

FEBRUARY 1937

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by Robert Willey

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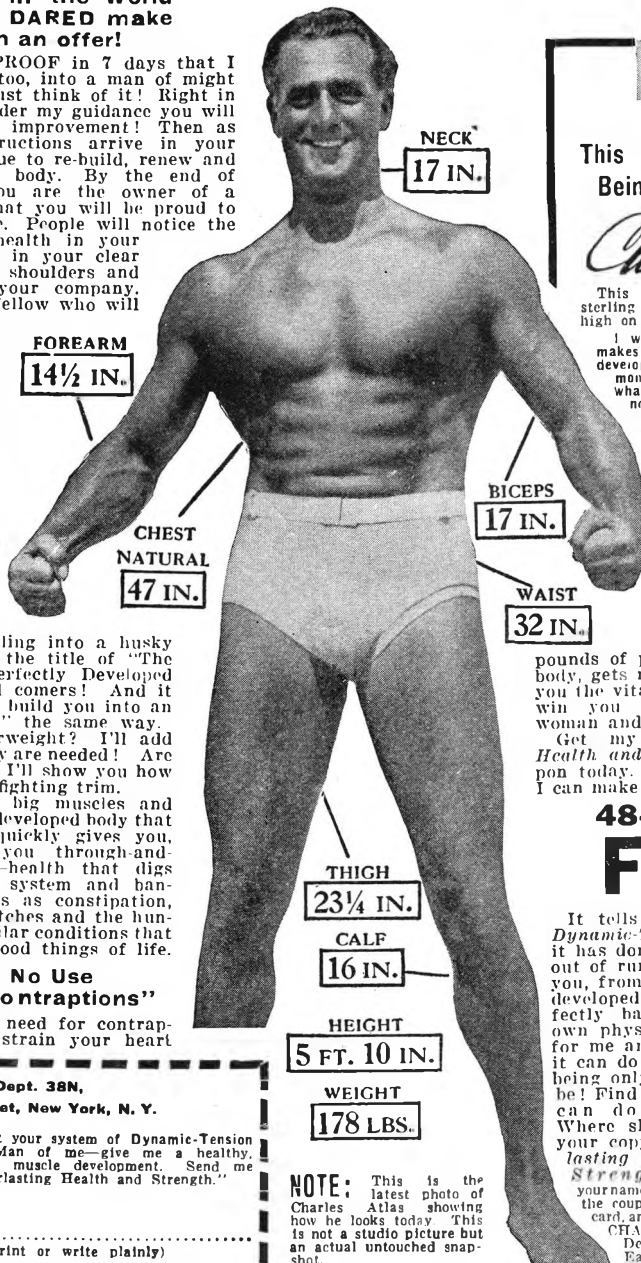
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ASTOUNDING STORIES

FEBRUARY
1937

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20x5	00-20	2.65	1.05
	6.25-17	2.90	1.15
20x5	25-18	2.90	1.15
20x5	25-19	2.95	1.15
20x5	25-20	2.95	1.15
20x5	25-21	3.25	1.15
	6.60-17	3.35	1.15
20x5	50-18	3.35	1.15
20x5	50-19	3.35	1.15
	8.00-17	3.40	1.15
20x6	00-18	3.40	1.15
20x6	00-19	3.40	1.15
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32x6	00-21	3.65	1.25
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Acid In Your Blood Kills Health and Pep Kidneys Often to Blame

There is nothing that can so quickly undermine your health, strength, and energy as an excess of Acid in your blood. Every time you move your hand, take a step, or use even the slightest amount of energy, cells are broken down in the body and create Acids. This process goes on even when you are asleep.

Fortunately, nature has provided an automatic method of getting rid of these excess Acids. To get rid of these Acids nature provides that your blood circulate 200 times an hour through 9 million tiny, delicate tubes, or filters, in your Kidneys. It is the function of the Kidneys to filter out these health-destroying Acids, and to purify the blood so that it can take energy and vitality to every part of your body. But if your Kidneys slow down and do not function properly, and remove approximately 3 pints of Acids, Poisons, and liquids from your blood every 24 hours, then there is a gradual accumulation of these Acids and Wastes, and slowly but surely your system becomes poisoned, making you feel old before your time, run-down, and worn-out.

Causes Many Ills

If poorly functioning Kidneys cause you to suffer from Acidity. Getting Up Nights, Nervousness, Leg Pains, Dizziness, Frequent Headaches, Rheumatic Pains, Swollen Joints, Itches Under Eyes, Backache, Loss of Vitality, or Burning, Itching and Smarting, don't waste time worrying and waiting. The natural thing to do is to help your Kidneys with the doctor's special, guaranteed Kidney diuretic prescription, called Cystex, (pronounced Sis-ter). Cystex works directly on the Kidneys and Bladder, and helps the Kidneys in their function of washing impurities and Acids from the system and in maintaining the purity of the blood. Don't try to overcome Acidity in your blood by taking medicines to offset the Acidity. The only way you can really get rid of the Acidity is by helping your Kidneys to function properly and thus remove the Acid from your system. The Acid is bound to stay there unless the Kidneys function properly.

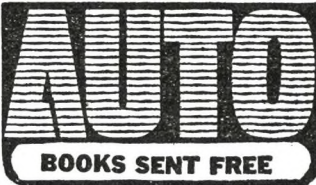


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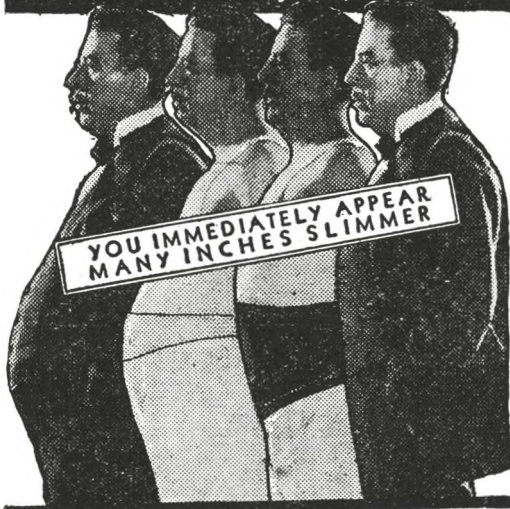
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The SAGA Pelican

by Eric Frank

Petrified, the group stared at the mercy-gas container and its goggle-eyed bearer.

"Put those guns on the floor!" commanded the voice behind the mask.

IT'S hell to be old and marooned, worse to be marooned in solitude. Of course, there had been George Andrews, Bill Dorian, Fergie McOchtra and Captain Beck. He'd buried them all three weeks back, their faces rotted beneath a yard of Ceres' loam.

Bert Pellinore West, erstwhile second navigator of the space freighter *Lady Betty*, sprawled across a rock and

studied his reflection in a pool of water. The shining liquid mirrored a pair of gray eyes set in a muscular, leathery countenance surmounted by a mop of bristly white hair. Not so good. Three-score years and ten were O. K. on Earth, but forty-five years was the span of the spaceways. And he was thirty-nine.

A pebble plopped, dissolved his fea-

of West

Russell



tures with a dozen ripples. He rolled on-
to his back, surveyed the spangled cos-
mic curtain, and pondered.

They had been thirty days out from
Great Plains City, the premier Martian

space port, when Michaelson developed
blue death. Terrestrial medicos claimed
this affliction was bubonic plague com-
plicated by alien metabolism. Anyway,
Michaelson had got blue swellings in

the armpits. There was no known cure. They'd given him an overdose of dope and incinerated him in the four-o'clock stern combustion chamber.

Next day young Jensen had the fateful lumps and might have concealed them but for the sharp eyes of McOchtra. Jensen swigged a special cup of coffee and passed out. They'd shoved his still-warm form into the six-o'clock stern chamber, and Beck had cursed like a pirate when the rocket expelled a partly charred body and threw the ship two degrees off line of flight.

Solikon, Roberts and Quayle had displayed the fateful symptoms within forty-eight hours. Solikon and Roberts had innocently quaffed what they were given, breathed their last and sped along the *Lady Betty's* fiery wake. Ever suspicious, Quayle had refused to eat or drink. In the end they'd held him down while his lungs absorbed a liter of mercy gas. Then his sparks had pursued the others' into the maw of night.

Fifty thousand miles Sunward off Ceres five more had paid the penalty for touching Quayle. The *Lady Betty* had landed on the surface of the little sphere; the fated five had been forced outside at the point of the ray gun. Lecko, senior member of the survivors, had tossed out a supply of food, iodine, quinine, one ray gun, two compressed-air guns and a box of poisoned darts. With a flash and a roar, the half-staffed *Lady Betty* had plunged into the sky and made for the Jovian system.

Yes, he'd buried the others three weeks ago. Strange that he, Bert Pelinore West, better known as "Pelican," had survived. So far as he knew he was the only man to produce buboes and recover. It must be the berries.

He sat up, plunged a hand into a pocket, brought forth a score of plump, red berries plucked from an adjacent bush. They were tart, but refreshing,

and packed his stomach comfortably. White teeth bit into the crumbly substance of a crimson fruit as he continued to consider the problem of his own survival.

Queer how he'd hung on, just him. And Alfred, the ship's mascot. Darn it, where was the animated sausage? He got to his feet and stood up on the rock, chest heaving in the thin air.

"Al-fred!" he bawled through cupped hands.

"Honk!" came the response from dark recesses of a near-by gully.

"Come here."

"Come here," mimicked the voice raspily.

"You come here, you overgrown fish bait!"

"Fish bait," echoed the unseen speaker.

"Damn!" Pelican West sat down with obvious exasperation.

"Damn!" repeated the voice dutifully.

Something moved in the shadows of the gully's depths, a small stream of pebbles cascaded down one side, the concealed speaker produced a veritable torrent of oaths.

"Hurry up," shouted Pelican impatiently.

Over the edge appeared a pair of brilliant optics set in a flat, horny head. The head moved forward followed by ten feet of sinuous body thicker than a man's arm. Weak rays from the distant Sun revealed a magnificent specimen of a Callistrian domestic *ulahulah*, or reticulated python.

Rapidly, the serpent glided toward the man. There was something jaunty about its carriage, which, coupled with its large head and liquid, intelligent eyes, deprived it of the repulsiveness of its Terrestrial prototypes.

"We've got to get a move on, Alfred," said Pelican West. "We've a thousand miles to tramp to get around this one-

cent world, and if we don't stumble across anything civilized we're gone coons."

He gained his feet, made certain his heat-ray gun rested securely in its holster, hefted his water bottle and haversack, slung an air gun over one shoulder.

"Left, right, left—quick march!"

"Honk!" said Alfred.

IT WAS the thirty-ninth day, Earth time, since the *Lady Betty's* departure. Pelican sat straddle-legged on the apex of a sixty-foot tor, the highest piece of ground he had encountered, and surveyed the scene before him.

Away to the brief, deeply curved horizon stretched a monotonous landscape of dust, rocks and loam, molded into low hummocks and shallow gullies, dotted here and there with tiny shrubs and berry-bearing bushes.

A heavy thump reached his ears, he turned his head, caught a momentary glimpse of something falling, and heard a second thump. He jumped to his feet, stared without avail, commenced running in the direction from which the mysterious sounds had come.

Assisted by weak gravity, handicapped by thin atmosphere, he bounded along in giant strides, his chest straining mightily. A gun whined in a distant ravine; Pelican saw its thin, pale-golden beam angle to the sky. Two figures—a woman and a uniformed man—sprang from the depression, raced across his line of progress a quarter of a mile ahead. Four more figures sprouted from the same spot and rushed after the fugitives.

"Pirates!" cried Pelican, flinging himself headlong into a hollow. He rolled in the dust, gained hands and knees, crept up the slope cautiously. With his ray gun in his right fist, he raised his head slowly above the rim.

The leading man of the quartet, a bulky individual with a week's growth

upon his face, had ceased to run and was standing with legs braced apart, his weapon extended in a hairy paw, his eyes drawing a line to the escaping couple. A golden heat beam lanced from the gun's muzzle, crossed intervening space in a split second and struck the man in uniform. The poor devil collapsed without a sound, thin spirals of smoke ascending from the back of his skull. The woman shrieked.

Callously, the marksman aimed again. Pelican got the fellow's image dead center in the frame of his Albada sight, squeezed shut the divided handle of his gun. The range was four hundred yards, but he made the bell ring first time, caught his mark in the middle. The pirate hooted like a factory siren, drapped, writhed onto his back and lay with legs kicking frenziedly and his arms flailing.

Two of the remaining trio turned and raced for the gully whence they had come. The third hesitated, bent over his screaming companion, unconsciously lowering his own head into the center of Pelican's Albada. For one second he stood a man, the next he sat a lifeless trunk, with a smoldering cinder on its shoulders.

Running crazily, the woman had described a half circle, bringing her fifty yards to Pelican's right. He called to her and she approached, sobbing hysterically. A roar of rockets came from the concealed gully.

"Down!" shouted Pelican. "Down!" Without more ado he pushed her to the ground and smothered her from feet to head with dust and pebbles. "For heaven's sake, don't move. Whatever happens, don't move."

He glanced around hastily, saw a boulder with a projecting upper edge, ran to it and wriggled into the narrow gap between rock and earth. The space available was scarcely adequate, but he crammed himself in as far as possible,

did his utmost to simulate a rock, and hoped for the best.

RARIFIED AIR shuddered under a barrage of sound waves, as the hidden rockets doubled their output. Something exploded into the sky and carried its hubbub in a sweeping circle around the field of action. The uproar moved to and fro as its source shifted rapidly from point to point, and when it came overhead Pelican opened a wary eye and saw a space liner's lifeboat burning the air at an altitude of five hundred feet. Scowling faces at the keel window were examining the terrain beneath.

Dust bubbled and stank, small pebbles burst with whippish cracks when the flying searchers cast a tentative ray along the tiny valley.

"Keep still," growled Pelican to the recumbent woman. "They're looking for a movement, and if you blink an eyelid you're a corpse."

Methodically, the lifeboat cruised back and forth, covering all ground within a radius of one mile, releasing a ray whenever its outlaw crew thought they could see something to disturb. Eventually it gained height, streaked across the sky and vanished over the horizon.

"Don't move yet," warned Pelican. "You stay put until I tell you."

Ten minutes dragged past before he congratulated himself upon his own caution. With rockets silent, the lifeboat suddenly appeared like a phantom; it dropped from an immense height, turned on its power and drummed four times around the area. If its crew expected to catch their opponents napping, they were foiled. The tiny ship drove upward for the second time and departed with an air of finality.

"You can get up now." Pelican scrambled from his refuge, dusted himself and stretched his arms. His companion came to her feet and stood re-

vealed as a brunette, about twenty-five, not beautiful, yet attractive.

"I'm Eve Kelshaw," she introduced herself.

"Such a pleasure," responded Pelican. "I'm Pelican West. Let's get back to that hill where I've left my worldly belongings. We can talk over there just as well as here."

"But Jim—Jim — Is he dead?" She stared wide-eyed, tears gathering again.

"I think so. I'm sorry, but I'm almost certain he is. Wait here a minute while I go and see." He trudged away, looking back now and then and waving a hand reassuringly.

It was better she hadn't accompanied him, he thought as he examined the body of her late companion. The corpse wore uniform and insignia of an engineer officer in the Earth-Mars passenger service. Below the left epaulet appeared the ship's name *Ongortolla*. Pelican turned the body over and noted the officer's brains had been cremated within the pan.

Both pirates were dead. Pelican searched the clothing of all three cadavers, but found nothing worth retaining except a gun and holster belonging to an outlaw.

He returned to Eve, gave her the spare weapon and holster and they walked back to the tor. Gratefully, she accepted a drink of water, ate two of Pelican's six ship's biscuits and completed her meal with a handful of berries.

"NOW tell me what happened," Pelican encouraged.

"There's little to tell." She shrugged and gazed pensively into the distance. "I was official hostess on board the *Ongortolla*. When we were five days off Great Plains, our ship was pirated by Jason Kemp and his gang of toughs, and——"

"Kemp, eh?" he interrupted.

"Yes. He swept alongside us, clamped on with magnetic anchors, forced the air lock and placed a prize crew aboard. The *Ongortolla* hung in space until Mars had swung clear, then made for the asteroid belt."

"And how does it happen they're chasing you around here?"

"They weren't making for this world; they've got a lair somewhere else—Vesta, I think. Something went wrong with the ship and they made an emergency landing here. Jim Kennedy, the *Ongortolla's* second engineer, took advantage of the confusion, broke loose, grabbed a lifeboat and escaped with me. The boat was only partly fueled. Half a dozen chased us in another boat and you saw what happened when we came down."

"Where's the boat you came in?"

"Still in the gully, I suppose."

"Hey?" Pelican looked startled. "I didn't know there were two boats. Come on, let's have a look at it."

"It's no use; there's no fuel aboard."

"All the same, we'll have a look."

They hastened over the ground and reached the gully. No boat was to be seen. Puzzled, they searched adjacent gullies, but the missing vessel remained missing.

"I can guess what has happened to it," said Pelican. "You say there were six pirates, so two couldn't have left the boats. I killed two. That leaves four. The pair who didn't appear must have been dividing their fuel so they could make off with both boats. The surviving four must have gone two to a boat, launching them simultaneously when we were lying with our faces in the dirt."

"Probably," she conceded.

"That's another dirty trick on us." He grinned to cheer her up. "Which way did you come from the *Ongortolla*?"

AST—2

"That way."

"O. K., we'll go that way. It's just as good as any other in this haven of delight. All roads lead to Rome, or so they say."

They returned to the hillock, gathered their few possessions, divided food, water and weapons. Pelican searched around to make certain nothing had been overlooked and, satisfied, placed a couple of fingers in his mouth and emitted a piercing whistle. Disregarding Eve's questioning glances, he continued to whistle himself red in the face.

"Curse the big, long string of——"

"Oh!" exclaimed Eve. She clutched his arm. "Oh, look! A horrible snake."

"It's only Alfred," he told her. "He's my pet. I'd like you to meet him. He's a Callistrian python, perfectly harmless and quite intelligent. Aren't you Alfred?"

"Honk!" responded Alfred enthusiastically, gliding up and nudging his hand.

"These snakes are just like dogs on Callisto," he assured the timid Eve. "Why, he can do tricks. Watch!"

"I'm looking."

"Now then—A is for Alfred, the luck of the ship."

The girl watched, fascinated, as the serpent curled itself into a script A and writhed through the alphabet while Pelican continued to recite, with obvious pride.

"P's the propulsion that drives you and me; Q is for queer, like the places we see." Obediently, the lissome body formed a P and a Q. "R is for rockets, the cause of our toil; S is for spittle, the engineer's oil."

"I beg your pardon," exclaimed the girl.

"Sorry, ma'am," he apologized awkwardly. "I forgot."

"Fish bait!" sneered Alfred.

II.

GRAY FINGERS of dawn sneaked through purplish skies and heralded the third day's march. Jupiter and his satellites sank slowly in the west; an anæmic Sun thrust its rim above the east horizon. Pelican nudged Eve into wakefulness and handed her a steaming water bottle.

"E-e-eugh!" She yawned widely, and blinked at the bottle. "What's this?"

"Hooligan's coffee."

"How'd you make it?"

"I plunked a dozen berries in the water and brought them to the boil with a dose of heat ray at ten-per-cent intensity."

She sipped, made a wry face and sipped again. Pelican busied himself collecting equipment in readiness for departure. Eve finished her drink and looked around.

"Where's the snake?"

"Gone looking for shrews, probably. There are plenty of them about; you can see their burrows all over the place. Half a dozen in his stomach and Alfred's a he-man for the rest of the day."

Casually, Pelican strapped his holster around his waist, filled the bottle at a pool, and slung the yet unused air gun over one shoulder. Eve came to her feet as Alfred slithered into view. With one last look at their camping place, the trio struck out northeast.

For one hour they trekked steadily across the switchback terrain. Bushes grew more profusely, but still the landscape remained as monotonous as ever, betraying no sign of anything so alien as a rocket ship. They crossed a crest and passed down the farther slope into a valley deeper than any they had encountered. Eve hesitated, then stopped as they reached the bottom. She looked at Pelican anxiously.

"It's queer, but I've had the strangest feelings for the last twenty minutes."

"I've had 'em many a time," Pelican assured her. "It's the thin air."

"No, not that." She stared around vaguely. "I'm sure I'm perfectly sane, yet I've been feeling as if some one has been trying to explain to me things I can't hope to understand."

"A touch of nervous trouble," suggested Pelican.

"Maybe. But it's stronger than ever—and altered somehow since we arrived here."

"How does it feel now?"

"For all the world as if I was blind and deaf and was standing in the center of New York while a patient but defeated guide tried to make me understand what was about me."

"Since you've described it so exactly, I'll admit I've been having the same ideas myself." Pelican looked a little uneasy.

"Let's get out of here quickly. I'm afraid of spooky places like this."

THEY hastened up the opposite slope and crossed another twenty valleys before Eve had recovered confidence enough to discuss the matter.

"That sensation was too strong to be a delusion. It was something supernatural."

"Bosh!" scoffed Pelican. "Things aren't supernatural merely because we can't find an explanation for them."

"Can you imagine any explanation?" she challenged.

"Let's suppose this world harbors a mighty civilization that is all around us, and——"

"Nonsense," Eve interrupted. "Your own five senses tell you that isn't the case."

"Are my five senses sufficient?"

"Well—well——" She looked confused.

"Suppose that life here, if any, and whatever it may be, has evolved only

four senses, three, or all, of which are totally different from ours. And suppose their forms have a construction that doesn't register on our senses, while our forms make little appeal to their senses. Could either of us comprehend each other?"

"Imperfectly, at best," she conceded.

"Could you describe a color to a man blind from birth?"

"No," she admitted.

"Can you explain to a Martian what your nose is for and how it can smell?"

"No. I've tried, and it's hopeless. Has a Martian ever succeeded in explaining to you what it means to poldek?"

"A Martian can't explain it because no Terrestrial has been born with the ability to poldek. All I've been able to gather is that it's a sort of sense that enables them to perceive life, a faculty by which they can tell, with ease, where life is and whether or not anything contains life. But how they do it beats me completely."

"I don't like to think there might be things I can't see hanging around us. It's much more comfortable to——" She broke off in mid-sentence, gasped and said, "Did you see that?"

"What?"

"Something like the wall of an immense building. The light caught it. It was shadowy and unsubstantial and seemed to turn past us as we walked through it."

"You're dream—— Hells bells!" He snatched Eve by one arm, dragged her aside. Together they stared at a wavering, watery vision of a monster wheel, with helical-cut gears, sliding past on their left. It vanished abruptly, leaving a vaguer impression of a multitude of shafts spinning madly at greater heights.

"Like delirium tremens in an auto factory," said Pelican. "Come on, let's put our best foot forward. We're suf-

fering from too little bread and too many berries."

A hillock far higher than its neighbors came into sight on the northeast horizon. Eagerly, they made for the landmark, reaching it within thirty minutes. Squatting upon the crest was a giant boulder with a flat, weathered side bearing an inscription. In deep, clear-cut letters they read:

SANDERSON EXPEDITION JAN. 1998.

"KEEP your hands down," growled a deep voice behind them. Eve started nervously and clutched at Pelican. "I said hands *down*," shouted the voice. "Now then, turn around slowly, drop your guns in front of you, and remember you're the targets."

They complied, turned round, dropped their weapons on the ground and stood with arms held rigidly to their sides. Eve and Pelican found themselves facing a squat, beetle-browed individual with a ray gun in his hand.

"Danka!" exclaimed Eve.

"Correct first time," acknowledged the pirate. He pursed his lips and whistled shrilly. A second outlaw came racing up and stared at the prisoners questioningly. "Here's the little devil who escaped with Kennedy," Danka told him.

"And her bold cavalier," added the other with a sneer.

"What's your name?" demanded Danka, jerking his gun at Pelican.

"Fetch." Pelican stood with arms held stiffly, and ignored Eve's expression of astonishment.

"O. K., Mr. Fitch, we'll settle——"

"Fetch!" corrected Pelican in a loud voice.

"Watch him, Danka," warned the other outlaw, "it's a gag."

"Oh, I can look after this——" His

speech ended in a wild yelp, as a lithe shape flashed through the shrubs behind and whipped his legs from under him. He came down heavily, the gun flying from his hand.

The second pirate made a frantic dive for the weapon as Pelican charged, got his fingers around the split butt, straightened up and half raised the gun. Pelican swung a steel-shod navigator's boot between the fellow's knees and kicked him. The man shrieked like a rabbit in a gin trap, dropped the gun and doubled up. Pelican swung a leg-of-mutton fist from the ground level and landed it on his opponent's nose with a satisfying crunch. Still folded up, the pirate somersaulted backward, his face a bloody mask.

Hoarse bellowing attracted Pelican's attention to Danka. The ruffian lay on his back, his arms pinioned to his sides by three muscular coils of python. With her own ray gun gripped with dangerous tightness, Eve was dancing excitedly around the fallen pirate.

"Call your—snake off!" roared Danka. "I give up."

"I can't," said Pelican quietly.

"But it's constricting. It'll kill him," Eve chattered breathlessly.

"Let it!" He fixed Eve with a cold eye. "I want you to scout around the nearest valleys and see if you can spot their boat. Be careful, there may be a couple of the gang on board."

"But——"

"Do as you are told," he commanded roughly.

"You can't order me——"

"Will you do as you are told?" Pelican stepped close to her and stared stonily. "I know what I'm up to."

Eve paled, muttered something unintelligible, cast a frightened glance at the struggling Danka, and departed. Pelican watched her receding form until it vanished into a gully. He picked up his ray gun.

THE LIFEBOAT rested on a shallow depression half a mile from the hillock. Eve came upon it suddenly and surveyed it from the cover of a bush. Its door stood ajar. Eve decided there was nobody aboard, walked up boldly and entered the boat. She emerged in time to see Pelican advancing over the crest, Alfred gliding at his side.

"Local boy makes good," Pelican observed with grim humor.

"You've murdered them," she accused.

"What of it?" He clambered through the circular doorway into the tiny control room and studied the bank of instruments. "Iodine, twenty gallons; oxygenated ammonia, one eighty-eight gallons at two hundred pounds pressure; air-rejuvenating cylinders one third full, and——"

"You killed them in cold blood," Eve persisted. She stood as far away from him as possible, her back to the cushioned wall, her face filled with revulsion.

Pelican locked the door and took the pilot's seat. "Ever heard of the *Lady Sue*?"

"The name is familiar, but what has that to do with it?"

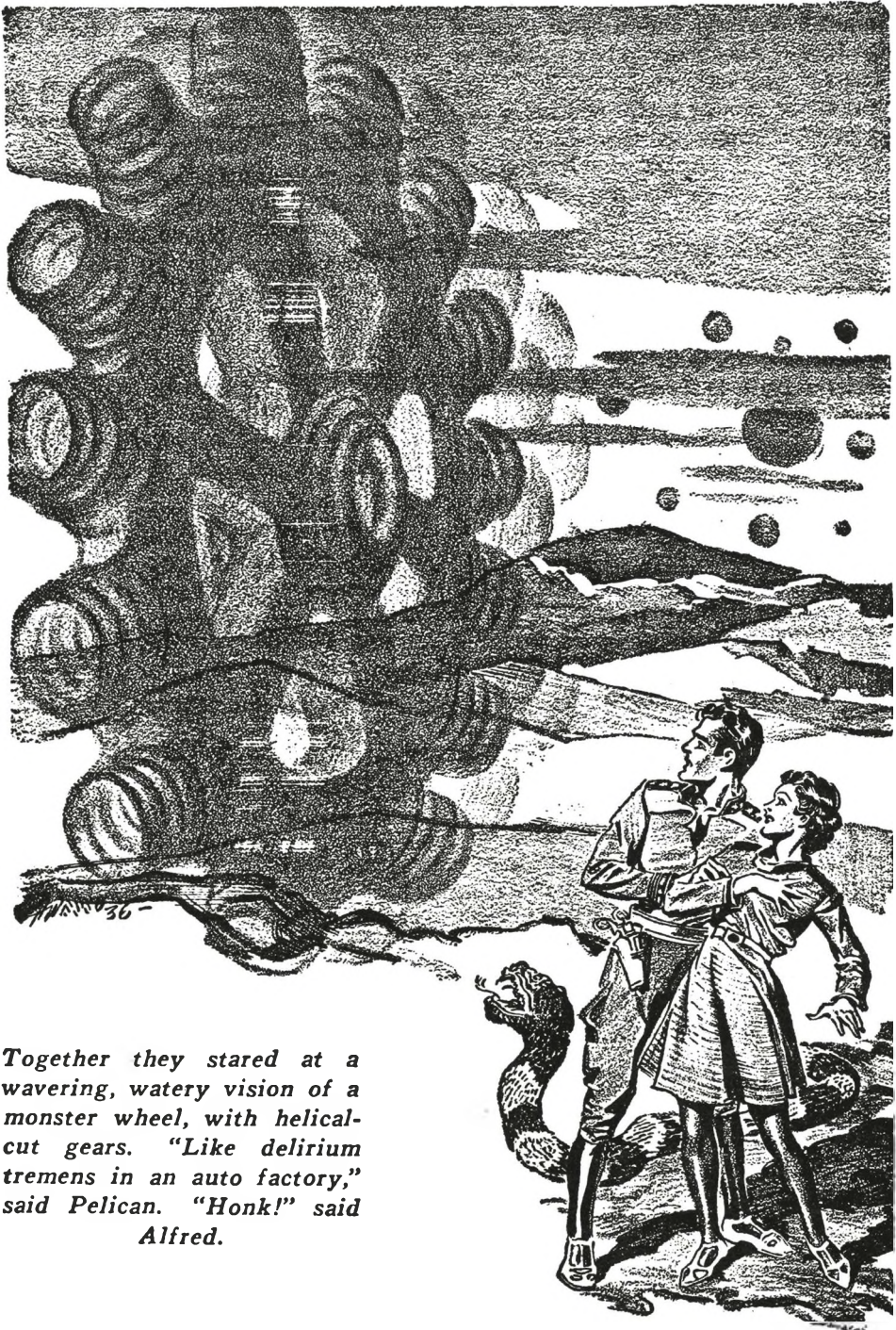
"She was sister ship to my own, the *Lady Betty*," he interrupted, "and her case was the *cause celebre* of 2006. Most of that year Kemp was in Mars, dickering for recruits for his gang and, in his absence, Danka, his deputy, pirated the *Lady Sue*."

"Well?"

"Danka couldn't be bothered with prisoners, at least, not with male ones." Pelican glanced across the cabin. "So he walked the whole twenty-seven of them through the air lock. Their bodies are now merely some of the flotsam and jetsam of the space lanes."

"Oh!" Eve paled and put a hand to her mouth.

"There isn't an employee of the *Lady Line* who wouldn't rip Kemp and his



Together they stared at a wavering, watery vision of a monster wheel, with helical-cut gears. "Like delirium tremens in an auto factory," said Pelican. "Honk!" said Alfred.

entire gang into little shreds and find pleasure in doing it." Pelican swung round in his seat and scowled through the low observation window. "My kid brother was on the *Lady Sue*." He moved the mixing levers and put a finger on the contact button.

"I'm sorry." A soft, cool hand rested momentarily upon his own. "I'm very, very sorry."

He shrugged, pressed the button. The rockets roared to life. Alfred slithered hastily under a rear bunk and gave vent to a hearty, "Damn!"

Bushes to the boat's rear recoiled before the blast as the midget rocket ship doubled the length of its flame gouts, trembled, left ground and curved noisily into the sky. Swiftly, the lifeboat spiraled upward, Pelican controlling it with masterly hand, Eve watching the broadening circle of horizon.

At twenty thousand feet nothing could be seen of the *Ongortolla*. Pelican brought the boat down, leveled it off at one thousand feet and let it hammer steadily into the northeast. A constant succession of ridges slid past as the crinkly surface of Ceres rolled under their stern.

THEY HAD BEEN traveling for one hour, when, suddenly, the mirage flashed out of nothingness. Pelican and Eve were keeping watch ahead and saw a forest of lattice-work masts sprout directly in their path. They were mighty erections, glistening, yet shadowy and vague, like great transparent radio masts betrayed by a coating of moisture.

With a wild swerve, the boat endeavored to avoid the uncanny obstacles, but was too late. It plunged headlong through a tangle of phantasmal girders, with no noise other than bellowing of rockets. The vision blinked out and was gone.

Beads of perspiration stood on Pelican's brow. He righted the boat, brought the compass needle swinging

around, and peered through the observation window.

"Did you see those masts that weren't?"

"I did," Eve admitted. She shifted to his side and stared at the horizon. "There it is—the *Ongortolla*!"

Pelican gazed in the direction indicated and saw a strip of light gleaming along the space liner's side, where it lay jutting above the sky line.

"We'll be there in five minutes. Quick, fill a couple of guns from the boat's supply."

"What are you going to do?" Eve broke the seals of a cardboard box, extracted a score of cobalt-shelled thermo charges, poured them, one by one, into a gun.

"Try and recapture the liner."

"Just the two of us? It's suicide! There are seventeen pirates on her."

"Just the one of us," declared Pelican firmly. "And that's *me*. You're staying in this boat. Nobody can get at you if you keep the door locked. You've got Dank's gun, the air gun and the darts. The air gun will be useful if your supply of thermo charge gives out."

"But——"

"I've carted that air gun from Jerusalem here and never used it yet," continued Pelican, determined to outtalk the objections he knew Eve was waiting to voice. "I'll leave Alfred with you, and if worst comes to the worst, you can always fire the rockets and beat it to somewhere safer."

"Will you listen——" Her words were cut off as the boat hit surface, skidded through dust and dirt and came to rest.

The *Ongortolla* lay five hundred yards away, its immense, cylindrical bulk casting a shadow over intervening ground and darkening the lifeboat's starboard windows. Pelican leaped from his seat, crossed the cabin and unlocked the door.

III.

"LISTEN TO ME," ordered Eve, "I'm going with you."

"You're not," Pelican contradicted. He looked at her. His frown died away; his face softened. "Please don't handicap me by compelling me to look after you as well as myself. Besides, this little boat is my only avenue of escape, and I'm trusting you to look after it."

"O. K." She regarded him with troubled eyes.

Pelican opened the door, jumped to the ground and grinned up at her. Alfred thrust his head past Eve's ankles and weaved in anticipation of the drop.

"Stay back, you!" commanded Pelican.

"Aw, hell!" grumbled Alfred, withdrawing his head and permitting Eve to shut and lock the door.

With a slightly exaggerated air of nonchalance, Pelican strolled toward the *Ongortolla*. Two figures stood by the liner's air lock and waited for him. He was within twenty yards of the ship before one of the watchers spoke.

"Where are Danka and Lane? Who are you?" The questioner was a muscular brute who studied Pelican with obvious surprise. His companion was smaller, shifty-eyed, ratlike. Both men had hands on their guns, but the guns were not in their hands.

"I've come to tell about Danka," responded Pelican evenly. He continued his approach, his manner suggesting casual confidence, his weather eye on the air lock. "Kemp aboard?"

"Yes, Kemp's here," answered the pirate. "What's happened to Danka?"

"Bad news." Pelican wagged his head mournfully and came to a stop beneath the great curve of the liner's side, with the air lock almost overhead. Six feet separated him from the two guards. "So sad! He's still dead, of course—but more so than ever."

"Hey?" The burly bandit reddened, thrust out a heavy jaw and glared. "I don't like your sarcasm, hobo, and—*A-a-argh!*" Pelican's ray struck him in the gullet and burned half his neck away. His head flopped to his left shoulder. The corpse stretched and posed grotesquely before it collapsed.

"B-b-by h-h-heavens!" stuttered the little rat, his face strained and white, his fingers plucking nervously at weapons they failed to draw. With calm deliberation, Pelican burned him between the eyes and watched the body slump across its fellow's.

Holstering his guns, Pelican waved a triumphant salute to the distant lifeboat, climbed the collapsible ladder to the air lock and entered the *Ongortolla*.

There was nobody on the starboard catwalk. Pelican trod the diamond-patterned steel plates cautiously, a gun in his left fist, his eyes flickering before and behind. He reached a bend, stopped, and heard voices mumbling behind the door of the gyroscope room. Gun ready, his right hand about the doorknob, he hesitated a moment, then crept away, placing his feet carefully to soften the clicks of his hobnailed boots.

Nerves taut, Pelican turned a corner into the control-room gangway, and came face to face with a red-headed tough. The outlaw sucked in his breath with surprise, eyed Pelican's gun and raised his hands.

"Click your teeth and you'll never use 'em again," Pelican whispered.

"What d'you want?"

"The prisoners."

"They're locked in the stern cabins."

"O. K., you lead."

With the ray gun's black snout six inches from his spine, the redhead led the way along a central corridor to the stern. He trod heavily and made plenty of noise as they passed the chart room, the gun's muzzle jabbed between his

shoulder blades. He moved ahead with haste.

Lounging indolently against the wall at the end of the corridor was a deep-chested gorilla with low forehead, beady eyes and a jaw like the ram of a battleship. His gun was in his pocket. A sloppily rolled cigarette dangled from his thick lips.

"Hi, Soame," rumbled the guard. "Who's the new guy?" His eyes found the weapon in Pelican's hand, he opened his mouth slowly; the cigarette dropped and splashed sparks upon the floor.

"The keys," said Pelican.

"I ain't got 'em."

"Hm, if I can't search you alive I'll have to search you dead." The gun came up.

"Don't, don't! I've got 'em."

"Pull them out slowly, and be careful that you pull the keys, nothing else."

"What d'you want 'em for? The door ain't locked."

"It's not, hey? Well, turn around and enter. Never mind about playing 'knock-knock.'"

The gorilla licked his lips furtively, turned and pushed the door half open. His hands stretched high above his head, he shuffled forward with unnecessary slowness, Soame following, Pelican in the rear.

THEY PASSED through the doorway. Pelican looked over Soame's shoulder and saw a ship's officer standing against the opposite wall, his eyes glued on the procession.

"Drop that!" The door jerked at Pelican's side, something hard pressed into the small of his back.

With reckless abandon, Pelican said, "Like hell!" rayed Soame and flopped to his face. A beam singed his top hairs as he went down. He rolled over, perceived a tall, sallow outlaw behind the door, ray gun in hand.

The pirate's weapon lowered for a second shot, and Pelican saw his own face reflected in the silvered Albada sight. Flat on his back, he squeezed the butt of his gun, burned the lobe of the pirate's left ear and raised a blister on the paralumin wall.

A twinge of pain distorted the pirate's face. He released his ray and scorched Pelican's neck, as the latter rolled over frantically. Both men fired together again. Their rays touched in mid-air, sparkled brilliantly at point of contact and filled the room with a smell of ozone.

A heavy boot thumped Pelican's head, and a phantasmal aurora wavered before his eyes. He dropped his gun, turned over and struggled to his hands and knees, his brain reeling. The boot landed squarely in his ribs and sent a shaft of agony down his right side; sounds of oaths and blows came to his ears, as if from a great distance. He flattened. The boot missed his side and swept across his back; he twisted, seized a leg and jerked its owner down.

Fighting furiously, the antagonists rolled across the floor. A scowling face came close to his own, and Pelican recognized the gorilla. He gasped as the thug's knee rammed into his stomach, got his two hands about a beefy neck and forced his thumbs into the fellow's windpipe. A sudden twist brought Pelican on top. He lifted his opponent's head and slammed it against the metal floor.

Out one corner of an eye Pelican caught sight of a hazy figure in full charge; he released the gorilla and came to his feet. He blinked, found his eyes refused to focus, stepped back to avoid the onrush and fell headlong over Soame's body. A golden shaft stabbed air where his head had been, a form toppled across his legs, grunted and clambered to its feet.

Pelican came perpendicular, found a leering face framed in a crimson nimbus,

and socked it with all the strength he could command. The face vanished like something plucked through a curtain, and was replaced by a vision of a fat man with one podgy fist describing a wild arc. Pelican kicked him heartily, in the stomach, and the fat man sank slowly, ever so slowly, bellowing, "Oh! oh! oh!"

PELICAN rubbed his watering eyes and looked around. Soame lay dead at his feet; the fat man sat nursing his paunch, while shouting at the top of his voice; the gorilla reposed against a wall, his eyes shut, his nose a ruby mess. Behind the door the uniformed officer struggled with the fourth outlaw, who clung to his weapon and fought madly for a chance to use it. Pelican kicked the pirate's legs from under him. As he went down the officer fisted him between the eyes and snatched his gun. Pelican straightened.

"Thanks," said the officer. "I'm Bill Wakefield, first engineer on this ship."

"Second Navigator West of the *Lady Betty*," Pelican introduced himself. He retrieved his own gun from beside Soame's body, walked to the door and glanced down the passage. "It's a wonder that fat fool's yelling hasn't brought the whole horde down on us."

"They're in the engine, chart and gyroscope rooms, all fairly soundproof places. I'll bet they haven't heard a thing."

"Good!" Pelican eyed Wakefield speculatively. "I thought the prisoners were in this room. Where are they? How did you happen to be in here?"

"The *Ongortolla's* crew and passengers are in the stern cabins, next door along the passage. They've been dragging us in here, one by one. Wanted us to put our signatures and finger prints at the bottom of a ransom note."

"Holding you for ransom! I'd wondered why they had kept you alive, in-

stead of treating you as they did the crew of the *Lady Sue*."

"They didn't want money for us. I understand that Kemp's idea was to exchange us for twenty-five of his gang who are languishing in the jails of Earth and Mars."

"Fat chance he had," Pelican scoffed. "Can you imagine the authorities making a bargain of that description?"

"No," admitted Wakefield. "We'd taken it for granted we were as good as dead."

"Oh! oh! oh!" moaned the fat desperado, arms folded about his middle.

"Shut up!" ordered Pelican, savagely. "I've got a pain as well as you."

"Oh! oh!" came the response.

