic voice came in at this point. "For what reason do you interfere with my improvements?" sneered the voice. "Could it be that you are accepting graft from the employees to keep them on the job by preventing the installation of superior equipment?"

Channing turned on his toe and let Burbank have one. It was a neat job, coming up at the right time and connecting sweetly. Burbank went over on his head.

"Get going," Channing snapped at Thomas.

Charles Thomas was not a small man himself, but after considering Channing's one's ninety, he decided to comply. He left.

Channing shook Burbank's shoulder. He slapped the man's face. Eyes opened; accusing eyes, rendered mute by a very sore jaw, tongue, and throat.

"Now listen," snapped Channing. "Listen to every word! Mosaic directors are useless. Have you any reason why? It is because of the lag. At planetary distances, light takes an appreciable time to reach. Your beam wobbles. Your planet swerves out of line because of intervening factors; varying magnetic fields, even the bending of light due to gravitational fields will make the beam microscopically. But, Burbank, a microscopic discrepancy is all that is needed to bust things wide open. You've got to have experienced men to operate the beam controls. Men who can think. Men who can, from experience, reason that this fluctuation will not last, but will swing back in a few seconds, or that

this type of swerving will increase in magnitude for a half-hour, maintain the status, and then return, pass through zero and find the same level on the minus side.

"Since light and centimeter waves are not exactly alike in performance, a field that will swerve one may not affect the other. Ergo your photomosaic is useless. The photoelectric mosaic is a brilliant gadget for keeping a plane in a spotlight or for aiming a sixteen-inch gun, but it is worthless for anything over a couple of million miles.

"So I've called the men back to their stations. And don't try anything foolish again without consulting the men who are paid to think!"

Channing got up and left. As he strode down the stairs to the apartment level, he met many of the men who had been laid off. None of them said a word, but all of them wore bright, knowing smiles.

Monday morning! Burbank was himself again. The rebuff given him by Don Channing had worn off and he was sparkling with ideas. He speared Franks

with the glitter in his eye and said: "If our beams are always on the center, why is it necessary to use multiplex-diversity?"

Franks smiled. "You're mistaken," he told Burbank. "They're not always on the button. They vary. Therefore we use diversity transmission so that if one beam fails momentarily, one of the other beams will bring the signal in. It is analogous to tying five or six ropes onto a hoisted stone. If one breaks, you have the others."

"You have them running all the time, then?"

"Certainly. At several minutes of time-lag in transmission, to try and establish a beam failure of a few seconds' duration is utter foolishness."

"And you disperse the beam to a thousand miles wide to keep the beam centered at any variation?" Burbank shot at Channing.

"Not for any variation. Make that any *normal* gyration and I'll buy it."

"Then why don't we disperse the beam to two or three thousand miles and do away with diversity transmission?" asked Burbank triumphantly.

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"Ever heard of fading?" asked Channing with a grin. "Your signal comes and goes. Not gyration, it just gets weaker. It fails for want of something to eat, I guess, and takes off after a wandering cosmic ray. At any rate, there are many times per minute that one beam will be right on the nose and yet so weak that our strippers cannot clean it enough to make it usable. Then the diversity system comes in handy. Our coupling detectors automatically select the proper signal channel. It takes the one that is the strongest and subdues the rest within itself."

"Complicated?"

"It was done in the heyday of radio—1935 or so. Your two channels come in to a common detector. Automatic volume control voltage comes from the single detector and is applied to all channels. This voltage is proper for the strongest channel, but is too high for the ones receiving the weaker signal, blocking them by rendering them insensitive. When the strong channel fades and the weak channel rises, the detector follows down until the two signal channels are equal and then it rises with the stronger channel."

"I see," said Burbank. "Has anything been done about fading?"

"It is like the weather," according to Mark Twain," smiled Channing. "'Everybody talks about it, but nobody does anything about it.' About all we've learned is that we can cuss it out and it doesn't cuss back."

"I think it should be tried," said Burbank.

"If you'll pardon me, it has been tried. The first installation at Venus Equilateral was made that way. It didn't work, though we used more power than all of our diversity transmitter together. Sorry."