"Will you shut up or not?" demanded Pelican. He raised his ray gun.

"You can't do that," exclaimed Wakefield, putting out a restraining hand.

"Can't I? You watch!"

The moaning man went white as a sheet, coughed weakly and nursed himself in silence. Pelican lowered his gun, Wakefield watching him askance.

"Sorry—my control isn't what it ought to be," said Pelican. "You'd better go around and free the crowd next door while I keep an eye on these toughs. Hurry up!"

WAKEFIELD frisked the gorilla, found his keys and vanished into the corridor. A minute later the *Ongortolla's* crew and passengers swarmed into the room, their eyes shining with relief. Under Pelican's directions they half stripped the recumbent pirates and bound them hand and foot.

"Ah, Mr. West." Florid-faced Captain Crompton shook Pelican's hand with hearty vim.

"How are you, sir?"

"Not so bad for an old-timer."

"Sorry, I can't tell you the story of my life," said Pelican, his attention on the door, "we've got to capture the re-

mainder of the gang. You're in command now. Any orders?"

"What do you suggest?"

"There are five guns available, three of the pirates' and two of mine. I think that five of us, with a gun each, should conduct the assault, while you unarmed people wedge the door and sit on the prisoners."

"Yes, that's the only method to adopt," agreed Captain Crompton. He passed a hand through iron-gray hair. "Give me a gun and pick three more men."

"You can't go. You're needed."

"I'm going. That's orders!"

"O. K., captain, let the ax fall where it may." Pelican shrugged, picked three likely men and distributed the weapons. In single file, Pelican, Crompton and another crept along the corridor in the direction of the chart room, while the other men made for the engine room. Wakefield had told them that the engine room held five or six outlaws who were repairing cracked combustion chambers and were not likely to be armed.

Four blue-jowled desperadoes sat playing cards in the chart room, when the trio burst through the door. Reaction sent cards, coins and cigarette stubs across the floor. Ray guns yawned in unshaven faces. The players surrendered and marched to stern, where they were bound and dumped with their glowering fellows. Six more pirates arrived from the engine room, arms held stiffly at their sides, features glistening with perspiration, clothes stained with oil and grease. Pelican counted rapidly.

"Fourteen here and two cadavers outside, sixteen in all. There's one missing—Kemp!"

"Two missing," corrected Wakefield, "Kemp and his sidekick Faragher."

"I thought—— But never mind. We'll have to get 'em. Let's try the gyroscope room. Somebody was there when I sneaked aboard."

"You need not bother," came in muffled tones from the doorway.

A girl passenger screamed. Pelican whirled and saw a figure at the door, a gas mask over its face, its fingers upon the pet cock of a long, black cylinder reposing in its arms. Petrified, the group stared at the mercy-gas container and at its goggle-eyed bearer.

"Put those guns on the floor," commanded the voice behind the mask.

"Kemp himself," murmured Pelican.

"I said you were to put——" commenced Kemp. *Phut!* His shoulder jerked and light gleamed on his goggles. A woman's shriek reverberated along the corridor outside. Came a heavy thump, an oath, a gasp and a sound of fierce struggling.

Kemp did not turn his head. Very slowly and deliberately he lowered the gas cylinder to the floor, released his hold upon it and straightened. Fascinated by his uncanny sluggishness, his audience watched without stirring. He raised his left arm like a character in a slow-motion movie, plucked a poisoned dart from his shoulder and held it up before his goggles. Still gripping the dart, he sank to his knees, remained in that position for several seconds, then slumped forward. His eye pieces splintered when his head struck the par-alumin floor.

Eve appeared, air gun in hand, and ran to Pelican's side. Her face was flushed with excitement, her hands trembling.

"I shot him," she gasped. "I shot him."

"You shouldn't have come aboard," Pelican reproved.

"I shot him," Eve repeated. "Faragher tried to stop me, but Alfred got him. They're in the passage. Call the snake off."

"If I can." Pelican was dubious. A flood of reptilian profanity poured along the corridor as he went out.

AFTER twenty-four hours of hard, determined work, the *Ongortolla* was ready for departure. Pelican's inquiries concerning the extra pirate brought forth the fact that the outlaw ship *Cosmozwolf* had arrived shortly after Eve's escape, had placed Kemp and Faragher on the *Ongortolla* and had taken off an injured member of the gang. The *Cosmozwolf* had departed for Asteroid C:137, and was expected to return at any moment.

There was no time to be lost. At Pelican's suggestion, and under Crompton's orders, six berry-bearing bushes were dug up and taken on board. A dozen passengers spent an hour picking berries from surrounding plants, filled a large barrel with the fruit and this, also, was placed in the storeroom.

With a bellow and a terrific blast, that sent air waves racing halfway round the little world, the *Ongortolla* forced its great length forward, lifted and thundered into the sky. Blue atmosphere gave way to purple, and that to the velvety blackness of cosmic space. Onward roared the Earth-Mars liner, millions of miles outside its normal traffic lanes, a freight navigator at its control board, where Crompton had relinquished all rights in favor of Pelican's local knowledge.

Deftly, Pelican slanted the ship until its course made a twenty-degree angle to the Earth plane. Ahead flickered a semitransparent aurora, like an immense tiara set upon the jewel-girt brow of night. Far beneath the *Ongortolla's* nose, describing a mighty arc from starboard to port, lay the Sargasso of space—the asteroid belt.

Directly above the belt the space liner corrected its angle and pointed its snout to the Jovian system. It scrawled a fiery line in the heavens. Through the stern-keel observation port, Wakefield peered down at a great concourse of tiny, half-illuminated

spheres scudding through the void. His powerful binoculars discovered Ceres far below and well to stern; a thin spark was sinking into the lighted edge of the little globe. He reached for the ship's telephone.

"Vessel just landing on Ceres."

"Probably the *Cosmozwolf*," answered Pelican. "Well, they're too late. They're faster than we are, but by the time they've landed, scouted around, taken off and circled Ceres just to make certain, we'll be well on our way. They can catch us if they can see us—but I doubt if they can manage it before we reach the area of Jovian armed patrols."

"*Humph!*" Wakefield replaced his receiver, focused his glasses on Ceres again. The spark had vanished.

THEY HAD been a week on Gany-mede when Pelican was summoned to the Palace of Justice. He went there accompanied by Eve and Alfred. He was admitted to Blenkinsop's office without delay. He left the girl and the snake in the outer room. Blenkinsop, plump and pompous as ever, rested his heavy form in a swivel chair. He sniffed, rubbed one side of his nose with a fat finger, shuffled some papers on his desk and ordered Pelican to sit.

"Ahem, West," he commenced, "it is my painful duty to report to you the finding of the commission of law administration."

"Well?" asked Pelican curtly.

"After most careful and painstaking examination of various written accounts made by yourself and others, the commission find you guilty of usurping the prerogative of the law by administering the death penalty to two wanted criminals, to wit, Herman Danko and Walter Lane."

"I've admitted it."

"This offense is tantamount to fourth-degree murder, and merits a penalty of ten years' hard labor in the Martian

mines." Blenkinsop wagged his eyebrows and cleared his throat. "However, the commission have been so impressed with evidence of extenuating circumstances in your case that they have decided to temper justice with mercy."

"Isn't that nice?" inquired Pelican.

Blenkinsop reddened, scowled and continued in a loud voice. "You are sentenced to be deprived of your certificate as second navigator for a period of two years, and you are prohibited from being employed in any position superior to fourth navigator within the same period."

"That means, in effect, that I am being mulcted of one year's salary and two years' promotion."

"Law and order *must* be upheld, if civilization is to be preserved," snapped Blenkinsop.

"Such as it is."

"I would have you understand that I, personally, am not interested in your degradation." Blenkinsop thumped his fist on his desk and glared. "I am a busy man and have neither time nor desire to bandy words with you. Kindly close the door as you go out."

Pelican went out, closing the door so that Blenkinsop's ink leaped in its pot. Harrison, tall, gray-haired chief of the Lady Line was waiting with Eve.

"What happened?" asked Harrison.

He listened carefully and sympathetically as Pelican told him, then said, "It won't affect your seniority—I'll see to that."

"It will affect my pay," Pelican complained.

"Yes, that's hard lines. Still, you'll get a tidy sum for the salvage of the *Ongortolla*."

"After I've filled in twenty forms and waited five years for them to circulate through twenty equally torpid government departments."


"True, true." Harrison rubbed his chin and looked vaguely troubled. "There are the berries, you know. They've made you look years younger, darkened your hair and put some more weight on you. If they turn out to be a certain cure for blue death, as well as an antidote for space strain, you'll get a tremendous amount of credit."

"Ah, take the cash in hand and waive the rest," quoted Pelican. He glanced at Eve and she looked confused.

Harrison intercepted the glance and said, "Maybe it's not necessary to remind you that the Lady Line pays married employees double the wages of single ones."

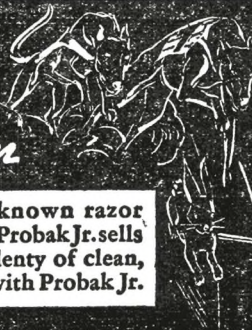
"I'd thought of that already," Pelican admitted. He favored Eve with a bold stare and she blushed furiously.

"You know what sailors are!" put in Alfred with a profound air.



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The REIGN of the



LONG TUSKS

A new conception of early man.

by Stanton A. Coblentz

INTRODUCTION

The following account was discovered years ago among the weather-beaten rocks of a cavern in the Austrian Tirol. Composed in a singular form of picture writing, or hieroglyphics, it covered many square yards of the dark cave surface; and though much of it had been nearly obliterated by the action of time and the elements, still enough was legible to make a corrected narrative—and one sufficient to alter our ideas of prehistoric man.

For it turned out to be the record of a vanished and previously unknown race. The deciphering of the characters—a task in which I have been engaged for the past two decades—was indeed a work of Herculean proportions; but now that I have mastered the inscriptions, I feel rewarded even beyond my expectations.

It is true that the new conceptions of early man, revealed by my researches, will not be easily accepted by orthodox scientists; it is true that it is difficult, even for me, to credit

the fact, here set forth beyond all questions, that man was not always supreme upon the earth; and that, except for an accident, he never would have been supreme, but would have bowed beneath the kingship of one of the so-called "lower animals."

But let me not anticipate by my comments. Let me merely repeat the story, as I translated it from the rock writings of Woo, son of Jaboo, the Red Bear, of the tribe of the Round Hill Dwellers of the North Woods.

THE STORY ON THE CAVE WALL

THIS IS the story whispered into our ears by our fathers, who had it from their fathers, who had it from their fathers' fathers, of a time so long ago that no man can remember. It is the story of how our people were not always free, as to-day,

to hunt the stag and the aurochs, but were the slaves of a much larger and more powerful animal, from which they rarely even dreamed of escaping.

In those far-off days, nothing was as now, when whole mountains of ice creep down from the north, and everything grows white and bitterly cold for many moons each year, and we must fight with the wolf for our prey—and sometimes are ourselves devoured by the howling pack.

Instead, the rivers never turned hard and stopped their flow in the season of short days; but the grass grew thicker and deeper than now in the valleys and marshlands, and the forests grew taller, and the winds were softer and gentler than in the memory of any man still living.

But at that time there were not many men on earth, and those men that did exist were poor and pitiable creatures—somewhat like the hounds that we whip when they do not please us in the chase. But there was one dread monster that they thought of as their chieftain and god.

He was a mighty being, and, when he walked, the earth shook beneath the thunder of his four great legs; and his tremendous curling tusks were things terrible to see; and his great squirming trunk was stronger than the two arms of the strongest man, and could lift a boulder as if it were a pebble; and his eyes were small, very wise and knowing; and his huge thick form was covered with shaggy hair that made him even more horrible to behold than a wild bull or a cave bear.

Of course, it is hard now to believe in the existence of such a creature, who was as tall as a small tree, and was called the Long Tusk or mammoth; but the stories told by our fathers' fathers all say the same thing, which is that there were thousands of these great animals on the earth, and that they thrived most wonderfully, and no one

even dreamed they would not thrive forever. For, beside these enormous beasts, a man was little more than a rabbit.

Now, the Long Tusk, they tell us, was not only a ruler, but a cruel ruler. He would go snorting through the country in great herds, and would tear up the trees and trample down the jungle just for the fun of making a loud noise; and sometimes his long, curling trunk would reach out and seize a man and dash him full length upon the ground; and all the other Long Tusks would trumpet with joy at the deed, just as we might shout to see a hunter bring down a crow with an arrow.

There was no place where our fathers could take refuge from the beasts. If they went up a tree, the Long Tusk would lean against it and shake them down like ripe apples; if they sought safety in caves, the Long Tusk might root them out as we dig out the burrow of a hare. Thus men lived in constant terror of their lives; and since they had not invented any weapons to slay their oppressors, they were not much better off than the frightened does we hunt and kill.

It was easy enough for us to see why the Long Tusk ruled the earth since he was so big and strong that nothing could stop him; and, besides, his trunk was more useful to him than a stout pair of hands. And it is, therefore, not strange that this great brute should have made man his slave.

It is true that man was not of much use to the Long Tusk, who did not need him to build houses, fetch water, or gather food; but our fathers seem to have amused the great beasts, who kept men just as our little children keep puppy dogs—as pets, to give them pleasure and perform antics to pass the time and make them laugh.

Yes, the sad fact—so all the old stories say—is that man in those ancient days was little more than a toy

which the Long Tusk tossed to his children to give them fun. The young Long Tusks would never tire of holding men and women in their trunks, of throwing them into the air and catching them, and of pulling their necks and legs, as our little ones pull the tails of puppies; and they used to shout and yell in glee whenever any of their victims cried out with pain.

OF COURSE, man did not thrive under this treatment, and there is no knowing how many were bruised or crushed to death in the games of their young rulers. But the great beasts thought nothing of taking human life, for they held that the only creatures with souls were the ones with long trunks and curling tusks. In return for his ill-treatment, all that man got was a bundle of straw to sleep on, and left-over roots and wild nuts and fruits which his masters gathered for him and flung him in scorn.

As a result of depending upon the Long Tusks, our fathers became less able to care for themselves. They had no arts, and had not invented even such simple tools as the hunting spear and pottery; they went about with their hairy bodies unclothed, like the beasts that ruled them; and their only possession was the language which they spoke to one another, and in which they preserved the story of their suffering.

Nobody knows how long the misfortune of our people lasted; but they say it was long enough for many great trees to rise and wither away with age, one after the other. There was no one on all the earth who believed that an end to man's misery would ever come, for it would be as easy to pull down a mountain as to balk the will of the Long Tusk.

They do say, indeed, that in the earliest times some of our fathers had fought back—but what result could they expect? There had once been a party,

tradition tells us, under Quee, the Gray Squirrel, which had thought of putting poison into the water of the Long Tusk and so winning their freedom; but one of their number had drunk the water by mistake, and so the plot was found out, and Quee and his brave followers were all stamped to death.

At another time, we are told, there was an uprising under that brave man, Zu, the Night Hawk, who planned to dig pitfalls in which the Long Tusks would stumble to their death; but when they had almost completed the trap of dead leaves and twigs over a deep hole, a storm came up and uncovered their plans—and that was the end of Zu, the Night Hawk.

There were also some cases, it is said, in which our fathers tried to run away; but usually they were captured, brought back, and mercilessly beaten by the trunks of their captors. One or two parties did actually get away, but what became of them no one can say.

As time went by, most men grew to accept their captivity, just as they accept the movement of the sun across the skies and the flow of the waters. They thought of it as something which always had been, and always would be, and which it was foolish to fight against. And fathers gave way to their sons, and the sons passed, and babes grew up and became bent and gray and were no more—and all the while the herds of the Long Tusks trumpeted across the earth, and there was no one to challenge them.

But all this, as we know, has long ceased to be. Search where you will on the earth, you will find none of the



immense, shaggy beasts with their long, curling sabers; but you will find many men. And how did the change come about? Was it through the wit and wisdom of our fathers? Or was it that the Long Tusks, like some foolish tribes of men that we know, got into a war and destroyed one another?

No! It was nothing so simple. But it was something very strange. Truly, the gods that rule the clouds and the storm winds are on the side of man, for it was they who came to our rescue, and it was they who helped us when nothing else could, and leaped up with such terror and fury that even the Long Tusk was less than a wriggling fly beneath their hands.

THE CHANGE, of course, took a long, long while. Many summers came and went; generations grew up and died, while our fathers began to wonder if they were mistaken in thinking the world was not quite as of old. The gales grew brisker and more chilly in the season of short days; little cakes of ice began to form on the lakes and rivers; the foliage of the countryside commenced to change bit by bit; palm trees drooped and withered with the frost, and tree ferns faded and died. In their place arose a sterner Northern growth of spruce and pine.

Yes! The climate was changing, and with it the landscape was changing, also; the vegetation was becoming less dense, and many succulent herbs and nourishing roots and fruits were waxing rarer each year. Finally, after many more seasons, a messenger brought the news that whole oceans of ice were moving

down from the North, covering and destroying everything as they advanced.

At first no one believed such a foolish-sounding story, but the winters kept growing colder, and the winds lashed out with fiercer whips, until the lakes grew hard and a whiteness covered all the world. And then our fathers shivered, and huddled together in little grottoes and hollows of the earth, and prayed to God to protect them, and felt that the end of all things had come.

They did not know that the ice kings had really arisen to save them. They did not know that this was their great test, which they would triumphantly meet. So bitter were their hardships that many of them perished in the snow and ice, and there was much wailing and lamentation; and, for a long while, they hardly noticed how the Long Tusks were suffering, too.

But these great beasts were not so many now as of old, and they were often hollow-eyed and thin of frame, and they ranged far through the country for the roots and shrubs to keep them alive. They no longer cared about man, or gave a thought to his queer antics, which had been wont to amuse their children.

Now, for the first time, man was left to himself; for the Long Tusks, as they thundered through the land, trumpeting with hunger and trembling with cold, were so hard pressed to find **sustenance** for themselves that they abandoned their charges, and no longer attempted to feed them. Hence our ancestors would all have perished, had they been unable to look after themselves.

MANY OF THEM, as I have said, did succumb; but the sturdiest and bravest remained. In the beginning, they knew no better than to comb the earth for tough roots, and to fend with the squirrels for the nuts of the forest; and they shivered in nakedness in caves, and had no defense against the wolf



pack, which often banqueted richly from their number.

It is surprising that they did not all die amid the cold and hardship of those terrible days. But our fathers, for all the feebleness of their bodies, were wiser than the beasts of the fields; and, after a while, they began to use their brains, which had remained idle while the Long Tusk ruled over them, and they made some wondrous discoveries and inventions. One day they subdued the god of fire, when the lightning had set a great oak ablaze. Ever afterward they kept the precious embers burning, and used them in their caves to warm themselves with, and to frighten off the wild beasts.

Even so, they were near to extinction, for, by grubbing all the hours of daylight, they could barely find enough roots and herbs to keep life feebly beating in their scrawny bodies. Then—though no one knows just how it came about—some man thought of making a pointed stick, which he could throw at the wild beasts, in order to slay them. It was found that deer and hares, when roasted by the cavern fire, made good food and sustained the breath of life better than did the weeds of the wayside. Thus, the stick was used, until it became a hunting spear; and with the hunting spear man challenged even the

great-clawed cave bear and the powerful, bellowing aurochs.

All the while, there were still many Long Tusks in the land; but they were not so wise as man, and could not capture prey; and they still wandered far in their hunger, while their food became less and less, and they were growing fewer each season.

Finally, so tradition tells us, there came a day when man took revenge for his ancient captivity. Some great inventor—much the greatest that ever lived—made the bow and arrow; and with the bow and arrow man shot at his ancient master, and brought him low. Since the Long Tusk was so large, he made an easy target; and when the great beast, stung by many arrows, would fall to earth, man would rush in with clubs and spears and slay him.

Thus, for many years, and for many generations, our fathers feasted on the flesh of the Long Tusk. They were a more dreadful enemy to him than hunger and cold; they slew him by the hundreds and the thousands, until, at last, the huge animal, with his long, curling white teeth, tramped no longer on the earth. But man was daily growing stronger, and his numbers increased, till he had spread over all the earth and was the master of all things.



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Other Eyes Watching

A Study of the Solar System

Article No. 9 by John W. Campbell, Jr.

ALL SPACE flamed with an intolerable incandescence; for two thousand million miles, titanic streamers of flame shot out, wove and twined, streamers that flared dull-red and cooling where they stretched to breaking, then great clots that swirled in blue-white heat of new creation. Dimming slowly in the distance, the Wrecker was vanishing, the vagrant star that had lashed worlds out of the Sun as it swept by.

Two worlds, each blazing with the blue-white heat of the violent racking their already incandescent masses were receiving, had neared, swung, passed on. Two suns, each a million miles in diameter—not quaking, since they were not solid, but flaming gas—had swept by at frightful, hurtling speeds, engendering gravitational stresses, as they passed within not millions of miles, but hundreds of miles of each other, that must have made the infinite fabric of space creak to the awful strains. Each a million-mile ball of incredibly hot matter—nearing, nearing—flames leaping out that were to make worlds, whole solar systems—shrieking at each other with a roaring thunder whose mere vibrations of sound would have pulverized this planet—and passing.

But this is the thing that paralyzes my thoughts: I cannot conceive that this thing, this blasting of flames that made worlds, the explosions that scattered giant planets over three billion miles of space—all that flaming catastrophe—took place, was, and was done in not more than three hours! So inconse-

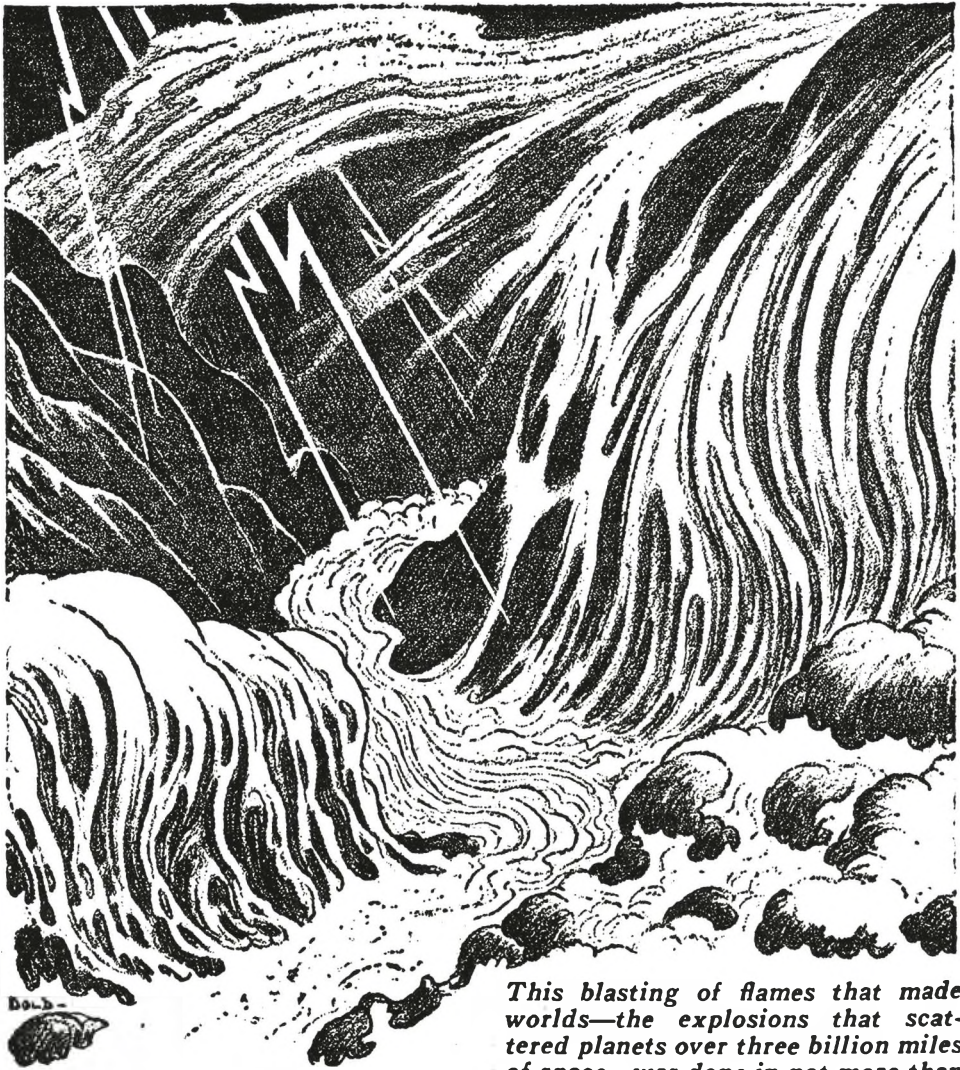
quential a thing as reading through this magazine will take longer than that. But in that almost instantaneous, Gargantuan catastrophe—worlds were made, set spinning, established—and the star that caused it passed on forever.

The flaming drift of flame that it left shrieking through two thousand million miles of space cooled slowly, flaming filaments of wispy heat being drawn by mighty gravities of forming planets, till nearly all that scattered matter was collected in nine major clumps.

But it could not stay, for the frightful heats that had been buried under cooler layers of the stars had been torn out into open space, and it could not even radiate till it began to collect properly. (Hot atoms can radiate only when they collide with others.)* Our Earth condensed; others swiftly lost the hydrogen, the other light gases. But out farther from the Sun, the mightiest of all the groupings dragged at those atoms of flying hydrogen with a savage grip that slowed them as they struggled up one—five—ten—twenty million miles from the heart of the mass that was to be Jupiter.

The Sun was far off, and the mighty drag it exerted to aid the gases in escaping the inner planets was weakened here. The gases, their speed exhausted in a running fight that lasted twenty million miles, fell back, captured. Half a million miles, and they could get free from Mars. But Jupiter? Not a

* One estimate places the temperature of that matter freshly torn from a star at more than 600,000° centigrade.



This blasting of flames that made worlds—the explosions that scattered planets over three billion miles of space—was done in not more than three hours.

chance! Already there were flaming aggregations that had half succeeded in escaping, only to be trapped as satellites rotating tens of millions of miles out, but captured, definitely.

Jupiter dragged them back. Heavy metals were there, and condensing now, under the pressure of inconceivable tons of that captured stuff, to a liquid, terrifically compressed core. On to them piled the greater tons of these returning, captured atoms. More, more, more turned liquid, as the cold of space drank in their heat slowly. Ages passed, and

the heat went rapidly. The core grew cold, as the core of all other planets had cooled.

AND NOW JUPITER, last to cool, felt the chill of its far position. The Sun gave no great heat at this distance. That vast atmosphere which had condensed out first the metals, then the oxides, the compounds, finally water, till all the compounds had churned in the slowly cooling furnace and had reached

a new stability, wound up, at last, with a condition something like this: Every last trace of oxygen had found something to grip, and hold. Down it had gone, as silicon dioxide or iron oxide or calcium oxide, some as trillions of tons of water. Fluorine, most active of non-metals, had beaten even the oxygen to a mate. Chlorine was coming out, the bromine and iodine; sulphur and phosphorous had gone down with the oxygen.

Everything was happily united—save for the inert gases that didn't want to be: helium and xenon and radon and argon. And two others: hydrogen and nitrogen. Nitrogen, because it isn't ordinarily very anxious to do anything about it. It's not a confirmed-bachelor element; but it usually takes the stimulus of high temperatures to make nitrogen active. Then, of course, nitrogen becomes so virulently active it will drive even oxygen out of combination!

Hydrogen didn't unite simply because there was too much of it. Most plentiful of all elements in those vast flames the three-hour catastrophe had thrown out to make planets, it had gone down, by the trillions of tons, with oxygen to make water. By the millions, it had gone contentedly to rest with chlorine. It had combined with everything that it could combine with—and there simply wasn't enough. So, there was hydrogen and nitrogen in the atmosphere, no half-hearted twenty per cent of hydrogen; most of that atmosphere was hydrogen.

Unfortunately, hydrogen and nitrogen, while they unite to form ammonia, do not do so very willingly, as Earth chemists know. During the War, Germany spent millions developing very complex and expensive apparatus to force the unwilling elements together. Haber, the inventor, should have been killed, by all rights, in one of the almost innumerable explosions they had trying to force these two into combination.

The principal point of the process is pressure—pressure in large doses—and

they tried to use enormous steel retorts, made of metal of the finest quality and nine inches thick. But hydrogen has a nasty habit of forming a compound with iron—iron hydride—under these conditions, and that compound is twice as brittle as glass and not a tenth as strong. The retorts, fifty feet long and three feet in diameter, for all those nine-inch walls, blew up. Hydrogen and nitrogen do not unite readily, except under great pressure—

Pressure! Of all things Jupiter has, pressure is outstanding. Pressure that would make the bottoms of our seas seem near vacuum conditions. The hydrogen and nitrogen inevitably combined. Ammonia takes less room than the two gases; the elements were literally crushed together—not to ammonia water, but to liquid ammonia, for Jupiter was cold, bitterly cold. Water was the stuff that made those great chalky mountains along the torrid equator, where the vast, intensely blue seas washed at them, and steamed slowly. Seas, of little, low, choppy waves, crushed under the gravity of that 86,000-mile world—seas of liquid ammonia.

The cold snows of the north—65,000 miles away around the titanic globe—were solid ammonia. And that atmosphere was hydrogen and ammonia vapor—and methane, carbon tetrahydride. That is the principal constituent of natural gas here on Earth, an excellent fuel. Not on Jupiter. On Jupiter it is the waste product, the incombustible residue. Gasoline would be a safe cleaning fluid there, utterly incombustible. There, they would say that hydrogen would not burn, but oxygen was an excellent fuel.

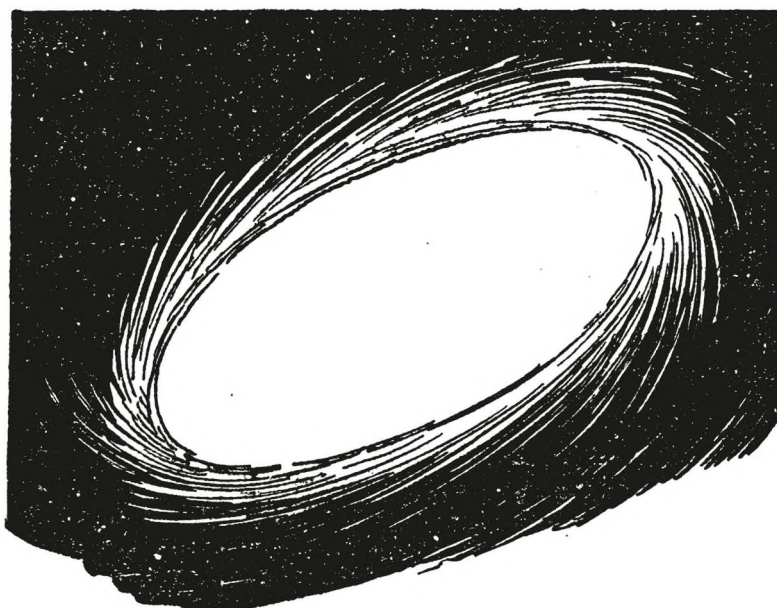
BUT that is not all that is strange in the chemistry of the giant planet. Jupiter is possessed of a climate ideal for life! The temperature is mild, about 120 degrees below zero centigrade,

185 below Fahrenheit. Yes that's a mild temperature! It's mild for life on an entirely different basis, an ammonia basis. Remember that in the discussion of the possible life media, I said that ammonia, though unstable, was a possible medium? That hydrogen could function as the active gas as low temperatures under great pressure? These conditions are fulfilled, for ammonia is stable, and the enormous pressure makes hydrogen active.

So a life is possible there, a life that

they attempt to forget their woes on Saturday nights with the aid of a bottle of ethylamine, C_2H_5NH , instead of that ancient Earthly staple, ethyl alcohol, C_2H_5OH . To them, perhaps that compound H_2O is a solid, white salt; at any rate, it is an immensely important part of their diet.

And what sort of a world do they live in? It must be a savage world of small animals. No great 100-foot monsters ever lived on the land of Jupiter, for they would have been crushed under



breathes in a pure, invigorating atmosphere of hydrogen, with gentle breezes of ammonia! Its foods are, perhaps oxidizing agents instead of reducing agents. There are many organic compounds that we know which are capable of this action, compounds called peroxides which are violently explosive at the temperature of Earth, but stable at temperatures so low that Jupiter would find them normal.

Chemistry of life would be strangely different. Perhaps if there are intelligent, but not-too-intelligent inhabitants,

their own weight. The animals would be small so that they could be active. Elephants never jump. Perhaps beings corresponding to men would be no more than two feet tall, but muscled so powerfully as to make any hand-to-hand encounters with such people (impossible due to the differences in atmosphere and pressure) a dangerous business indeed. Swift-moving beyond belief, in order to keep up with an environment lashed by a gravity two and a half times as swift as ours.

Things fall more swiftly. The spring

of an attacking animal there would be a blur of motion to our eyes, for if it were not, he would not be able to spring any distance before that snapping gravity jerked him back to the ground.

They would have hard ground of low, almost flat country, where even the strength of mountains cannot lift themselves high against an overwhelming, eternal gravity. Though Jupiter is 300 times as massive as Earth, its gravity is not, fortunately, 300 times as great at the surface, because the surface is so far from the center of the planet. At one hundred thousand miles from the center of Earth, the gravity is one three hundredth that an equal distance from the center of Jupiter, but the latter planet is larger—and the surface is farther from the center.

But the hills are low, for the gravity is still intense. The trees are low, scrubby things, perhaps with many stalks supporting a widespreading network of branches. There's reason for that, too—two good ones. The gravity—always that—and the winds. Not the gentle zephyrs of a minor planet like Earth, but howling, roaring, shrieking tornadoes that seem left-over memories of that wild day when planets were created in three brief hours. Winds that shriek past at two hundred miles an hour. Those are the steady, day-in-and-day-out trade winds of Jupiter—gentle things that they expect every day of the long, long year. At least, we know they exist in the upper atmosphere, and surely something more than a hint of them goes raving around the surface.

SPEAKING OF SURFACE—Jupiter has lots of that! How much of it is flooded, we have no way of guessing, but the planet is about 265,000 miles in circumference, and it spins around that circumference at a mad pace: once each ten hours, 26,500 miles an hour. But if ever a Jovian Magellan set out to circle his world, he would be

tackling a task that even light would require a very distinctly measurable time to accomplish. Jupiter is a full-size planet, no accidental scrapings dropped behind that world!

And that fearfully heavy atmosphere is going to introduce difficulties when they start to make airplanes. The planes are easy enough—almost anything with a flat surface will fly in an atmosphere as thick as that frightfully compressed stuff is. But speed is something quite different. It takes more than streamlining to wriggle a path through that ultra-condensed soup.

Under the circumstances, probably an automobile would have the better of it, for, could we see a Jovian driver, we would undoubtedly praise the gods of the universe that we couldn't ride with him. They would have a habit of taking right-angle turns at forty to fifty miles an hour, braking the car to a dead stop from seventy miles an hour in about fifteen feet, and jittering through traffic with the general effect of one of those trick movies of a wild ride through New York.

Why? Because brakes there would have a far greater effect; the mass of the car, its inertia, would be unchanged, while its weight, and consequent pressure against the surface would be two and a half times as great. The jarring decelerations, approaching the severity of a full-fledged collision, would not bother the concentrated balls of muscular strength a Jovian would have to be, anyway. Swinging a corner at forty would be no trick at all, when the car was held to the road by Jupiter's savage clutch.

But top speeds? That forty or fifty would be like doing approximately the same speed through water. If the brakes stop a car quickly, so does the air. What they'd burn for gasoline, I don't know—perhaps pure hydrogen peroxide—but they would burn it at a frightening rate, to make any speed.

And what would they build these automobiles of? Not iron—remember what happened to Haber's steel retorts. Iron is a hopelessly brittle metal under those conditions.* Not aluminum—for in the strongly alkaline rains of that world, aluminum would melt away in no time. Silver would run away in liquid streams of ammonia-silver complex salts. So would copper. None of the noble metals—they're all too heavy, by far, even if they are not as rare as on Earth, though they probably are. They would develop an utterly alien metallurgy, and a completely alien chemistry.

What do they burn in their gas stoves? Oxygen? Would they be able to develop radio where radio vacuum tubes would be crushed instantly by the brutal hand of that atmospheric pressure? Even if the tube is built sufficiently strong to stand the pressure, hydrogen atoms would seep through, as they diffuse through almost any material we know of. Perhaps, though, they would develop Alexanderson alternators for sending, which are nothing but specially designed dynamos; and receive by crystal detectors. Still—even our best sets would never receive messages around that world—a quarter of a million miles.

BUT are there any people there to worry about such things? We can't know, of course, but we can say this: There is an active liquid, not water, but one we have reason to believe is an excellent substitute. They have an atmosphere containing an active gas. They certainly have reason to develop life—

* You may be interested in one solution of the problem of getting hydrogen under great pressure safely. They use two retorts, one inside the other, like an arm in a sleeve. The "arm" is the hydrogen retort, with hydrogen at a pressure, let us say, of 2000 pounds to the square inch. The sleeve is a heavy steel retort about it. Between the two, in the hollow, is nitrogen at 2010 pounds. The hydrogen leaks and weakens the inner retort, but that's under no real strain. The nitrogen keeps it from reaching the outer sleeve, taking all the strain safely because it is not weakened by seeping hydrogen.

a nice mild climate, lots of land and "water" area in all probability. The Sunlight may be a bit diluent, but it's there.

Yes, those people may be based on a weird chemistry that makes liquid ammonia their "Adam's ale," and hydrogen their air; but the chemistry is possible. They might fry an egg—of a Jovian chicken—on the freezer tray of a Terrestrial refrigerator, but based on an ammonia scale, they have the proper temperature. They have day and night—shorter than those of any other planet of the system—to distribute the Sun's heat evenly.

If some strange and utterly alien creature from other solar systems were to come to make a guess as to which of Sol's children bore life, which do you suppose he would choose? Tiny planets—the Terrestrial type—with an almost perfect vacuum for atmosphere—or mighty worlds like Jupiter? I think I would choose Jupiter, were it not that I just happen to have special, one might say "inside," dope. My personal economy is based on water.

I'm glad of that. That and the atmosphere I breathe. For I wonder if there are on Jupiter, peoples more intelligent than we, gazing out through mighty telescopes, wondering and longing, imagining life on tiny, more Sunward worlds—and vainly wishing. Wishing, and knowing that they cannot leave. For just as surely as no near-evacuated vessel made of matter could resist for a day, that awful, crushing atmosphere of Jupiter, so surely could no vessel made of matter resist the frightful, bursting pressure should it venture into space charged with that ultra-compressed air. Burdened by an enormously heavy air, seeking to escape an enormously massive planet—and the filtering, seeping hydrogen escaping steadily through the very atoms of the metal. I wonder if they look—and wish—

An Open Letter To You

Dear Readers:

Your response to my request for "Science Discussions" has been so overwhelming that I must take this means of explaining why many carefully and thoughtfully prepared items were omitted. You will realize, some of you, that I could not run the dozen or more refutations to Mr. White's remarks on Atlantis.

It was necessary to omit some valuable suggestions as to discussions—and, because of the unexpected length of many of the letters, I was forced to include a few which are typical of "Brass Tacks."

But the whole-hearted surge of enthusiasm with which the change has been greeted is so impressive that I am ready once more to promise new progress. 1937 will be the greatest year Astounding Stories has ever experienced.

Interest is expanding. Our circle is bound to enlarge—and as it grows I will be able to offer increasingly valuable issues. We are interdependent to a greater extent than you may realize.

I feel a new sense of confidence in the policy which is being launched. Two science articles each month. One (the Campbell series) is an arbitrary presentation of factual science as at present accepted. The other will swing around more debatable subjects; this month the possibility of undersea farming; next month the experiments with rocket ships. I'm seeking the best authorities for each subject. Simon Lake, inventor of the submarine, is responsible for this month's idea.

But, regardless of the authorities, these are thought-provoking, debatable subjects for "Science Discussions" and I shall be looking forward to your reactions.

And another thing—please try to hold your letters down to 1,000 words (3 double-spaced typewritten pages—or 5 hand-written) or less. A lot can be said in that space and it is only fair to the audience to be brief. A famous newspaper publisher is credited with the line: "Please excuse this long letter. I haven't time to write a short one."

Also, please feel that I want your comments on the stories and articles. Make this a separate part of your letter if you wish, so I may omit it and still find space for your debates. But I want to maintain my contacts with reader reactions. I want to feel the pulse beats of your likes and dislikes. I will undertake to give you a combined reaction—a composite of the vote—so to speak, each month.

For example: The approval of Van Lorne's "World of Purple Light" is overwhelming—the ratio of favorable to unfavorable reactions being 17 to 1 and representing 54 letters. "The Incredible Invasion" comes next with 11 to 1, representing 24 letters. Third, "Infra-Universe" 9 to 1 but representing 30 letters. The "Expedition from Kytln" stands 7 to 1 with 16 letters. "The Single Clue"—5 to 1. "Tryst in Time" and "Frankenstein Unlimited" were both heartily liked and disliked, their ratio being 9 to 5 on the basis of 28 letters each. "The Flame Midget" rates only a 2 to 1 approval. The science articles by Campbell drew a fair amount of commendation—and no censure at all!

Do you see how it helps me? It's a pretty good score on the December issue. Only one story in the last 5 issues drew more blame than praise. But I want your comments as well as your discussions.

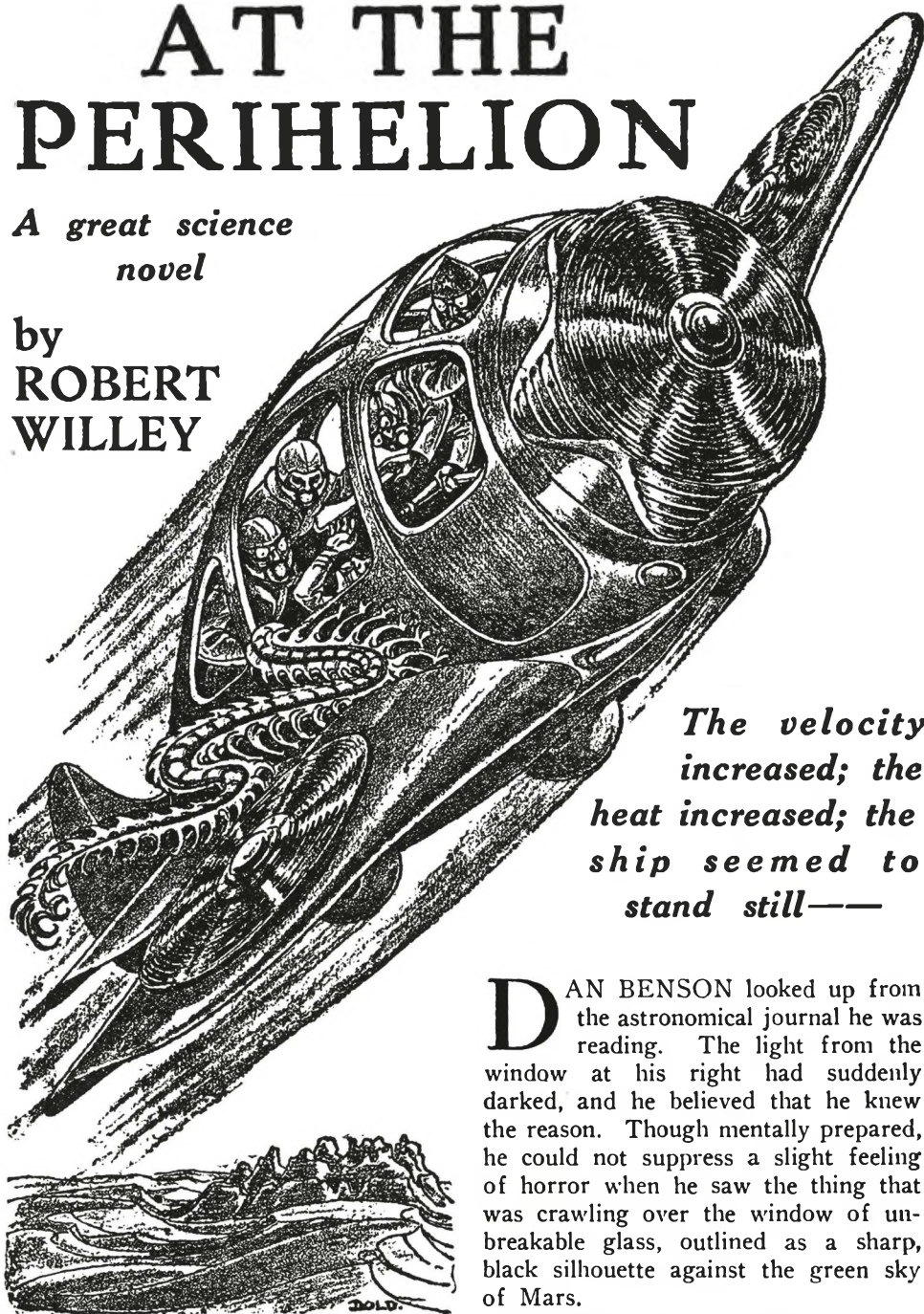
Give me both—and Astounding will climb to a new peak of interest this year.

The Editor.

AT THE PERIHELION

*A great science
novel*

by
**ROBERT
WILLEY**



*He heard the roar of the motor, saw
a blue body leaping and the window
closing——*

*The velocity
increased; the
heat increased; the
ship seemed to
stand still——*

DAN BENSON looked up from the astronomical journal he was reading. The light from the window at his right had suddenly darkened, and he believed that he knew the reason. Though mentally prepared, he could not suppress a slight feeling of horror when he saw the thing that was crawling over the window of unbreakable glass, outlined as a sharp, black silhouette against the green sky of Mars.

The silhouette looked like a ribbon about a foot wide, crawling legs on both sides of it. The legs showed something like balls, about the size of a golf ball,

clinging to them. It looked as if they were wrapped into some kind of net made of rather thick threads. The threads gave the impression of a spider web, tough and flexible, hard and sticky at the same time.

"A female with eggs," he said to himself in a low voice. "Wait, you *tchort*, I'll get you!"

He looked around in the single room of the small hemispherical aluminium house that protected him against the manifold dangers of the Martian desert. There were six round windows like those in the cabins of ocean-going vessels, spaced equally around the circumference of the house, about three feet above the floor. One of them was darkened by the body of the thing; he looked through the others for further undesired guests. There were none; all five windows gave him an unobstructed view on the reddish-yellow sands of the Martian desert and the green Martian sky.

He muttered again to himself. "Only one, crawling around in search for moisture. The liquid most conveniently stored happens to be my blood, but I strongly object to this thought. Wait, *tchort*, I'll give you some liquids."

Next to the door there was a small aperture, about one inch in diameter. He placed a square metal box near the opening, a queer-looking nozzle dangling from a metal hose attached to it. Then he took another little instrument, consisting of a short piece of narrow copper tubing and a rubber ball. He squeezed the rubber ball in his hand and inserted the copper tubing in a water container, filling the ball with water. After making certain that the dark shadow still rested on the window, he opened the aperture, thrust the end of the copper tubing through it and pressed the ball. A jet of water spouted from the tube, splashed on the sand, almost forty feet away, due to the lesser gravity of Mars.

Before the sand could swallow the water it began to freeze, being not salty like most of the water on Mars. But even before it froze the body of a long and slender animal leaped toward it. It was the shadow from the window, a centipede of gigantic dimensions. Its body, every inch of six feet long, was of bright-blue color; the many legs moved more rapidly than the human eye could follow. It was a full-grown specimen of the blue skolopenders of Mars, the only large animal of Mars discovered hitherto. The settlers called it the "Blue Menace"; the Russians, that lived mainly on Thyle II, where Dan had settled, called them simply "the devils"—*tchorts* in their language.

Dan shuddered and smiled grimly at the same time.

"Go home to the hell you came from, *tchort*," he muttered, raising the queer-shaped nozzle of the square metal box to the aperture and pressing a lever with his foot. Another stream of liquid jetted from the nozzle, but a much thicker stream than the thin jet of water he had sprayed as a bait. The oily liquid struck the animal, enveloped it. Dan pressed a trigger at the nozzle; a spark appeared at the muzzle, and the thick, oily liquid caught fire instantly. The flame raced along the jet and the animal was in the middle of a flaming cloud. When the fire died down, twenty seconds later, there was nothing left. Nothing but a black spot and some ashes on the sand of the Martian desert.

Dan looked through all six windows again, then he donned a heavy fur and, muzzle of the flame thrower in readiness, he opened the door. Nothing living was in sight, nothing but a few copper-hued, brownish plants with thick, leathery leaves. They crouched flat on the ground, sending their enormous roots deep into the sand, sixty and eighty feet deep, to where the soil began to show traces of moisture.

HE buttoned up his fur coat; it was cold, though it was summer for the southern hemisphere of Mars. The Martian summer of the year 1978 A. D. Dan breathed slowly and deeply. He was just able now, after one and a half Martian years, to stand it without an oxygen mask. This, of course, applied only to leisure on the ground. If there was physical labor to be done, and on top of the Martian mountains—none of them exceeding three thousand feet—the oxygen mask was essential.

There were only very few hardened settlers that did without them under all conditions. Well, he did not intend to stay long enough to achieve the same ability. He was homesick for the Earth, and he knew that he might board the next Earthbound passenger space ship. But that would not leave before the planets were in much more favorable relative positions, two hundred and thirty or forty Martian days from now.

Dan glanced around again; then he went back into the house. It was about supper time. And it was dangerous to be caught by the darkness in the desert. There was practically neither dusk nor dawn on Mars and the blue *tchorts* could see in the dark. Later, after midnight, they were comparatively harmless, because the extreme cold of the Martian night froze them stiff. But nobody who lost his way in the desert was lucky enough to survive till midnight.

Three things were essential for travel in the Martian deserts, aside from the food and water supply. These things were: oxygen apparatus, flame thrower, and so-called "desert automobile." They were low-powered, fast cars that could be sealed airtight. In outer appearance they looked very much like Terrestrial streamlined limousines. Explorers and adventurers that left the safety of the glass-walled settlements ate and slept in these cars; there was

Terrestrial air pressure and Terrestrial warmth inside. In addition to these comforts, they offered protection against the blue skolopenders.

For a prolonged stay in the desert, however, the so-called "desert tents" were used. They were aluminium structures, perfectly hemispherical, twenty feet in diameter and ten feet high in the center. Between the two layers of noncorroding aluminium alloy sheets that formed the walls a layer of a new glassy material was fitted; it was an excellent heat insulator, impervious to the most savage attack of any conceivable animal and impervious, also, to a chance blast from a flame thrower.

The corporation that manufactured and rented these desert tents also claimed that the insulation could withstand the splash of the exhaust of the rocket motors of a landing or departing space ship. The settlers distrusted this statement somewhat, but they knew that the insulation was bulletproof to a certain extent—an additional feature that was good to know.

Dan closed the door of his tent behind him and restored Terrestrial warmth—the regulator for air pressure was set midway between Martian and Terrestrial pressure.

While preparing his supper, he thought about his plans for the next few days. He had to go to Space Port, the largest city on Thyle II, within the next few days. There was some matter with the local government to be attended to and it was necessary to do it in person. Two weeks ago, when the regular space ship of the Interplanetary Transport Corporation had arrived, he had been in Space Port to call for his mail.

Among the interplanetary mail he had found a heavy letter from the local government. More than a year ago, when the Martian districts had been assigned to the principal countries of the Earth, the large island of Thyle II was made

Soviet territory, because the majority of the permanent settlers in this district were Russians.

All settlers on Mars had been given to understand that they could move into the territory belonging to their own nation within four weeks. After that time they became subjects of the country to which their territory was assigned, except when a special application of "Retainment of Terrestrial Citizenship" was filed.

Dan Benson had no intention of moving and no intention of losing his American citizenship. He had filed the application, which was a document of exceptional length. The answer was this letter, which was a cross between an American income-tax return, a German *Fragebogen* as to Aryan or non-Aryan ancestry and a G.P.U. questionnaire for prospective members of the Russian communist party. It was a light year of red tape.

Dan was a college graduate, a well-known writer and a specialist in some scientific lines—but to answer this questionnaire properly, without the assistance of a government clerk, was beyond his abilities. He had pored over it for hours, and recalled his past until his head was dizzy with memories—not all of them pleasant. It had been to no avail. Since the answer had to be filed in person to be valid, he had decided to go to Space Port.

II.

IT WAS LATE when he awoke the next morning. He had been sitting up and writing till late into the night. There was a scientific controversy as to the nature of the extinct intelligent inhabitants of Mars in the magazines and journals of Earth, and he had added whatever he could from his personal observations. It was a difficult question. These original inhabitants, extinct now for at least ten thousand years,

had built stone houses and cities that were now ruins, heavily infested by the Blue Menace. Nobody knew how they had looked, how they had lived and where they went. Popular belief was that they had been men, with a civilization comparable to the European civilization of the year 1700, and that the blue skolopenders had killed them.

But there were other theories, too. One party of scientists held the belief that they had been gigantic insects. Another party of scientists thought them birds, because there were no roads and apparently no doors to their ancient buildings. And a Chinese professor had advanced the theory that they had fled from Mars when the Blue Menace became too menacing. He based his opinion on the Chinese legend that their emperors were the "sons of heaven," and he had pointed out that the fire-belching, Chinese-dragon symbol might well be interpreted as a distorted heraldic design of a space rocket. He had even unearthed two ancient Chinese paintings, picturing the "lost land" and showing two moons in the sky. But an authority in Chinese script had pointed out that the characters read as "lost land" by the imaginative professor had the meaning of "dreaming country."

It was war to the knife among the anthropologists of Mars, who did not know whether they could call themselves anthropologists. One day they might be compelled to change the name of their science, since the Greek *anthropos* means man. If it should be discovered that the Martians had been birds, a linguistic difficulty would arise that could only be solved by the invention of a new Greek term. German philologists had already coined a few terms covering the various possibilities.

A black line appeared at the horizon—the glass wall of Space Port. All settlements on Mars were surrounded by these walls of tough, black glass. They were a hundred feet high and

built of T-shaped sections. No skolo-pender could climb these walls and the few doors were fortified by batteries of flame throwers.

Seen from the air the city of Space Port looked like the figure 8. One circular wall inclosed the city, the other the space port, which had given its name to the settlement. Where the two circular walls touched there was an avenue connecting the immense field of the space port and the settlement.

Dan drove slowly through the main street to the administration building. There were buildings and houses of all sizes, many of them aluminium structures of the general design of the desert tents, but also stone houses and a few towering office buildings of steel and glass. They were fifteen stories high. That was the limit the sand could carry, in spite of the lesser surface gravity of Mars. There were no wooden shacks, because wood had to be imported. The main materials for building purposes were aluminium, steel and glass, the raw materials of which were abundant on the surface of Mars.

WHILE EATING his lunch in a restaurant, Dan heard the loud-speakers announce that the government space ships were to land the same afternoon. There was nothing else for him to do, so he decided to witness the landing, which was always a spectacular sight.

Standing under the protection of a domed, transparent-glass structure, he saw a black dot appear in the grass-green sky. It swept in a wide arc toward the space port. Suddenly the black dot changed to a flaming cloud. Dan knew that the rocket motors were working full blast to check the fall. The flaming clouds disappeared and reappeared, the large ship was plainly visible now, even to the unaided eye. When the ship was less than a mile high, the flames shot again from the muzzles of the rocket motor.

Dan knew that the pilot attempted now the most difficult task of the entire voyage. The recoil of the rocket motors had to be just powerful enough to check the fall of the ship so that it did not hit the ground harder than an object falling for about five feet. In addition to that, the ship had to be balanced on its jets; a side swerve would make it fall like a stone.

Dan had a very good theoretical knowledge of space traveling, and he had once even started a small ship on a trip to the Moon. But that was easy; it merely involved giving full power on all rear nozzles for a certain time. Landing needed more than theoretical knowledge and experience; the pilot had to be an artist. If everything failed while landing in an atmosphere, the pilot could throw out the parachute of the ship. But that was considered a bad job, though it actually saved ship, passengers and crew, if not done too late.

Dan saw yellow clouds rise from the ground. The exhaust of the ship, which was not more than five hundred yards high by now, began to strike the ground. Then came the thrilling moment when the landing field was *one* mass of hot exhaust gases splashing over the ground. He could feel the heat through the glass walls. Nothing could be seen but a sea of white flame and whirling yellow dust. Suddenly the spectacle ceased, and through the slowly settling sand and dust the silvery space ship could be seen on the ground, undamaged. Perfect landing without use of the parachute—that meant a reward to the pilot.

A number of cars started out to receive the passengers. They stopped suddenly when one of the smaller nozzles starting working again. Dan wondered about it. To fire one single rocket motor on the ground was senseless. But after a few moments of reflection he understood.

The other space ship was to land within a few hours, the ship that had

just landed would probably still be out in the open and might be hit by the splash of the second vessel. Therefore the pilot was using up the rest of the fuel in his tanks to avoid a possible explosion. Dan's guess proved to be right.

About half an hour later, when the cars that had received the passengers and the trucks that had received the goods had departed from the space ship, the green signal lamps lighted up. This meant that visitors were admitted on the landing field until the signals would change to red again.

Dan and a score of other visitors strolled across the field. Talking to one of the officials who spoke English, Dan learned that the ship had carried only seven passengers, all government officials from Moscow, and that the goods on board had also been government property. But the ship had also brought a few dozens bags of mail; he could call for his mail in the post office after 7:30 p. m.

It was a large new ship of latest design and able to carry up to twenty passengers with as much comfort as a space liner could offer. Dan deciphered the Russian characters at the prow: "Lenin—Leningrad." He asked a question of the guard at the door of the ship, but the man shook his head. Apparently he did not understand English.

Dan looked around and was about to go back, when something caught his attention. This "something" was the imprint of a human foot in a place where oil, flowing out from one of the cars, had formed a thick paste with the Martian sand. The imprint was that of a girl's foot, exceedingly small and slender. Dan wondered. Girls were rare on Mars—beautiful girls that would leave prints like that were very rare. But the main thing was that the official of the space port had told him that there had been only government officials on board the ship. And from

the way he had said it they could be expected to be higher officials.

"Did one of these people bring his secretary along?" inquired Dan, forgetting that the guard had not replied to his first question. The man remained silent. Dan hunted up the necessary Russian words in his brain and repeated the question in Russian. The uniformed guard looked puzzled.

"*Yah nya ponimayoo*—I don't understand."

Dan tried again, but it was to no avail. Turning around he caught himself wishing to meet the girl. It was about a thousand days that he had lived like a hermit in the Martian desert. One thousand days of hunting knowledge, hunting treasures, fighting skolopenders and pounding the typewriter. He felt very lonely when he crossed the landing field and went to his car.

III.

THERE WERE a few letters for him. Reports from his agents on Earth, copies of scientific journals, and letters from scientific societies. There was, also, a government form, requesting his presence at 10 p. m. at the Torgsin Konditerskaya at Marx Boulevard and 12th Street.

Torgsin Konditerskaya was one of the best restaurants in Space Port. He wondered about the locality and the time chosen for the meeting, but he was punctual. The doorman, after having inspected the letter Dan showed him, called a uniformed guard, who ushered Dan politely into one of the back rooms.

There were five people in the room, aside from the two guards standing at the door. They were grouped around a table on which there were little stacks of papers and forms. Two of the five looked typically Russian to Dan, dark-eyed and dark-haired. He had seen that type often on Thyle II. The one

that seemed to be the boss of the five was a tall, lean man with a long nose. Though he seemed to be quite young he had little hair left and it was gray; it had probably been brown originally, Benson thought. His eyes gave Benson the impression of a fanatic, and the carelessness of attire, the decayed teeth and the fact that he had not shaved for days supported this opinion. It seemed to Dan that he could detect Tartaric blood strains in him, though the tall, lean figure seemingly contradicted such an assumption.

The next was a veritable giant, certainly standing six feet tall. He had a massive chest and an immense head, and he was the only one wearing the proverbial Russian beard. But his hairy hands were white and soft and comparatively small, and his blue eyes were kind.

The fifth was a girl; Benson had seen her first when he entered the room and had looked at her ever since. "The easiest way to describe her," he thought, "is to say that she is a beauty. Just a beautiful Russian girl." He saw her looking at him with large gray eyes, he saw dark-blond hair in beautiful curls. Dan would have stared at her much longer, if the giant had not interrupted him.

"Please allow me to introduce myself, comrade," he said slowly, in a deep bass voice in Russian language. "I am Professor Konstantin Kyrillovitch Rakolsky of the Zoölogical Institute at Stalingrad."

"I do not understand Russian," answered Dan, speaking English. "But if you do not speak English, we can try German."

"Vee all speek English," interrupted the lean man.

"Let me introduce the other gentlemen here," continued the professor in English. "This is Comrade Tchernikoff, the new governor." That was the lean man. "This is Comrade Djilinskiy."

One of the dark-haired men rose a little from his chair. "This is Comrade Tishtshenko." The other dark-haired man nodded. "And this is Comrade Tcherskaya."

The girl murmured a Russian greeting and lifted her right hand for a moment. Benson noticed that her teeth were white and flawless and that she had small and beautiful hands.

"Sit down with us, comrade," continued the professor.

WHEN BENSON was seated, the lean man, Comrade Tchernikoff, the new governor of Thyle II, began to speak. "Comrade Benson, we asked you to come because we needed an intelligent and educated man with practical experience." He glanced at a sheet of paper lying close to him on the table. "You are American, thirty-six, studied astronomy in America and have a German doctor's degree in chemistry. Your profession is that of a writer on science matters. You were professor of astronomy at Columbia University and planned to marry about three years ago. Suddenly you resigned from your post, did not marry and went to Mars. Since then you were a fairly successful gem digger and a successful author. Occasionally you write stories under the pen name of Herbert H. Harr."

He looked questioning at Dan.

"These facts are correct," answered Benson. "Let me add that I am homesick for Earth, that I plan to return soon and that I'll probably resume teaching. Then you have a fairly complete outline of my life."

Tchernikoff nodded and was silent for a moment.

"You don't belong to any party, do you?"

"No."

"It is all right. If you join our service you will be classified as a foreign expert. You applied to stay on our territory without becoming a citizen of

the Union of the Socialist Soviet Republics. This wish can be granted, of course. But with my arrival a few changes are to take place on Thyle II, and we would like you to take part in making these changes. From now on Thyle II will bear the name of Novaya Respublika—The New Republic. It will be an independent country within the Union of the Soviet Republics. I am to be its governor and at the same time what you would call Russian Ambassador, though this term cannot be used in its full meaning. Comrade Djilinskiy and Tishtshenko are political commissaries. They will take over the supervision of police and communication to-morrow. Comrade Rakolsky will not be permanently on Mars; he is scientific advisor on special mission.

"You, Comrade Benson, will become the same, if you accept our offer. We will need your services for seventy-five Martian days according to our plan, and we offer you a payment of twenty-five dollars a day, payable every ten days either here or on Earth, according to your own preference. You must be at our disposal at any minute during this time, must not do any private work, and must pledge yourself to utmost secrecy."

He paused for a minute and then asked: "Do you accept?"

"What am I to do?" asked Benson, his suspicions aroused by this offer which, somehow, sounded too fair.

The lean man answered with the attitude of a slightly annoyed dictator: "The plan for the colonization of Novaya Respublika calls first for complete extermination of the blue skolopenders. We have all the necessary equipment prepared. Comrade Rakolsky, being a zoölogist, is assigned to lead the extermination, and you, if you accept, are to guide and to advise him."

It sounded to Benson as an offer of exterminating sharks would sound to a sailor. He accepted without hesita-

tion and signed a document in Russian and English, which had been prepared in advance.

The governor added his signature to Benson's and rose from his chair.

"It is still early," he said. "I suggest that you and Comrade Rakolsky discuss the first moves right now."

The professor rose, too, and led the way, Benson following him. Outside, they selected a table and Benson told the professor all he knew about the skolopenders. That the first six pairs of their legs were poisonous and that even a little scratch was fatal to human beings and to all Terrestrial animals. That fire was really the only means of killing them. That the females carried their eggs around attached to their legs, and that the best bait was fresh water. Apparently not able to smell, the creatures in their constant search for moisture tried to swallow any liquid within reach, but they abhorred salt water. Therefore, the seashore was comparatively safe, the Mare Australe, the only ocean on Mars, being extremely salty.

THE PROFESSOR was busily making notes and asked countless questions. When Benson's knowledge was finally exhausted, he said: "Your personal observations are invaluable to us. You can imagine that I am thoroughly familiar with the scientific literature on these animals, but there is a difference between a personal narrative such as yours and printed description. I even think that you related a few facts that are not mentioned in the scientific description. Be assured that I will inform Comrade Tchernikoff and Tcherskaya how valuable your coöperation is."

This was the opportunity Benson had waited for.

"What is Miss Tcherskaya's assignment?" he asked.

The professor looked at him kindly and said in a low voice: "I do not

know whether you are supposed to know it, but I'll tell you. She belongs to the G.P.U. and is to supervise both of us."

"Supervise us?" Benson was startled. "What does the G.P.U. want from us as long as we are exterminating skolopenders for the government?"

"We use military equipment," said the professor hastily, and rose from his chair. Benson believed that he wanted to retire and rose, too. Then he saw that the girl, Comrade Tchershkaya, was approaching their table. He viewed her with distrust, his idea of G.P.U. agents was certainly not very flattering. But he could not help but notice that her figure was flawless, and that she had long and slender legs.

"Be seated, gentlemen." The girl smiled. "I need some refreshment and I thought you wouldn't object to my joining you. If you haven't finished your discussion yet, please don't mind me. But if you have, I'm eager to know what you've decided to do."

She glanced over the list of drinks. "Pretty much American drinks," she muttered, "but I think that in honor of our distinguished foreign advisor it would be O. K. to go American tonight. What's that, Mint Julep?" she began to drawl. "Well, if they make it as they do down South, Ah think Ah'll have one."

Benson was startled. His surprise was manifest and the girl smiled.

"Where did you get all that English?" he asked.

"Fifty-seventh and Broadway, mister," she replied. "I lived there for three years. That is long enough for a woman of only little less than average intelligence to pick up a language. My chauffeur was a Negro from Florida, which added flavor."

While she was sipping her drink, the professor related the story in Russian. Benson understood a word here and there, and as far as he could make out,

it was actually the plan they had decided upon.

Since he understood but little, he had time to watch the girl. She was beautiful; there was no doubt of that. She, also, had a pleasant voice, and there was no doubt about her intelligence. Suddenly, he stopped the drift of his own thoughts. He must stop thinking about her; he must never again start dreaming around her; she was—all circumstances considered—the most undesirable girl to fall in love with. But, suppose they were in love, both of them of course, how would he call her, what might be her first name?

She interrupted his thoughts. "Tell me, Mr. Benson, are there no other living things on Mars than those terrible skolopenders? And is it true that one falls ill if one looks at them?" It was not only her eyes that looked unbelieving; it was not only her mouth that spoke with clearly expressed doubt. Her whole body was disbelieving.

"There are no larger Martian animals known," answered Dan. "Only other insects, not much larger than our own on Earth, a few small insect-eating birds and, of course, fish in the seas. And crabs and jellyfish and starfish—"

"As to your other question, whether one falls ill when looking at those things, I can only answer that I strongly advise you not to. I have seen people faint when they saw the preserved head of one of the *tchorts* in the museum. They certainly look hideous, and it needs strong nerves and some experience to remain calm in their presence."

The disbelief in the eyes of the girl changed to horror, and Dan caught himself pitying her. She would see enough of them, though she would be protected by metal and unbreakable glass.

A few loud words in English from passers-by made him turn his head. And half a second later he regretted his pity. To the left there was a large mirror,

reaching from floor to ceiling. He could see under his own table in this mirror. He saw the girl's foot knocking at the boot of the professor. Immediately afterward, the professor rose and asked to be excused because he felt very tired.

"The first examination by the G.P.U. is due!" thought Dan, and for a fleeting instant he was willing to retire, too. But then he felt like facing whatever might come, and stayed.

BUT if it was an examination, it was a very clever one. "Tell me something about Mars," she begged. "Nadya Tcherskaya is on this planet for the first time."

"It is a very clever beginning," Dan thought. "Now she tells me her name, so that I shall know how to think of her.

"There aren't many things to tell," he said aloud. "It is a cold planet—cold in summer and very cold in winter. The climate is healthy, though, but life is hard, even if we succeed in exterminating the Blue Menace. It will always remain unfriendly to man."

"Tell me about the people that live here," she said. "And tell me about your own life. I want to get the feel of the planet, so that I may more easily accustom myself to it."

That sounded genuine enough, but Dan was still hesitant.

"I read some of your stories, Mr. Herbert H. Harr," she continued, and there was the faintest trace of mockery in her words. "But they deal no longer with Mars since you are here."

He still hesitated.

Then she said—and it mirrored his innermost thoughts, "I do not object to a scientist writing stories—if they are good stories. And I do not object to yours, Dan Benson!"

"It is true," he said slowly, "when I lived on Earth I used to think of dramatic yarns of the spaceways; I used

to tell stories about gem diggers fighting blue skolopenders; I used to describe the green sky of Mars, her yellow seas and her red deserts. I once knew an author who used to write war stories. Then he had to go to war. It was a very minor war, but he saw untold thousands of men die. He himself escaped, but he writes peace articles ever since. Now I am on Mars; now I write about love under the blue sky of Earth. I prefer our Luna to the two moons of Mars. I adore our foaming seas and green forests. I am homesick for the fiords of Norway and the coral islands of the South Seas.

"Nadya—beg pardon—Miss Tcherskaya, this planet is dead. Dead are its yellow, salty seas and the fish in those waters. Do you know they have blue bones and green flesh? It is a mistake that they are alive. They are dead, dead like the water that has no foaming surf. The red plants are dead and so are the red deserts. The civilization is in ruins. There is only one thing alive—the blue skolopenders."

He took a long sip from his glass. The girl looked at him; there was pity in her eyes. Her hand touched his for a moment.

"A severe case of homesickness," she commented. "You were preparing to leave, weren't you? So why do you stay with us? Do you need the money? Or do you want to take revenge in killing blue *tchorts*?"

Dan felt as if this girl could read his thoughts.

"I want to kill them all right," he answered. "There should be nothing alive on a dead planet. And I can use the money, too."

The girl looked at him for a long time. Her eyes seemed to convey some message; he could not find out what message it was.

Then she spoke, with lowered voice. "Dan Benson, I can see through you. To-night you forgot what drove you

away from Earth. I do not know whether I should congratulate you; I cannot decide that for weeks. Now you are homesick for Earth. And as soon as the contract you signed to-night expires you will return to your planet and to your country." Her voice changed, began to sound businesslike. "I do not know whether somebody informed you that I am of the G.P.U. This institution knows everything. It knows that you were broke when you arrived here. It knows that you made two thousand seven hundred and fifty dollars on literary work and close to eighteen thousand dollars by the sale of your Martian gems. It knows, therefore, that you do not really need the money of to-day's contract." Her voice changed again and was as before. "The G.P.U. even knows what you do not know: why you signed the contract. But the G.P.U. does not comment, it acts.

"If you think me beautiful, as you do, Dan Benson, I ask of you one thing. Let me always make the first move. It is better so. Don't let your vanity interfere with that. Do you promise?"

"I do!" he said, without hesitation.

She emptied her glass, smiled, and said, "First Move No. 1: I go to bed. So do you. To-morrow at eleven o'clock at the landing field. Good night."

After two steps she turned around. "You have a German doctor's degree in chemistry, haven't you? All right then: *Du kannst mir trauen!*"

Going to his hotel, Dan rehearsed, word for word, their conversation. There was no doubt—he loved her and she knew it. She knew it as well as she knew why he had left the Earth. She probably even knew the name of the girl that was the reason for his decision to go to Mars. She knew it all, and was honest enough to tell him. He thought of that last sentence, the German sentence, "*Du kannst mir trauen*. You may trust me." His reasoning told him that he should not. But

he wanted to. And he decided to trust her; hers was always the first move.

He did not quite understand the full meaning of that—and so it could not do much harm to trust her. Nothing could be said against him as long as he did his duty. And he would not trust her if it meant to neglect his duties. One could never know. After all, she was a commissary of the G.P.U. She had told him so herself. Did she want to cover the indiscretion of the professor? This seemed somewhat mysterious, too—but it could not be denied that she was very, very beautiful.

IV.

BENSON and the professor had decided to test the method they had worked out for the extermination of the blue skolopenders on a small scale first. If the experiment was successful, the method would be used generally, if not, they had to think of something else.

On the landing field an airplane was waiting for them—a sight-seeing plane hired for one day by the government. The workers had not finished assembling the large government planes yet. One of the soldiers was trained in aerial bombing. Dan took him along. The other passengers were the professor, the girl and himself. Since the window of the cabin had to be open for bombing—naturally a sight-seeing plane of a private company had no bomb release—they all had to wear oxygen masks and heavy furs. The professor looked as if he weighed a ton, while the girl did not lose her graceful slimness, even under the heavy furs.

The plane headed for a single ancient ruin in the desert. Dan knew that skolopenders were abundant there. He had always hoped to be able to investigate this ruin and to search it for ancient gems that were so highly priced on Earth. It had always proved impossible. The blue skolopenders had attacked his

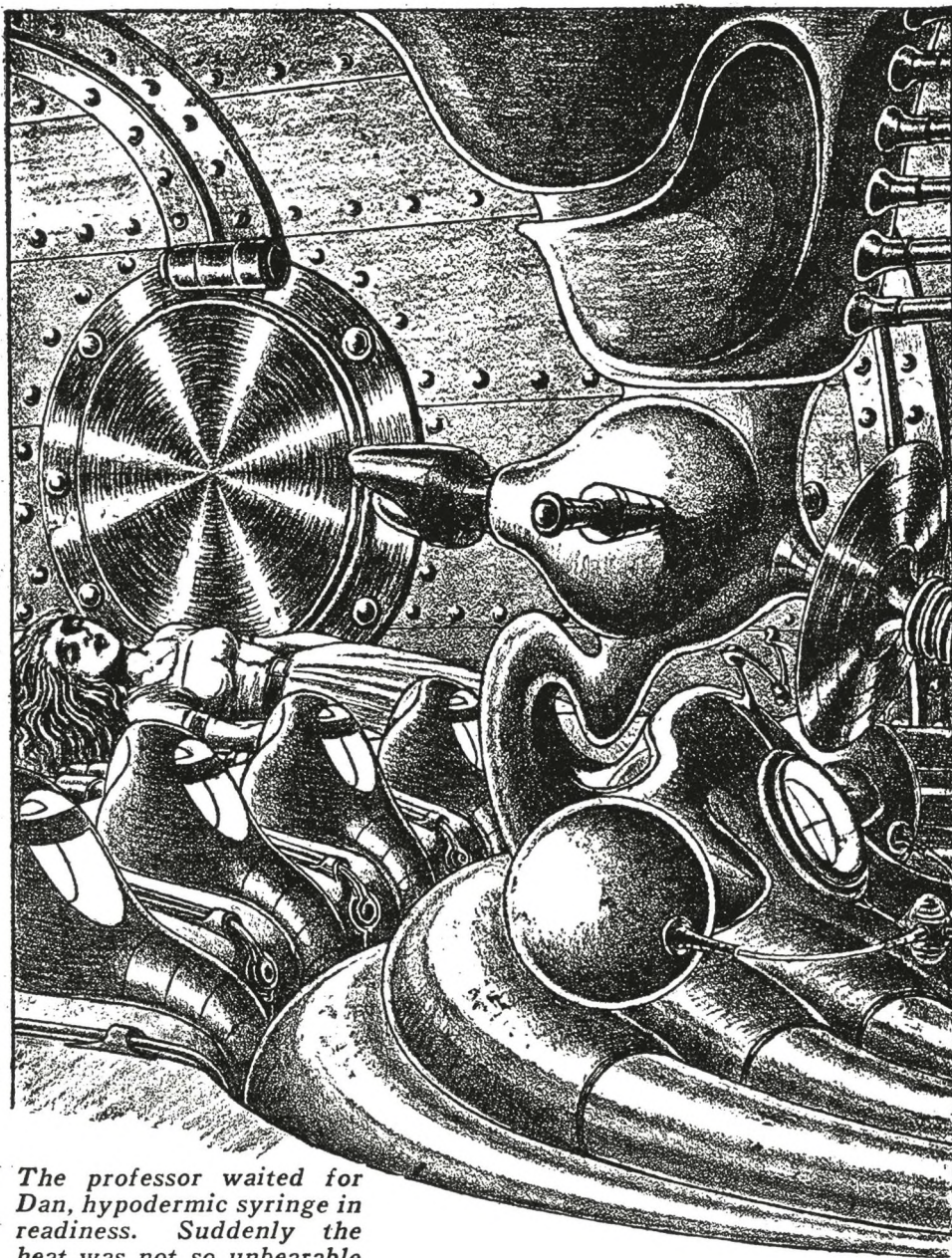


car in such numbers that he had feared the top would crush in. Not even during the coldest period of Martian winter was an approach possible. Dan wondered what the skolopenders fed on. It was one of the things the Terrestrial scientists were most eager to know.

Very early in the morning, trucks had brought soldiers and equipment to the place. The soldiers had been digging a shallow trench around the ruins dur-

ing those hours when the cold rendered the animals harmless. Then they had retired into the inclosed trucks, leaving men on guard armed with flame throwers. When the plane came in sight of the soldiers, large barrels of kerosene were emptied into the trench. There was one exit; it was guarded by batteries of flame throwers.

The plane circled over the ruins and a small thermite bomb, hardly larger



The professor waited for Dan, hypodermic syringe in readiness. Suddenly the heat was not so unbearable any more——

than an egg, was thrown by the soldier. His aim was accurate. The bomb dropped to the ground only inches away from the trench, and the heat of the thermite ignited the kerosene instantly.

Thick clouds of black smoke and a curtain of red flames formed a circle around the ruins. The airplane darted over to the ancient building and a number of bombs were dropped. They exploded

with a dull sound, releasing a very heavy yellowish gas that flowed like a liquid into the cracks of the ancient walls and found its way into the basement. The gas was the strongest poison known to Terrestrial warfare.

Soon blue, squirming bodies could be seen darting from the ruins, running in all directions to escape the gas. Dan looked at the girl. Her face was pale, but she held herself bravely. The skolopenders came in touch with the flaming kerosene; a few were burned; most of them darted back, running to and fro for minutes. Then they discovered the opening in the fiery circle. They were greeted by more fire; the flame throwers shot long flames at them, sizzling heat devoured the oily bodies.

But more and more came, and slowly the men gave way. Suddenly there was confusion. Over the flaming pools, across the bodies of unfortunate soldiers, raced the animals. Benson shouted orders to the pilot, the plane instantly turned and followed the skolopenders. High as their running speed was, they could not compete with the airplane. They dropped a rain of thermite bombs on and around the animals. Benson was in a frenzy. The sight of blue, slender bodies scorching in the blazing heat of the thermite made him mad with emotions of vengeance.

THE SUPPLY of thermite bombs was soon exhausted, but there were still a few animals alive, racing in single file across the endless frozen desert. The plane had a flame thrower on board; it was the standard equipment of any vehicle on Mars. Benson ordered the pilot to land. He emptied a water container through the one open window and took his post, muzzle of the flame thrower in his hand.

"Attention now," he said. "They will be attracted by the water I spilled. As soon as they are within range, I open fire. Should the flame thrower fail only

for a second, or should the fuel supply be exhausted before all are dead, one of you must close my window at once. If only one of the *tchorts* leaps in, we are doomed, all of us. When it is necessary, I yell to you, Larry." The pilot nodded. "Then you take off at once, keeping the motor running."

The pilot nodded again, understandingly. He knew how to deal with Martian skolopenders; they died in higher altitudes from lack of air pressure. The bomber took his post at Benson's side. He gripped the handle that closed the window.

The skolopenders came in a straight line toward the plane. The water attracted them. Benson waited as long as his nerves allowed him to, then he opened fire. The first three of the animals died in the fiery blast; two others were caught when they tried to run away. Dan was just ready to direct the flame against the last survivor—an especially large specimen—when the flame lessened in intensity and stopped. The fuel supply was exhausted.

"Take off! Shut the window!" yelled Dan.

The sudden acceleration of the plane made him stumble; he heard the roar of the motor, saw a blue body leaping and the window closing at the same time and felt that they were in air. The soldier was lying next to him on the floor, dying. Benson saw an ugly scratch on the forehead of the man; then he looked up and saw the heavy body of the animal dangling from the window, two of the legs caught by it. They were inside the cabin, madly clutching at empty air.

The pilot saw the same in his small mirror, and sent the plane spiraling upward until it reached its ceiling. The skolopender must be dead by now. Benson donned a pair of heavy leather gloves to make safe against accidentally touching the legs of the creature and, carefully avoiding looking at the dangling

body, he opened the window. He saw the blue body fall; if it was still alive, the impact on the ground would kill it.

Then the plane returned to the ruins. The kerosene was still flaming and made an excellent landmark. The lieutenant of the ground crew had his soldiers withdrawn into the trucks. Eleven bodies were lying on the sand, killed by the sudden onslaught of the animals. There was nothing to do but to bury them and to leave a well-equipped and provisioned detachment to guard the place and to kill possible survivors.

Benson was unhappy as they returned to Space Port. The accident in the airplane had been out of calculation and he felt responsible for the loss of the eleven men of the ground crew. He should have insisted on waiting until all equipment was ready. Nadya radioed the news to Tchernikoff on the flight back. Dan could not understand what she said, but he received the impression that Tchernikoff was satisfied.

When the airplane landed, a waiting orderly gave Dan a letter. It contained a short note of congratulation and an invitation to have dinner with the governor and the other members of the government.

After dinner, the professor called Dan to a conference. There were the same people present as at the previous meeting, but, in addition, two men wearing the uniforms of officers of the Red army. The governor opened the meeting and outlined the plans made by the government in Moscow. First, Thyle II, or Novaya Respublika, was to be swept clean of the skolopenders. Then new cities were to be built on certain spots where geological surveys indicated the presence of ores of some kind.

The aim was to manufacture from Martian resources whatever was possible and to produce quantities sufficient not only for Thyle II and its population—which was to be increased—but also for the other Martian districts which had

capitalist government. Naturally, Mars-made products, however inefficient the production methods, were much cheaper than any imported products, which suffered under the extremely high cost of transportation.

In short, Thyle II was to become the industrial country of Mars. At the same time, it was to be completely socialized. Private labor of any kind was to be outlawed soon. Everybody present on Thyle II at a certain date—except government employees of other nations—was to become an employee of the soviets. There was to be no alternative, and possible applications for a permission to leave Thyle II were to be regarded as “attempted high treason” and punished accordingly.

Then one of the army men spoke.

He had six hundred soldiers and approximately twice as many workers at his disposal at Space Port. There were about eight hundred workers and one hundred and fifteen soldiers at Planetogorsk, the only other city on Thyle II. In addition to these forces, there were seventy men of motorized police. The remainder of the male population numbered around four hundred men.

He, Commander Koltchakoff, demanded every man between the ages of seventeen and fifty-five years for the force.

The commissioner of the police spoke next. Due to the rigid registration system, everybody on Thyle II was known to the police. There were all in all three thousand one hundred and eighty-nine male and two hundred and thirty-six female inhabitants on Thyle II. Only two hundred men, approximately, were younger or older than specified.