"Have you anything to report?" Burbank asked Channing.

"Nothing. I've been more than busy investigating the trou-

ble we've had in keeping the beams centered."

Burbank said nothing. He was stopped. He hoped that the secret of his failure was not generally known, but he knew at the same time that when three hundred men are aware of something interesting, some of them will see to it that all others involved will surely know. He looked at the faces of the men around the table and saw suppressed mirth in every one of them. Burbank writhed in inward anger. He was a good poker player. He didn't show it at all.

He then went on to other problems. He ironed some out, others he shelved for the time being. Burbank was a good businessman, give him credit. But like so many other businessmen, Burbank had the firm conviction that if he had the time to spare and at the same time was free of the worries and paper work of his position, he could step into the laboratory and show the engineers how to make things hum. He was infuriated every time he saw one of the engineering staff sitting with hands behind head, lost in a gazy, unreal land of deep thought. Though he knew better, he was often tempted to raise hell because the man was obviously loafing.

But give him credit. He could handle business angles to perfection. In spite of his tangle over the beam control, he had rebounded excellently and had ironed out all of the complaints that had poured in. Ironed it out to the satisfaction of the injured party as well as the Interplanetary Communications Commission, who were interested in anything that cost money.

He dismissed the conference and went to thinking. And he assumed the same pose that infuriated him in other men under him; hands behind head, feet upon desk.

The moving picture theater was dark. The hero reached longing arms to the heroine, and

there was a sort of magnetic attraction. They approached one another. But the spark misfired. It was blacked out with a nice slice of utter blackness that came from the screen and spread its lightlessness all over the theater. In the ensuing darkness, there were several osculations that were more personal and more satisfying than the censored clinch. The lights flashed on and several male heads moved back hastily. Female lips smiled happily. Some of them parted in speech.

One of them said: "Why, Mr. Channing!"

"Shut up, Arden," snapped the man. "People will think that I've been kissing you."

"If someone else was taking advantage of the situation," she said, "you got gypped. I thought I was kissing you and I cooked with gas!"

"Did you ever try that before?" asked Channing interestedly.

"Why?" she asked.

"I liked it. I merely wondered, if you'd worked it on other men, what there was about you that kept you single."

"They all died after the first application," she said. "They couldn't take it."

"Let me outta here! I get the implication. I am the first bird that hasn't died, hey?" He yawned luxuriously.

"Company or the hour?" asked Arden.

"Can't be either," he said. "Come on, let's break a bottle of beer open. I'm dry!"

"I've got a slight headache," she told him. "From what, I can't imagine."

"I haven't a headache, but I'm sort of logy."

"What have you been doing?" asked Arden. "Haven't seen you for a couple of days."

"Nothing worth mentioning. Had an idea a couple of days ago and went to work on it."

"Haven't been working overtime or missing breakfast?"

"Nope."

"Then I don't see why you should be ill. I can explain my headache away by attributing it to eyestrain. Since Billyboy came here, and censored the movies to the bone, the darned things flicker like anything. But eyestrain doesn't create an autointoxication. So, my fine fellow, what have you been drinking?"

"Nothing that I haven't been drinking since I first took to my second bottlehood some years ago."

"You wouldn't be suffering from a hangover from that hangover you had a couple of weeks ago?"

"Nope. I swore off. Never again will I try to drink a whole quart of Two Moons in one evening. It got me."

"It had you for a couple of days," laughed Arden. "All to itself."

Don Channing said nothing. He recalled, all too vividly, the rolling of the tummy that ensued after that session with the only fighter that hadn't yet been beaten: Old John Barleycorn.

"How are you coming on with Burbank?" asked Arden. "I haven't heard a rave for—well, ever since Monday morning's conference. Three days without a nasty dig at Our Boss. That's a record."

"Give the devil his due. He's been more than busy placating irate citizens. That last debacle with the beam control gave him a real Moscow winter. His reforms came to a stop whilst he retrenched. But he's been doing an excellent job of squirming out from under. Of course, it has been helped by the fact that even though the service was rotten for a few hours, the customers couldn't rush out to some other agency to get communications with the other planets."

"Sort of: 'Take us, as lousy as we are?'"

"That's it."

Channing opened the door to his apartment and Arden went

in. Channing followed, and then stopped cold.

"Great Jeepers!" he said in an awed tone. "If I didn't know—"

"Why, Don! What's so startling?"

"Have you noticed?" he asked. "It smells like the inside of a chicken coop in here!"

Arden sniffed. "It does sort of remind me of something that died and couldn't get out of its skin." Arden smiled. "I'll hold my breath. Any sacrifice for a drink."

"That isn't the point. This is purified air. It should be as sweet as a baby's breath."

"Some baby," whistled Arden. "What's she been drinking?"

"It wasn't cow juice. Nor yet lake filler. What I've been trying to put over is that the air doesn't seem to have been changed in here for nine weeks."

Channing went to the ventilator and lit a match. The flame bent over, flickered, and went out.

"Air intake is O. K.," he said. "Maybe it is I. Bring on that bottle, Channing; don't keep the lady waiting."

He yawned again, deeply and jaw-stretchingly. Arden yawned too, and the thought of both of them stretching their jaws to the breaking-off point made both of them laugh foolishly.

"Arden, I'm going to break one bottle of beer with you, after which I'm going to take you home, kiss you goodnight, and toss you into your own apartment. Then I'm coming back here and I'm going to hit the hay!"

Arden took a long, deep breath. "I'll buy that," she said. "And tonight, it wouldn't take much persuasion to induce me to snooze right here in this chair!"

"Oh fine," cheered Don. "That would fix me up swell with the neighbors. I'm not going to get shotgunned into anything like that!"

"Don't be silly," said Arden.

"From the look in your eye," said Channing, "I'd say that you

were just about to do that very thing. I was merely trying to dissolve any ideas that you might have."

"Don't bother," she said pettishly. "I haven't any ideas. I'm as free as you are, and I intend to stay that way!"

Channing stood up. "The next thing we know, we'll be fighting," he observed. "Stand up, Arden. Shake."

Arden stood up, shook herself, and then looked at Channing with a strange light in her eyes. "I feel sort of dizzy," she admitted. "And everything irritates me."

She passed a hand over her eyes wearily. Then, with a visible effort, she straightened. She seemed to throw off her momentary ill feeling instantly. She smiled at Channing and was her normal self in less than a minute.

"What is it?" she asked. "Do you feel funny, too?"

"I do!" he said. "I don't want that beer. I want to snooze."

"When Channing would prefer snoozing to boozing, he is sick," she said. "Come on, fellow, take me home."

Slowly they walked down the long hallway. They said nothing. Arm in arm they went, and when they reached Arden's door, their goodnight kiss lacked enthusiasm. "See you in the morning," said Don.

Arden looked at him. "That mug was a little flat. We'll try it again—tomorrow or next week."

Don Channing's night sleep was broken by dreams. He was warm. His dreams depicted him in a warm, airless chamber, and he was forced to breathe that same stale air again and again. He awoke in a hot sweat, weak and feeling—well, lousy!

He dressed carelessly. He shaved hit-or-miss. His morning coffee tasted flat and sour. He left the apartment in a bad mood, and bumped into Arden at the corner of the hall.

"Hello," she said. "I feel rot-

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ten. But you have improved. Or is that passionate breathing just a lack of fresh air?"

"Hell! That's it!" he said. He snapped up his wrist watch, which was a chronograph, equipped with a stop-watch hand. He looked about, and finding a man sitting on a bench, apparently taking it easy while waiting for someone, Channing clicked the sweep hand into gear. He started to count the man's respiration.

"What gives?" asked Arden. "What's 'It'? Why are you so excited? Did I say something?"

"You did," said Channing after fifteen seconds. "That bird's respiration is better than fifty! This whole place is filled to the gills with carbon dioxide. Come on, Arden, let's get going!"

Channing led the girl by several yards by the time that they were within sight of the elevator. He waited for her, and then sent the car upward at a full throttle. Minutes passed, and they could feel that stomach-rising sensation that comes when gravity is lessened. Arden clasped her hands over her middle and giggled. She squirmed and giggled.