Tchernikoff listened to all these reports, which were briefly translated for Dan by the professor. The discussion lasted for hours and began to drag endlessly. Everybody was tired, and Tchernikoff, who was to make a decision, did not say a word. Suddenly he rose.

"I hereby declare Novaya Respublika in state of war. Comrades, go to your duties."

V.

TWO DAYS LATER airplanes searched every square foot of territory. Wherever they saw a car or a desert tent they dropped a small cylinder. Falling through the thin air it emitted a whining howl that could be heard over long distances. Hitting the ground it produced a smoke column everybody would approach to investigate. Doing this, he would find an order engraved upon an aluminium plate attached to the cylinder. It was the order to come to Space Port at once, for duty.

The radio notified the governments of the other parts of Mars that Thyle II had declared martial law. All Mars was warned to stay away from the island; neither airplanes nor sea-going vessels were allowed to land except in case of engine trouble.

All private activities were outlawed; all inhabitants concentrated in the two cities, mainly at Space Port. Squadrons of tanks stood lined up outside the glass wall; fleets of airplanes were ready on the landing field.

Dan was overworked, nervous and uneasy. So were all others feverishly working out details, they waited for Tchernikoff's order to march. It was the atmosphere of war, the first war in history not directed against other human beings.

Dan was more nervous than the others. There were many things he did not understand. Oftentimes this was due to linguistic difficulties; more frequently it was not. He had the feeling of being outside the real activities, though he was invited to every conference of the government. At least to every conference he knew about. Certainly there were others kept secret from him. There were questions he asked that were not answered. And

there were questions asked of him he could not make out. He answered to the best of his knowledge, and sometimes it seemed that his answers pleased those that asked the questions. But why it pleased them and why these questions were asked he could not understand.

He did not see the girl at all, except during the official meetings. Once she sent him an official letter. It contained a course for a trip to Earth, plotted according to the positions of the two planets at the present moment. She asked him to check the calculations. He set to work and found a number of serious mistakes. To correct them meant to do the whole work over again, to plot an entirely new course. He did it and sent it back to her. The answer was one of the questions he did not understand. It asked exactly how much time he had needed for the work. He replied truthfully and did not hear about it again.

One morning, when he came to the office given to him in the administration building, he found a slip of red paper—the order to march.

The astronomers in the lunar observatories and the astronauts in their space ships—when they turned their powerful instruments upon the reddish disk of Mars—saw Thyle II going up in smoke and flames. Across the island there was a line of black during the day and of flickering fire at night. It progressed slowly, and as it progressed people knew that it meant the extermination of the blue skolopenders. But while this looked like an achievement if viewed from other parts of the universe, it did not to the men who were ordered to do it.

They hated the Blue Menace. But the joy felt by them during the first weeks of the war, when their flame blasts killed the animals by the thousands, slowly disappeared. Tchernikoff's commands, executed by Koltchakoff, Nadya

and the scientific committee—consisting of Dan and the professor—drove them on restlessly. The men had practically no rest periods.

Trenches were dug and filled with inflammable liquids, the vapors of which ranged from unpleasantness to poison. Tanks clanked on through the desert; the men froze at night and suffered from the ultra-violet rays of the Sun—only insufficiently absorbed by the thin Martian atmosphere—during the day. Their skin ached from the biting cold; their fingers and toes were frozen. They had unbearable sunburns and their hair and eyebrows were scorched by the flames they directed against the skolopenders.

MANY men died from Martian sickness, from accidents while handling the liquid fire, from the thermite bombs and the explosives. Unforeseen attacks of the skolopenders took heavy toll.

Men, especially in detachments where professional soldiers were in the minority, began to revolt. They demanded rest on days of extreme cold.

The plan had to be fulfilled.

There was food shortage, due to the explosion of a number of fuel tanks that burned provisions, too.

The plan had to be fulfilled.

There were sectors where two thirds of the men had succumbed to the various and many causes of death. The remainder were utterly exhausted.

The plan had to be fulfilled.

One detachment went on strike one morning. The lieutenant radioed Kolchakoff and Tchernikoff and then lined his men up.

"Comrades," he said, "this is war. An enemy threatens the prosperity of Soviet territory. That the enemy is not human does not matter. It is war. But you may tell me who is too ill for duty to-day."

Of the two hundred and fifty men about twenty stepped out. The lieutenant had them brought a few hundred

yards away. Then he turned to the others.

"I understand that the presence of these people made your work inefficient, comrades. Now they are no longer with us and our detachment is as efficient as during the first day of this war. It is even more efficient, due to the experience gathered in the meantime. Go to your duties."

While charging the flame throwers and fueling the tanks, the men heard the sound of rifle shots. Firearms were not used against skolopenders. Later they were informed that five of the twenty, assumedly simulants and leaders of the strike, had been shot.

Similar happenings were repeated.

The black line at day and the fiery line at night, that crept over Thyle II, slackened in speed. It had been a straight line at the outset, extending from Space Port to the shore of the Mare Australe. Then the line split up into two parallel lines, one going northeast, the other southwest. The latter soon reached the shore, and thus showed that Thyle II was free of the Blue Menace southwest of Space Port. But the northeastern front became jagged. There were ancient cities that were ruins on the surface but caverns of enormous size underneath. The caverns protected the animals; they attacked the advancing lines of men from the rear and slew numbers of the invaders from Earth.

Benson ordered a new type of bomb. They were heavy, with a large charge of high explosive. When the ruins were gassed and sprayed with liquid fire, the new bombs were dropped. Since they fell but slowly, due to the lesser gravitation of Mars, Benson used what were called penetration bombs by the army experts on Earth. A powerful rocket charge drove them downward; they arrived with a speed several times as high as gravitation alone could produce it. The penetration bombs broke through the debris piled on top of the ancient

basements and exploded inside. The ground shook when they went up—dust, debris and sand mushroomed high into air.

The battle became routine work. The tanks, trucks and cars advanced through the desert at a distance carefully calculated to be short enough to reach any skolopenders with the jets of the flame throwers. The supply trucks and the men followed half a mile behind. When ruins were encountered, the vehicles closed in around them. There were enough to avoid digging trenches. Then the airplanes appeared and dropped their bombs, gas, thermite and—if necessary—penetration charges.

Benson grew to enjoy the rather monotonous performance. He was practically in command. Tanks moved and stopped when he ordered it, flights of airplanes came when he summoned them over the radio. And the hated blue skolopenders were killed by the thousands every day.

Dan liked the old Russian professor, who had proven to be a pleasant companion as well as a cultured man. And it was sweet to be near the girl all day and part of the night. It was sweet though it hurt. "She is too damn beautiful," Dan said to himself night after night when he was alone. "She is so beautiful that it hurts to look at her, not knowing how she feels or whether she feels at all. But it would be harder not to look at her."

Thinking of Nadya did not keep him from his work. Nor did it keep him from listening to the growing rebellion. The men were on the verge of open revolt. Sometimes Benson wondered when they would turn their flame throwers upon his tank.

THERE WAS one night when Phobos and Deimos, the two small moons of Mars, shone more brilliantly than usual. They were like diamonds in the sky, maybe because it was so

very cold. Benson went around in the camp. The men had dug a fire trench around themselves, protecting themselves by a fiery circle. They had twenty-four hours of rest. Dan had argued it out with Tchernikoff. He tried to keep the men in good humor; he knew himself that he failed rather badly.

When he came to the small bus which was Nadya's quarter, he saw her sitting alone near the fire trench, wrapped in heavy furs. She had discarded the oxygen mask. She could breathe now without artificial aid, when in the open, if she did not work or move. He set down next to her. Her face looked tired and nervous but lovely in the red glare of the flames of the near-by trench.

"Say *something*," she said after a while. "Don't sit like a stupid boy who happens to meet his hero and is struck dumb and deaf because he has the opportunity to talk."

Dan was surprised. This sounded like the first evening, and she looked at him as she never had in the many days since.

"The men are uneasy," he said. "Sometimes I wonder that they still obey."

"I know," she answered. Dan felt that she did not like the subject. "They obey till we have reached the other shore. When there are no skolopenders left, they won't obey any more. Right now there are still blue *tchorts* in existence, and they hate them more than they hate us. *Us*, I said—Tchernikoff, Koltchakoff, me, the professor, you, the officers."

"Do they hate me, too?" asked Dan.

"Certainly. You belong to us. Once they classified you with them. They were not right with this classification, but they did. You were a gem digger like they were. Now their licenses are withdrawn and you are in command. That's why they hate you more." She looked at him fully, and Dan felt un-

easy under her clear gaze, that seemed to penetrate his brain and read his thoughts. What she said increased this feeling. "You don't like to belong to us, do you? But you do belong to us. Hand me my mask."

"She donned the oxygen mask and rose. "Come with me under shelter; there is something more to say."

They climbed into the bus. Dan shut the door behind him. When he reached for the switch he felt her hand upon it, keeping his hand back. "Don't, the batteries are run down."

He watched her taking the furs off in the dim light that came through the windows. He could just see the two moons in the upper left corner of the window, and his thoughts shifted for a moment to the much-discussed ancient Chinese painting. Nadya sat down, lighted a cigarette, looked at him again. "So you don't want to belong to us. But you would like to belong to me. Maybe I want it, too—occasionally or for a short while. Maybe even for a very long while, I don't know yet. There is one thing I want to be certain about——"

She did not finish the sentence because he kissed her. She did not withdraw for a while; then she struggled free.

"Very nice work, Mr. Benson," she said mockingly. He knew that it was a very, very untruthful mockery. "I understand that you thought you had to display the man in you, so that I should not overlook this fact. Very well then, I made a mental note to that effect. 'Mr. Benson is occasionally masculine——'"

She had to stop because he kissed her again.

"As I was saying," she continued minutes later, "I want to know one thing." She rose from her seat and faced him fully. "This is serious now. Things are pretty complicated because we met on Mars. First, because you

had to forget a love; second, because I have to avoid an undesirable marriage. I *must* know whether you feel that you can believe in me."

He had no answer to this question. How could he believe in her? She was beautiful—very beautiful, he amended the thought—and she was a perfect actress. In addition to that she was of the G.P.U. However, he wanted, very much, to believe in her.

He did not know whether he said all this, or whether she read it in his face. He was inclined to think the latter. She knew what he thought, so much was certain. And she smiled and murmured something in Russian he did not understand. In English she said: "The stupidity of otherwise intelligent men is amazing to behold." She slapped his face—very, very gently—and said: "Forget that you were alone with me."

"That's impossible to forget!"

"All right, keep it as a pleasant memory, if you think it to be one. And now leave me alone; I want to get some sleep. What else do you want? . . . Another kiss. . . . All right, if you want to make me suffer, kiss me again. . . . Go now. Nadya is tired."

When Dan walked through the bitter cold of the Martian night, to his own sleeping quarters, he thought that he would not sleep at all. He thought that he would sit up all night, thinking. But he fell asleep before he had all his clothes off.

VI.

THERE WERE only a number of isolated ruins and one single city left. It was routine work and it progressed on schedule. Nadya left them for two days. She flew to Planetogorsk. From there she sent a message to the professor that she had to fly to Space Port. When she came back, Koltchakoff and Djilinskiy accompanied her.

Djilinskiy ordered a number of arrests, and Koltchakoff reduced the force.

He himself picked the soldiers that were to stay with Dan. The others were disarmed and marched to Planetogorsk. Space Port was too far away. A railway connecting these two, and three projected cities, was the next step of the plan. Some of the men were to start work in the factories at once, producing rails, while the others were to begin building the tracks. It was the one hundred and twenty-second day of Tchernikoff's reign, and he wished the railway completed on the day of his first anniversary, the year counted in Terrestrial manner with 365 days.

When Dan's airplanes were just attacking the ancient city, Nadya's plane came back. She brought many orders from Tchernikoff with her. The airplanes were to fly to Space Port as soon as the bombardment of the last stronghold of the Blue Menace was finished. The tanks were to drive to Planetogorsk full speed, as soon as they could be spared. The orders forced the men to work all night, if necessary. There were only trained soldiers in the camp now, and there was not the slightest question of obedience.

It was about four o'clock in the morning when the lieutenant reported the work finished. Ten minutes later the tanks drove on. There were only two busses left. Nadya and her driver—a girl of the Red army—slept in one; Dan and the professor in the other. Their order was to be in Space Port at ten o'clock at night, a drive of six hours, if nothing happened.

They were having breakfast together at eleven o'clock; Dan looked at the ancient ruins from which occasional clouds of smoke still arose. Suddenly he felt empty, useless, superfluous. His job was finished. The girl driver looked at him in a peculiar way when he voiced these thoughts.

Nadya said: "You are still on duty, Comrade Benson. I advise you to await orders."

The professor said that, out of scientific curiosity, he would like to look at the ruins more closely. Nadya granted the wish, but said that she would accompany him and ordered Benson to come along, too. They dressed in suits that were to protect them against the poison gas they had sprayed twenty-four hours previous, and walked toward the ruins. The drivers were ordered to have the two busses ready for immediate departure after their return from the ancient city.

When they were among the ruins, the professor separated from them.

"Do you like him?" asked Nadya.

"Immensely," answered Dan.

"I am glad," was her reply, but she did not explain why; if the answer needed an explanation. After a while she asked one of her inexplicable questions.

"Do you know Beethoven?"

"Certainly, and I like him and classical music in general, if that interests you."

"It does. Do you know the 'Sonata Apassionata'?"

Dan whistled the leitmotif for an answer, though it sounded strange through the headphones.

"That's good." She nodded. "Dan, there may be surprises during the next few days. Surprises for you, for me, for all of us. Do me a favor: *be* surprised when they happen. Be very much surprised. Let your temper ride you. But whenever you hear the 'Apassionata' you'll know that it is a favorable surprise. Now, tell me the story of these Martian gems. I only know that they are expensive on Earth. What are they? How are they obtained? You ought to know."

Dan looked around over the ruins and said: "We may find some here; in fact, I am pretty certain we will find some here if you'll let me dig for a while."

"Have you been notified about the

withdrawal of your license? They probably overlooked you. Dig!"

SELECTING A SPOT that looked promising, Dan began to relate what he knew. "You know," he said, "we know nothing about the original inhabitants of Mars. We only know that once a race of intelligent beings dwelt here. They built houses and cities, as men would. Don't ask me how old the ruins are; there is a controversy about their age that lasts since the first landing of a space ship on Mars. If the ruins were on Earth we would say that they are about ten thousand years old. But erosion progresses much more slowly on Mars—where it rains once a year, if at all. They must be much older—one hundred thousand years, two hundred thousand, maybe a million. Maybe even more. We don't know. Anyway, they are so old that there are no traces of the inhabitants left. Nobody ever succeeded in finding a bone or a piece of furniture that would allow some guess as to their looks, size or habits. If the size of the buildings permits a conclusion, I'd say that they were approximately as tall as one of the smaller human races.

"Rusty pieces of metal were discovered occasionally. They are called 'tools,' and they probably were tools. But they are rusted through, and it is impossible to say whether one particular piece was a knife, a spear blade or a can opener.

"We have no idea about the height of their civilization. All that remains of them is their jewelry. They made golden rings, of a size too large for any Terrestrial finger and too small for any Terrestrial wrist—of adults, I mean. They carved stones with utmost delicacy and precision, and made sculptures of a material similar to our ivory. All these things go under the name of 'Martian gems.' If you are lucky enough to find some, you usually find

several pieces together. I have the suspicion that they belonged to their dead, that they buried their dead in or near their cities and placed their jewels in the grave."

He paused for a minute, turning a large slab of stone. It would have required the strength of several men on Earth; on Mars he could do it alone. Something glittered in the sand—a large gold ring, inlaid with small emeralds and rubies. There was a heavy, but very short, piece of golden chain, with a large amethyst, about one inch across, dangling from it. And there were several balls of the white, ivorylike material. They were solid. Their surface showed ornamental designs. Dan handed the pieces to Nadya. He was excited.

"Look here," he said, pointing to the amethyst. "The design is entirely ornamental. There has never been a find which showed animals or plants or parts of them—like leaves, for example. I believe that these Martians had a religion which tabooed live things, and that this is the reason they always used geometric designs. There are primitive religions on Earth that have similar taboos."

Nadya looked at the jewels.

"They are yours, Nadya," he said.

She shook her head. "No. Later, perhaps. They are yours. And remember you found them before you signed the contract. What are they worth?"

"The balls about ten dollars each. That's what I get. When you buy them at Fifth Avenue you'll probably pay twenty-five. The ring is worth around a thousand, and the chain I would not sell for less than three. I would offer it to a museum first and might get more. But I think you like this chain and I'll keep it. You may want to wear it—'later, perhaps.'"

Nadya looked at her wrist watch. They had to drive back to Space Port now, if they wanted to be punctual to

Tchernikoff's summons. It was very advisable to be punctual.

VII.

BENSON was on his way to Tchernikoff's private quarters.

There were excited crowds on the streets, discussing something he did not know about. He saw them pointing to an article in the weekly news magazine that appeared every Thursday. But it was printed in the Russian language. Dan looked around for somebody he could ask, and finally saw one of the policemen who had been with him in the war against the skolopenders. He knew that the man spoke fair English.

He bought a copy of the magazine and asked the policeman to read the article on the front page to him. It was signed by Tchernikoff, and it praised, in a somewhat self-laudatory manner, the fulfillment of the first part of the industrialization plan. Then the next move was sketched and the construction of the railway from Space Port to Planetogorsk announced. The important part, however, and apparently the one that caused the excited discussions of the crowds, was a decree that all gems found during the execution of the industrialization plan belonged to the government. This also applied to all gems already discovered, since the day when Tchernikoff took over the administration. In doubtful cases, the government would buy the gems at prices decided by the official in charge. All private trade, as well as the hoarding of gems, was punishable by death without trial.

Benson thanked the policeman for the translation and continued his walk. He understood a lot of things, now. He understood Nadya's advice to remember that he had found his gems before he signed his contract; he understood how Tchernikoff was going to finance the industrialization plan. He had asked

this question many a time and never received an answer.

There were many people in Tchernikoff's house. Benson saw almost everybody he had met before and some he had not. But two were absent—Djilinskiy and the professor. Benson asked several people about them, but they were reluctant to answer. It even seemed to him that they were reluctant to speak to him. He asked for Tchernikoff and received the answer that he was most probably in the music room. Dan went to the music room. There were Tchernikoff and Koltchakoff. Nadya was sitting at the piano.

"Hello, Dr. Benson," Nadya welcomed him. "We are just indulging in classical piano music. Do you have a favorite composer?"

It seemed to Dan that this question was not without hidden meaning.

"Yes," he said. "I like Beethoven."

"All right," agreed Nadya, "let's play Beethoven."

She touched the keys lightly, and Dan at once recognized the melody.

She played the "Apassionata"!

A door opened and somebody came into the room. Nadya broke off and Dan turned around. Djilinskiy!

"Good evening!" he greeted courteously, and turned to Dan.

"Dr. Benson, I have been informed that you had the decree of Comrade Tchernikoff translated to you on the street. Therefore, it is certain that you are aware of the law. In view of this fact, would you mind explaining to us how you obtained the gems we just found in your room. It will be useless to say that you possessed them before the drive started; they were not in your room at that time."

Dan was aghast. Nadya's words, "Let your temper ride you," flashed through his mind. The advice was not necessary; he felt like fuming. But he controlled himself.

"Would you mind, Commissar Djilin-

skiy, telling me with what right you search my rooms while I am absent? As to the gems, I understand perfectly that you did not find them during your first search. I have had these gems for many months. They were the first I ever found and I carried them with me always, as charms."

If Dan had expected to anger Djilinskiy, he had failed utterly.

"And to-day you did not take your good-luck charms with you? Too bad indeed. You would just love to have them to-day. Consider yourself under arrest, Dr. Benson."

"Arrest? What have I done?"

Djilinskiy did not answer. He had arrested too many people without reason to pay attention to this question. But Tchernikoff answered, looking malicious.

"You have committed sabotage during the drive. The extermination was to be finished within seventy-five days. You needed fifty days longer. When you were already behind schedule you still applied for rest periods, misleading Commissary Tcherskaya as to the condition of your men. We know that they were in perfect condition, as can be expected from a Soviet organization."

Dan knew that it would be useless to argue; he had as much of a chance to escape as a fish in a net.

"Excuse the interruption, governor," he said with cold irony. "You made a mistake because English is not your native tongue. You meant to say the men were in as good a condition as can be expected from a Soviet organization."

Tchernikoff did not answer. Two guards held Dan's arms.

Nadya came and faced him. She shrilled at him, "We'll do you the favor to have a trial before we shoot you. But the end will be the same. As a personal favor, I'll play Beethoven at your funeral."

Dan kept calm. He said, smiling, "Please, do so, Commissary Tcherkaya. The 'Apassionata,' preferably."

Tchernikoff cursed his impudence. Nadya shot a Russian sentence at him, and Tchernikoff agreed with an evil smile. Djilinskiy and Koltchakoff smiled, too.

Djilinskiy sat down and said, "The commissary is obliging you, Dr. Benson. She will play your funeral piece right now. Later, there might be no time to do it properly, when you are executed."

Nadya looked at him again. Her fingers made a motion as if they were pulling the trigger of a revolver. Then she started to play, and there was silence in the room except for the sounds of the piano.

She played the first movement of the "Apassionata."

IT WAS after midnight when Dan was dragged from his cell. "The commissary wants to see you."

He thought it would be Djilinskiy, but there was Nadya behind the desk. Two guards were at the door, and at another desk was another man, paper and pen in readiness. Dan knew this man, he spoke only Russian.

Nadya addressed him in Russian; she spoke very slowly and distinctly, so that he could understand. She explained that he was to answer in Russian, if necessary she would translate. Then she started asking the usual questions, telling him that it would be much better for him to admit that he had committed sabotage and to say who had paid him for doing it. Sometimes she had to translate, because he really did not understand. Amidst the translations she inserted short sentences that had nothing to do with the official examination.

"I hope I didn't scare you. . . . I expect you to admire my talents as an actress. . . . Your case is already known to the American consul on

Thyle I. . . . There is a nice little revolt going on in Planetogorsk. . . . Koltchakoff disarmed his men very poorly. . . . He loves Tchernikoff's post. . . . Probably he'll get it. . . . The diplomatic intervention will drag the trial infinitely. . . . Sleep well and watch out for classical music. . . . I wish I could kiss you."

He was brought back to his cell. Nobody disturbed him the following day, nor the day after. Then he was called. A man he did not know read, in the presence of two witnesses, a short Russian document to him and asked him to sign it. Dan refused, demanded an interpreter. There was no sworn interpreter around, so he was brought back to his cell.

Nothing happened during the next day. Late in the evening he was brought before the same official again. This time there was an interpreter present and the document was read to him in English. It stated that due to the intervention of American diplomats it had been ordered by the governor to transport the prisoner, Dan Benson, to the Supreme Court in Moscow, if he agreed to be tried on Earth.

Wonderingly, Dan signed the document and was brought back to his cell. This night a different guard brought his supper. While rattling with the keys and watching him eat, as was customary—revolver pointed at him all the time—the guard whistled. First the "International." Then a Russian folk song Dan knew. Finally a melody Dan knew, too. "Watch out for classical music," Nadya had said. Here it was: Beethoven's "Apassionata."

"I advise you not to sleep," said the guard finally, in a broken English. "Zey may call for you any minute."

BENSON STRUGGLED to keep awake. It was not very difficult. There was much commotion in the building: people running along the corridors,

shouting orders and making noise with weapons. From outside he heard occasional rifle shots. All his nerves were tense. He took them to be executions. Heavy motors roared in between. He heard tanks passing the short concrete part of the street near the prison.

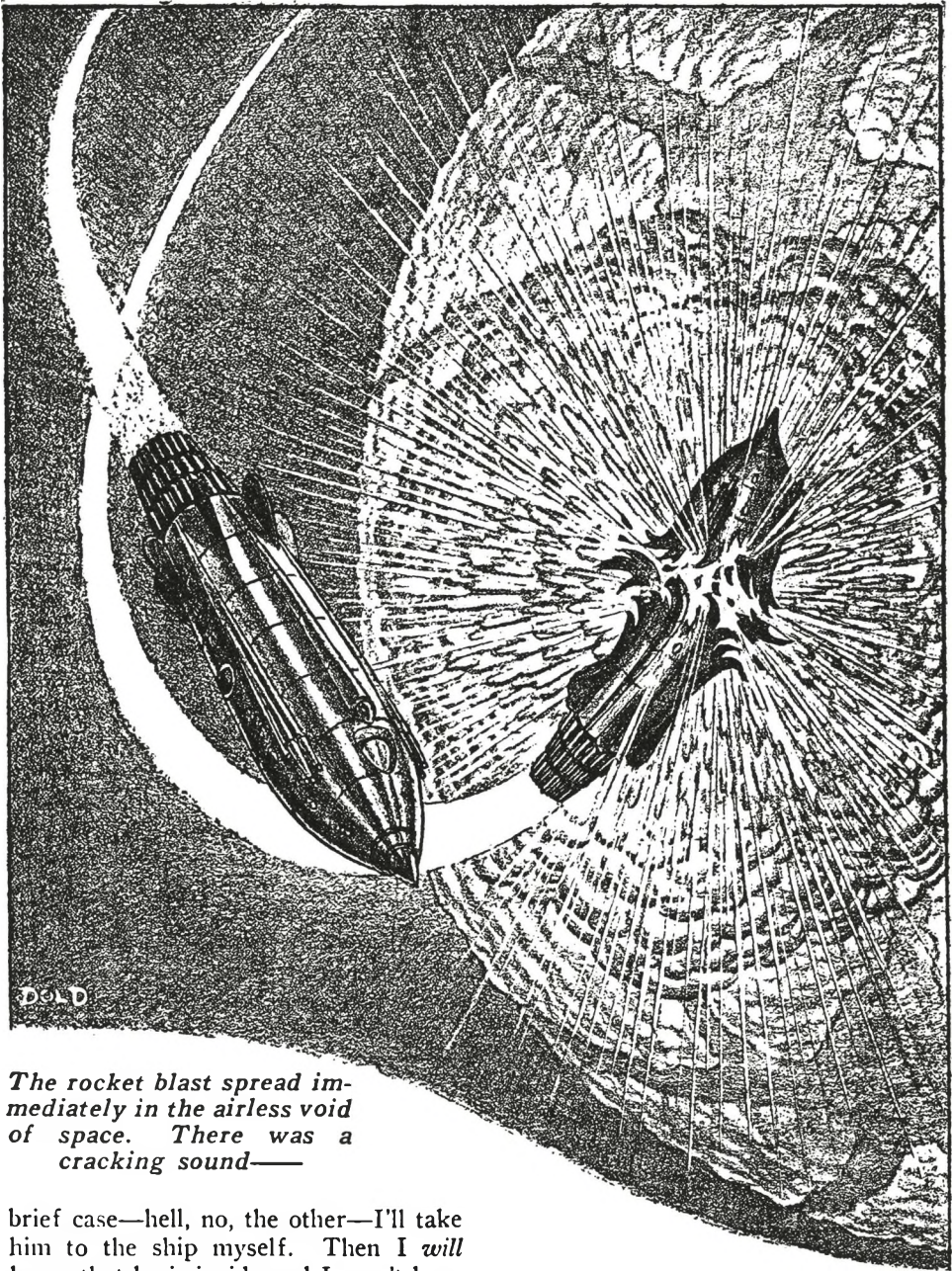
Suddenly machine guns hammered; rifles spat from the roof. He heard two explosions, as if of bombs, shouts, commands—then the noise of the machine guns drowned all other noises. After about ten minutes, silence reigned. It was deadly quiet outside. The tenseness of his nerves slowly vanished; he fell asleep. His wrist watch told him that it was around nine o'clock in the morning when he awoke. Usually the guard came at around eight o'clock with breakfast. Apparently nobody had been there.

Suddenly, the machine guns started again. One of them had a peculiar sound, Dan remembered. A few men with heavy boots came along the corridor; they stopped in front of his door, opened it and motioned him to come out. They did not speak a word, neither to him or among themselves, and did not answer Dan's questions. They brought him to the room where he had signed the document.

Nadya was there, waiting for him. She wore a uniformlike dress, oxygen mask at the belt and a heavy army revolver in a holster. Turning to one of the guards, she said, "Prisoner Benson departs to-day for Moscow. Call an orderly to accompany him to the landing field."

An orderly came. Nadya looked at him and was at once enraged.

"Kervin, you? I can't trust you with such a valuable prisoner. Isn't there anybody even of a very inferior intelligence available? Idiots, everything is messed up as soon as one of you looks at it! If there were a law against stupidity, all of you would stand against the wall. All of you. Give me that



The rocket blast spread immediately in the airless void of space. There was a cracking sound—

brief case—hell, no, the other—I'll take him to the ship myself. Then I *will* know that he is inside and I won't have to take your word for it, you stupid idiots. You should be whipped before you are shot!"

She turned to Dan: "Come on, you, committing sabotage here right under our eyes." Then in English, "I hope

to Heaven you did not understand all these nice expressions of our language."

Outside, she put on the oxygen mask and took the revolver out of its holster. It was easy for everybody to see that he was under arrest. A car was wait-

ing. The driver brought them as far as he was allowed. They were at the gates of the landing field. Nadya talked to one of the officials; he let them pass unmolested.

At this moment, the ground shook with an explosion. Looking up, they saw two airplanes at low altitude, the symbol of the Soviets plainly visible on wings and fuselage. A black object separated from one of the planes; a flame flashed and dark smoke appeared. With a whining howl, a penetration bomb made its way toward one of the buildings. Another one and a third. Machine guns started firing at the planes, they answered with more bombs. Gigantic black bushes of smoke and dirt flashed up where the bombs hit. The other airplane spilled a rain of small thermite bombs. One of them hit the foot of one of the glass walls and melted a hole into it large enough for a tank to pass.

There were three space ships on the field: the large *Lenin*, the smaller *Lena*, and the *Atlantis*. The plane flew toward the ships, and fiery blotches appeared around them on the ground. If one of these bombs hit an already fueled space ship and melted its way through the hull—thermite would do that—the ship would go up in an explosion that would leave nothing behind save a crater half a mile in diameter. Still walking toward the space ships, they automatically watched what happened. Three bombs hit the *Atlantis* and spread fire over her hull before they melted through the metal.

"She is not fueled," said Nadya. There was a minor explosion inside the ship, but nothing serious happened.

A particularly heavy explosion made them turn again. One of the planes had been brought down by the machine gunners. The other began to go into a glide at the same moment; it was hit, too. Cars and tanks raced across the landing field behind that plane. It

landed in the farthest corner, and its two pilots hastily mounted a light machine gun. Fighting started around the airplane. One of the cars that had pursued the plane, turned around and stopped in front of Nadya and Dan. He believed that the officer who jumped out of the car could hear his heart beat. But he only asked Nadya whether she had been hurt.

"Not yet," she answered and pointed to Dan, saying that she was to bring him to the space ship. To her surprise the officer answered that Tchernikoff had just arrived and was already on board the *Lenin*.

"I did not know that," she said to Dan, when they were alone again. "Be careful now; you see, the ships are about two hundred yards apart. In walking toward the *Lenin* we pass the *Lena*. When we are near, I faint with Martian sickness. You grab me and run with me to the *Lena*. If the plan fails, you say you misunderstood the name of the ship. Fortunately, both names are pretty much alike. They may think you want to kidnap me; but they won't shoot because you carry me. Besides, I have a revolver, too. Once inside the ship your worries are over. Just throw me on one hammock and yourself on another."

"Nadya, what is all this fighting about?"

"Ah, yes, you don't know. Koltchakoff is making himself independent. He promises free gem digging and free gem trade for two years. Planetogorsk is his; the workers are on his side and the army isn't very reliable, either. Apparently, Tchernikoff wants to go to Earth and complain at the Kremlin. He is no soldier and he cannot fight, not even for his own life."

THEY WERE now only twenty yards from the *Lena*. Nadya suddenly stopped, fumbled with her oxygen mask and uttered a shrill scream. She gasped

for breath and slowly dropped to her knees. It was so evident that she had a severe attack of Martian sickness that Dan almost believed it himself. He picked her up.

She murmured, "Don't worry, the thing is safe-locked," and pressed the muzzle of her revolver against the back of his neck.

Two men appeared in the door of the *Lenin*. Dan had no time to ascertain their identity. He was only ten feet away from the foot of the aluminium ladder leading to the open air lock of the *Lena*. He leaped toward the ladder and climbed it with the agility of a monkey, even more so, because he had only one third of Earth's gravitation to overcome. Nadya was not heavy, but his lungs burned from lack of sufficient oxygen under the strain of the fast movements. He knew, however, that he could stand it for a few seconds.

Still carrying the slender form of the girl, he scrambled through the open door. Passing the door, Nadya caught the lever that closed it. Simultaneously, the inner door of the air lock opened. They were now in dense atmosphere. Nadya slid to the floor. They jumped through the inner door and closed it, too.

There were the hammocks. The girl hurled herself on one, Dan on the other, which was next to a window. Dan saw through it that a machine gun was brought from inside the *Lenin*. In the same moment, the ship shook and the fiery splash of the rocket motors blotted the ground from sight. Dan felt the acceleration of the ship increase, he felt his body becoming heavy. This continued for a period of time seemingly indefinite. His watch told him that it was approximately one minute.

Then it lessened, and Dan heard the professor's voice calling him to the control room. He asked him what to do. Dan realized in this instant why he had been asked several times to what ex-

tent he was able to operate a space ship and why Nadya had him plot that course. He knew that he had to prevent the ship from falling back and had to bring it into a circular orbit first.

He looked at the speedometer. The needle stood at 2000 meters per second and crept upward at the rate of about eight meters per second. He increased the acceleration in opening two more fuel lines from tanks to motors and looked at the instrument again. There were colored marks on it. A red line at 3.510 was the circular velocity of Mars. At this speed the ship would circle Mars, without any expenditure of fuel, for any desired time. A red double line at 4.97 indicated the parabolic velocity of Mars. At that speed the ship would leave the attraction of the red planet. Other colorful lines marked the circular and parabolic velocities of the other celestial bodies safe for space ships of this type. There was the yellow line at 1.69 for the Moon, the yellow double line at 2.39. The needle just passed it. There were the white lines for Venus at 6.98 and 9.87, and the lines for Earth at 7.91 and 11.2. They were blue, as the Earth looks blue if seen from the void.

The needle was near the first red mark. Some manipulation of the various levers and knobs turned the ship so that it flew parallel to the surface of Mars. Dan turned a pointer until it covered the red mark. This was the automatic control for the motors; they would stop working at the moment when the needle of the speedometer reached the indicated velocity.

He climbed back to the main cabin. He had just reached it and sat down on his hammock when he felt the weightlessness that indicated that the power was shut off. The ship circled the planet now. They had enough time to discuss the situation.

"Before we make any decisions," commenced the professor, "we want you

to know a secret. Nadya is my daughter."

"This seems to be a day of revelations," murmured Dan, concealing his surprise.

THEN NADYA and the professor, interrupting each other, informed him about the events of the last week. Koltchakoff, well knowing that a revolt was bound to come, had organized it, deceiving Tchernikoff and Djilinskiy. It was a good opportunity for him and there was but little doubt that he would succeed. It was an opportune time for a revolt; there was no ship in space that would arrive on Mars earlier than two hundred and forty days from now. Tchernikoff was not the man to offer open resistance; Djilinskiy did that for him. Djilinskiy and Koltchakoff were fighting each other with tanks, airplanes and speeches over the radio.

"Maybe we'll learn something," Nadya thought aloud, switching on the radio and listening intently for a long time.

"It's open war," she explained. "As I expected, a part of the army went over to Koltchakoff. Now he has declared Thyle II an independent republic, he himself being its dictator."

"There is a star that did not exist a minute ago," exclaimed Dan suddenly. He looked through one of the small but powerful telescopes built in the wall of the ship. "It's the *Lenin*," he stated finally. "They are training a searchlight upon us, probably a space telephone. I'll try and switch on the receiving set."

"Space telephone?" repeated the professor questioningly.

"Yep. The frequencies of a microphone superimposed on an electric arc light. It makes the light fluctuate with the frequencies of speech. At the other end you have a telescope to gather the light rays, a photo-electric cell and a normal telephone receiver. It's the easi-

est way to speak over long distances in space, where no air interferes."

"They are calling us all right," he continued after a while. "They anticipated our circling the planet and departed just in time to catch us."

"They are armed!" interrupted Nadya.

"Put on your space suits then. One can never tell."

While they donned their space suits, the professor said, "I don't know what good it will do us, but we have three of those penetration bombs on board. They were to be loaded into the next plane to fight the rebels, and I took them."

An idea slowly formed in Dan's brain. "We may be armed, too," he mused. "I don't know yet, but I think so. Do you remember the news torpedoes that were used in case of emergency?"

They all remembered. The so-called news torpedoes were small torpedo-shaped contrivances. They were launched, by means of compressed air, from a small air lock and were to drop to a planet circled by a ship which was assumedly wrecked by meteorites. Once in the atmosphere of a planet, the news torpedoes opened automatically into a small parachute and started emitting a radio scream, which attracted attention and allowed people to locate them. News torpedoes and penetration bombs were of approximately the same size and of superficial resemblance.

"It will be hard, igniting the rocket charge of the bomb, closing the air lock and starting the compressed-air mechanism all at once," Dan continued. "However, we have got to try it."

He and Nadya squeezed themselves into the tiny supply room. The jubilant cry of his daughter told the professor that the bombs fitted the air lock. Both, news torpedoes and penetration bombs, had eight inches diameter. Dan prepared a fuse for the rocket charge of the bombs, packed one in the air lock.

Meanwhile, the *Lenin* had come closer by means of short bursts of rocket fire. They were less than half a mile distant now, seemingly motionless. In reality, both ships circled the planet with a speed of approximately two miles per second.

"Now let's see what they want." Dan switched on the receiving set and trained his searchlight upon the *Lenin*.

THE VOICE was Tchernikoff's; he spoke in Russian. Nadya listened for a while, then whispered to Dan. "Shoot at once. He accuses me of treachery and he has proof for it. He knows that you did not kidnap me, but that it was a fake. They are going to fire at our fuel tanks with incendiary machine-gun bullets. He only waits for our answering call because he wants to announce our fate to us."

Dan hurried to the supply room. While turning the wheel that closed the air lock, it occurred to him that it was plain murder he attempted. The others had not fired yet; Tchernikoff's speech was still only a threat. But he knew that Tchernikoff meant what he said.

Suddenly Dan could not see the sky and the other ship any more; he knew that his bomb was on its way, driven by the rocket charge as if it were an air torpedo. The rocket blast spread immediately in the airless void of space and looked like fog. He knew that effect; it made every rocket ship look like a comet, provided its reaction motors were firing. As fast as he could, he lifted the next bomb into the air lock and fired again. The third he saved. He strained his eyes on the telescope, but he saw only the opaque-looking masses of gases; very dimly, the outline of the planet showed through them.

Seconds later, something struck the hull of the *Lena*. He heard a cracking sound and the hiss of escaping air.

This was not dangerous; they wore their space suits. But he waited for the explosion of the fuel tanks, expected to see a blinding flash and then nothing.

Instead, it became dark and silent; apparently the window shutters had been closed. Dan started back to the cabin, when Nadya's face appeared in the opening. The electric light bulbs were glowing now. She opened the visor of her space helmet and threw her arms around his neck. Kissing his still-closed visor plate, she shot a stream of Russian words at him, paused, then said in English, "I know I should not think so. But for exterminating Tchernikoff I'd love you, if——"

"If——" he asked.

"—if I had not loved you already."

"Who observed?" asked Dan.

"I did," said the professor. "Your first bomb struck the large window of the main cabin. Apparently it went right through without exploding. But that put them out of action. They were not wearing space suits; they felt too certain that we were helpless. The second bomb hit their fuel tanks and exploded at the impact. Probably the whole fuel supply went off with it. A queer sight, such a noiseless explosion in space. Then one of the splinters hit us, cracking our window. I closed the metal shutters and turned on the light."

"Our troubles are over, I think," said Nadya. "The *Lenin* just ceased to exist; the *Atlantis* was punctured by the rebel thermite bombs. The *Lena* I claim as my personal property and the *Kibaltchitch* is somewhere in space, Mars-bound. All we have to do is to go back to Earth."

"To Mars, you mean," corrected Dan. "I think we'll land on Thyle I; it has French government. Hope I manage the landing."

Nadya shook her head.

"Or on Hellas, which is German; or or Argyre, which belongs to Japan, but it is still better than Thyle II. Too

bad the United States did not grab a part."

Nadya shook her head again. "I did not tell you yet. I learned something over the radio which I could not relate to you because the *Lenin* troubled us for a few minutes. The interruption over, I have the unpleasant task to inform you that the countries of the Earth signed an agreement to refuse the admission of Russian, or other refugees from Thyle II, on any part of Mars. It is meant to be an effective way to keep out of the revolt and to avoid international complications. We must go to Earth."

"But we cannot!" cried Dan. "I had time enough to make a cursory computation of the possible orbits. You know, checking up fuel supply against the weight of the ship and the relative positions of the two planets and their relative orbital velocities. The positions are most unpleasant, to say the least. We have not enough fuel, or, which is the same, the ship is too heavy for one of the so-called Pirquet routes, the hyperbolic orbits. We might just be able to slip into Pirquet VII B, but then we'd have no fuel left to check our fall toward the Earth. We'd crash to atoms or less.

"We could make the elliptical orbit Hohmann I. It necessitates the smallest fuel expenditures. But it takes exactly forty days longer than our air supply will last. Hohmann II is already beyond our fuel means."

"Is there no way at all?"

Dan hesitated to answer.

"Yes," he said finally, "there is one. It is that crazy orbit Pirquet XIV C. It means almost falling into the Sun. We'd approach the Sun closer than the planet Mercury, and it'll probably not only scorch our eyelashes, but the rest of us as well."

They sat silent for a few minutes, considering. Then Nadya rose, looked long into Dan's eyes and decided:

"Bring the *Lena* into the orbit Pirquet XIV C."

VIII.

THE SHIP was falling toward the Sun.

Mars moves in its orbit with a velocity of 25.9 kilometers per second, the centrifugal force resulting from this velocity just balancing the attraction of the Sun in this distance. The *Lena* had traveled away from the planet with more than six kilometers per second, her prow pointing opposite the direction of the flight of the planet. Thus the speed of the ship was subtracted from the orbital speed of the planet, the attraction of the Sun gaining the upper hand and drawing the ship with ever-increasing speed, toward its stupendous mass.

They did not fall in a straight line, of course; there are no straight lines in space. The orbit was a curve, the Sun being its focal point. This curve led from the orbit of Mars across the orbits of Earth and Venus. It crossed even the orbit of Mercury, approaching the Sun as near as only comets do occasionally.

At the point nearest to the Sun—the perihelion—the speed was highest; then it would diminish as it had increased, the rate of decrease being the same as the rate of increase. The curve would cross the orbits of Mercury and of Venus again. It would again cross the Earth's orbit and approach that of Mars. But at the time the Earth's orbit was reached again the planet would be near, and they would have to alter the direction of the flight by using the attraction of the Earth and the power of their rocket motors in most carefully calculated maneuvers.

This was Orbit Pirquet XIV C, simple in its elements, but risky beyond comprehension, because of its near approach to the Sun. It had never been tried before, but one of the first expeditions had completed a voyage using the

very similar orbit, Pirquet XIV A, and had escaped.

As soon as the rocket motors had ceased firing, the ship had changed her appearance. She was a madly spinning double star now. On the one end of a thin but tough steel cable there was the main cabin, the supply room and the control room—in short, the upper part of the vessel—on the other side the machinery and the fuel tanks. Held together by the three miles of cable, the two parts spun around each other, thus producing an artificial gravity in the cabin.

Last adjustments made, Dan returned to the cabin and announced that their imprisonment had begun. For more than four months they had to live together for every minute of the twenty-four hours of the day. That is a severe test for understanding among people, a severe strain on their nerves. It had happened that the crews of space ships had killed each other on these long trips—for no reason at all. Confinement to one room, if extended sufficiently long, is enough reason to hate those that are in the same room—enough to kill them.

Dan did not expect trouble of this kind, because all of them had made space trips that lasted for months. But he feared the period inside the orbit of Mercury. There would be seven days that would be unbearably hot, seven days out of Dante's "Inferno," seven days they would never be able to forget—if they lived to remember them.

The first three weeks passed quickly. There was much to tell, many things to be discussed. Then came weeks when they grew silent. Everything memory held had been told over and over again. Dan introduced lessons, to pass the time. Three hours every day he taught them astronomy and chemistry; three hours the professor taught zoölogy and geology.

Nadya did her part, too. She sometimes disappeared for hours in the sup-

ply room and reappeared dressed up in rags and with pots and pans. She played Cinderella beautifully, and looked poor and sweet. Or she came attired in woven metal—normally used for fuel filters—with tools in her hands, and acted as Queen of Space, commanding her lover just to conquer the next galaxy for her and ordering her father to cure the pimples of the moon. Once she smeared her face with lampblack and came to them as a drawling Southern Negro; then she disappeared and came with a costume consisting of shoes and a piece of metal cloth—as a modern gold digger. The two men laughed for hours.

THE SHIP had long since passed the orbit of Venus and now approached that of Mercury. Its speed increased every second. Inside it was warm, in spite of the refrigeration units. The men became lazy and slept the greater part of the day. Dan was contented with it. They had to live through two hundred more days, and every hour that passed while they slept was a gain.

They passed the orbit of Mercury. The gigantic disk of the Sun seemed to fill the greatest part of the heaven; actually, it was less than a quarter of the sky. The three people in the ship were in their hammocks, stripped of their clothing, sweat standing in large drops all over their bodies. The curve of the flight still drew nearer to the Sun. The velocity was beyond imagination. It is easy to say that their speed had mounted to more than four hundred miles per second. The figure four hundred can only be comprehended as a figure. Four hundred miles per second are inconceivable. It is possible to conceive four hundred in thinking of four hundred people in a lecture hall, or of four hundred soldiers marching. It is even possible to conceive four hundred miles of distance. But four hundred miles per second is beyond conception.

It can be calculated—it can even be done, because it is within the realm of the natural laws—but it cannot be understood.

Then the velocity increased further.

The heat still increased further.

The ship seemed to stand still in space, except for its spinning.

The three in the ship believed that they felt pulsing waves of heat. Whenever the cabin part of the ship swung toward the Sun it seemed to grow hotter. But there was no feeling of a cooling effect when the cabin swung the other way.

They had sufficient water. The tricky little mechanism that extracted the moisture that was in the air of the cabin, cooled and condensed it, worked to perfection. But water, cold as it was, did not seem to help. It merely made the heat—by contrast—seem more embarrassing. They did not speak for hours at a time. Occasionally Dan forced Nadya to prepare some food. Afterward, when it was prepared, he had to force the others and himself to swallow it. It was as if eating had become the hardest possible work.

Dan knew what every one of them thought. Are we going to fall into the Sun? His burning eyes forbade them to ask this question.

Seven days near the perihelion.

Dan had prophesied them. The others had read and studied enough to understand what happened and what was going to happen. And with the aid of cool, mathematical abstractions these seven days near the perihelion had become feasible; they had developed mentally into seven hot days on Earth. They had become a one-week heat wave in New York City in Dan's imagination. They were a week in summer at Trinil on Java to the professor; he had dug there for fossils in the Pithecanthropus layers. They were a week in the Gobi Desert to Nadya.

Thus they had formed their ideas.

Now these seven days were actuality. Every one of them consisted of 86,400 seconds of unbearable heat.

"I thought I would die last hour," said the professor suddenly. "But every hour brings a new and worse death—a death surpassing all the previous deaths taken together."

"We cannot fall into the Sun," Nadya voiced her thoughts. "Our velocity prevents it."

"I cannot say where we are," Dan answered the unspoken question. "I cannot make observations with all window shutters closed and the ship spinning as it is. But I do not dare to stop the rotation. Being toasted on both sides we may survive, being roasted on one we will not."

THEY fell into silence again, for hours, for half a day. The heat grew, the pulsating waves of heat seemed to quicken.

Dan looked at the watch. "Dawn of the second day," he announced, "prepare breakfast, Nadya."

She did not answer; she did not even move.

"Prepare breakfast, I said," he insisted. "You love to do it and you are crazy to eat it."

She went to the supply room. It was unpleasant to have a duty, but it would have been more unpleasant to have none. They sat up to it; they swallowed food.

And Nadya said: "People that are alone on these long space voyages begin to hate each other bitterly. I wait to start hating you, Dan. But it does not happen. I wait till I have the feeling that I should shoot you. But my revolver was still safe-locked when I threw it through the air lock half an hour ago. I do not hate you, even if I try. Maybe it's too hot."

Dan did not answer. His brain was occupied with an even more terrifying thought. The thought had occurred to him three days before, and since then

it had grown into fear—a fear great enough to be a greater strain than the heat of these seven days. They still had fuel on board, tons and tons of it. Would the insulation stand up? The emergency valves were wide open; he had seen to that. The fuel could boil and its vapors would escape through these valves, that opened into the large exhaust nozzles. But the boiling fuel might explode. The tests on Earth had shown that it occasionally did explode when heated for days to the boiling point. Normally, it did not explode. But occasionally it did.

The reason for this extraordinary behavior was unknown, and was a matter of dispute between various parties of scientists and rocket engineers. Probably impurities in the fuel—impurities in so minute quantities that they were hardly traceable, even with most refined chemical methods—caused the explosions. The impurities might form in the fuel tanks themselves. Fuel that had been in tanks of a ship for weeks was always found to be impure. But it did not always explode. There was probably one particular impurity that worked as a catalysis. And it was a question of luck whether this particular impurity was present.

The professor interrupted his thoughts.

"Son, is there anything we can do during the next week or so?"

"No. Just wait."

"You have no observations to make?"

"I don't have to make any, and I could not do it even if I wanted to or could muster the necessary strength."

"Would it do the slightest bit of harm if we all slept for ten days?"

"No. But who can sleep in this hell?"

The professor went out, dug into his luggage. He carried a few small parcels, which he placed on the table.

"Foolish of me not to remember sooner. We have a new drug in Russia. It produces sound sleep. No after ef-

fects, if the tests on hundreds of volunteers and prisoners have any meaning. My friend, Dr. Jourovski, taught me how to use it. All it needs is a sound heart and an empty stomach. My heart is all right; so is Nadya's. How about yours?"

"Mine is all right, too," replied Dan. "But how about the empty stomach? I suppose we'll have to wait a day or so?"

"Maybe not. I have something else that makes you seasick in five minutes. I don't know how many of these pills one has to take, but I'll try it out myself."

Without waiting for any argument that might arise, he took the small glass tube with the white pills and went out. It took a very long time till he returned.

His voice sounded weak, when he said: "Three of these pills will do it. I am even hungry. Nadya, you take them now; I'll prepare the hypodermic in the meantime."

When Nadya returned, Dan took the phial of pills without a word. It was no pleasure to become seasick in this heat. But even that somehow resulted into a feeling of relief.

When he returned to the cabin, Nadya was sound asleep. She was strapped to her hammock and hardly breathed. The professor waited for Dan, hypodermic syringe in readiness. Dan strapped himself to his hammock; the professor thrust the needle into his leg.

Suddenly the heat was not so unbearable any more. It began to feel pleasantly warm, like the warmth of a bed in a chilly night. He felt his eyelids grow heavy. The last he saw was the professor strapping himself to his hammock, holding the syringe between his teeth.

IX.

THE FIRST IMPRESSION that came to Dan when he awoke was that of a warm summer morning.

"Son, do you feel all right?"

Dan needed a few minutes to remember. The voice was that of the professor he had met on Mars—the professor who was father of a charming daughter. The same professor who had thrust a hypodermic syringe into his leg. Now he remembered fully.

“How long have you been up?” he asked.

“Only for about three hours. I ate meanwhile. I could not wait. There is plenty left for you, however.”

“Is Nadya still asleep?”

“She is, but we might make some noise. It cannot harm her to get up now. Wonder where we are. We slept almost exactly 300 hours.”

Dan felt like laughing. He did not know why, but he laughed—

Until Nadya said, “I’ll ask for a divorce as soon as we are married and separate from my family, consisting of one old, grouchy professor, who gives my prospective husband advice to make a noise while I am asleep. My husband, of course, obeys merrily. Men are horrible no matter how you look at them. They do not even allow a sweet and innocent girl her beauty sleep.”

“Which you do not need, commissary,” finished Dan. “Don’t you think, darling, that you might like some breakfast with your cruel husband-to-be? We might come to peaceful terms after eating, you know.”

“Of all men on Earth, the Americans are the worst. As soon as I work up a nice little temper you start drowning it with food. Food! Oh, fie! Why don’t you help me to unstrap these things? First you bind me helpless, and then you let me starve! Do you call this love or devotion? Wait till I feel healthy again! Just wait!”

Dan, laughing, helped her to untie the straps.

“If you ask me, you feel healthy enough, judging from the way you talk. Come on now, dear, be a good girl, brush your little teeth and eat your oats.

Afterward, daddy opens the win low and shows you the Sun.”

They wore smoked glasses when the professor opened the metal shutters. The mighty ball of the Sun had diminished in size, though it was still about four times as large as if seen from Earth. Dan took a measurement of the apparent size—as accurately as it could be done from the rotating ship—and compared it with the table of “apparent diameters of the Sun” in the *Astronautisches Handbuch*, the one book that could be found in the control room of any vessel of the space ways.

“Hm, about four times the diameter as if seen from Earth. Here we have——” The rest was a mumble, in which only an occasional “o-point-three-five-o” could be distinguished.

“We are still inside the orbit of Venus,” he finally announced. “The planet itself is on the other side of its orbit; so we won’t miss much if we keep the shutters closed. Fact is, it is of no use to tamper with our orbit for the next three weeks or so. In twenty-two or twenty-three days I’ll tie the ship together again, stop the spinning and make the necessary observations. Afterward, I’ll try to make the orbital corrections.”

FOR HOURS and hours he worked. Inside the cabin spun three metal wheels, each weighing one ten thousandth of the weight of the ship. They were mounted in the three-dimensional planes of space, rectangular to each other. When these wheels—the mechanism had the name “Oberth” after its first inventor—were turned, the hull of the ship turned also, but in opposite direction. Ten thousand turns of one wheel made the hull of the ship make one complete turn opposite to the direction but in the same plane as that particular wheel. The Oberth did not influence the orbit. Speed and direction of the ship were not changed by it, only the position of

the ship on its orbit. The mechanism was used to bring the ship into the proper position for rocket blasts that were to correct the orbit.

For hours, the shell of the ship moved and shifted in response to the spinning of the wheels. The rocket motors spit their blasts into the void; quarter power for five seconds, two hundred turns of wheel A, full power for twelve seconds, one hundred and thirty turns of wheel C, half power for thirty seconds. Followed by five thousand revolutions of the wheel controlling the position of the longitudinal axis of the ship. It was flying backward now, *i. e.*, it turned the exhaust nozzles in the direction of flight. The speed was still too high; a full minute of half power on all rocket motors diminished it. Then Dan came back from the control room.

"Pretty amateurish how I did it. A real pilot would make all these corrections with one carefully calculated blast in the proper direction. But I think I got the bugs out of the orbit. The thing I am afraid of is the curve between Moon and Earth and the landing."

The flight continued. Dan left the ship "tied up," as he expressed it, so that corrections of the orbit, should observations indicate their necessity, could be made immediately. It did no harm to feel weightless for a few days. The Earth was growing; it now looked almost as large as the Moon does if seen from Earth. One "day" it seemed to Nadya as if she, looking through the telescope, for pastime, saw a faint, glimmering light on the dark side of the Moon. Though the two men looked at her rather disbelievingly, Dan trained the most powerful telescope on board upon the spot indicated by the girl. He saw that she was right.

He knew that there was an astronomical observatory near this spot, but that did not explain the presence of a searchlight powerful enough to be seen at this distance. On the contrary, astronomers

tried to get away, as far as possible, from artificial sources of light. It would have to be a searchlight of the largest type, such as is used to speak to ships in space. "Maybe they do want to speak to us," he thought, and connected the photo-electric equipment with the telescope.

As he slipped the ear phones over his head, he heard a voice calling out in English: "Calling SS *Lena*. Calling SS *Lena*. Please answer. Answer please. Calling SS *Lena*. Are you still alive? Answer please. Please answer."

The message was repeated in German, French and Russian.

Dan switched his own searchlight on and trained it upon the Moon. He judged that they would not call at such a distance if they did not have the necessary equipment to receive an answer with a searchlight as weak as could be expected from a space ship.

"SS *Lena* calling the Moon. SS *Lena* calling the Moon——"

Two minutes later he heard a clicking sound, and the mechanical voice that had repeated the call for hours, or days, was replaced by a human voice.

"SS *Lena*? . . . Glad to hear you answer. Congratulations. You made a daring flight. Which orbit did you use? We did not detect you until you made your corrections. . . . What? Pirquet XIV C? Congratulations again! The first time in history anybody has dared this orbit. How did you manage to survive the perihelion?"

Dan answered the questions that poured in on him, asked many himself. They spoke for hours, and Dan learned what had happened. Koltchakoff had won on Thyle II. It was an independent State now. Koltchakoff had observed the battle in space and informed the American government about the departure of the *Lena*. The lunar observatories watched for them all the time of their flight, hoping against hope.

Dan explained to them that he was afraid to land the ship, that his practical experience was insufficient and that he could not work out the calculations, to his satisfaction, in time. He gave them his exact position, velocity, weight of the ship and amount of fuel left.

The observatory put the mathematicians at the job. Thirty hours later Dan received all the data he needed. A pilot, who knew the type of space ships to which the *Lena* belonged, gave him the necessary directions. There were a few minor corrections to be made first. Then he had to wait for five days. Meanwhile, the orbit was rechecked again and further corrections given via the space phone. The complicated landing could be done by the automatic steering devices. They advised Dan to set the time clock releasing the parachute at a certain moment.

Five times he let the ship circle the Earth before he dared to throw the switch that activated the robot pilot, set for the landing. The observatory told him that exact moment. He closed the switch and threw himself on his hammock.

Outside, thin air screamed past the rapidly moving ship. The scream ceased, started again; the hull grew warm. Then rocket motors roared; air screamed again. They felt weight press them upon their hammocks, and they

had to hold themselves down when they suddenly became almost weightless.

Then they heard the peculiar swishing sound of the parachute rushing out and opening. They knew that they were safe.

They opened the window shutters and saw water below them. They were still about three miles high, landing slowly by means of the giant parachute. Two coast-guard ships were waiting for them.

NADYA came into Dan's room in the hotel.

"I don't know whether it is correct that I come now," she said. "But I do want you to tell me whether you think that I look good enough for an American wedding."

He looked at her, beaming with pride. From her neck dangled, on a golden chain, the large Martian amethyst they had found together.

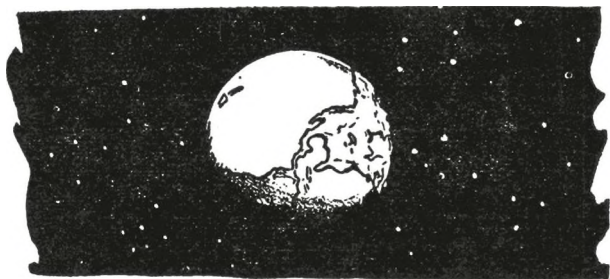
"Isn't the dress lovely?" she asked.

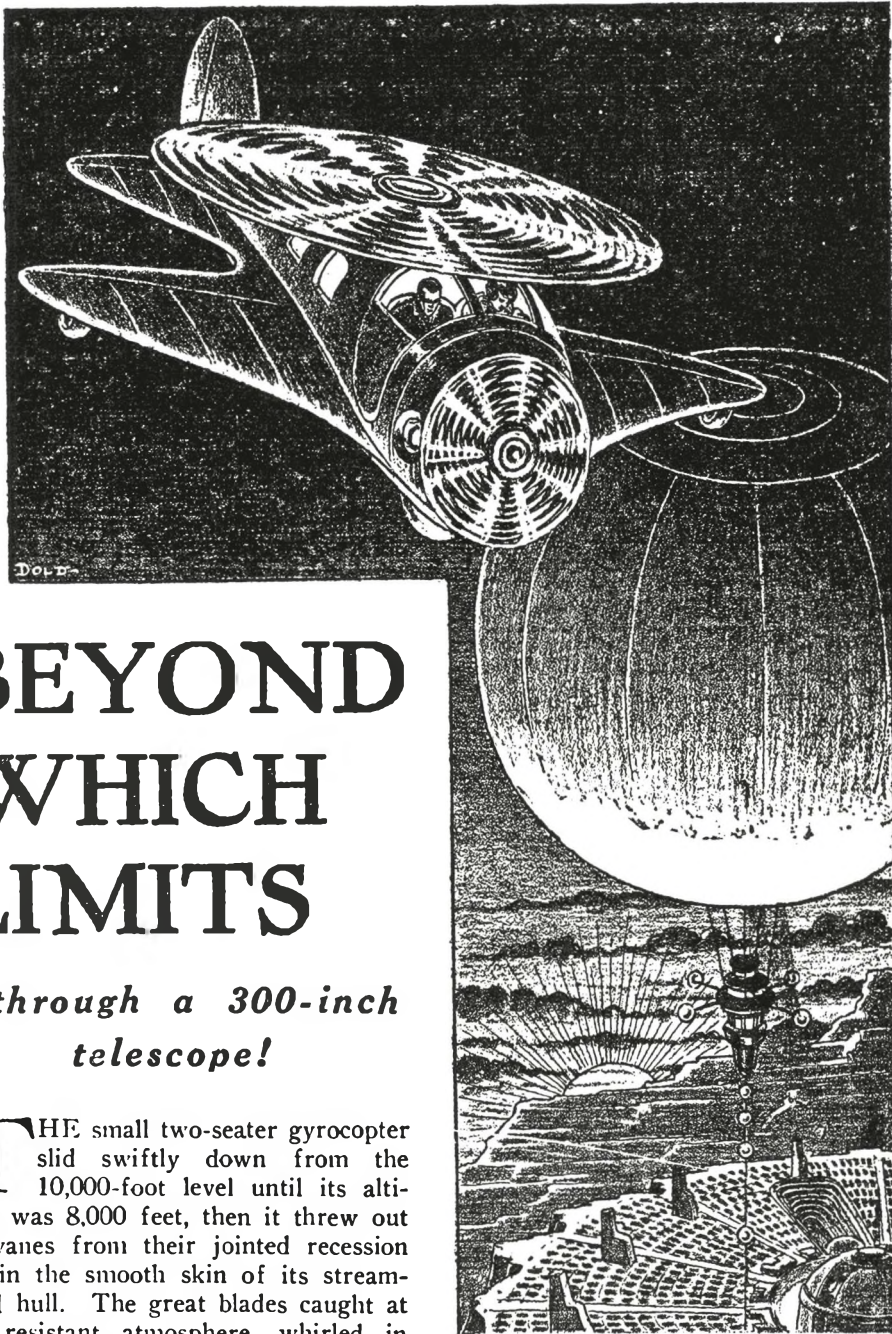
Dan was all admiration. But he said, "I thought you were going to dress as Queen of Space and give the news photographers a break."

A knock at the door interrupted them.

It was the manager of the hotel. He wanted to know whether they had a special wish as to the music the organist should play before the ceremony.

Dan and Nadya looked at each other understandingly and smiled.





BEYOND WHICH LIMITS

*—through a 300-inch
telescope!*

THE small two-seater gyrocopter slid swiftly down from the 10,000-foot level until its altitude was 8,000 feet, then it threw out its vanes from their jointed recession within the smooth skin of its stream-lined hull. The great blades caught at the resistant atmosphere, whirled in rapid revolution. The plane decelerated smoothly, until it hung, almost motionless, over the great mesa fifteen hundred feet beneath. Lights blinked, in the universal code, from the captive balloon

The plane decelerated smoothly, until it hung, almost motionless, over the great mesa, fifteen hundred feet beneath.

by Nat Schachner

that swayed gently in the thin breeze, and before whose aluminium bulk the gyrocopter had come to a quivering halt.

The girl in the pilot seat leaned forward, eyes intent on the winking lights, translating as they flickered on and off with an assurance born of long practice.

"We're still in time," she told her companion, "but it was a close call. The air director says there's only one parking space left on the whole mesa, and we'd better hurry if we want to grab that. Look, there are three more late-comers up in the air, trying to beat me to it. Swell chance!"

She laughed, pressed a button on her right. A green light uncovered, glowed steadily a moment, then darkened. It was a warning signal to the belated planes; the signal of preemption, meaning "Stand clear! It's all mine!" Then she pressed another button.

The whirling vanes slowed their mad pace. The motionless gyrocopter dropped down smoothly, perpendicularly toward the mesa.

The sun was setting in a blaze of glory over the parched mountains that rimmed the desert landscape of New Mexico. The plateau was a vast, deserted bowl, except for the mesa that gauntly reared its level table top a full two thousand feet above the cactus-dotted floor.

Even as the sun went down with an almost audible hiss of extinction, and darkness descended with the suddenness of the desert, lights twinkled into being on the mesa top. Myriad lights—lights that rimmed in noble outline the great dome of the newly erected International Astronomical Observatory, that picked out the huddle of smaller engineering buildings which housed subsidiary instruments, that swung in spider tentacles through the plane parking area, and swarmed in clusters over the outdoor amphitheater. In the still, mountain air the concerted whisper of eager, thronging humanity came up

sharp and clear to the silently dropping gyrocopter.

Lorna Page stared through the port-hole at the uprushing sight. "It's beautiful," she whispered, with a little catch of breath.

The young man in the cushioned seat next her seemed wrapped in thought; he did not even trouble to follow her glance. And, from the furrows on his forehead, it was obvious that his thoughts were not pleasant.

She repeated her admiration, a bit louder, more violently. He started, stared, said absent-mindedly: "Oh, the mesa! Yes, very beautiful! Very beautiful!" And he relapsed into his former troubled silence.

THEY WERE coming close, now. A single luminous space in the crowded rows of parked planes showed barely room enough for the gyrocopter to squeeze into. Lorna jockeyed her craft skillfully over the spot, whirled the vanes a trifle faster to slow down the speed of their fall, and dropped, with not an inch to spare, into the oblong markings. Then she leaned forward and cut off the motor. But she made no further move to get out.

Instead, she turned steady eyes on her companion. There was a strange, appraising quality in her glance. "Jim Weldon," she said quietly, "I know it's been a blow to you. It was most unfair of the International Commission to pick Norvell Sands for the post of honor tonight at the inauguration ceremonies, instead of you. This wonderful new telescope of the observatory is the child of your brain; without your invention of the photo-electric mosaic it would never have been possible; yet they chose Norvell Sands. It was a rotten shame, but"—and her voice became a bit breathless—"I—I didn't think, Jim darling, you'd take it so hard. I—I thought it——"

Jim had not been attending rightly

to the beginning of what was obviously a set speech on the girl's part. It had pained her to see the man she adored sulking and acting the part of a poor sport. How else could she decipher his gloomy brow, his preoccupied air, his few words since she had picked him up, protesting, at the Croydon Observatory and hurtled the intervening six hundred miles to get him here in time?

Jim sat up, stared blankly at the girl. "Eh, what's that?" he grunted. Then Lorna's hurried implications smote him, and he thrust back his head and laughed. Somehow his laughter struck a false note. "Don't be silly, darling," he answered. "I never even thought of that end of it. Why should I? Sands is a considerably older man than I; he heads the 200-inch telescope at Palomar, the No. 1 Lens that was set up in 1938; while my 200-inch telescope at Croydon was not erected until 1947. I think the commission made an excellent choice."

Lorna was obviously bewildered. "Then why, my dear, have you been ——" She stammered and stopped. It is difficult to tell one's sweetheart that he has been sulking.

Jim grinned, trying surreptitiously to keep the worry out of his voice. "Sulking?" He helped her out. "Forget it, sweet. You should know better." But, in spite of himself, his face clouded. There was almost fright in his look as he stared through the side port at the great, graceful loom of the observatory as it etched its bulk against the velvet blackness of the desert. Yet how could he tell Lorna, *any one*, of his vague, inchoate fears, hardly formulated even to himself.

THOSE last photographic plates from his own monstrous lens, for example, which, fortunately, he had privately developed and then stared at with incredulous eyes. He had tried out for the first time his experimental "mosaic" on the great telescope, had directed the

huge mirror, without quite knowing why, on the Black Hole in Cygnus.

That Black Hole, in the early days of astronomy, had been envisaged as an actual hole in the sky. Sir William Herschel had exclaimed of a similar one, "*Hier ist wahrhaftig ein Loch in Himmel!*" Here is actually a hole in Heaven!

But modern astronomers had come to believe that these black vacancies were merely vast, dark nebular masses, whose invisible substances screened from earth's view forever the teeming stars behind. Jim Weldon had accepted that view, nor had the 200-inch Croydon disturbed his acceptance. That is, not until that strange, terrible photograph with the photo-electric mosaic!

The thin, evanescent layer of silver that clouded the film was close to the borders of visibility, so faint, so nebulous, that Jim strained his eyes to piece out the gaps in what he thought he saw. Strained—and at the same time prayed vehemently that he could see no more. It was a frightening sensation. The skin on his body prickled as though he had been staring at things too horrible to contemplate.

In vain, he told himself that he was being a fool; that all there was on the photographic plate was a mere formless breath of vague cloudiness; that he was a scientist, not a hysteric given to imaginative conjurings. He stormed at himself; but, for all his logic, all his finely drawn scientific training, certain deep-rooted instincts—the instinct of the Neanderthaler in the presence of the spirit-peopled dark—swept all else away.

The 200-inch telescopes had not lived up to earlier expectations. They had, of course, in the sense that the universe had immeasurably expanded before their questing eyes. But the knowable universe of space time had proven considerably larger than had been anticipated. The huge mirrors, gathering the light of one billion, two hundred million

light years, had revealed but new outlying universes, new nebular galaxies. There had been no end anywhere, no matter which portion of the heavens had been swept.

The experimental mosaic invented by Jim Weldon had increased the depth of vision to two and a half billion light years; but, except for this single spot in Cygnus, it had not mattered.

All Jim's training shrieked against what he felt he must do. Almost like an automaton, yielding to forces beyond his control, he had deliberately shattered the curious photographic plate into a thousand shards, had carefully dismantled the mosaic and packed it away. To the later questionings of his subordinates, he had made plausible answer to the effect that it had not worked quite as he expected. But from that time on the staff and Lorna Page had noticed a change in him.

He was crazy, he told himself; he had overworked and needed a rest. After all—he would think during the long, sleepless nights—what was it that he had actually seen? Nothing, nothing that a saner, more normal person wouldn't have laughed at. He knew, without telling, what Norvell Sands would have said, after a brief examination of the plate. "My boy," he would have boomed, "what you have there is merely confirmatory proof of what is already well established. The so-called Black Hole in Cygnus is a masking dark nebula. The better resolution of your experimental mosaic has merely gathered the faint reflections of light from the neighboring stars, and deposited them on the plate."

Even now, still seated in the gyrocopter on the International Mesa, aware of the probing look of the girl he loved, uneasily aware that the seconds were hurrying by to a dénouement that he dreaded, he could hear in his imagination the sudden, gusty laugh of Sands at his hesitantly expressed fears.

"Shapes out there?" echoed that ghostly laughter. "I'm surprised at you, Jim Weldon. You, of all people, one of the clearest headed young men we have, to give way to jittery nerves! What possible shapes could there be in Cygnus, or anywhere else? Have you ever watched the clouds on a summer's day? Haven't you ever seen castles and horses and giants and sea serpents and Heaven knows what? Surely you realize that——"

The invisible wrestling came to an abrupt halt. "Well?" demanded Lorna. "Are we going to sit here all night, and miss the ceremonies?"

Jim jerked to an awareness of his surroundings. "Sorry, darling," he muttered. "Let's get going."

He swung the door open, jumped lithely out. Lorna followed with easy grace. He took her arm, and they walked in silence toward the huge outdoor amphitheater. He could feel her body, ordinarily pliable toward his, now rigid and distant. She was hurt, disappointed in him. He grimaced to himself in the dark. How could she understand what he himself did not? How could he tell her that the directorship of the international had first been offered to him, and that he had turned it down, without going into explanations which would have sounded utterly incredible? Now he was sorry for his refusal. Once in charge, he might have been able to devise ways and means——

THEY FOUND SEATS just in time. The great concrete bowl was packed with thousands of expectant people. They had come from the ends of the earth for this epoch-making occasion. The flower of world science—astronomers, physicists, chemists, biologists, the presidents of three republics, the dictators of six nations, a solitary king from a solitary monarchy, statesmen, economists, famous authors, captains of industry—all were present. As

well as such a horde of anonymous John Citizens who had been able to beg, borrow or steal the necessary metal disks of admittance. For once, all rivalries, racial and political divisions, were obliterated. They had come to pay tribute to the mightiest achievement of modern science, of man's aspirations toward the unknowable.

Fellow scientists rose eagerly before Jim's youthful figure, before the trim loveliness of the girl on his arm, as they passed down the aisle to their seats. He returned their warm greetings with short, preoccupied nods, so utterly unlike himself. Lorna's inward thoughts were a torment. Had she misread this seeming stranger at her side? Was he but a marble idol she had set up for worship in the secret recesses of her heart, with feet now, for the first time, exposed of vulgar clay? But nothing of that struggle showed in her pale, composed face. And the murmurs of the general populace were as much for her as for the youthful scientist of world reputation, whose much advertised mosaic was for the first time being used in connection with the tremendous instrument they had come to see unveiled.

Jim had been offered a seat on the dais in the center of the field, together with all the other guests of honor. But a strange reluctance had impelled him to refuse, to seek the anonymity of the common grand stand. In fact, it had been that same unaccountable reluctance which had made them late, which had yielded only to the pained look in Lorna's eyes when he had flatly announced that he would not come.

There was a sudden stir, a craning of necks, a wind of expectancy. The ceremonies were about to begin.

Jim Weldon was never to forget that scene. The soft, velvety blackness of the desert night, the stars overhead like limpid, bright-glowing flowers, the motionless traffic balloon with its single red warning light, the maze of interlacing

lights, the illuminated purity of the great observatory, the banked masses of people, the platform of honor in the center of the stadium, and the crowding dignitaries who sat self-consciously and importantly thereon.

The President of the United States arose slowly. A hush fell on the assemblage. He was a tall, spare man, with gaunt cheeks and a kindly, slightly weary smile. He spoke without notes, and the amplifiers carried his voice clearly and distinctly to the topmost row of seats. It was, he observed, an epochal occasion. They were gathered to do honor to man's most idealistic achievement. Wars had torn the world; there had been certain occurrences of late better left unmentioned—here the dictators looked a bit fiercely uncomfortable in their glittering military uniforms—but for the first time in many years the nations had united in a common cause, had poured out lavishly of funds and brains in a common enterprise from which no Earthly territories could be gained, no new markets be tapped, no new colonies of overabundant populations be planted.

He paused; the hush deepened. Instead, he went on in his slightly weary voice, only the cause of pure truth was being forwarded, the restless reaching of man for the stars. It was confidently expected that the age-old dreams of the great scientists would finally be realized. In minutes now the great telescope would be battering at the gates of space time, would seek to wrest from the hitherto impenetrable heavens themselves the secrets they had long withheld. He therefore took great pleasure in welcoming the peoples of the earth on this momentous occasion. Then he sat down to thunderous applause.

THERE WERE other speakers—too many of them, in fact. Speeches from the dictators, each of whom seemed slightly regretful that he had

been inveigled into spending money on a telescope, of all things, to be installed, of all things, in a nation not their own, when such money might much more profitably have gone into big guns, submarines, and the new experimental rocket bombers. But they managed to be fulsomely pompous, betraying their true thoughts only in veiled allusions. The solitary king was an utterly charming, politically ineffectual young man, half friendly, half cynical.

Then came an interminable string of *must* addresses—the financial giants who had contributed, scientists, politicians, who could not be slighted. The audience grew restless under the torrent of words. The platform dignitaries struggled with boredom and politely withheld their yawns. The massed spectators were not as well-mannered. They scuffed their feet, chattered, muttered discontentedly. They had come to see the telescope, to watch Norvell Sands peer into the eyepiece and report to them immediately that which had never been witnessed by the eye of man before.

A purely theatrical effect, it was true. Sands had protested against such futile dramatization. He was not, he argued, a Hollywood star or a President of the United States, that it was necessary for him to strike a pose for the public eye and the public prints. Astronomical work was not performed as a publicity stunt; it was essentially tedious routine and a strictly private communion. But necessarily, though with an ill grace, he had had to yield to the insistent demands of the news casters and the *vox populi*.

The president felt the growing tension, and, at one bold stroke, lopped off a half dozen waiting speakers—who were nervously glancing at their set manuscripts—and rose to announce the final addition to the plethora of words, the erstwhile director of the Palomar Observatory, the newly chosen director

of the International Observatory—he might add, unanimously so chosen. Jim Weldon, tense in his seat, grinned wanly. Not even Sands himself knew that he, Jim Weldon, had turned down the coveted position.

Norvell Sands arose to a thunder of sound. Thank Heaven!—breathed the audience. It would soon be over. Then they could settle back and watch the telescope in action. Three quarters of them, and that included a goodly number on the platform, had only the vaguest thoughts as to what would happen. But they were sure it would be something dramatic.

Sands was an elderly man with a long and honorable, if slightly academic and uninspired, career behind him. He had none of Jim Weldon's youthful zest and brilliant intuitions, but he was a solid man, with both feet firmly, and unimaginatively, planted on the ground, even though his eyes peered up occasionally at the stars.

The heavens to him were a mathematico-physico-chemical problem to be solved; the unknowable was that which, as yet, he had not been able to reduce to an exact equation. The glamour, the romance, the mystery of the universe were not for him. He snorted derisively at some of the brilliant, semi-poetic conjectures of young Jim Weldon. "Bring me *facts!*" he would boom genially. "I don't give a tinker's dam for supposings; I want stuff my instruments can measure, my equations decipher."

Nevertheless, a sound astronomer, with no such nonsense about him as instinctive shrinkings from a faint, almost undecipherable film over the Black Hole of Cygnus.

Lorna Page leaned forward to listen, clenching her hands to ease the inward hurt. Jim should have been up there in Sands' place, should be now taking the plaudits of the world. Yet perhaps, she told herself with a growing panic, the

commission had been right. Even now, Jim sat at her side, his brow wrinkled, his lips bitterly tight. He, too, was staring at Sands. She misread that glance utterly. To her, it was the expression of a hurt vanity, of a jealous pettiness that only short weeks ago she would have thought inconceivable in Jim Weldon. But Sands was already speaking.

IT TURNED OUT, in the beginning, to be a rather dry, monotonous lecture on the newly installed telescope. It was, he declared, 300 inches in diameter, a 50 per cent physical mark up on existing instruments. The mirror had taken 6 years to pour, cool and grind. It was of pure, fused quartz, with not the slightest bubble in all its vast expanse. Ordinarily, he continued, this in itself would have been a tremendous advance. For, theoretically, the limits of vision with such a mirror would widen nearly two billion, seven hundred thousand light years, perilously close to the latest calculations as to the radius of the universe of space time.

He paused, and, suddenly, his voice kindled with a new warmth, an emotion that jerked slightly nodding heads awake. "That, in itself, is an achievement," he declared. "But there is something else about our instrument, something so novel, so revolutionary, that we ourselves are not aware of its ultimate complications. I refer to a certain attachment which, until now, has been kept a strict secret at the modest insistence of the inventor himself, but which I believe should now be broadcast to the world."

Jim jerked forward, as if to catch the speaker's eye, to shut off what was coming, but he was a mere dot in a sea of faces.

"I refer," said Sands, "to the photo-electric mosaic, and to James Weldon, the brilliant young director of Croydon, its inventor. To him must go the glory of whatever new discoveries we may

be able to make; and, in all humbleness, and with due deference to the wisdom of the commission, it is my belief that Weldon should now be occupying this platform in place of myself."

The audience craned and swayed with emotion. No one thought of sleeping any more. Those few in the immediate neighborhood of Jim turned their heads, tried to catch his eye, to smile approval of Sands' generous gesture.

But Jim shrank back in a vain attempt to escape notice. He didn't want recognition; he didn't want glory. He wanted only to dismantle his mosaic, to forget that he had ever invented it. Lorna was breathing rapidly. She was torn between conflicting emotions: exaltation at this public avowal of Jim's brilliant achievements, and the sinking sensation that Norvell Sands was showing himself the better man by the magnanimity, the self-effacement of that very avowal. But Sands was still talking, and she strained forward to drink in every word.

"The principle of the photo-electric mosaic," he said, "had been faintly adumbrated as far back as 1933, by Dr. Zworykin; but seemingly insuperable difficulties had halted any practical attempt to put his ideas into operation. James Weldon has succeeded, and succeeded amazingly. He has concentrated in his instrument the light-gathering properties of literally billions of infinitesimal photo-electric cells.

"He took a sheet of an electronegative alloy of his own contriving and, by a most ingenious process, deposited upon it ultramicroscopic globules of silver, each so tiny that its diameter is less than a single wave length of light. Silver is, of course, electropositive. Accordingly, when a beam of light falls upon this mosaic, a small electrical charge is built up on each of the countless little globules of deposited silver. Condensers store up these charges, which are directly proportional to the intensity of the original light beam, and the silver globule pat-

tern thus formed represents an electrical image of the source of illumination.

"An electronic scanning beam, so narrow it covers only a single one of the ultramicroscopic silver beads at a time, sweeps at tremendous speed over the mosaic. This has the effect of discharging the silver-alloy photo-electric cells one by one, and releasing, simultaneously, the condenser charges. A current passes from the condenser, is stepped up and amplified enormously in like fashion, as in radio communication, and a visual image is reproduced in the form of light waves by another electronic beam and fluorescent screen. This magnification alone had been set at ten thousand times.

"Think of it! Add this increase to the original magnification of the powerful 300-inch mirror on which the light from the distant stars has fallen, and you have a total magnification which runs to an incredible figure."

HE PAUSED dramatically, and his eye kindled. "Ladies and gentlemen," he declared slowly to a now intent audience, "I believe that with Weldon's invention attached to the international telescope, we are about to solve the last, the hitherto immutable secret of the universe. We shall penetrate far beyond the most sanguine limits set upon the radius of curvature of space time. Once and for all the moot question of Einsteinian curvature will be laid to rest. Either we shall see completely around the universe, and view ourselves, so to speak, from the rear, or"—and now his voice lowered to a dramatic whisper in the straining hush—"we shall view the viewless, discover what lies beyond the confines of that space time."

Once more he raised his voice. "And for this, we must thank Jim Weldon." He looked around the crowded amphitheater, seeking. "He is here to-night. He had begged off from the list of

speakers. But I am going to ask him to say a few words to you. Jim Weldon, will you be good enough?"

The great stadium rocked with the thump of clapping hands. Jim huddled lower in his seat, desperately. "No!" he muttered half to himself. "I won't speak; I refuse——"

All about him men started up, crowded toward him. "Speech! Speech!" they yelled excitedly.