"You've been up to the axis before," said Channing. "Take long, deep breaths."

The car came to a stop with a slowing effect. A normal braking stop would have catapulted them against the ceiling. "Come on," he grinned at her, "here's where we make time!"

Channing looked up the little flight of stairs that led to the innermost level. He winked at Arden and jumped. He passed up through the opening easily. "Jump," he commanded. "Don't use the stairs!"

Arden jumped. She sailed upward, and as she passed through the opening, Channing caught her by one arm and stopped her flight. "At that speed you'd go right on across," he said.

She looked up, and there about two hundred feet overhead she

could see the opposite wall.

Channing snapped on the lights. They were in a room two hundred feet in diameter and three hundred feet long. "We're at the center of the station," Channing informed her. "Beyond that bulkhead is the air lock. On the other side of the other bulkhead, we have the air plants, the storage spaces, and several cubic inches of machinery."

"Inches?" asked Arden. Then she saw that he was fooling.

"Come on," he said. He took her by the hand and with a kick he propelled himself along on a long, curving course to the opposite side of the inner cylinder. He gained the opposite bulkhead as well.

"Now, that's what I call traveling," said Arden. "But my tummy goes *whoosh, whoosh*, every time we cross the center."

Channing operated a heavy door. They went in through rooms full of machinery and into rooms stacked to the center with boxes; stacked from the wall to the center and then packed with springs. Near the axis of the cylinder, things weighed so little that packing was necessary to keep them from bouncing around.

"I feel giddy," said Arden.

"High in oxygen," said he. "The CO<sub>2</sub> drops to the bottom, being heavier. Then, too, the air is thinner up here because centrifugal force swings the whole out to the rim. Out there we are so used to 'down' that here, a half mile above—or to the center, rather—we have trouble in saying, technically, what we mean. Watch!"

He left Arden standing and walked rapidly around the inside of the cylinder. Soon he was standing on the steel plates directly above her head. She looked up, and shook her head.

"I know why," she called, "but it still makes me dizzy. Come down from up there. Or I'll be sick."

Channing made a neat dive

from his position above her head. He did it merely by jumping upward from his place toward her place, apparently hanging head down from the ceiling. He turned a neat flip-flop in the air and landed easily beside her. Immediately, for both of them, things became right-side-up again.

Channing opened the door to the room marked: "Air Plant." He stepped in, snapped on the lights, and gasped in amazement. The room was empty! Completely empty! Absolutely, and irrevocably vacant. Oh, there was some dirt on the floor and some trash in the corners, and a trail of scratches on the floor to show that the life-giving air plant had been removed, hunk by hunk, out through another door at the far end of the room.

"Whoa, Tillie!" screamed Don. "We've been stabbed! Arden, get on the -type and have . . . no, wait a minute until we find out a few more things about this!"

They made record time back to the office level. They found Burbank in his office, leaning back, and talking to someone on the phone.

Channing tried to interrupt, but Burbank removed his nose from the telephone long enough to snarl, "Can't you see I'm busy? Have you no manners or respect?"

Channing, fuming inside, swore inwardly. He sat down with a show of being calm and folded his hands over his abdomen like the famed statue of Buddha. Arden looked at him, and for all of the trouble they were in, she couldn't help giggling. Channing, tall, lanky, and yet strong, looked as little as possible like the popular, pudgy figure of the Sitting Buddha.

A minute passed.

Burbank hung up the phone.

"Where does Venus Equilateral get its air from?" snapped Burbank.

"That's what I want—"

"Answer me, please. I'm worried."

"So am I. Something—"

"Tell me first, from what source does Venus Equilateral get its fresh air?"

"From the air plant. And that is—"

"There must be more than one," said Burbank thoughtfully.

"There's only one."

"There *must* be more than one. We couldn't live if there weren't," said the Director.

"Wishing won't make it so. There is only one."