Lorna faced him with flaming, bitter eyes. "James Weldon," she blazed, "you've acted a petty part long enough. Either you get up on your legs and say something gracious in response to Sands' marvelous gesture, or I'll never speak to you again." She was surprised at the tears that blurred her vision, tried to tell herself they were tears of rage, not of scalding disappointment.

Jim stared at her incredulously. His mouth went suddenly hard, his eyes grim with new-found purpose. So that was it, eh? Even Lorna had turned against him, thought him capable of petty jealousy. Very well then, let her think so, let all the world think so. He'd give them good cause for such a belief. After what he was about to say, he'd be a pariah, a man to be avoided by his fellows. O. K., then. But he'd not permit that horror which he had dimly sensed, to color the thought, the activities, the dreams of the world for uncounted generations to come.

He rose slowly to his feet. A cheer sprang up, swiftly died. He made a splendid figure—young, lithe, with well-set jaw and grim, steady eye. The directional amplifiers swung to where he stood, ready to pick up his words, and lift them out over the thousands. Lorna gazed at him raptly; perhaps now he would redeem himself somewhat in her eyes.

But his first words fell like a bomb-shell.

"Norvell Sands has overestimated my talents and my modesty," he announced

quietly. "I made a mistake when I made my photo-electric mosaic. I see that now. It was based on wrong calculations. Accordingly, I have decided to request its return."

There was a stunned silence; then a low, uneasy mutter. It took time for his abrupt declaration to penetrate.

Sands concealed his startlement in an indulgent laugh. "My colleague is carrying modesty to a fault," he explained. "We have tested his mosaic with laboratory tests, and found that it exceeded even the theoretical claims for it. Of course——"

"You do not seem to understand," Jim interrupted. There was steel in his voice. "Whether good, bad or indifferent, the mosaic is my invention, and I elect to withdraw it from use."

The mutter merged in a gathering growl. Lorna plucked vainly at his sleeve. "Jim! Have you gone mad?" An angry flush mounted in Sands' pinched cheeks, but he controlled himself with an effort.

"I still don't understand," he protested placatingly. "There must be some other reason than the one you've just given for your rather astonishing decision. What is it?"

Jim set his teeth. How could he tell them of the haunting nightmares that had overcome him since he had stared vainly at the photographic plate of Cygnus, and tried to trace in its vague nebulosities things that should never have been traced? In the steady light of the arcs above the International Mesa, in the firm outlines of stadium and spectators' upturned countenances, he realized that perhaps he was a little mad.

They—if he tried to put into words what had been merely an emotional response—would think him wholly mad, would lock him up in an asylum, or, worse still, pass him by with significant gesture and pitying look. Better that he pursue the course on which he had

suddenly determined, no matter what the cost to himself.

"I'm sorry," he said stubbornly. "I can give no other reason. But I must insist upon the return of my mosaic, now."

THE GROWL became an uproar. The amphitheater seethed with ugly sounds. Lorna's shocked cry was a torment to his ears. But he stood erect, facing them all, inflexible.

Then the amplifiers swung back to Sands. The old astronomer's voice thundered out, blasting down all opposition. "It is too late to retract your gift. Your deed of gift, properly signed and witnessed, reposes in the coffers of the observatory. It is legal, binding." His voice trembled, broke. "You are ill, Jim Weldon. You have overworked. That is the only way I can account for your astonishing attitude."

Already a half dozen men of the government police were efficiently at Jim's side, eyes inquiring on the President of the United States for further orders. Jim grinned wryly. He had done what he could. He had spoken out too late. Jail or the madhouse beckoned if he persisted, and it would do no good. He made a gesture of renunciation. "On your own heads be it," he whispered to himself, and sank into his seat. Lorna was crying softly. The police, at a nod from the president, withdrew. The incident was closed.

Already the spectators had quit their benches, were streaming over the flat mesa toward the huge observatory, where the next act in the ceremonial would take place. The unveiling of the great telescope, the first peep into the unknown by Norvell Sands.

Jim's hand went out toward the girl at his side. "Lorna!" he implored.

She shivered away from him, her face tear-stained. "Don't touch me, Jim Weldon," she flashed. "I—I hate you."

He grinned mirthlessly. He had lost everything—his job, the esteem of his friends, the girl he loved. And for what? A stupid, unscientific intuition, a strange horror that had overwhelmed him as if he had been the veriest untutored savage. No doubt they were right—he had suffered a nervous breakdown.

"Lorna, listen to me!" he began again.

"No!" she answered in muffled tones. "Go away."

He did. The great bowl was almost empty; the speakers' stand completely so. They were all at the observatory, waiting the final touches. He strode across the field with long, swift strides. He, too, would watch. He had been a crazy fool; he had imagined things too terrible even for the faintest hint; soon they would prove him wrong. So be it!

Behind him he heard a faint, startled cry—his name being called. He did not slacken his pace.

He bored unnoticed through the jostling, neck-craning crowds, worked his way to a position in front, just as the domed cylinder swung open on oiled bearings to disclose the interior of the observatory. A murmur of admiration arose from the thousands.

Before them, in all its splendor, stood revealed the giant telescope. Its criss-cross of open girders extended almost a hundred feet into the night sky. In the trough of the huge steel base was the enormous 300-inch mirror, polished to perfection, glittering in the faint darkness like a lambent jewel.

Halfway up the bridgelike girders was an oblong screen, tilted at an angle, so as not to interfere with the original passage of light, yet able to catch its rebound from the parabolic mirror. It, too, sparkled with its myriad invisible globules of silver. This was the famous mosaic. Jutting from the other side was the eyepiece, almost lost in a bewildering maze of machinery. Light

steel stairs spiraled up to a platform convenient to the eyepiece. On this open space stood Norvell Sands, a lonely, dramatic figure against the immensity of the instrument that man's genius had contrived, and man's machines had fashioned. He raised his hand.

AT THE SIGNAL, the lights of the vast mesa winked out. Only a single, indirect glow bathed his figure, silhouetted it to the tense multitude. The desert stars blinked down wonderingly at the spectacle. The velvet back drop of night seemed never more mysterious. There was not a sound.

Jim's eyes crept up the pointing instrument, stared past its orifice into space. A little cry burst through clenched teeth; involuntarily, he jerked forward. By some incredible fatality, the giant telescope was focused directly on—the Black Hole of Cygnus! Coincidence? With a groan, he realized that he had tried to warn Sands, with careful hints, away from that very spot. He had only succeeded in calling attention to the alleged dark nebula.

A brawny spectator in front sloped back angrily at his lunge; another cried "Shush!"

A hand plucked at him from behind. "Jim!"

The faint, timidly sounded name brought him pivoting around, all else forgotten.

"Lorna!"

In the dark her face was pale, but determined. "I'm sorry," she murmured agitatedly. "My conduct was inexcusable. Whatever you've done, whatever you are, I—I love you, darling!"

Then, unaccountably, she was weeping quietly in his arms, heedless of the jostling crowd, while his heart bounded with a great gladness.

"Lorna!" he whispered, stroking her hair. "I'm not what you think. Some

day I'll explain. I may be crazy, but I——"

The vast concourse said "Ah!" in simultaneous exclamation. Jim looked up, startled. Norvell Sands had plucked away the enveloping cloth with a dramatic gesture, had affixed his eye to the eyepiece.

Jim's blood seemed to freeze. His nerveless arms fell limply away from the girl. He could not exhale the bursting air in his lungs. God grant he had been wrong, crazy, anything! His own reputation did not matter. But Sands must not see, could not see, what he had imagined he had seen.

Then his blood started to flow again, his arms prickled back to life, and the suffocation left his chest. Sands had been staring intently into the eyepiece for almost thirty seconds, and nothing had happened. He laughed shamefacedly. "Now, darling, I can tell you a rather silly story——" he started, and was interrupted.

Norvell Sands had shuddered violently, torn himself loose, as if by a supreme effort, from the eyepiece. A piercing scream ripped from his lips. He staggered on the platform like a drunken man, groping for support. His face turned blindly out into the night. Never, in all Jim's experience, had he seen a face like that. It was twisted, contorted in an agony of hopeless horror. It was the gray, terrible mask of one who had looked into the unutterable depths of Hell. It was the countenance of one whose reason hung on a single, snapping thread.

For one blasting moment the crowd was paralyzed. Then a shout rose in the thick silence. "I knew it!" And Jim was hurtling forward, pounding for the spiral stairs, to catch Norvell Sands before, in his madness, he might look again.

But Sands had heard his cry, looked up with blind, stricken eyes that seemed to clear. He screamed again—it sounded

this time like the death cry of a mortally wounded animal—then he had bounded over to the tool box at the rim of the platform, thrust open the wooden cover, was rummaging feverishly in its capacious depths.

Before the horrified spectators could sense what he was doing, two heavy wrenches appeared in his hands. Before Jim could get to him, he had hurled them, one straight for the photo-electric mosaic, the other down into the depths, a direct hit on the huge mirror. There were two sharp, crashing sounds, the splinter of glass. The mighty telescope, monument to man's genius, product of years of unremitting toil, was irrevocably ruined in a single, shattering instant!

By the time Jim had reached the platform, Norvell Sands was a hopeless, senile idiot, mouthing queer, thick sounds, chuckling ceaselessly, horribly. He made no resistance as they led him away——

AFTER the excitement had subsided, and the mesa was bare of all frightened onlookers, except for a little group of grim, harassed men gathered around Jim Weldon, he explained. There had been, he said glibly, a fatal flaw in the conception of his mosaic. The gathered photo-electric effect, instead of scanning in parallel, normal rays, had concentrated to a single, dazzling point. Magnified as it was to almost unbelievable proportions, small wonder that the single beam had seared like a white-hot sword into poor Sands' skull, blinding him, driving him in that moment's agony to dreadful madness. In that madness, he had destroyed the instrument that had brought him low.

He had tried, Jim went on hurriedly, to recall the mosaic as soon as he had discovered the flaw in his calculations; with what result, they were well aware. He satisfied them with the explanation.

But Lorna was not as easily satisfied. As the gyrocopter winged away from that scene of horror and disaster, she turned abruptly to him. "Now tell me the truth," she said quietly.

He was startled. "But I did," he protested.

She shook her head. "I know better. That mosaic of yours was perfect. Your calculations were correct. They had been tested out. I want the truth."

Jim looked suddenly haggard. He shivered. He wanted to forget, once and for all. There would be no more mosaics; he would see to that. Let them build another 300-inch reflector; 400 inch even. Without the mosaic, the mystery of what Sands saw, what he, Jim Weldon, had almost seen, would never be revealed to mortal man. It was true that the sun and its attendant planets were heading directly for the constellation Cygnus, but long before they could reach the incredible thing that lay beyond, an eternity of years would have passed. Earth itself would be but a lost memory in infinitude.

He took a deep breath. "I'll tell you this much—and no more," he told her gravely. "The mosaic did work. As a result, poor Sands saw out into infinity for a distance of over twenty billion light years. Our own universe has a radius of not over five or six billion light years."

He looked up at the moveless constellation of Cygnus, continued with a

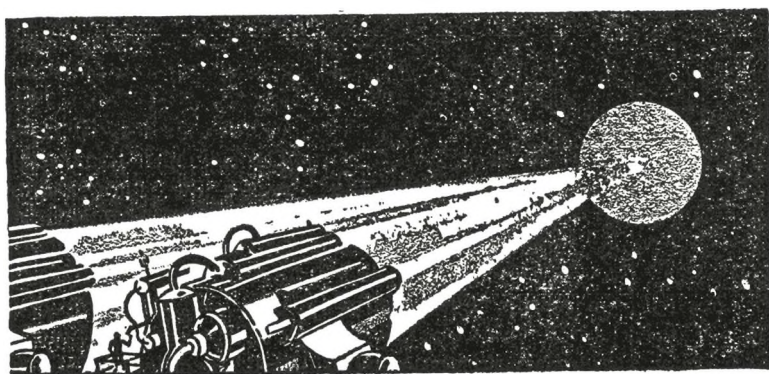
shudder. "The Black Hole of Cygnus is actually what Herschel had first believed—a funnel of emptiness giving out on a starless space time—and beyond. Norvell Sands saw beyond—out into the void where the universe of familiar things does not exist, where space and time have no meaning, where the impossible itself may be a commonplace. He saw something out there—and the sight drove him mad."

Lorna looked at him again. Her eyes were steady. "What was it he saw, Jim darling?" she queried bravely.

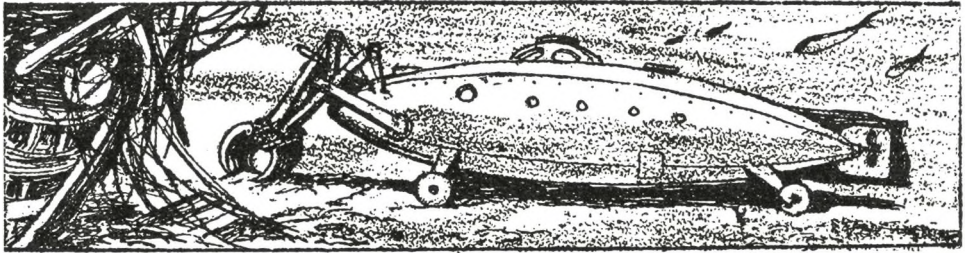
"I—I do not know," he lied, and did not lie. For he had only imagined he had seen, and the adumbration of that thought had almost wrecked his brain. He faced her squarely. "Lorna, let us understand each other," he said. "We shall be very happy together. But never again, as you value my sanity, or your own, must you question me on that point."

She saw that within his eyes which caused her to answer at once: "I promise, darling!" And she kept her word.

Norvell Sands never recovered his reason. He died not long after, confined to a straight-jacket, screaming unutterable things, which were rightly put down as the tragic ravings of a madman. Yet even the attendants, inured as they were to such things, blanched and made haste to cover his poor, tortured face with the muffling shroud.



NEW FRONTIERS



*An article by the author of "Rebirth,"
giving a vision of the vastness of the
scientific conquest which is to come.*

by Thomas Calvert McClary

THE GREAT FORTUNES have been made. The vast tracts of timber, grazing and farm lands, mines, have been gobbled up. Some lands are crowded and barren. Trucks trundle steaming jungles. Airplanes shadow the pampas. Seas are charted; mountains scaled. Railroads and ships girdle the globe.

Gone is the last frontier. There are no new lands to conquer.

The world seethes with swelling hate, while nations bitterly eye richer neighbors. Countries without enough food and wealth must fight or perish or slave for others.

Yet a land of 15,000,000 square miles, five times the size of the United States, lies almost untrodden by the foot of man. It is a land of wealth vast beyond conception. It is the land lying adjacent to every continent and covered by less than 100 fathoms of water.

Here, beneath the seas stretch great plains and hills and valleys, which know no drought nor erosion, which are heavy and lush with sea life, fertilized 24

hours a day. There are hills of iron and copper and coal. There are rich mineral deposits on the very surface of the bottom. There are sea "fruits and vegetables" and forests of sea life valuable for manufacturing. Within the 100 fathoms lies nearly every type of wealth, or its equivalent, known on dry land, with the single exception of timber and some wood products.

Man has burrowed a mile into the earth and has conquered the skies, but in the chill, dark fathoms he is still in the age of armor. Yet we know that it is an immensely rich land. Nature has been lavish under the sea. And winds and floods and rivers have carried the best of dry land's riches into the sea.

Sometimes a high-quality diamond is found on a beach near Cape Town, South Africa. Valuable gems have even been scooped off the ocean bottoms by dredges. There are ancient submarine river beds where gold and minerals have collected for unknown ages.

The bottom of the ocean is bedded with coal and metal deposits. In the

English Channel, and a very few other water places, they mine coal of superior quality. Off the coasts of Wales, tin mines have been tunneled out from shore. Oil derricks dot the coasts of Venezuela and California. But not many; and the ocean covers such vast reserves that the oil industry looks to it for its future!

ISLANDERS have told of little-known sea fruits which were succulent and palatable, if salty. Marooned sailors have found sea life similar in taste to potatoes, squash and cabbage. Sometimes small, woody-fibered "nuts" are washed up after storms. They are edible and might be tasty with the right processing.

We know that paper, cloth and excellent building compositions can be made of various types of seaweed. Still others contain chemical and mineral elements valuable to industry, particularly for medicinal use. There is no telling what plant and shell life exists at deeper fathoms than worked up to now, but we already know of immense scallop beds—one off the Atlantic coast extends over 500 miles!—lying at unworked depths. The shelled abalone of the deeper waters are immense. Many of them could supply as much meat as a steer.

The finest sponges in the world come from waters it has been impossible to reach. One of the best sponge beds in the Gulf of Mexico lies at 200 feet. It is workable by a diver for exactly 5 minutes, at slack tide. The diver must spend 120 minutes, two full hours, ascending from that depth, or risk death or mutilation from the bends. Altogether, a sponge boat requires four hours to come into position, put over the diver and take him back aboard with his work of—five minutes!

There are vast beds of mother-of-pearl shell untouched. There are potential stone quarries of great value, where the chemical action of ages of

seeping and washing sea water has produced stone the land cannot offer. Without doubt, there are valuable minerals, and the results of catalytic action we cannot yet imagine. Man has invented devices which show deposits of platinum and radium in the sea, but none to fetch up the riches.

The Japanese have been planting small bits of mucous muscle in young pearl oysters and cultivating "seed pearls," very little different from their more prized "natural" sisters. Oysters in other parts of the world occasionally produce pearls. But nobody has tried to find out if pearl oysters could be induced to breed and flourish in other sections than the Pacific Islands, Indian and Persian gulfs.

Oysters are a pretty valuable crop just for eating purposes. But efforts to increase their production or protect them from carnivorous enemies have been negligible. Excepting some spotty location work by various governments, about all the commercial attention so far paid to sea life has been scattered agreement governing the slaughter of whale, seal, salmon, localized pearl control, and, here and there, legislation governing pollution and sewage disposal.

Sewage, being fresh water, seldom sinks to greater depth than forty or fifty feet, in any event. At that point, salt water, weighing 64 lbs. per cubic foot, two pounds heavier than fresh water, begins to flow clear and unpolluted.

FOR the past 2,000 years man has been taking just about the same products from the sea in about the same way. But never before has he had the need for tapping and cultivating the sea's raw wealth; the means to reach the dark, chill, swirling 100-fathom lands; the transportation and processing requirements within his grasp.

Now he has the need; he can develop the means overnight; transportation and processing and new uses for sea products

are within reach. These reasons lead Simon Lake, father of the even-keel submarine, to predict that the next fifty years will see more millionaires and industries grow out of the 100-fathom lands than any previous era has yet counted.

The more recent trend in submarine work is the use of small submarine vessels, equipped with wheels to "drive" over smooth bottoms, with powerful outside lights, derricks, claws and grapples, which can be manipulated from inside. If the outside assistance of a diver is needed, he leaves through a compression chamber, is protected against currents by his submarine, and is relieved from pulling the clumsy length of hose and life line necessary otherwise.

The military submarine is a highly efficient and complex mechanism, but its use is at a broad tangent from commercial work. In the development of radio, airplane, automobile, synthetic substitutes and chemicals, wars stimulated invention and perfection. In the case of the submarine, the war left commercial development right where it was.

The independent submarine diver, working with a surface mother ship, is heavily handicapped. Few men can work for long at greater depth than 200 feet. Body movement is slow at great depths. There are the obstacles of moving heavy equipment and lights. And the deep-sea diver carries a veritable sail with him.

You can walk without difficulty against a 10-mile wind, but moving against a 4-knot current in the depths is laborious and difficult. The diver's suit is large, and trailing overhead he has a long air and life line, 3 inches in diameter. Multiplied by the length, he is pulling considerable square footage in a current.

His balance is difficult along a rough bottom. He is constantly at the mercy of the weather above. A heavy swell

or a sudden storm and he must join his mother ship as soon as possible. From great depths, that takes hours. During the ascent he is dangled and buffeted at various depth levels. Sometimes divers' air hoses have been snatched loose while they were ascending; giant fish have fouled their lines.

Captain Simon Lake believes that the problems of individual diving leave only the recourse of submarine-vessel work, from which divers could operate more effectively when necessary. There are two broad classes of submarines: the self-contained units able to operate independently; and submarines which are really nothing but reinforced steel tanks, taking their power, air and electricity from a surface mother ship.

The first type are expensive and crowded for working space. The second type have the inconvenience of limited movement, but not as great as the individual diver. Down to 50-fathom depth, Lake prefers the submarine tank connected with the surface ship by a rigid steel tube. This anchors the mother ship, overcomes problems of ordinary swells and minor storms, and allows men to work in air about the same as that on the surface.

When it is desirable to put out a diver from the submarine, hatches are closed into the tube, pressure raised equal to that of the water depth, and divers put out. Doors can be opened in the submarine bottom and work managed from inside without water coming in, just as water does not enter an inverted glass as long as it is held down into water on a level.

Probably the first steps in broad submarine work will be under-sea farming of deeper sponge, oyster and shell beds. The homes of giant sea crabs and deep-sea turtles, octopi and squid will be raided. Placer mining will be immediately possible and the raw forests of the ocean floor will be hewed down. At the same time, steps will be taken for the

cultivation of ocean products in waters and depths best suited and more easily worked.

ASHORE, there will be hectic experiment to find means of preserving and shipping sea food, of utilizing new-found minerals, of processing ocean plant life. New industries will spring up and some established ones, unable to compete with the lush fertility of the sea, will give way to economic and scientific progress. There will be new work in some old industries. Farm implement companies, for instance, will busily strive to find means of cultivating ocean products and open new markets for new types of machinery.

There are colossal treasures along the path of submarine conquest, such as the felling of forests or irrigation of plains seldom offered. The sea has stolen a continent from dry land. From man she has stolen cities and treasure ships galore. Most of these lie within the 100-fathom lands.

Midway between Japan and Korea is a wreck with 11,000,000 pounds sterling aboard. Off San Domingo is the hulk of a galleon with a single gold nugget weighing 3,370 lbs. At the very mouth of Vigo Bay, a Spanish flotilla lies with \$100,000,000 in bullion and plate. Off the chilly isle of Mull is the foundered Spanish Armada. In Navarino Bay is sunk a Turkish fleet with \$50,000,000.

In 1680, the West Indian trading port, Jamestown, went down in an earthquake. Another quake of 1691 carried the pirate-treasure city of Port Royal to the bottom.

Colonel Lindbergh photographed Mayan ruins on the coast of Central America, with a stone-paved road running into the ocean. Sixty miles due east lies a low, isolated island. Coming out of the sea and running into a bank of topsoil is an ancient road similarly built.

Is it the same road? Are there cities

along that road in the murky, octopus-haunted depths? Does the Caribbean cover the mythical lost continent of Atlantis, which Pliny and others said was submerged "to the west"?

Only a few years ago, an aviator sighted a strange formation below the blue Mediterranean. A diver was sent down and reported upright columns of marble and red granite and what seemed to be stone or composition roofs of some ancient buildings. After 2,500 years a sunken city was discovered in a good state of preservation!

When Premier Mussolini had Lake Nemi drained to search for lost art treasure, the second barge of Caligula was found. Its lower hull and planking, which had been covered by silt, were in perfect condition—the wood harder than ebony, after 2,000 years.

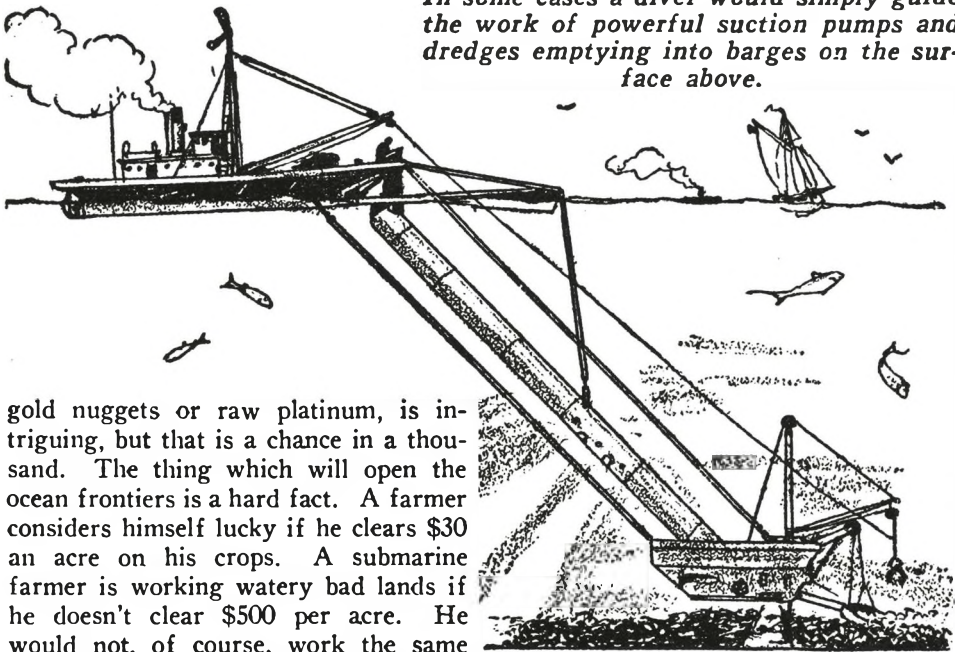
These facts are important to tomorrow's submarine engineers, for they show that the sea does not destroy all that it seizes. In places, of course, toredos and other boring worms are so vicious they will undermine cement. Some parts of the ocean depths are swept by violent and erratic currents, against which the strongest steel could not long endure. But other places lie undisturbed for years.

Captain Lake, revisiting a section of smooth bottom off the north-Atlantic coast, found tracks, made by his submarine a year previous, still distinct in the sands. One of the great dangers of diving around wrecks is that a slight vibration, the current made by a moving foot or arm, will often start a slide of weights which have held undisturbed for centuries.

THE SURVEYING of the ocean bed will be a heavy task, particularly as most waters beneath 10 fathoms are dark or completely opaque.

But it is a task which will be done before long. The thoughts of a great treasure find, or stepping into a pit of

In some cases a diver would simply guide the work of powerful suction pumps and dredges emptying into barges on the surface above.



gold nuggets or raw platinum, is intriguing, but that is a chance in a thousand. The thing which will open the ocean frontiers is a hard fact. A farmer considers himself lucky if he clears \$30 an acre on his crops. A submarine farmer is working watery bad lands if he doesn't clear \$500 per acre. He would not, of course, work the same acres every year. There are many clam beds which would produce over a thousand bushels of clams per acre. Even at the low price of \$1.25 per bushel this shows nearly a thousand-dollar profit. But harvesting on such a complete basis would have to be done from under water.

Conjure up a vision of an ocean city of fifty or a hundred years hence. Say it was at the 100-foot depth. It would be semicircular shaped, built of some new steel and glass composition. It would not need windows or ports, for only the barest gray light filters down to that depth, and then only for a few brief minutes out of a few brief days each year.

The human body would have to be experimented with before that city could be built. If man can stand working and living under great pressure, then the city's covering could be of light composition. The air pressure inside would be kept equal to the water pressure outside, which would be roughly 44 lbs. per square inch more than the

average 15 lbs, per square inch atmospheric pressure at sea level. That is, roughly, about 75,000 lbs. pressure on the surface of the average-sized man.

If man cannot long endure life under such pressures, then the city would have to be of heavy, tremendously strong material and heavily reinforced. In this case, the strength of the city's covering would itself support the water weight. The air pressure within the city could be nearly the same as on dry land.

The inside of the city would be light in color, to reflect light best, but it would not be one solid color. Man's spirits would need some compensating colors to make up for the bright sun and blue sky and green grass of the upper world. Workers would probably come out on 3-month stretches, as it would take them days, perhaps a week each way, to become acclimated and re-conditioned to the great change of pressures and life in the 100-fathom lands.

Air conditioning would be a most important function of this submarine city.

The air would have to be especially pure and clean to keep the men in good health. It would have to be of the right temperature and humidity, for workers at that depth, unless in tropical waters or currents, would be working in extremely cold water. Toward more northern zones, the water temperature would approach freezing.

The hospital would be very completely equipped with lamps of various rays to stimulate healing, and electric cabinets to warm men suffering with cold and fatigue. There would be equipment for the curing of bends and the squeeze. The bends, that dread contortion of muscles and bones, results from too rapid changes of pressure. The squeeze comes when a diving suit is ripped or an air hose faults and, suddenly, the water crushes in, the protection of equal air pressure within the suit is gone. Sometimes divers rip a suit high up, or rip it low down, and then fall so that their helmet gets on a level below the gash. Those divers are buried in their helmets, their bodies broken and crushed and forced upward, molded into helmets and breastplates like gobs of dough.

The electric consumption of the submarine city would be tremendous. Research and experiment might show the secret of the electric eel's powerful small dynamo, so strong in cases that a shock can kill a man. But, if present known laws of electric production were followed, the power house would be the largest building in the city, for everything would operate by electricity.

THE BUILDINGS of the city might be built up within the half circle, or extend down into the floor of the ocean, so that the oval top covering would be as small as possible and meet less water action. But extending the buildings down like cellars would have its dangers, for a sudden shift or slide of earth or

rock, with such pressures atop of it, would crush in the strongest steel.

The city might be permanent or be a movable cylinder, which would be moved at will to various places and then set down on the floor of the ocean. This would not be very difficult, for the air pressure would simply be increased to greater than the waters, and water ballast tanks emptied, as is done with submarines.

There would be heavily built entrance and exit locks to the city, one size for the admission of submarines and another for men. Both would operate the same. They would have outer water chambers. Men would come into these chambers, which would slowly be pumped dry. If the atmosphere in the city was less than that of the water outside, they would go through a period of decompression, until the pressure inside their bodies was equal to that of the atmosphere.

The city would be surrounded by tremendously powerful lights, but they would not show far through the murky depths. Divers and surveyors going out to work would usually use submarines and work out of these moving units. In such cases, at least until brilliant progress had been made with air-manufacturing, they would use air supplied by the submarine.

When absolutely necessary, they would carry self-contained air-manufacturing units on their backs. But the equipment would be heavy and affect their strength and balance. It would leave them tense and nervous, with the chemicals reconditioning the air, or drawing oxygen from the waters, liable to go out of commission.

There would be two types of mines connected with the city: placer and vertical mines. The placer mines would be operated in various ways. In some cases, a diver would simply guide the work of powerful suction pumps and dredges emptying into barges on the

surface above. In other cases, sand, sludge, and silt would be swirled out of its bed by hydraulic pressure and run over sifting screens on the bottom of the ocean. In still other cases, where mineral content was high and valuable, the loose, wet ore would be dumped into pipe lines running to shore. The ore would be sluiced through these lines under pressure, with boosting stations along the way, such as are used on oil-pipe lines on dry land.

The vertical mines would not be very deep for a number of years and fraught with risk and danger. They would be wet mines, the steel-braced tunnels filled with water, so that the pressure inside was as solid and equal as that of the water above. There would be numerous slides and cave-ins of the wet earth structure, the great amount of water running through ore and rock veins giving different and more serious problems than the slides in land mines.

Blasting would be highly dangerous. Men would have to be a great distance away or the sudden pressure waves would rip through the dark depths and crush them with tremendous solid force. Blasts set off at a 168-foot depth once caused a secondary explosion in a dynamite boat on the surface above!

The early mines would be mostly copper, tin, lead, coal, gold and platinum. The heavy first processing would be given in the submarine city. The broken ore, with as little waste substance as possible, would then be piped to land through hydraulic pipe lines.

It would not be possible to pipe some ores or process them to a fine point in the submarine city. For such ores, lines of submarine barges would be towed out from land. On the surface over the city, their special double holds would be filled with water, and the barges would sink to the bottom. They would be loaded with great attention to even balance. Then air hoses would be attached to valves in their double bot-

toms and their water ballast forced out. With chambers then filled with air, they would rise to the surface and be towed to shore.

Oil wells, of course, would be drilled by workers in the depths, but piped directly to shore. A gusher would make little difference to the city. The oil would rise immediately to the surface of the water.

THE PLANT LIFE of the ocean depths thrives. A sudden shift of current may deprive it of needed food, but that is its greatest danger. Most fish live on other fish and minute animal organisms in the water. Some infinitely small organisms live off the plants without doing the plant great damage. The ocean is cannibalistic. The farmer's main worry would be to keep his plants clear of parasite strangling plants.

His work this day might be in the vegetable patch, or the fruit or nut orchards, or the forests of heavy-stalked, deep-water kelp, being used for paper.



There is no telling what plant life exists at deeper fathoms than have now been explored.

For silk and cotton and wool substitutes, the finer kelp of more shallow depths is better.

If it was harvesting time, he would harvest his plants, probably with an electric scythe. He would only want part of them, either the roots crawling across the sands or growing fast to the rocks, or the upper sections. These he would pile into a small submarine barge. When loaded, an air hose would be attached from the submarine and the tanks of the barge blown partially clear of water ballast, so that the barge would lift its load and float at that depth without rising higher. Then the barge would be towed into the city by the submarine.

The same procedure would be followed with oyster, muscle and clam beds. An electric gun might be developed to kill off the oyster-eating starfish and other enemies. But the weight of a diver stepping on the ooze of the shell beds would break many fine shells, and it might be better farming to cruise slowly just above the beds, with a door open in the bottom of the submarine and work going on from there. As long as the submarine's air pressure equaled that of the water outside, no water would enter.

Where crustaceans were being gathered solely for shell or pearls, special equipment might be taken right out to the beds to open and examine shells on the spot. This would avoid the carrying of useless weight back to the city and the disposal of waste afterward.

Once back at the city, the city's real work would begin. Plants would have to be dried, most of them processed for the extraction of salt, and their waste part discarded. Some of the plants would be shredded or chunked, others left in their natural state, but dried of much water.

In the case of the kelp used for the new hard-wear cloth, only the first stages of processing would be carried

on in the submarine city. The duties of the city would be limited to cutting out waste materials and reducing weight and transportation as far as possible.

Once through the preliminary processing stage, the plants would either be sent through pneumatic tubes, bound in waterproofing and sent through the hydraulic tubes, or loaded aboard barges. From the city they would go to coastal land plants, to be made into processed foods, dyestuffs, medicines, synthetic woods, cloths, building materials, paper, etc. A great deal of iodine and other mineral substance would be extracted as a by-product. Only such plants would be of value as offered something the land could not produce, a finer quality, or a cheaper price in competition with land-grown produce.

Crustacean, shellfish and dried salt fish might be completely treated at the submarine city. Great strides would be made in canning processes, and oysters and clams might be shelled and canned at 100-foot depths, to roll off into pneumatic tubes and be whisked to land by the thousand. Dried fish would be cured and salted and packaged, but probably in metal or foil, as the atmosphere of the city would be highly humid and paper or cardboard materials would thicken and dampen.

Canning in the submarine city would present its own problems. Food would be canned under a submarine normal pressure of 75,000 lbs. to the square inch. If the pressure was drawn off from within the cans, the cans would be crushed. If the cans were permitted to be sent to shore without some equalizing of pressures, they would split open like bombs when they came into the land pressure.

Yet the shipping of waste shell all the way into shore from considerable distances out would mean great transport costs. It might be necessary to decompress products after primary processing stages and have the rest of the work

carried out at a near sea-level, normal pressure, without the products again coming into contact with the submarine pressure.

WITH the day's work over, men would find short hours of relaxation, probably movies and radios, but there would be a great deal of research and experiment with well-known and new-found species of sea life, in an attempt to find new uses for old species or their waste products, or some use for newly discovered animal or vegetable life or some new mineral. With salts taking an increasingly important part in manufacturing and bodily welfare, there would be great interest in the many salts found in sea water.

The interest in experiment would not slough off for years. For out in the chill depths beyond the city would be millions of tons of the same life or mineral a man was working over. It would belong to nobody, not even a government, should it be beyond the new territorial limits. It would be his for the taking.

But entertainment would not occupy too many hours in that city of lean, tense-faced men with an increasingly greenish pallor. For the labor and strain of working and living under pressure would leave bodies tired, craving and needing a great deal more sleep than bodies on the surface.

Those who conquer the sea bottom may not live to see vertical mines and

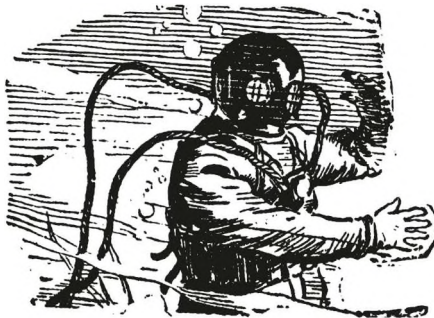
submarine cities. They may not live to see the day when people can, if they choose, live their lives beneath the sea and never touch a food or product not produced from the submarine depths. They may not even see the day when submarine mines and wells and plantations seriously rival those of *terra firma*.

But they will see, and maybe share in, great reclaimed treasures. They may strike another Eldorado. They may become submarine mother-of-pearl kings, submarine quarry barons, or czars of miles of paper kelp or deep oyster or crab beds. They may discover the lost continent of Atlantis, or fabulously rich Port Royal, or the ancient land bridge to Asia. They may give a new metal to industry, a new mineral to science or medicine.

Or they may become nothing but weary, green-tinted desert rats, trudging the shifting sands and sludge of sea bottoms. Or fish wardens and starfish exterminators, slaughtering murderous killers of other sea life.

But they will live in an exciting new world, part of the dynamic force which pushed back new frontiers. Fifteen million square miles is a vast new world to conquer. It will take the lives of many. To some it will give riches. To the world, it will give new lands and foods and wealth, for teeming, restless, pushing populations.

The battle against the ocean depths looms over the horizon. Man needs the conquest.





*The fluids seemed
a coiling serpent,
the red cells
were the wheels
of a terrible
machine—
Three ways to die—*

*A blaze of white light—a mighty
roar—darkness—*

by K. Raymond

THE COMET

I AM DYING—not in a comet-made pit deep in the African Belgian Congo, as I had thought to—but in New York's Mercy Hospital. Lying helpless in bed, I, Miles Carton, slowly dictate this story of an alien horror to a sympathetic interne who will see to its publishing. For Professor Brett Kramer's astounding astrophysical discovery must be made known to the world.

The professor is dead, a martyr to science. But to him will go the world's praise when this account of his work is made known. He proved his cometary hypothesis of the dread Deveraux Wind, proved his belief that a comet once struck earth, and that the cometic gases yet remained, and—his finest truth—*what comets really are.*

Since I must be the one to tell of his work, I shall have to explain how I happened to be with Professor Brett Kramer.

I was but a youthful adventurer of the modern sort—jaunting around the world after finishing college. I started out at twenty—I am but twenty-five years now—a lad six feet in build, blond, blue-eyed and, as my name of Carton shows, of English descent. Just before I graduated from college, my mother and father died a few days apart. They left me with a trust-fund income which gave me the chance to travel, something I always wanted to do.

Four years I roamed the world's five continents. It was in September of 1935 that I ran across the professor's *safari* at Wamba, in the Belgian Congo of Africa.

I loved Professor Brett Kramer at sight. He was an odd man—and I like the odd. In build, he was like a gorilla—six feet of bulky, muscular body in

khaki shirt and breeches and pith helmet. He had a broad, hairy face, from which hung a big, black beard. Horn-shell glasses covered steady eyes of brown. He little appeared his sixty years.

The professor liked me as much as I did him. Pleased with the interest I showed in his scientific adventuring—for such it seemed—he asked me to go with him.

"Miles, my boy," he said gruffly, though heartily, "your aimless exploring is a poor sort of curiosity into things unknown. Do it with a purpose. Come with me. As professor of astrophysics in a great university and research director of a great observatory, I am here for the greatest scientific exploration ever made. I shall not explain—yet. But I can promise you an amazing experience."

Though I wondered at his last words, I was glad to go with him.

LET ME dwell but briefly upon our painful *safari* southward into the wildest Congo. Old explorers will know of the endless plunging through almost impenetrable forests; the life-infested streams we crossed, the burning heat and the misery of fever and dysentery. But that was nothing. We also bucked the November week of the grim Deveraux Wind.

The Deveraux Wind, I must briefly explain, is a frightful gale of furnace-like heat that comes in a red fog. Four times a year it blows for a week—always from mid-Africa toward the Atlantic coast between latitudes 15 degrees north and 1 degree south. It has a sickening smell to its ruby vapors, like that of rotten eggs. More about the wind later.

It seemed like the hot breath of some gigantic organism.

Southward, we continued into virgin fastnesses. Five more days of grim *safari*. The Deveraux Wind grew more intense. Searing heat. And always the red fog, with its evil smell and throat-biting attack, whirled around us. Often we ran into queer electrical storms, queer because of their unnatural violence, and that no rain fell.

Where were we going, I wondered, and why?

You will not understand—yet—when I tell you that each day we seemed to be nearing a *source* of the frightful wind.

But I shall skip the rest of that agonizing travel, and tell of the terrible day that ended our scientific exploration. I shall not speak in a technical way; I am not a learned man of science, like the professor. I shall tell it as a tragic drama——

For such it was.

Now an astounding change came over Professor Kramer. His calm, methodical stolidity left him. He became possessed by a wild, inner excitement.

I was soon to know why.

On the morning of the sixth day of bucking the Deveraux Wind—alas! that tragic day—we were unable to break camp. Our native black porters lay weary, blistered by the furnace blasts of the gale. The whirling, blood-red fog was so thick that tree trunks three feet away were but reddish shadows. The smell was nauseating, choked nose and throat membranes. I, too, lay completely exhausted.

But iron-bodied Professor Kramer had gone from the camp before any of us awoke. A note he left pinned to my tent flap read:

MILES:

I am certain we are close to what I seek. I have gone to find it. Back by evening.
B. K.

What did he seek? What did he expect to find?

EIGHT HOURS LATER, I lay in my shorts on my cot, about ready to get up and start looking for Professor Kramer, when he returned. Standing over me in the red fog, he was a queer sight. His khaki shirt and breeches were torn, boots oddly black, white pith helmet missing.