"I tell you, there must be another. Why, I went into the one up at the axis yesterday and found that instead of a bunch of machinery, running smoothly, purifying air, and sending it out to the various parts of the station, all there was was a veritable jungle of weeds. Those weeds, Mr. Channing, looked as though they must have been put in there years ago. Now, where did the air-purifying machinery go?"

Channing listened to the latter half of Burbank's speech with his chin at half-mast. He looked as though a feather would knock him clear across the office.

"I had some workmen clear the weeds out. I intend to replace the air machinery as soon as I can get some new material sent from Terra."

Channing managed to blink. It was an effort. "You had workmen toss the weeds out—" he repeated dully. "The weeds—"

There was silence for a minute. Burbank studied the man in the chair as though Channing were a piece of statuary. Channing was just as motionless. "Channing, man, what ails you—" began Burbank. The sound of Burbank's voice aroused Channing from his shocked condition.

Channing leaped to his feet. He landed on his heels, spun, and snapped at Arden: "Get on the -type. Have 'em slap as many oxy-drums on the fastest ship

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they've got! Get 'em here at full throttle. Tell 'em to load up the pilot and crew with gravanol and not to spare the horsepower! Scram!"

Arden gasped. She fled from the office.

"Burbank, what did you think an air plant was?" snapped Channing.

"Why, isn't it some sort of purifying machinery?" asked the wondering Director.

"What better purifying machine is there than a plot of grass?" shouted Channing. "Weeds, grass, flowers, trees, alfalfa, wheat, or anything that grows and uses chlorophyll. We breathe oxygen, exhale CO<sub>2</sub>. Plants inhale CO<sub>2</sub> and exude oxygen. An air plant means just that. It is a specialized type of Martian sawgrass that is more efficient than anything else in the system for inhaling dead air and revitalizing it. And you've tossed the weeds out!" Channing snorted in anger. "We've spent years getting that plant so that it will grow just right. It got so good that the CO<sub>2</sub> detectors weren't even needed. The balance was so adjusted that they haven't even been turned for three or four years. They were just another source of unnecessary expense. Why, save for a monthly inspection, that room isn't even opened, so efficient is the Martian sawgrass. We, Burbank, are losing oxygen!"

The Director grew white. "I didn't know," he said.

"Well, you know now. Get on your horse and do something. At least, Burbank, stay out of my way while I do something."

"You have a free hand," said Burbank. His voice sounded beaten.

Channing left the office of the Director and headed for the chem lab. "How much potassium chlorate, nitrate, sulphate, and other oxygen-bearing compounds have you?" he asked. "That includes mercuric oxide, spare wa-

ter, or anything else that will give us oxygen if broken down?"

There was a ten-minute wait until the members of the chem lab took a hurried inventory.

"Good," said Channing. "Start breaking it down. Collect all the oxygen you can in containers. This is the business! It has priority! Anything, no matter how valuable, must be scrapped if it can facilitate the gathering of oxygen. God knows, there isn't by half enough—not even a tenth. But try, anyway."

Channing headed out of the chemistry laboratory and into the electronics lab. "Jimmy," he shouted. "Get a couple of stone jars and get an electrolysis outfit running. Fling the hydrogen out of a convenient outlet into space and collect the oxygen. Water, I mean. Use tap water, right out of the faucet."

"Yeah, but—"

"Jimmy, if we don't breathe, what chance have we to go on drinking? I'll tell you when to stop."

"O. K., Doc," said Jimmy.

"And look. As soon as you get that running, set up a CO<sub>2</sub> indicator and let me know the percentage at the end of each hour! Get me?"

"I take it that something has happened to the air plant?"

"It isn't functioning," said Channing shortly. He left the puzzled Jimmy and headed for the beam-control room. Jimmy continued to wonder about the air plant. How in the devil could an air plant cease functioning unless it were—*dead*! Jimmy stopped wondering and began to operate on his electrolysis set-up furiously.

Channing found the men in the beam-control room worried and ill at ease. The fine co-ordination that made them expert in their line was ebbing. The nervous work, that made it necessary to run the men in ten-minute shifts with a half hour of rest in between, demanded perfect motor control, excellent perception, and a fine power of reasoning.

The barely perceptible lack of oxygen at this high level was taking its toll already.

"Look, fellows, we're in a mess. Until further notice, take five-minute shifts. We've got about thirty hours to go. If the going gets tough, drop it to three-minute shifts. But, fellows, keep those beams centered until you drop!"

"We'll keep 'em going if we have to call our wives up here to run 'em for us," said one man. "What's up?"

"Air plant's sour. Losing oxy. Got a shipload coming out from Terra, be here in thirty hours. But upon you fellows will rest the responsibility of keeping us in touch with the rest of the system. If you fail, we could call for help until hell freezes us all in—and no one would hear us!"

"We'll keep 'em rolling," said a little fellow that had to sit on a tall stool to get even with the controls.

Channing looked out of the big plastiglass dome that covered the entire end of the Venus Equilateral Station. "Here messages go in and out," he mused. "The other end brings us things that take our breath away."

Channing was referring to the big air lock at the other end of the station, three miles away, right through the center.

At the center of the dome, there was a sighting 'scope. It kept Polaris on a marked circle, keeping the station exactly even with the Terrestrial North. About the periphery of the dome, looking out across space, the beam control operators were sitting, each with a hundred-foot parabolic reflector below his position, outside the dome, and under the rim of the transparent bowl. These reflectors shot the interworld signals across space in tight beams, and the men, half the time anticipating the vagaries of space-warp, kept them centered on the proper, shining speck in that field of stars.

Above his head, the stars twinkled. Puny man, setting his will

against the monstrous void. Puny man, dependent upon atmosphere. "Nature abhors a vacuum," once said Torrecelli. What braggadocio! If Nature abhorred a vacuum, why did she make so much of it?

Arden Westland entered the apartment without knocking. "I'd give my right arm up to here for a cigarette," she said, marking above the elbow with the edge of her other hand.

"Na-hah," said Channing. "Can't burn oxygen."

"I know. I'm tired, I'm cold, and I'm ill. Anything you can do for a lady?"

"Not as much as I'd like to do," said Channing. "I can't help much. We've got most of the place stopped off with the airtight doors. We've been electrolyzing water, baking  $KC_{10_3}$  and everything else we can get oxy out of. I've a crew of men trying to absorb the  $CO_2$ . Jimmy Dickson is bringing me hourly reports on the  $CO_2$  content and we are losing. Slowly, Arden, but we are losing. Of course, I've known all along that we couldn't support the station on the meager supplies we have on hand. But we'll win in the end. Our microcosmic world is getting a shot in the arm in a few hours that will reset the balance."

"I don't see why we didn't prepare for this emergency," said Arden.

"This station is well balanced. There are enough people here and enough space to make a little world of our own. We can establish a balance that is pretty darned close to perfect. The imperfections are taken care of by influxes of supplies from the system. Until Burbank upset the balance, we could go on forever, utilizing natural purification of air and water. We grow a few vegetables and have some meat critters to give milk and steak. The energy to operate Venus Equilateral is supplied with the photoelectric collectors—sun

power, if you please. Why should we burden ourselves with a lot of cubic feet of supplies that would take up room necessary to maintain our balance? We are not in bad shape. We'll live, though we'll all be a bunch of tired, irritable people who yawn in one another's faces."

"And after it is over?"

"We'll establish the balance. Then we'll settle down again. We can take up where we left off."

"Not quite. Venus Equilateral has been seared by fire. We'll be tougher and less tolerant of outsiders. If we were a closed corporation before, we'll be tighter than a vacuum-packed coffee can afterwards. And the first bird that cracks us will get hissed at."

Three superliners hove into sight at the end of thirty-one hours. They circled the station, signaling by helio. They approached the air lock end of the station and made contact. Their bulk tipped the station slightly, tipped it and rotated it by gyroscopic reaction. The air lock was opened and space-suited figures swarmed over the mile-wide end of the station. A stream of big oxygen tanks were brought into the air lock, admitted, and taken to the last bulwark of huddled people on the fourth level.

From one of the ships there came a horde of men carrying huge square trays of dirt and green, growing sawgrass.