"Miles—I have found it!" he exclaimed, trembling with excitement. "My theories—mathematical calculations—all proved! Come with me. I am going back. With your help I shall learn more!"

His strange manner roused me. "Yes, professor," I gasped. "First, though, don't you want food and rest——"

"Food—rest? When I have found where a comet hit earth!" His deep voice was vibrant with emotion. "When I am about to prove what I have always believed, that a comet is—— No, that can wait; I must be sure. Get dressed, Miles, while I explain things!"

Eagerly, I began to pull on my brown shirt and breeches. Now I would learn what he sought in the Congo wilderness—and why.

"You say a comet hit earth?" I inquired, amazed. "In my astronomy course at college I was told that was impossible."

"No, no, Miles. Think how many comets enter the stellar system—many almost cutting through earth's orbit. If the distance between a comet's orbit and that of our world was less than the sum of the radii of the comet's head and that of earth, and if they came to a certain spot in their two orbits at the same moment—well, would they meet?"

"If they moved in the same direction—I guess so."

"No, Miles; they must be moving in *opposite* directions. Otherwise they would but touch. The comet would bounce into a new orbit——"

"But the blow of a comet would wreck earth!"

"Nonsense. If anything was wrecked it would be the comet. They are all of light mass. Earth would but seize them by gravity."

"And you have found where a comet hit——"

"Hit earth, yes. A small one. Are you ready, Miles? Come, I'll explain more on the way. You're going to see a comet itself. And help me to prove my theory as to what comets *really* are!"

My brain whirled. See a comet? What they really were? When did one hit in the Belgian Congo? How did he know about it? I wondered if I were dreaming.

We left the camp, plunged into the Congo jungle following a southward trail that Professor Kramer's bulky body and hatchet had earlier opened. Around us the tangled masses of palms, ferns, huge shrubs, and creepers gleamed amid the whirling fog which now began to glow and shine queerly. The wind, with its sickening smell of rotten eggs, moaned wildly.

"The comet I found is a small one—part of the great comet of 1858," Professor Kramer half shouted, to be heard against the gale. "The main one was seen in June of that year by Donati at Florence. It was in the constellation Leo. In October it was 50,000,000 miles from earth, and twice as bright as any star——"

"I know about that comet," I interrupted, as we hurried deeper into the jungle. "My textbook said its 70-degree tail divided. And something happened to its nucleus and envelope."

"Yes, Miles; the comet seethed with internal force. It split; and a small comet, believed to have been caused by an explosion of gases, was seen. Do you know what then happened?"

"Sure do! Small comet vanished. Big one was seen for some time."

"Correct, Miles. The small comet struck earth. But nobody 77 years ago thought of that. Millions of people had not been killed; nor had earth's orbit been changed."

I started to ask Professor Kramer how he knew the little comet had hit our world that long ago, but was stopped by a sudden electrical squall. The swirling, red fog was abruptly shot with dazzling lightning. Deafening thunder cannonaded. The Deveraux Wind shrieked. The storm without rain raged for five minutes. Then it went, though the red gale moaned on.

"A dozen of these unnatural squalls lately!" I yelled. "What causes them?"

"Electrical forces from a source alien to earth," was Professor Kramer's amazing answer. "The same source from which arises this uncanny gaseous wind."

NERVOUSLY, I hacked away at dense undergrowths with my hatchet. How could an alien source cause these storms, and this hot, blood-red wind?

"Say, Professor Kramer," I bellowed, remembering my unspoken question, "how do *you* know a comet hit earth 77 years ago?"

"Mathematical computations from astronomical records. It took years—but convinced me that the great comet had hurled the lesser one into an eccentric orbit whose first aphelion fulfilled the conditions of collision I told you about. The two orbits—of earth and the small comet—did not intersect; but the distance between was less than the sum of the radii of the comet's head and that of earth. The comet's flight was retrograde, east to west—while earth circles the sun from west to east—so they met."

"And the little comet didn't fall into the sun?"

"No, Miles. Earth's gravity was strongest. So that, Miles, is *how* I knew of the striking."

"Yes, I see now," I agreed, as I cut away at sharp-edged ferns that tore my brown shirt, and tipped my pith helmet sideways. "And was it mathematics told you the comet hit here in the Congo?"

"Partly. Also practical research—files of newspapers and science magazines," Professor Kramer shouted over his shoulder, for the red gale moaned louder than ever. "Issues from 1858 to 1935."

"What for?"

"To see if there was anywhere on earth an atmospheric change great enough for scientific reporting. I was not surprised to find many accounts about a hitherto unknown wind in Africa. The first report was written by one Deveraux, the French explorer after whom the wind was named. It was in an article entitled *Voyages et discours dans l'Afrique Centrale*, in the *Paris Journal of Science*, December 1859. He told——"

Professor Kramer spoke of the latitude and periods of the Deveraux Wind—things you already know. As for the uncanny characteristics of that gale—what I have told of our sufferings should have made that clear enough!

"You think this terrible wind is caused by the comet that hit 77 years ago!" I cried.

"I know it—now—for I have seen the comet. I admit, however, it was but a crazy theory at first. But knowing that a comet had struck earth made me sure that nothing but periodic exhalations of cometic gases could explain the weird wind——"

"Why periodic exhalations? Why hadn't the gases spread over all the world upon striking?"

"Because they keep a strange unity. I think I know why. But I must have positive proof before I talk about it. My idea is rather astounding."

Again that odd hint that comets were really something amazing, not just burn-

ing gases. Puzzled, I followed the seemingly iron-bodied Professor Kramer deeper into the virgin jungle. It was all too much for me. Was this blood-red, hot gale, gas from a comet—gas, with a bad rotten-egg smell, that we breathed? As for a comet being something astonishing, what could it be but fiery vapor?

THE WILD GALE now glowed with a ruby fire, as we left the jungle behind and breathlessly strode across a rolling area whose surface was a minerallike black crust—black even in the deep-red light.

Our painful march was like crossing the red Sahara desert at high noon. I nearly roasted with the heat, sickened with the odor of combustion or decay. As I fought to strap my white helmet tighter, I actually leaned against the wind!

"Carbonized by the meeting of comet and earth!" shouted Professor Kramer, pointing at the black crust below. "We near the great comet-made pit. There it is—the great pit——"

We broke into an agonizing half trot, finally stood panting and weary at the gusty brink of a great abyss. And now I knew. Here—here was the source of the awful Deveraux Wind—a source that no one else ever dreamed existed, and had therefore never tried to find. Here a comet had hit. And deep in its own pit was——

The comet itself!

I am at a loss to describe the pit and comet. I shall have to compare it to a raw egg at the bottom of a teacup, providing, of course, that both are of titanic size. Make the white of the egg a transparent fluid of red, and the egg yolk an opaque sphere of crimson floating within; enlarge on a hundred-mile scale—the teacup also—and you have it.

The comet seethed with a terrible activity. It threw off a whirling, rushing cyclone of red vapors which, by some

freak of air pressures, swept along in a ground belt of wind instead of spouting high into the sky.

It was like standing at the brink of a volcanic crater.

"That red liquid—though it is not fluid or vapor in the earthly sense—is the comet's envelope!" shouted Professor Kramer. "That solid-looking red sphere that spins madly is the nucleus. Come—we shall help one another go down these smooth, steep walls."

"Great Scott! Are we to go down into this comet!" I cried, against the howling gale. "We'll be roasted alive—maybe killed by radio-active rays, or something!"

"Only part way, Miles. I must find some clue to prove an amazing theory."

"But, professor—I've got a creepy feeling—about this comet!"

In the intense, red glow, Professor Kramer's broad face was a study in triumph. He trembled with emotion, for I saw the quivering of his black beard. And his brown eyes shone behind their horn-shell glasses. He shouted, and his deep voice came faintly through the red gale.

"Yes! I feel that, too—and I am almost certain why! But come. Let us go down—part way!"

"But Professor Kramer," I yelled, "you've proved your theories that a comet struck here—proved that the gases yet burn. What else?"

"Why does this comet remain here as a vast unit? Why do not all its gases spread into earth's atmosphere? I have a theory—an incredible one, to be sure—and I must find some clue to prove it. Come, take one of my hands. We will go down as far as we can!"

NOW I KNEW why Professor Kramer came back for me. The wall of the black pit was almost vertical. To descend, one of us had to chop steps in the claylike crust, while holding fast to the hand of the other above. A rope

would— But we had no rope. I fully believe that continuous breathing of the comet's gases made us giddy-headed, that Professor Kramer should suggest, and I agree, to such a mad action as descending.

Alas! That ever we went down into that pit of horror. How dear the cost of proving what comets really are!

Slowly, we chopped our dangerous way down the pit wall. The parching gale of red vapors died away as we entered the belt edge of a layer of cohesive substance—the surface of the lakelike comet's envelope. The clear, red substance—neither vapor nor fluid—something like mercury would be if crimson in color and a dozen times lighter, and transparent—was calm. It was like the peaceful depths beneath a storm-roused sea.

A sense of coming horror filled me. I was in something alien and evil. A *presence* watched me. I fought against unreasoning, blind terror, threw off these strange fears.

"Still that awful, rotten-egg smell!" I said to Professor Kramer who, flat against the wall, chopped away below me. "Darn hot, too. But not enough for a comet! S'pose it cooled since it hit earth?"

"No. It has an even moderate temperature because—but I must be sure before I tell you that! Come, let us go deeper."

Down, down we went into the glowing red substance. Far, far below us the heavier, nucleus-sphere spun wildly.

My strange fears grew stronger. "Professor Kramer," I cried, "I feel danger in here. Let's go up again—"

Suddenly a mighty force tore at us—jerked us from the pit wall, whirled us downward—

Like meteors, we spun toward the spinning nucleus. It grew to giant size as we neared it. I screamed, waited for a killing blow. We struck its mass—

like feathers landing on water. The nucleus substance was soft as down!

I rose to my feet, stared around me. Professor Kramer stood near by. We seemed on a tiny world, some miles in circumference, whose surface was a muddy mass of cohesive fluid that glowed like red fire. An elastic gas that pulsed, throbbed with life. It swelled and shrank in rhythm. A beating force—like something *alive*. Yet we breathed freely!

"It lives! It lives!" Professor Kramer shouted, as we rose and fell to a wavelike motion. "My theory is right; everything is explained! We are on the heart nucleus of the cometic organism, Miles! I knew its envelope was the life skin—knew that comet tails controlled sky flight!"

ALIVE? Were comets moths, flitting around the sun lamps in the heavens? I stood in amazed silence as Professor Kramer continued hurriedly.

"Miles, this is the fantastic theory I kept from you until I was certain. A comet is a living being! That's why its mass is held together, temperature kept even. And its periodic breathing forms what we call the Deveraux Wind. This—this is the tiny comet *born in space* from the parent comet of 1858!

"Why did it fall to earth? Compare it to a lost child, or a bird weakly falling from its nest, unable to control its wings!"

"This comet a living being!" I exclaimed. "But it hit earth hard enough to blast open this great pit. That would surely have killed it!"

"No, no, Miles. Comets must certainly be protected against collisions. Think of the meteors, asteroids, the dark masses of iron and rock they meet in space. They must have a natural protection. What better one than a gaseous envelope that can swell or shrink without injury?"

Looking back, it seems to me that

the comet's gases had made us light-headed. For there we stood discussing science instead of thinking about escape.

"But what could a living being exist on in empty space?" I wondered.

"It might change ether into life energy. That would also explain how it lives here on earth. Ether is everywhere!"

"Why you have an answer for everything——" I stopped suddenly at feeling myself sink. "My Lord! We're being sucked down into the heart——"

We sank to our knees in the vile-smelling, cohesive substance—to the belts of our khaki breeches—the necks of our brown shirts——

"We'll suffocate in this denser fluid!" Professor Kramer cried. "The comet being is trying to kill us——"

He was gone. Buried alive.

And the glowing red slime, which, like mercury, neither wet nor clung to the body, drew me down, down. Suddenly I fell into the bright-crimson space of a hollow interior. The red ooze had been a heart sac of giant size. Now I was inside the organ, floating in a cyclone of red gas—breathable—like a germ in human blood circulation. With Professor Kramer, I was swept in and around shining white masses that must have been internal organs of enormous bulk. Miles and miles we were bowled along as the vast heart sac beat.

Professor Kramer's big hand held fast to my wrist. "We're alien to the comet being!" he yelled. "It's trapped—will surely kill us! We'll never get out of here!"

Overhead, the immense heart sac beat jerkily. And now from its red substance spun a thousand flat disks—gaseous pancakes, the size of locomotive wheels——

"Professor Kramer!" I shouted. "Those whirling things—they're after us!"

"Some kind of killing cells!" he

yelled. "They'll probably devour us—to protect the comet organism!"

THE ALIEN BEING was in trouble. The heart sac pulsed slower. The glowing, red life stream around us quivered; its sudden starts and stops sickened me. An intense heat grew. An odor of decay.

"We're a disease to the comet!" Professor Kramer cried. "We will surely kill it—unless we are destroyed first. It was an accident—being drawn into the heart!"

But the red cells, spinning through the thickening life stream, closed in on us. Like circular saws cutting into wood, came their whining drone—

"Only the comet's death will stop them, Miles! But that will kill us, too! If the organism dies—its gases will surely explode!"

Suddenly he was torn away from me, shrieking in agony. Giant red cells sliced into his body. Hundreds clustered around him like flies at a feast. Other attacking disks spun toward me. But the comet's life fluids thickened, and they whirled slower. Pressure of the cohesive gases around my body became a mighty, crushing force.

Three ways was I doomed to die! Pressure, the red cells, a mighty explosion. I was in a dazed terror. The fluids seemed a coiling serpent that was crushing my bones; the red cells were the wheels of a terrible machine rolling over me. All this going on in a blast furnace filled with hot, evil-smelling gases.

Dimly, I knew that Professor Kramer had been sliced to ribbons, then absorbed by the red cells. I remember,

too, that the heart sac above seemed to be vaporizing, that a giant life was dying, that the life stream was a-quiver as in pain. Then a blaze of white light—a mighty roar—darkness.

And then, racked with pain, I found myself lying at the bottom of an empty pit. Above me, blue-white stars shone against a black sky. A silver, tropic moon gleamed.

Then I knew. Death had claimed the alien organism—

The comet had exploded, even as Professor Kramer had said. The gases, within whose atoms was the absorbed body of that ill-fated genius, were now mingled with earth's air.

Horror, terror, and pain swept me into a shrieking delirium. Doubtless I would have gone mad, had not a merciful unconsciousness claimed me a second time—

I KNOW LITTLE of the three months that followed. I have been but semiconscious. The interne who writes down my words tells me that I was rescued and kept alive by the black porters of our native *safari*, then sent to New York's Mercy Hospital for a necessary surgical operation, through the efforts of Belgian government officials at Rangu.

The operation was only partially successful. I have full consciousness, but am told my weakened body cannot long survive. However, if my story proves the greatness of him I loved, Professor Brett Kramer, and further advances his own beloved astronomical science, I shall die content.

And he shall not have died in vain.

Next Month:

LIFE DISINHERITED

A great story by Eando Binder.

Fractional Ego

A normal man is an organization of living cells, the material of which has always been a part of the universe—and which can be changed—but not destroyed.

by Clifton B. Kruse

TUCKING his order book in the door pocket of his coupé, Mr. J. H. Friml, salesman for the Los Angeles Canning Co., checked the time and eyed the monotonous blue expanse of the North Dakota sky. It was just four o'clock. He had completed this day's schedule of some seven rural towns in good time. A brisk three-hour drive would put him into Bismarck in time for supper. There were good hotels in Bismarck. He shot down the straight highway, the motor purring nicely at seventy miles. He was recounting the day's calls and congratulating himself upon the several substantial orders.

Abruptly the roadway vanished. The interminable fields of brown wheat stubble melted into a churning blue vapor. In place of the steady rhythm of the automobile motor a sibilant, unearthly scream tortured his ears. There had been no loss of consciousness. Yet now he was reclining upon a harsh, padded couch.

He opened his eyes, staring at the somber interior of a vast building. Queer stone figures lined the walls and across the great hall there arose a pungent stream of incense smoke before the grotesque figure of a heathen idol. Then he saw the amazed brown faces, heard the indecipherable cries of many frightened voices as the strange men took but one glance at him and ran from the tem-

ple. J. H. Friml staggered to his feet. Bewilderedly he gazed from a portal off across the high plateau of Tibet.

But how had he come to be here in this place across the world from North Dakota? And, too, what was the significance of those peculiar smoldering thoughts just beneath the surface of consciousness? Instinctively, it seemed he knew that this was an ancient temple of Tibet. Yet until this moment he had never consciously realized that such a nation and such a people existed.

That evening's special edition of the Bismarck, North Dakota, papers carried the startling announcement of the discovery of the wrecked coupé of a West coast fruit packer's salesman. The crushed body of a strange dark man wearing a dirty-white gown was found in the car. The salesman, said to be one J. H. Friml of Los Angeles, was not discovered. The police feared that Friml had picked up the dark man—possibly a demented hitchhiker—and had been murdered sometime previous to the wreck.

PROFESSOR PHIL DAVIS, of the Manual Training High School at Phoenix, Arizona, had just dismissed his last class for the day. Glancing wearily over the long, smelly chemistry laboratory, he reflected upon the series of experiments in the decomposition of water by electrolysis which would fill to-morrow's



It was no longer Paulino, but a huge, shaggy ape which faced them.

schedule. It might be wise to get everything in shape this evening so that he could swing into action in the first-hour class without unnecessary delay.

Crossing the room to the chests of glassware he bent down, gathering up as much apparatus as he could carry. Then, suddenly, the dark laboratory became exceedingly bright. The stained benches with their racks faded mysteriously. The entire room swirled in a glorious sea of bluish mist.

Davis sensed that he was falling. With an effort, he forced himself to stand upright. The mist vanished as quickly and inexplicably as it had assailed him. But the laboratory had disappeared. The perplexed teacher blinked in amazement. His eyes widened in a fearful stare about a comfortable dining room. He was standing before the table, fingers clutching the cloth.

Across from him a thickset, bald old gentleman got to his feet, his mouth gaping like a strangled fish. There was also a woman at the table and a small boy. All of them eyed the intruder, their faces lined with horrified incredulity. Then the woman screamed.

But what was he doing here in Indianapolis, Indiana? Who were these people? His mind burned with deep-rooted memories which sought to break through into conscious perception. In some way, without being told, he knew that this was not Phoenix, Arizona, but Indianapolis, Indiana. Yet nothing else was quite clear.

"Freddie!" the woman cried. "Where's Freddie?"

"Who are you?" the bald-headed man bellowed. "Where did you——"

Davis started to speak, then quickly closed his mouth. Of course he could not say that minutes before he had been in his laboratory hundreds of miles away. What really had happened? Was he mad?

The telephone rang. Davis heard the older man answer the call. It was long

distance. The police department at Phoenix were calling the parents of Fred Parks. The young man, evidently a victim of amnesia, had just been found in the Manual Training High School at Phoenix. He had a garbled, incomprehensible story to which the police could not give credence. Would his parents send for their son who doubtlessly must have been missing for some time?

CONGRATULATING both himself and his personable young secretary upon being able to round out a monotonous day so early in the afternoon, Dr. William Eckert, official observer of the United States Meteorological Base at Kansas City, began the final dictation of the day's researches. Miss Cora Randolph bent her blond head over the typewriter as she inserted the oversized governmental record sheet.

Dr. Eckert smiled a blend of admiration and self-satisfaction. Miss Cora was a marvelous assistant. She reminded him of his youngest daughter Eldra. "It is just a few minutes past four," he remarked.

"Which means?"—Cora smiled up at him impishly—"that you can go take a postman's holiday and work from now till midnight in your own private lab."

"Exactly," Dr. Eckert agreed. "And on that same experiment, too. But it's worth a lifetime, Miss Cora. It is truly cosmic—and I'm sure that very soon I—I—— Miss Cora! Why—what is——"

Miss Cora Randolph was no longer in the office. In her chair before the typewriter, his hands touching the report sheet precisely as the girl had held it, sat a very bewildered young man.

"What the devil!" the stranger choked out. As he jerked around to face Dr. Eckert, a huge blob of shaving cream slopped from the man's jaw. Dr. Eckert rubbed his eyes. Yet this was no apparition. The lanky, square-shouldered, wild-eyed young man was very real as

he sat there clothed only in military trousers and undershirt. One side of his face had been scraped clean of whiskers. The other was still foamy with soap.

"Where am I? What's happened?" the man shouted. Then a queer expression spread over the sharp, prominent features. "Good Lord—this is Kansas City. But I'm in—I mean I was in my apartment at Columbus, Ohio!"

Dr. Eckert staggered backward, bumping into his own swivel chair and slumping down in it. For several minutes he continued to sit there and stare at the stupefied intruder.

Then the fellow rose, uttered a harsh laugh. "I'm mad!" he shouted. "Loony—nuts—screwy—that's it! I'm—I'm — Oh, Lord—I can't get it! What happened to me?"

The look of amazement slowly faded from Dr. Eckert's face.

"Sit down," he ordered.

"But what— But I—"

"Confound it, get back down in that chair. Now, who are you and where did you come from? Never mind about how you came. Just tell me—"

"Then you know what's the matter? Listen, mister, have I gone gaga and got myself shut up in some damned institution?"

Dr. Eckert sat up rigidly in his chair. His clenched fist pounded the desk.

"Let me do the asking! Just you answer my questions. Now, who—"

The tall young man returned the doctor's stare grimly. "O. K., mister." He seemed to be forcing his voice down in pitch. "I am—or was—Pilot Emery Brundage of the North American Airways. I was scheduled to take off tonight at eight fifteen from the Columbus field. I'd just got up and was shaving when—well, believe it or not—I found myself sitting here in front of this typewriter in Kansas City."

"I believe you."

"You sound like you really do."

"Thanks, Brundage." Dr. Eckert got

to his feet, walking up and down the office in brisk strides, head bent forward and forehead creased by a deep, furrowed frown. Stopping abruptly before the pilot he stared down at him intently.

"It is true!" Dr. Eckert murmured, almost enrapturedly. "I could not quite realize how it could happen before. But now—it has actually come to pass."

Brundage began wearily to clear his face of drying shaving soap. He said: "You're telling me a lot of nothing."

However, the elderly scientist seemed not to have heard. He was back at his desk now, gripping the telephone fiercely.

"You have a phone in your apartment in Columbus, haven't you?"

Brundage nodded, observing the ro-tund little man rather suspiciously.

"Sure, but there's nobody home. Lieutenant Stevins and I share it. But when I'm in Columbus he's in Spokane, so you—"

"Your number?" Dr. Eckert barked. "I must locate Miss Cora. She'll be there—unless she's been frightened by the—the interchange and ran off. Hello—hello, long distance."

Five minutes later Dr. Eckert returned his attention to Pilot Brundage. The scientist was dry washing his hands vigorously. His eyes were narrowed in tense speculation.

Brundage rubbed his head, his eyes fixed curiously upon Dr. Eckert.

"You mean this woman was in my — Say, listen, mister—I don't—"

"Get this straight, Brundage. My secretary, Miss Cora Randolph, found herself in your apartment the same instant that you realized yourself as being here in my office. She—she was even standing before the mirror clutching a razor. Fortunately, Miss Cora is an unusually brilliant young woman."

Brundage closed his eyes and groaned.

"If I could only think of it—of what I'm trying to think of but can't. It's

here—here inside this thick skull, but I——”

“You’ll never completely break through,” Dr. Eckert said as he approached the aviator. “Listen, boy—relax. Don’t try to force those thoughts which almost, but do not quite break through. Just wait—Miss Cora will reach Kansas City by ten o’clock. She’s returning TWA. Until she comes you are to rest.”

Brundage groaned out his words. “Then I’m not crazy?”

“Definitely not. At seven minutes past four something happened which affected you and my secretary. There was an interchange——”

But Brundage was beyond hearing. He was laughing, trembling with the sound of his own voice and with tears clouding his eyes.

CORA RANDOLPH left the plane clinging tightly to Dr. Eckert’s arm. Her face was pale and her eyes seemed incredibly tired. It was as if her mind had burned long hours with heavy, torturing thoughts. She had smiled weakly at sight of Dr. Eckert’s bobbling little figure amidst the crowd at the airport. She had greeted him wordlessly.

As they drove across the city the scientist spoke cautiously, his voice purposefully soothing. Cora had kept her head, he noted, but the strain was telling on her. He commanded her to relax and cease this futile worry. Almost uncannily he understood about that terrible strain as her mind sought to reach down and bring to light that illusive something which she was trying hopelessly to remember.

“Then this man—Emery Brundage—was at my desk in the office—at the same time that—that I——”

“At the precise instant,” Dr. Eckert replied very softly. “He is at my home now. I’ve tried to make him rest and to assure him that he is indeed sane. Fortunately he is strong.”

Cora laughed nervously. Her fingers dug tightly into Dr. Eckert’s forearm. “I was not afraid. It wasn’t like that. Only the place was—well, just half strange and half as if I remembered it. And I knew where I was, though not why. I thought I had gone mad. I was standing there in that room—knowing that within an instant I had somehow jumped from Kansas City to Columbus—and I was staring at my reflection in the mirror and holding a razor. Then the telephone rang and you called me over long distance.”

“You have been very brave,” Dr. Eckert said.

“But those thoughts!” Cora exclaimed. “You can’t understand how—how miserable it is. My brain was seething with them. But I couldn’t make them clear. Almost, it seemed, I was on the verge of remembering—something. But—well, that’s just it. And I still feel it; only the ache has subsided considerably. I had to force myself to try not to think.”

“All right now, Miss Cora. Here we are.” The car glided up the long driveway. Dr. Eckert took the girl’s arm. She was weak and trembling. Once, before they had entered the house, she halted, digging her fingers into the scientist’s arm.

Her whisper was sharp. “Is *he* in there now?”

At that moment the door swung open and the tall figure of Pilot Emery Brundage stepped out upon the porch. He was staring down at the girl. Dr. Eckert put his arm about her shoulders, urging her forward gently.

“Miss Cora—this is Emery Brundage—the young man who——”

As if some gripping nerve force had suddenly released its agonizing clutch, the man and girl laughed. Brundage reached forward, clasping the girl’s small hand.

“I guess maybe,” he spoke haltingly, “you and I got mixed up somehow.”

Cora had ceased to tremble. Her voice was clear and firm. "Yes. Wasn't it awkward?"

Dr. Eckert followed them on to his private laboratory in the left wing annex. His face was lined deeply and there was a stare of perplexity in his mild blue eyes. These two young people were as normal as ever—now. The second they had faced each other the spell seemed to break. Still shaking his head slowly as he pondered, he paused to order coffee sent into the laboratory.

"While you were at the airport there came in two more reports which might be down our alley," Brundage informed him.

Cora gasped: "Then this—this strange thing has happened to others?"

"Quite likely," Dr. Eckert answered. "But what did you get?"

"News flash from North Dakota," Brundage spoke up promptly. "They found a salesman's car which had crashed a stone wall alongside the State highway leading toward Bismarck. Inside the wreckage was the body of some queerly garbed Oriental, but no sign of the Los Angeles salesman."

Dr. Eckert nodded. "That might be. And the other?"

"From Phocnix. The police think they've picked up an amnesia victim. A young fellow eighteen or twenty years old who claims that he was suddenly and mysteriously transported from the dinner table at his father's home in Indianapolis. It tallies with the other report from Indianapolis where those folks had a man arrested. They claimed he had abducted their son before their eyes, but neglected to get away himself. But don't you think we ought to call the officials at both those cities and tell them the straight of it?"

"Tell them what?" Dr. Eckert questioned brusquely.

Emery Brundage started to speak, but stopped. His eyes met the alert gaze of Cora's.

"They'll think we're as mad as they believe those two young men to be." Dr. Eckert spoke hurriedly. "We can't say anything until we know what has happened. And we must find out to-night—before it is too late."

"You mean"—Cora's voice was fearfully hushed—"that some force or thing is acting upon the world—something from another dimension?"

"No—no, not that!" Dr. Eckert began to remove his coat and tie. He secured a chemical-stained smock, fitting it about his stocky body. "In a moment—just a moment and I will explain. But first I must begin the build-up."

THROWING HIMSELF into a whirlwind of activity, the energetic doctor began uncovering a most unusual apparatus which completely filled the laboratory bench across one end of the room.

"I'll help you." And Cora hurried to gather up the canvas carelessly tossed upon the floor by the scientist.

"Keep back," Dr. Eckert thundered. He was already at the improvised controls of his machine. "I do not know for sure what will happen. Clearly there has been a shift—a break in the orderly consciousness flow. Ah, the tubes glow evenly!"

Emery Brundage stared and said nothing; although his eyes narrowed suspiciously at the bewildering set of monstrously shaped, curiously glowing tubes. The air became weirdly pungent and even the light from the huge chandelier assumed an unnatural bluish-green radiance.

For fully a quarter of an hour Dr. Eckert worked intently, frequently rearranging certain of his grotesque tubes. Cora had backed away from the apparatus. There was something fearful about it, as if the multicolored quartz spheroids were possessed of mysterious demons. Brundage had touched her arm and sought to mumble a question.

"It is an ultra-dimensional generator," Cora whispered to him. "Dr. Eckert has labored years to develop it, and even yet it is far from perfect. Nevertheless he has formulated quite definite laws of consciousness by it."

Brundage shook his head slowly. "I'm afraid I don't get it, sister."

"Oh, I'd forgotten you didn't know. Of course Dr. Eckert has not published his discoveries yet. But some day——"

At this moment the scientist turned upon them. His face was flushed and his hands quavered with excitement.

"There is a rift in the flow," he announced with grave concern. "Some cosmic disturbance likely. Nor is it over yet. But to-night we will make the complete test. You, Brundage, and Miss Cora will have a share in it. But what's that? Who's knocking? Oh, it's Paulino with our coffee. Will you let him in, Miss Cora?"

The bespectacled Filipino boy tiptoed into the laboratory bearing a tray of coffee. His large brown eyes rolled in distrust toward the glittering array across the room. He was advancing timorously in the direction of Dr. Eckert when his legs and arms jerked in an exaggerated spasm. The tray of coffee crashed to the floor, and a scream of horror was wrenched from the fear-twisted mouth.

"Paulino!" Cora cried out and started toward the boy. Instantly she stopped, her eyes widening in horror.

It was no longer Paulino, but a huge, shaggy ape which faced them. The beast was momentarily bewildered. It stood there swaying its massive trunk and moving the ugly, protruding jaw as if making ready to charge upon one of these pale, fear-stricken creatures before him.

Cora screamed and threw herself upon Brundage. Simultaneously Dr. Eckert ran to the apparatus. Just as the ape tensed his short, stout legs for a spring there came a blinding flash of searing red

flame. For an instant the ape twisted and turned in agony. Then his hideous body vanished in a grayish cloud of heavy vapor which slowly settled to the floor.

Brundage, still holding the trembling girl in his arms, stared from the slowly dispersing vapors near the floor to Dr. Eckert. "You killed it," the aviator was saying. "So help me, that's a death ray if ever——"

"But Paulino——" Cora sobbed. "Now we don't know where——"

Dr. Eckert shrugged in resignation. "If the lad went where this thing came from he's probably dead—or soon will be. But Paulino has not gone in vain. It proves that consciousness is all inclusive."

BRUNDAGE was clawing nervously at his hair. "But it doesn't make sense! First something happening to Cora and myself! We're jumped from one spot to another—like that! Then this Filipino chap. One second he's here, the next he's exchanged places with a jungle ape.

"It does make sense," Dr. Eckert spoke heatedly. "There is a rational explanation for everything—every physical cell, every thought impulse—everything which has been, is or will be. But we're just learning. We are learning about consciousness now just as through the ages we have accumulated facts about our physical selves and the touchable things around us. Yet what about the thing within our brain which gives memory, meaning and organization to our sense impressions? In short, what *are* we, of *what* are we composed?"

"We have physical bodies. When we are conceived, the single cell of our beginning takes unto itself material sustenance and builds up to an increasingly complex organism. Yet what is it in this organism we call an individual man which makes that accumulation of physical mass seem more than a meas-

urable, weighable quantity of chemicals?"

Dr. Eckert was pacing up and down the laboratory as he spoke. Now and then he would pause to scrutinize an indicator upon the strangely glowing apparatus. Again he faced the two young people.

"For years I have sought to unravel the mystery of conscious life. Then I came upon the theory. From the theory I constructed, bit by bit, this instrument, so that I could put the problem upon a demonstrable basis. Gradually I came to discover certain immutable laws of consciousness, beginning with the indestructibility of consciousness. I found that consciousness is a stable life element which acts upon the physical unit or body of an individual. Let me explain: A normal man is an organization of living cells, the material of which has always been a part of the universe and which we can change, but not destroy."

Brundage frowned nervously. "The conservation of energy, to be sure, yet the——"

"Precisely. And it follows that the mind of man is an analogous composition of fractional consciousness which he has taken unto himself from the universal store, just as he has taken in indestructible physical energy by way of his stomach. In other words, you and I are but organized assemblages of chance fractions of both physical and consciousness energies. Birth does not create consciousness any more than it creates matter. Instead, it merely organizes the free fractions of universal consciousness into a temporary unit which we call individuality."

"Then why did Cora and I change places suddenly?" Brundage shouted the question. "There's a reason——"

"To be sure there is," Dr. Eckert interrupted. "It was a matter of attaining balance. Look! The indicator shows an erratic movement in the free-flowing field of consciousness energy.

That means some force has acted to temporarily upset the normal balance. As a result the consciousness energy is seeking to correct that condition. There is a sharp shift in the field. By mere chance that fractional assemblage of consciousness—which for the span of your lifetime is the mind of Emery Brundage—happened to be in line with the shift. So was Miss Cora's. In this instance there was a tremendous eruption in the field which caused the displacement of that part of you two composed of consciousness energy. The force was great enough to interchange entire physical-consciousness organizations by powerful drives through the ultra dimensions. Such counter-balancing flows are not uncommon. The unusual factor in this case is merely that the force was great enough to move a three-dimensional solid through the indeterminably complex dimensions of the consciousness field."

"Please, listen." Cora moved impulsively toward the scientist. "We must try to find Paulino—and that salesman—and there may be others!"

"We'll try," Dr. Eckert agreed. "But in a few minutes. The build-up is not quite clear. You see, my generator must reflect through so many dimensions. I have calculated it through seven changes—beyond that I am unable to follow."

"I know," Cora pursued. "But the reflector shows the red line!"

"The consciousness line," Dr. Eckert explained. "When it shows distinctly the line indicates that the rays of the apparatus have passed through the series of dimensions and are in contact with the field of free-flowing consciousness energy."

"It looks like a jagged streak of lightning," Brundage muttered awedly.

"That is the rift—the indication of disturbance. But you can observe for yourself that the irregularity is confined to one area. It is along that line—by way of these ultra dimensions, of course

—that your minds were situated when the disturbance occurred.”

Brundage turned quickly upon the scientist. “Then it might happen again! And the next time—— Damn you, Eckert, I don’t believe it! You did this; you did something to this girl and to me.”

“Be calm,” Dr. Eckert screamed. “Control yourself! Don’t—Brundage!”

EVEN as the doctor yelled, Emery Brundage had leaped toward the apparatus. The aviator’s clenched fist struck squarely at the bright, gaugelike mirror in the center. But there was no crash of glass and quartz. There came a missing swirl as if a sudden streak of wind had cut across the laboratory. For an instant Brundage was invisible. Then the mist cleared.

“He’s gone!” Cora screamed. “Emery! Where——”

It was an elderly man who stood there glaring at them. His clothes were soiled and torn. An ugly gash above one ear still seeped blood. Sweat and grime were smeared over the face.

The stranger stumbled forward in few steps, slumping weakly into a chair and burying his face in his hands.

“Heaven be praised,” he groaned. “They had me; I couldn’t run any farther. I was lost in that tunnel—and they were going to kill me. Anyway I’m sure there was a machine there—and if I could have reached it in time——”

Dr. Eckert went over to the fellow. He tried to comfort him. The scientist’s voice was gentle. The stranger looked up, blinking in the glare of the glowing apparatus. Then he laughed.

“I guess they got me—got me with that knife. And this must be Heaven.”

Dr. Eckert’s tone was soothing, yet distinctly firm. “You are in the private laboratory of Dr. William Eckert in Kansas City, U. S. A. Now, if you will tell us who you are?”

The stranger looked incredulous. Fumbling in the pocket of his bedrag-

gled jacket he produced a sweat-stained note book. Grinning wryly, he said: “Well, sir, I think I was John Friml of Los Angeles.” Then, leafing through the book, he mumbled: “And I’ll swear I took these orders up in North Dakota to-day.”

A sudden cry from behind him caused Dr. Eckert to jerk around quickly. Cora was staring at the stranger as if gazing upon a lost soul.

“Emery—changed places—with him. And he said—said they were about to kill him——”

“Miss Cora! Miss Cora, please!” Dr. Eckert tried to grasp her rigid body. She shoved him away.

“They’re going to kill him—kill Emery—in Tibet!”

“Don’t! Miss Cora—stop!”

But the girl had torn her hands from the old man’s grasp. Viciously, she hurled herself upon the apparatus. Instantly Dr. Eckert dashed toward her. His outstretched arms touched her body just as the vast sea of swirling blue mist descended upon them.

For a moment it seemed to Dr. Eckert that the whole of the terrible energy within his apparatus had discharged through his rigid, throbbing body. His gaze was fixed upon the central mirror. In horror he saw the red line gleam with blood brilliance. Then it seemed to form a swirling, pulsating knot of energy.

Bitterly, he cursed himself. What terrible havoc had he wrought? Too late, he realized that it must have been his own meddling which had upset the balance in the consciousness energy flow. And even as he stared he saw strange quavers pass up and down the line. Yet he was powerless to move. A terrible sense of loss assailed him. He seemed to be drowning in a vast cloudy sea of misty nothingness. He, Dr. William Eckert, had become a disembodied mind. The memory of laughter haunted him.

His dreams were lost. The Eckert laws would never be made known to a

stupid, groping world which did not realize the meaning of the duality of life. For a moment longer he sought to reason upon his eventual return to material earth, innumerable dimensions removed. Yet it was becoming increasingly difficult to think. Memory became more and more illusive. Then, with a last terrible shudder of realization, he felt the force of his organized mind dissolve into the common flow of universal consciousness. The consciousness energy of the mind of Dr. William Eckert had returned to the dustlike fractions from which it had been assembled.

COLONEL BRIDGEPORT, commandant of the insect-infested outpost far up the Gundac River in central Behar, sweltered beneath the sun of India.

"Tollingham!" he roared. Then, glaring about the room, he banged a fat fist upon the desk and shouted lustily: "Captain Tollingham, where in the bloody hell are you?"

"Here, sir." The gangling, lean-faced Britisher came to erect attention. "I was but getting the very latest: don't you know? The radio says——"

"Poppycock!" Colonel Bridgeport pronounced with emphasis. "Why the authorities permit such rot to be broadcast is entirely beyond explanation. Listen, Tollingham, can you fancy that yarn about the Coldstream Guards parading before the palace Tuesday forenoon only to vanish—and every man jack of them turning into a pajama-garbed schoolgirl! And then the blasted announcer says the personnel of the guards were discovered peacefully sleeping in the dormitory of a girl's school—Marytown College, wasn't it?—somewhere in the U. S. A. Do you grasp it, Tollingham! Why, such——"

"Quite, sir," Captain Tollingham spoke up. "But on the other hand the absurd story was verified word for word, or rather Coldstreamer for schoolgirl if I may be specific, by numerous other news agencies. And that is not all, colonel——"

"Don't tell me! Haven't I listened to every silly word of it? Men and women from all over the world suddenly disappearing only to pop up some place a thousand miles away."

"It all occurred on Tuesday last, colonel. But I rather think there must be something to it. The reports have come from everywhere, sir. From every point on the globe. Just now the latest from London estimates that fully four million individuals——"

"Umphf," Colonel Bridgeport snorted.

"Exactly, colonel. Nevertheless they say the queer disturbance is ended. It all happened within a few minutes last Tuesday. Ah—what's this? Pardon me, colonel, but I believe we have guests."