For six hours, Venus Equilateral was the scene of wild, furious activity. The dead air was blown out of bad areas, and the hissing of oxygen tanks was heard in every room. Gradually the people left the fourth level and returned to their rightful places. The station rang with laughter once more, and business, stopped short for want of breath, took a deep lungful of fresh air and went back to work.

The superliners left. But not without taking a souvenir. Francis Burbank went with them.

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His removal notice was on the first ship, and Don Channing's appointment as Director of Interplanetary Communications was on the second.

Happily he entered the Director's office once more. He carried with him all the things that he had removed just a few short weeks before. This time he was coming to stay.

Arden entered the office behind him. "Home again?" she asked.

"Yop," he grinned at her. "Open file B, will you, and break out a container of my favorite beverage?"

"Sure thing," she said.

There came a shout of glee. "Break out four glasses," she was told from behind. It was Walt Franks and Joe.

It was Arden that proposed the toast. "Here's to a closed corporation," she said. They drank on that.

She went over beside Don and took his arm. "You see?" she said, looking up into his eyes. "We aren't the same. Things have changed since Burbank came, and went. Haven't they?"

"They have," laughed Channing. "And now that you are my secretary, it is no longer proper for you to shine up to me like that. People will talk."

"What's he raving about?" asked Joe.

Channing answered. "It is considered bad taste for a secretary to make passes at her boss. Think of his wife and kids."

"You have neither."

"Maybe so. But it is still not proper for a secretary to—"

"You can't call me a secretary

in that tone of voice," snapped Arden. "I quit! I resign! I refuse to be secretary to a man like you!"

Channing looked helplessly at Franks.

Walt looked at Arden, saw what was in her eyes, and told Channing: "See if you can wriggle out of what comes next!" He took Joe by the arm and said: "Joe, now that the ban is off, may I buy you a drink?"

And Joe answered: "It is a beautiful night out, isn't it?"

It is always a beautiful night on Venus Equilateral. The stars shine forever in a sky that holds a molten ball. Sol flares endlessly in an absolutely black, star-studded sky. There is no moon. The air is always soft and warm and unchanging.

And at the moment that Channing was finding out why Arden resigned, a little man of Northern Venus handed a message to the operator in the International Hotel in Detroit, Michigan. It went out on the land wires to Hawaii; to Luna; to Venus Equilateral; to the rotating relay stations that circle Venus five hundred miles above the planet; down through the raging heaviest layer to Northern Landing; and across the Palanortis Country to Yoraleen.

Channing was still investigating his secretary's resignation when Korvus, the Magnificent, read:

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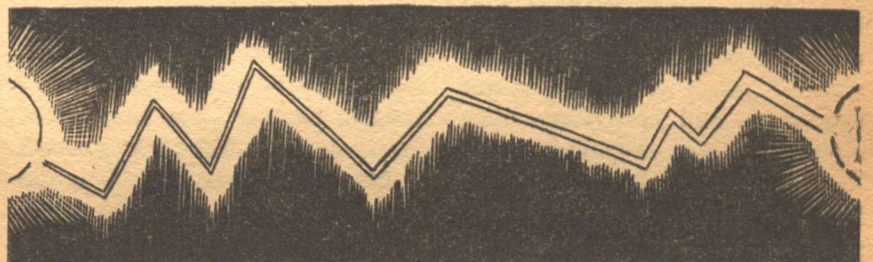
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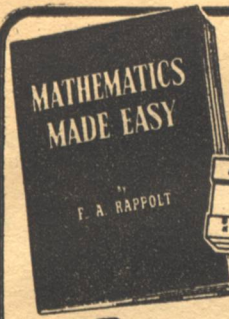
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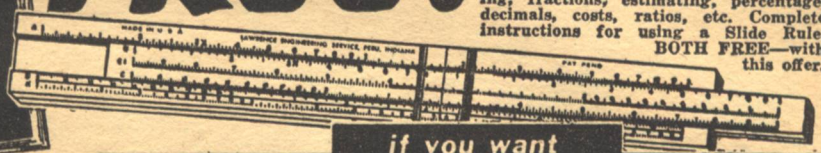






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