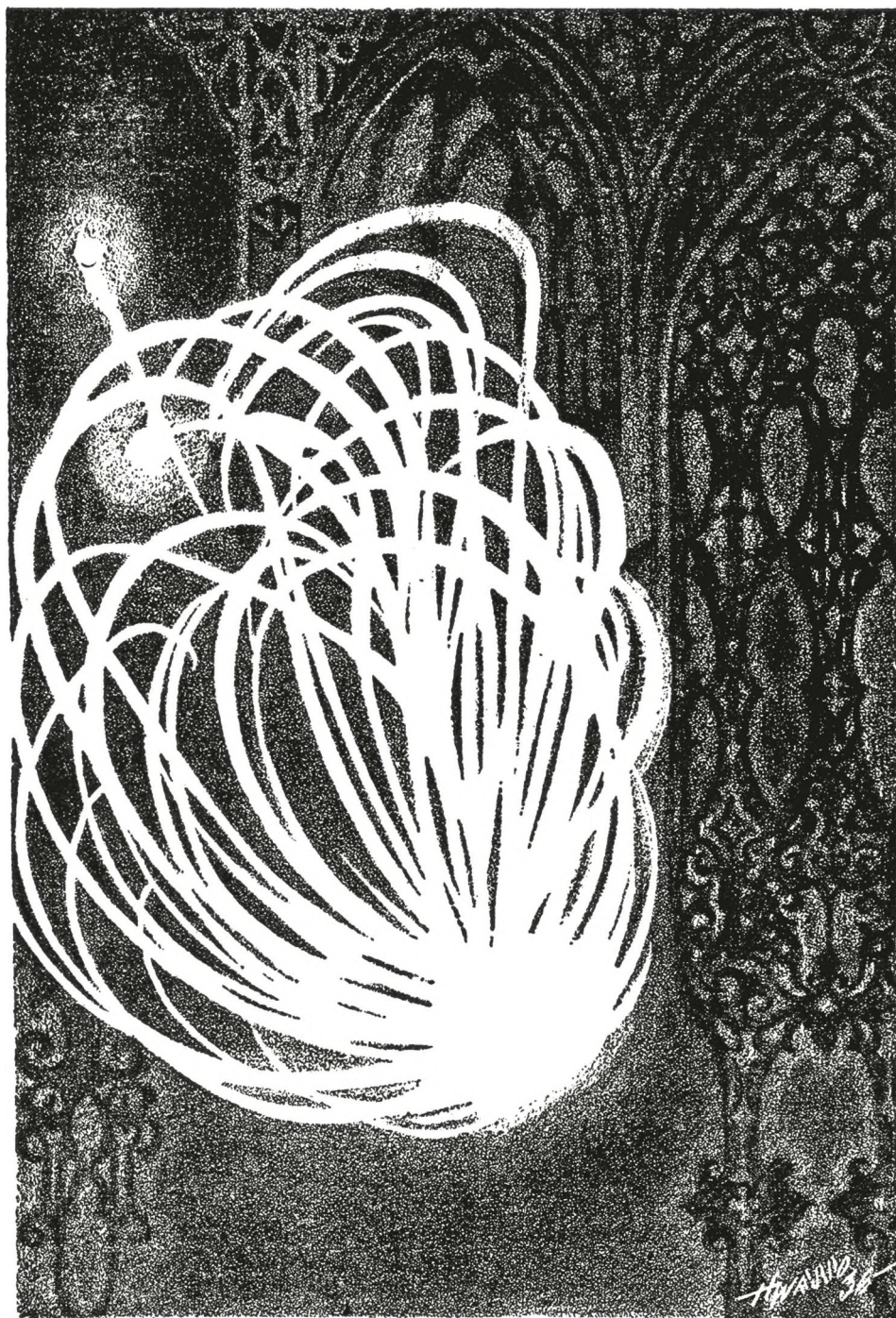
Colonel Bridgeport regarded the ragged pair suspiciously. Surrounded by a patrol of Tommies and half a hundred natives were a man and woman, both white and both apparently half dead from strain and exposure.

"Americans, sir," the sergeant reported. "They'd been flying south in a plane which must have been in storage for twenty years. Anyway it looked that old. They crashed ten miles upriver."

The man spoke up. "We're Emery Brundage and Miss Randolph of America, colonel. We've just escaped from Tibet. I swiped an airplane which the Tibetans had evidently taken from some poor devil years ago. We're trying to get back to civilization."

Don't miss John W. Campbell's tenth article on the Solar System which will appear in the March issue of Astounding:

COSMIC CACTUS



Cube and sphere were lifted by the flaming tentacles, carried downward through the vast and splendid spaces of Gogok's dwelling.

THE BLUE SPOT

*Concluding a great scientific
two-part novel.*

by JACK WILLIAMSON

UP TO NOW:

The rivalry between the families of Andrel and Jildo is almost a feud. In spite of this, Ivec Andrel loves Thadre Jildo. The thought of seeing her almost wipes out the horrible knowledge of the impending doom of the Earth.

The Sun and its family of planets must pass through a dusty nebula—a colossal cloud of nonluminous particles. This will result in an ice age so terrible that even the air will freeze and fall like snow.

Ivec's father, knowing all this, and explaining it to his son, tells him that, with enough power, independent of the Sun, a weather-control system can be extended over the entire planet, which would keep it warm, in spite of the nebula.

The only source of this power is in the liberation of material energy. In certain laboratory experiments, the energy of the atom had been set free, but such experiments, without some catalyst to control the process, threatened to burn up the Earth.

Ivec's grandfather had devoted his life to searching for a clue to the catalyst. He discovered a new planet, Persephone, upon which was a Blue Spot, radiating so much energy that it could only come from the controlled conversion of matter. He believed that life and intelligence existed upon Persephone, and that it had discovered the catalytic agent necessary to save Earth from cold.

Ivec's father, having discovered a means of getting to Persephone and

back, sends for his son. He explains to Ivec that he has only four months to make the trip before the nebula overtakes Earth, then he shows Ivec a small cube. By means of a special conversion apparatus, he intends to drain the minute electrical charges from his son's body—leaving it dead—and cause the energy to reappear in the balance of the cube, making it live. Ivec is given one hour before the change.

During that hour, Barthu Jildo, Thadre's uncle, crazy from the lust for power and the fear of death, persuades Thadre to convert his life into the cube intended for Ivec. Deceived by lies, Thadre does so.

Barthu attempts to kill Ivec, but is unsuccessful.

Ivec learns that his father has built two cubes, as preliminary attempts, which are weak and unstable. He begs to be put in one of them. His father warns him of the cube's instability, the insane hatred of Barthu Jildo and the hostility of the masters of Persephone, but finally consents.

Wingless, Ivec Andrel flies at the speed of his will. On past the planets, suffering agonies from the increasing instability of the cube and the terrific demands upon its vital energy, he flashes toward Persephone.

VII.

IVEC drove at last, dazed with pain, through the outermost streamer of the nebula, and found himself close upon Persephone—the smallest of the planets, incalculably the most ancient.

It was smaller and more rugged than the Moon. The blotting out of the Sun would make small difference here—for a thousand million years, to this frozen world of eternal night, the Sun had been but another star. It was black, time-scarred, dead—save for the enigma of the Blue Spot.

Against the grim desolation of jagged, frozen mountains unchanged through a billion years of dark, the Blue Spot shone like a solitary eye of evil mystery. A little oval patch of strange light, its edges were dull, misty. It was like a low-clinging cloud of blue-lighted fog. He could see nothing through it.

Ivec slipped down cautiously, far from it.

Had this bleak globe been the Sun's first cradle of life? Had warm and kindly seas once filled these black chasms of abysmal mystery? Had vegetation once softened these incredibly lofty mountains?

That seemed at first a fantastic impossibility. Yet, as his father had reasoned, the existence of the Blue Spot, with its peculiar high-energy radiations, was a certain indication of the presence of an ancient and highly developed life.

And, presently, he saw a line drawn across a rugged, riven plain. He dropped toward it. It had been a wall, he saw, a long and massive barrier of something more durable than stone. In this airless, changeless world, erosion would be imperceptibly slow—yet its dark, perdurable blocks had been shattered with the impact of unthinkable aeons of time.

Its purpose was lost with the long-dead hands that built it. But it surely spelled intelligence older than the life of Earth. He left it, drifting low and cautiously toward the Blue Spot.

Two dangers, now, were paramount in his mind.

The first was Barthu Jildo. That other mind, within the swifter, stronger photon cube, crazed with the fear of

death and animated by a ruthless power lust, had doubtless arrived here long before him. It might well be that Barthu Jildo had already won the prize. In any event, he would know Ivec for a rival and one of his hated rival family. An encounter would surely mean a battle to the death, fought with the flaming light energy of the cubes.

The second danger—unknown, but, if possible, greater—was from the enigmatic masters of the Blue Spot. Doubtless they would defend the secret of material energy from any invader, which was at the same time their most precious possession and the most powerful weapon conceivable.

His existence meant little to Ivec for his own sake, now—but for the sake of the world, of Thadre Jildo, he advanced with utmost caution, slipping alertly through the eternal shadows of the black, titanic mountains.

Presently, he came within view of the Blue Spot, a hundred-mile bank of haze, shining with a peculiar dull blue, rising in a vague arch against the black and frosty sky. A barrier of fog before him, shining, mysterious. It lay heavily upon black, ragged slopes. Near the edge, a few sharp, tremendous peaks burst above it. Beyond, all was hidden.

Approaching, he was suddenly aware of the tingle of strong radiation beating against the faces of the cube.

Fears, memory, purpose, sensations, all seemed strangely dulled. His strength flowed away. The cube was falling, he knew dimly, into the shining cloud. But he didn't care. It didn't matter. A faint sense of danger stung him in vain. Even his life didn't matter. Why should it? He couldn't remember——

“UP! Fly upward!”

Although very faint, that sudden, warning voice was as real as any he had ever heard. Its anxious urgency revived his failing senses. Feebly, he tried to check the falling cube. But why

should he suffer the pain of effort? What mattered?

"Upward!" the voice reached him again. "Or Gogok will destroy you. And the cold will take your world; the one you call Thadre will perish. Up!"

The name of Thadre awoke his memory. Her face seemed to float above him, white and lovely in the painful blue. He battled his numbness to rise toward it, endured increasing agony. It receded above him, mockingly; he followed through eternities of agonized despair.

Then, suddenly, he was free again, floating above that long bank of shining cloud—whose radiations he now realized, were insidious death to his photon body.

The faint voice spoke again, saying, "Come to me."

Its slight vibration, he knew now, was not sound. With the analytic energy senses of the cube, he perceived that it was a very weak tight beam of electromagnetic radiation—projected waves of pure thought.

He was able to locate its origin approximately. It had reached him from a thousand miles away, far beneath the north pole of this rugged, night-bound little world. The soft, pure quality of the vibrations led him to think of them as feminine.

Free from the sinister trap of the Blue Spot, he directed a tight wave beam in the same direction, and began the thought emanation: "Who?"

"Do not speak to me now," the warning reply came swiftly. "But please come and set me free. We can aid one another—if you are not discovered." The wave was fading, very faint. "My energy is nearly exhausted. Come——"

Puzzled, and somewhat astonished that life should still exist outside the Blue Spot, on this world that must have been within a few degrees of the absolute zero for a billion years, Ivec was delighted at the promise of aid—if a lit-

tle apprehensive that it might cost too much of his meager energy reserve.

He set off at once in the direction from which the wave had emanated. The cube soared over a bleak mountain range, whose cragged, hostile peaks, Ivec thought, must lift twenty miles against the planet's feeble gravitation.

Beyond the summits, and beyond a bottomless cavern of fearful darkness, lay a vast, black plain. Upon its frozen waste reared masses of rock that had been grotesquely carved by erosion in the youth of the planet—megalithic monuments and monstrous statues to the departed life of a world long dead.

He flew many hundred miles above that fantastic cemetery, before he approached a mountain looming above it, more colossal than any he had seen. Its unimaginably rugged slopes rose fifty miles, walled with precipitous, cragged barriers of stone forbidding beyond conception.

He was hesitating, puzzled, when the faint, strange vibrations of thought reached him again: "My prison is beneath the mountain. Follow the caverns below the crater——"

Upward he soared, over hostile cliffs and the cruel fangs of minor black peaks, until he found the crater's black pit, five miles across. He dropped into it. Colossal walls rushed upward, blotting out the stars. They narrowed, like a hideous maw.

He fell, scores of miles, into the cavernous space left by the cooling of the magmas that had formed the giant volcano. The darkness became intense beyond all his experience. In a younger world, he knew, his delicate senses could have perceived the emanation from radioactive elements in the rock. But this world was so ancient that even its uranium was dead.

He was able, at last, to find his way only by emitting a thin, searching beam from the cube—at a painful cost in precious energy.

Life, he perceived, had once reigned within these enormous, frozen caves. Strange patterns were graven here and there within the black walls. He passed above the crumbled ruins of a fantastic city, now fallen into the dust of illimitable ages.

TWICE AGAIN, as he hesitated before dividing passages, the faint thought beam brought him directions. And at last, upon the farther walls of the lowest cavern he had reached, he perceived the stark outlines of an enormous metal door.

Dimly, the fading vibrations reached him: "Here I am. Release me, if you can. Give me energy—or I die——"

No lock or handle, nor any opening, was visible on the time-blackened surface of the massive door. With an effort that cost him dazing pain, and drained his energy alarmingly, Ivec generated a beam of high-frequency radiation, which penetrated the door and revealed the ponderous mechanism of its bolts and tumblers.

The dense, heavy metal tended to dampen the field effects with which the photon body was able to manipulate material objects. Pain of effort staggered Ivec as he lifted the tumblers, slid back the heavy bolts, swung out the door's weight upon hinges that had not moved for millenia of millenia.

Behind the door was a rectangular space, walled massively with the same dense, black, refractory metal. Within it lay a heavy, dark gray block.

"Within this block," came the dying wave. "Cut me free——"

He tried first to shatter the block with a field effect, but it proved intensely hard and tough. He hammered at it in vain, with fragments of rock from the cavern floor. At last he was forced to attempt to cut it with a heat ray.

Beneath the thin needle of intense radiation, it proved to be highly refrac-

tory. It glowed red beneath the ray, orange, bright-yellow, intensely white. It was too tough to crack from expansion. But, at last, the surface fused, flowed beneath the ray.

Pain from effort and energy loss rose upon Ivec like a red, numbing tide. He was sharply aware of the fatal flaw in the structure of the cube, of the instability that increased with all expense of energy. But the white face of Thadre Jildo seemed to look beseechingly from the cold, gray block; it was for her that he pushed the cutting needle deeper.

The great block, at last, fell in twain. The faint thought wave directed the making of a second, shallower cut. And, at last, the prisoner of the æons was free.

It was a sphere, less than three inches in diameter—but slightly larger than the green cube. Very feebly it shone, with a pale, milky luster, like a giant dead pearl. It lifted a little, weakly, and fell again upon the fragments of the block.

"Energy," came the faint desperate plea. "Give me energy—or I shall die."

Ivec dropped the cube into contact with the sphere, emitted a slight flow of radiant energy. In a few moments stronger, grateful emanations came from the sphere, to tell him which frequencies were needed. Then the entity of the pearly globe seemed to relax, drinking in the life-giving beam. Ivec increased its strength, until the pain of radiation fogged his senses with a crimson mist.

This flow of vital quanta, he knew, decreased his strength and heightened the danger of the cube's disruption. Yet his strange, new ally was obviously unable to help either of them without such aid. He was moved, moreover, by a quick sympathy for it and the desire to understand its own situation—which, sealed in the prisoning block, must have been desperate indeed.

The nacerous globe ceased, at last, to absorb his energy. Its milky light was steady now, more intense; its voice came

to him, thankful and strong: "That is enough; I am sufficiently restored. You are very generous. Let us now discuss our respective situations, and decide what must be done—for we are both in deadly peril."

Ivec asked, "What is the danger?"

The sphere replied: "Our lives are threatened both by Gogok, who is the master of this planet, and by the being Barthu Jildo, who has come from your world. They are now together, yet at peace. And the outcome of their meeting bodes evil indeed for you and me—and the people of your world."

"I must do—something," said Ivec uneasily, recalling his recent misadventure in the radiant deadly haze of the Blue Spot. "Who are you?" he inquired. "And why were you—here?"

"Call me Lakne," came the swift thought radiation from the opalescent globe. "You are Ivec Andrei?"

"I am." Ivec was somewhat surprised. "Barthu and this—Gogok—are they planning something? What is Gogok?" He hesitated apprehensively. "And what can we do?"

"Listen," said the sphere. "I must tell you something of this planet, of Gogok and myself, and of my long imprisonment here. Then we can plan what to do. Our time is short, but you must understand."

"Then," urged Ivec, "tell me!"

VIII.

THE GREEN CUBE, flawed, flickering, and the softly opalescent sphere lay side by side upon the shattered prison block, beside those time-crumbled ruins that floored that black cavern within a dead and frozen world. Intently, tortured with a straining apprehension, Ivec absorbed the thought waves of the globe.

"This planet is no child of the Sun," Lakne began the swiftly radiated story. "Ages beyond calculation past, it was

born from the tides of another star. A small world, it swiftly cooled; and beneath the kindly rays of its near-by mother sun, it soon gave rise to organic life—as any planet must, when all the conditions are satisfied.

"Life in turn gave birth to intelligence, and intelligence to science. There is no time to detail the long history of the planet, as tidal forces pushed it farther out and its sun grew old and cool. But its people—my forbears—met and conquered many aspects of hostile nature. Many times they were menaced by some astronomical event, and always they survived by the triumph of science.

"But at last, as the dying world grew cold, it seemed that they must ultimately perish for want of the very stuff of life—energy. They had for ages been aware of the illimitable reservoir of power in the matter of the planet, but no scientist had found means to tap it without inviting cataclysmic catastrophe.

"The planet's people, then, had become divided into two races. The surface had lost its atmosphere and moisture, through dissipation into space, save for traces that remained in the abysmal deeps of the ancient seas. A few still dwelt there, depending for their energy needs upon the scant and decreasing radiation of the star.

"But explorers had found air and water remaining in these far-stretching caverns, which were presently colonized. The new race of troglodytes depended first upon the planet's small remnant of volcanic heat, and, when that was gone, upon the emanations of radioactive elements. In quest of vital power, they sank their mine shafts to the very heart of the planet.

"I came of the upper race. My father—for we were of two sexes, as your race is—was the greatest and the last scientist that our kind produced. We lived in a dome-armored city upon the salt-crustured cliffs above the last bitter

sea. Our city was the last upon the surface, and we had no knowledge of the delving race beneath us.

"Early in his youth, Sardoc, my father, perceived that our race was near its end. Another Sun, a young, giant star, had long been observed approaching our dying system. My father's calculations revealed that this great star, during his lifetime, would pass very near our ancient Sun.

"Collision would be very narrowly avoided, he predicted, and each star would survive to resume an independent path. But our old planet, he found, would suffer extreme vicissitudes. It would be seared, half fused, by the new Sun's heat, wrenched and riven by terrific tidal stresses. It would be torn from its parent star, and finally flung into a regular orbit about the new Sun, but at such a tremendous distance that it would soon freeze and remain forever dead.

"I was a daughter, and my father's only child." Ivec became aware of infinite age-old weariness in Lakne's voice, a leaden weight of tragic regret. "We dwelt together in that last city by the salt-rimmed lake, and I worked beside him in his laboratory.

"He told me of the coming danger, and of his plan to save his life, and mine. For he had found a means of compacting light quanta into a stable form that could serve as a vehicle for life, for mind. We prepared to trap the increasing radiations of the new Sun approaching, and build two of these spherical bodies. We were to escape the cataclysm with them, and perhaps journey to a kinder world to live.

"We were busy with that project. I was happy for a time, in anticipation of the adventure of the change, and the experience of eternal life with my father in a wondrous body that could fly from world to world.

"But sometimes, when I walked among the despairing, terror-stricken

people of the city, who knew that they and their race must die in the cataclysm, dreadfully and without hope—then my heart was touched with pity.

"THUS, once I saw a male of our race, one named Gogok. He was young and strong and handsome to my eyes. He stood upon a white-crueted cliff, and looked with tragic, baffled gaze across black waters at the flaming star of doom.

"It wrenched my being with pain to see him so splendid in his strength, yet crushed with the terror of death, helpless and sick with despair. I loved him, and I could not endure to let him die.

"I begged my father to build a third sphere of photons, for Gogok. But we had not time or sufficient energy for that. And when my father perceived that my love for Gogok was greater than my love for him, or for life itself, he resolved to perish so that Gogok might take his own photon body.

"In the blindness, the madness, of my passion, I thanked my father, and let it be so. When the spheres were finished, and the giant, hurtling Sun was near, my father conveyed my being from my old body to one sphere, and my lover, Gogok, to the other.

"Gogok thanked my father, and I did. Father set his laboratory in order, and waited to observe the phenomena of the cataclysm, and to perish with his body.

"My lover and I were briefly happy in the freedom and the splendid power of our new bodies, in the high and strange communion that they made possible between our minds, and with the glory of the universe.

"As I have said, we had lost all knowledge of the race of troglodytes. For ages past, our fathers had been confined to the deep and narrow chasms where they dwelt, and the original entrances to the caverns had long since been covered by erosion.

"But when Gogok and I, rejoicing in the free, swift motion of our new bodies,

were exploring the vast, high, airless plateaus, we entered a narrow crevice in the mountains and discovered the caverns of the other people.

"They were much changed by æons of life beneath the surface. Their eyes were enlarged, their skins pale and colorless, their bodies adapted to the toil of delving. But they were still beings of intelligence, for their minds had been developed by the eternal struggle to survive.

"We found their greatest city within this very cavern—a busy place, ancient and populous. Its huge buildings were metal and stone, and the very walls glowed with eternal, varicolored light. We entered an immense central building, and made contact with the council of five who ruled the troglodytes.

"From the five we learned the history of the delving race. It was the story of an age-long struggle for power, energy, for light and heat, for transportation, for the manufacture of food. With the depletion of the planet's feeble volcanic heat, they had turned to radioactive elements, for which their mines riddled all the planet.

"Their science, forced to meet the many problems of discovering, refining, and utilizing radioactive substances, reached a very high development. With increasing understanding and control of atomic and subatomic processes, they were able to speed the disruption first of uranium and then of a few other less-active elements.

"But at last the complete exhaustion of even those more common elements had brought the troglodytes to face a supreme crisis. Food supplies failed; the caves grew dark and cold again. Nine tenths of the race perished of famine. But lights burned on in their laboratories, when all else was dark; and their science, with its deep knowledge of the nature of matter, devised a catalytic control for the release of material energy.

"With that discovery, the troglodytes entered a millenium of triumphant happiness. No longer must their lives be spent toiling in the mines. The lifetime needs of an individual could be supplied by a pebble. Liberated science branched into many new channels. Art flowered among them for the first time. Splendid cities and monuments were built; the very walls of the caverns were cut into colossal representations of their history.

"OUR COMING signaled the end of that golden age. For all their science, the troglodytes were not astronomers; indeed, it was a dogma current among them that the universe outside the caverns was compact, of solid matter. They accounted for gravitation and the observed effects of the planet's motion by a very ingenious hypothesis of the repulsion of matter toward the open space of the caves. We brought them their first hint of the approaching cataclysm.

"Gogok's mind, I now discovered, had been warped by the fear of death. He was moved by a savage lust for life, energy, power—and by a mad and fearful jealousy of any other possessor of them. The dread of perishing for want of power that had haunted all his youth, that had first won him my sympathy and love, persisted even in the eternal security of the photon sphere.

"He determined at once to secure the secret of the material-energy catalyst from the troglodytes. But the five members of the council—who alone had been entrusted with it—refused to share the secret, lest it be used selfishly against them.

"Gogok, therefore, devised an elaborate stratagem to gain the secret. And I agreed to aid him with his plan, because I wanted the catalyst for my father and our race in the upper world.

"He and I, thereupon, parted, as if we had quarreled. I left the city, and he proceeded with the ruse. He first ex-

plained the science of astronomy to the five rulers, and told them of the cataclysm that was soon to result from the passing of the suns. But he made them believe that our planet was doomed to collision with the second Sun, and that they all must perish with it unless they escaped with his aid.

"He demonstrated the nature and the power of his photon sphere to the five, and convinced them that such bodies of light would be able to escape to another world and endure there forever. He proposed to build similar energy bodies for each of the five, in return for the secret.

"But the five were unwilling to betray their positions by giving away the secret and abandoning their people to perish. And Gogok, thereupon, called me back, with a thought beam, to play my part in the ruse.

"I came as an enemy of Gogok, and demanded the secret for myself. I displayed the destructive energies of my photon body, and threatened to destroy the cities of the troglodytes unless they yielded the secret to me.

"The energy process could have been used to destroy me. But the troglodytes were a peaceful race, somewhat softened by the generations of easy living since the discovery of the catalyst. They were, moreover, uncertain and apprehensive of the true extent of my powers. When Gogok offered to become their champion, they eagerly accepted his aid.

"He and I engaged in a mock duel, with the emanation of spectacular rays and field effects that destroyed buildings and shook the cavern walls. Gogok presently retired as if defeated. He told the five that I was a dreadful antagonist, and that they and he would surely be destroyed unless he was given the catalyst to restore his depleted energy.

"TO SAVE THEMSELVES, the troglodytes yielded the secret to the being they thought their friend. Armed

with it, Gogok returned to the encounter and continued the struggle, until I fell helpless and became his prisoner.

"The five rulers now insisted that Gogok build them photon bodies, as he had offered to do before. For they were now alarmed by his possession of the secret, and wished to have these powerful bodies to protect their people.

"With a simulated reluctance, Gogok agreed. With the aid of my knowledge—for I had been my father's helper—he constructed five spheres, and conveyed the beings of the rulers into them. But, as a part of his whole plot, he had made the spheres weak and unstable. One by one, they collapsed; and the five perished.

"Since none of the surviving troglodytes possessed any knowledge of the catalyst, they were helpless to resist when Gogok declared himself their absolute ruler, as he had planned to do.

"It was only then that I discovered that I, too, had been a victim of Gogok's machinations. From the first, I had been tortured with regret that my father had given up his own eternal body that Gogok might live. I had been sometimes alarmed by Gogok's selfish thoughts and the discovery of his mad lust for power. Yet I had forgiven him—even for his ruthless treachery in destroying the five—because I knew that only the dreadful fear of death had made him so, and because I loved him.

"I was wounded, beyond expression, to find that Gogok could be as cruel to me as he had been to the troglodytes. For he had agreed to allow me to carry the catalyst to my father, so that he might use material energy to build a photon body for himself, and to enable our race to survive after the cataclysm.

"Gogok, I thought, had made our sham battle realistic beyond necessity. I had been forced to expend nearly all my vital energy to protect my very life. Now, when I begged him to repair my

body and restore my energy with the catalyst, he tricked me again.

"He made apparent preparations to give me the energy, and seemed to be willing enough for me to take the secret to my father. I submitted to his power, and found myself trapped in that gray block from which you released me.

"It was a prison which not only confined my movements, but prevented my absorbing energy from any source. To make my restraint doubly secure, he forced the enslaved troglodytes to hew this vault in the cavern wall and seal it with that great metal door.

"With that, my active part was ended; I have been but a grief-stricken watcher. The gray block damped out nearly all frequencies of energy vibration. For a long time my senses were blurred and dull. But, after a slow and laborious rearrangement of the quanta in my body, I was able to perceive, very keenly, events over all this planet and beyond it.

"I watched Gogok's return to the surface world. He found that my father, ignoring caution in this extremity of peril, had inaugurated experiments of his own to find the catalytic control for material energy. Gogok was alarmed lest my father succeed and equal his own power.

"With cunning lies about the tremendous danger of the process, he infuriated the people against my father. Despite the fact that he was toiling to save their lives and the life of the race, the mobs attacked his laboratory and sought to destroy him. He was able to defend the laboratory until the danger point was passed, and successful results enabled him to promise life to the people.

"WHEN the mobs failed him, Gogok conceived another plan. He told my father that I had been attacked and overcome by the material energy weapons of the troglodytes, that I was helpless and in need of aid—as indeed I was. He thus induced my father to accompany

him on a rescue expedition into the caverns; and, in a narrow place, turned upon him in sudden, cowardly attack, and destroyed him with the aid of the secret catalyst.

"My father's death left Gogok the undisputed master of the planet. But, for a time, he dared not remain upon it. The approaching Sun was now near, the planet already scorching from its rays and cracking from tidal strains. Alarmed, Gogok fled far away into space, until the cataclysm should be ended.

"The celestial events took place as my father had foreseen. The two suns, red, ancient dwarf and hot-white, young giant, swept near together, each deflected from its straight path by the other's gravitational pull.

"Each was torn by terrific tidal forces. Tremendous tides were raised upon the less-dense surface of the giant, and finally dragged out into the long spiral arm of gaseous matter which later separated into the condensations which formed your planet and the others of this system.

"This planet, meantime, suffered all that my father had predicted. It was flung toward the flaming, tide-racked giant. The mountains upon one face were fused; the surface was riven, shattered, battered with meteoric hail. Then it was hurled away again, out of the gravitational net, and, at last, torn from its departing mother sun and left to freeze forever in this remote and lonely orbit about the second star.

"The heat and the meteors destroyed the last surface city, where I was born; but a few of my kind survived in deep excavations. Many of the troglodytes died as their caverns crumbled to tidal strains, but their greatest metropolis, here, escaped.

"As if stimulated by disaster, the survivors made desperate efforts to renew their grasp on life. The last members of my race joined the troglodytes, and

the two peoples made a common cause against cold and darkness and death. They found a new reservoir of radioactive elements in the meteoric matter that had fallen upon the planet. Again they sought, with the promise of success, the lost secret of material energy.

"But when all danger was past, Gogok, the fugitive, returned, to resume his lordship of the planet. He established his dwelling upon the surface, in that guarded place which you were seeking so unwisely to enter, when I first reached you. He reduced the two races to abject slavery.

"He seemed to rejoice in the degradation of his subjects, through fear, perhaps, of any independence or originality that might threaten his own absolute dominion. He allowed life to exist only in direct service to his vanity and his power lust. He killed a living world, to fashion a monument to his selfish egoism."

THE opalescent sphere ceased its story. It lay quiet for a time, in the utter darkness of the great cave. The small, flawed green cube quivered beside it, as Ivec Andrei sensed again the immemorial antiquity of the dust-shrouded ruins where the troglodytes had dwelt, and felt the dreadful loneliness of this buried metal vault that had been the sealed prison of Lakne, the unfortunate daughter of Sardoc, the scientist, since before the Earth was born.

Keenly, he perceived the old weariness, like an illness, in the sphere, the heartbreaking regret that had been age-long torture, the agonizing tension of an ancient conflict of passionate love and bitter hatred that had never been resolved.

"And the ages have gone," Lakne resumed at last. "I have lain here, tortured by thirst for the energy that is the food of this body, wearied to desperation by the agony of restraint. Æon after

æon, I have watched events without, hoping for release.

"I saw Gogok crush the people of this planet into mindless automata. I watched them slave to build the dead and empty glory of his dwelling place, and then to tend it. I saw that Gogok's fear-born selfishness had slain this world.

"When hope died here, I looked to the other planets for aid. But the nearest—which you call Pluto—cooled so swiftly that its life never emerged from its seas. A promising life form evolved upon Triton, single moon of Neptune—so swiftly that Gogok became alarmed by its advance, and went there to destroy it.

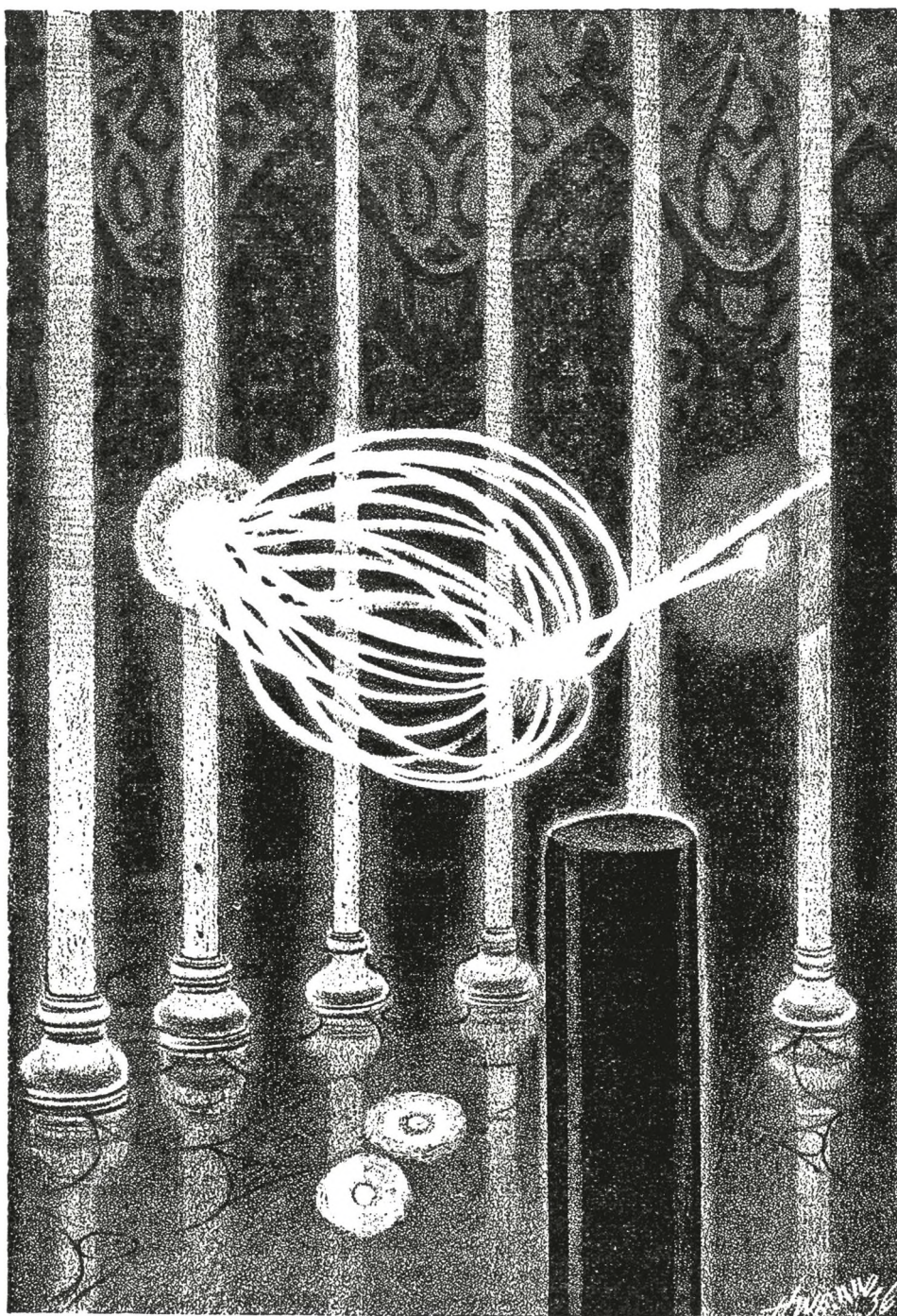
"Again Gogok obliterated a race of winged, metallic beings—splendid, vivid-colored things, whose vital energies were radioactive, and who could fly through interplanetary space—that had conquered all the moons of Saturn.

"Once more he destroyed the old fifth planet, the one within Jupiter's orbit—shattering it into the myriad fragments you call the asteroids—when the electrostatic relation between the crystals of the cooling elements in its interior became the basis of a planetary intelligence.

"It is only recently that he visited Mars, to blot out the desert dwellers there, when their long struggle to conserve the dwindling water and atmosphere of their aging planet promised to develop minds sufficiently keen to grapple with the problem of material energy.

"Upon the same occasion he examined the life of your planet, but found that no animal had evolved sufficiently to leave the ocean. The Trilobites, then the dominant form, seemed unworthy of extermination.

"He has been aware of the more recent development of intelligence upon your planet, but has neglected to destroy it, being certain that it would be overtaken by death in the approaching nebula, which he has for some time per-



A narrow blade of burning red leaped at the green cube—

ceived, long before it advanced high enough to discover the energy catalyst.

"He was amazed and frightened to find that your father had rediscovered the art of forming photon constructs stable and complex enough to serve as media of intelligence. Cowardly as of old, however, he dared not venture to Earth to destroy them. Rather, he chose to wait within the intricate and deadly maze of defenses he has fashioned about his dwelling, confident that your photon bodies had been devised to start a quest for the energy catalyst, and that his possession of it would surely lure them to destruction here.

"GOGOK received into his place Barthu Jildo, the traitor from your own world, who arrived here long before you. He seeks to learn as much as he can about your planet and its peoples, that he may anticipate any danger from them.

"Also, in his ancient, cunning mind is the beginning of another plan. He has come to regard this planet, because of its small size and the time-battered weakness of its structure, as insecure. He thinks now of migrating to Earth, whose relatively tremendous mass would be a vastly greater reservoir of material energy.

"He is weary of this world where he has dwelt so long. He desires new slaves to master, a new and younger planet to rule, the more splendid monuments to his vanity and the more powerful defenses of his life that he could build upon Earth.

"But in Barthu Jildo his ancient craft has a worthy antagonist. Barthu is seeking to employ the same ruse that won Gogok the secret. He brought Gogok warning that you would come behind him, and told a fabulous tale of an army of invading cubes to follow you. He offers his aid in return for the secret, and Gogok merely puts him off. Each is hoping to pit the other against

you, so that he may step in to destroy the weakened victor."

As the sphere of opalescence paused again, the small green cube stirred apprehensively in the utter, frigid darkness of the ancient caverns.

Swiftly, Ivec asked: "Do they know that I have set you free?"

"Not yet," answered Lakne. "Gogok has been distracted by his parley with Barthu. But his senses are keen enough to perceive my movements, whenever he makes the effort. And when he does, both of them will surely unite against us, for their danger from the two of us is greater than their danger from each other."

"Then we must act before they discover us," said Ivec. "For they are superior to us in knowledge and energy. We should certainly be destroyed in a fight. Can we enter Gogok's fortress, do you think, and reach the place where material energy is released? Secretly?"

And, as the sphere seemed to hesitate, doubtfully, he explained: "This cube possesses a wide and delicate sensitivity to wave and radiation phenomena. It was particularly designed to undertake the analysis of the material-energy process. I believe I could learn the secret of the catalyst by studying the operation of Gogok's apparatus."

Anxiously, he awaited Lakne's reply. "The fastness of Gogok is well-guarded." Slow thought came from the small globe of mother-of-pearl. "His cowardly craft has devised many defenses to trap and destroy intruders, as well as to warn him of their approach.

"Yet, I believe I know a way that we may enter his dwelling undetected—through the ancient mines of the troglodytes. But if we are discovered near his secret apparatus, as we almost certainly will be, our doom will be swift and sure."

"But come," said Ivec.

The green cube quivered, as if to shake off its fear.

"Let us try it," continued Ivec. "Our energy is scant and the time is short. I must obtain the catalyst and return to Earth at once—in spite of Barthu and Gogok—or all my kind will be destroyed."

"Our perils are many," said Lakne. But she rose beside him.

The flawed cube of green and the milky sphere floated away from the broken vault, through the frozen, airless dark that filled those age-dead caverns.

IX.

"LOOK WELL at the guarded dwelling of Gogok," came the soft, cautious thought waves from Lakne of the sphere. "For there—if we reach it alive—you will see the future of the planet Earth, as it will be if either Gogok or Barthu is victorious. You will see the inevitable issue of dictatorship, the final fate of any world enslaved to the egoism of one selfish mind."

The globe of glowing pearl and the tiny, flickering emerald cube wound silently, together, through dark, endless caverns. They passed above the dust mounds of immemorial cities, and through airless, frozen tunnels hewn æons before the Earth was born.

"We are near," Lakne warned at last. "The mines extend no higher. We must find our own way, now—and be cautious of any radiation that might be detected."

Black rocks narrowed upon them. They slipped upward through tiny rifts and crevices, extinct volcanic fumaroles, the fissures left in the surface of the dead, contracting world.

The delicate senses of the sphere found the way with uncanny accuracy, yet again and again they came to some passage that must be widened with a cutting beam of directed radiation—always at a painful cost in energy, and with the danger that Gogok, above, might detect the operation.

"Halt!" the sphere emanated abruptly, in alarm. "Gogok has set a trap here, also!"

Ivec had hardly been aware of the faint, blue radiance of the rocks; the impact of a sinister radiation had been almost imperceptible. But suddenly, even as Lakne spoke, the cube was robbed of all energy. It fell helpless on the glowing stones. And the unending pain of its inner flaw exploded abruptly into a fountain of crimson agony that drenched all his being.

Extinction was close upon him, when he felt the vital contact of the sphere, sensed the shelter of a swiftly projected counterbarrier of interfering frequencies that shut out the hostile emanations. The red pain ebbed; his numbed mind groped again for sensation and strength.

"Come," Lakne urged him, apprehensively. "And swiftly. I can guard you until we pass the danger—unless it is too long."

Again they sought a way upward, through the tortuous labyrinth of crevices. The sinister blue faded slowly from the rocks, and the sphere was able to cease the effort of maintaining the barrier wave. But it was visibly weaker from exhaustion, its milky light duller, clouded.

"We are now within Gogok's defenses," came the very faint and cautious warning. "He can detect us very easily, now—and if he does, there is no escape."

They emerged presently, through a narrow fissure in the flank of a time-shattered mountain. The valley beneath was a pool of faintly shining haze, the sky a chasm of blue mist. Cautiously alert, cube and sphere drifted out into the luminous air.

Strange plants covered mountain and valley and the opposite slope. Frail leaves shone like pale-hued gem stones, saffron and pink and soft violet, wrought into shapes of ineffable, delicate grace. For all its eldritch beauty, however, the vegetation seemed to Ivec unhealthy,

lifeless, unpleasant as the dream of a diseased mind. Unconsciously, he shrank from the fragile, pallid fronds.

PRESENTLY, as the two flitted apprehensively forward, Ivec was startled to see living things. Thick-bodied, repulsive scarlet worms were feeding upon the singular pale shrubs, cropping them into neat, artistic symmetry. Small, humped violet things, like snails with spiral shells, delicately lovely as the maggotlike worms were hideous, were indistinguishable against the soft violet moss that covered the surface. They mowed the vegetation evenly, Ivec saw, or turned the soil with sharp appendages.

"There is no danger from them," said Lakne of the sphere. She paused above them, as if with pity. "These are the children of my ancient race. Once they were individuals, with lives and aims and values of their own. But Gogok's slavery shut off all original expression, and degraded them into mindless instruments of his will."

Cube and sphere flitted more cautiously ahead, keeping within the cover of the pale, repulsive vegetation. At last, in the thick copse that crowned a long high ridge, the sphere paused again.

"Beyond," said Lakne, "is the dwelling of Gogok. The mechanisms of the catalytic process are locked within the glowing dome."

Quivering fearfully, the cube slipped forward to peer through the pallid, screening leaves. Before Ivec, upon a long plateau, stupendous and lofty beneath a sky of dusted azurite, loomed a building that shook him with amazement.

Upon this black and frozen world, æon of æons dead, it was an incredible thing. From the pale, well-tended gardens of the violet-carpeted plateau towered scarlet columns. Colossal, a full mile high, they were made delicately beautiful by an exquisite perfection of

proportion. Curving walls of ebony black, beyond, were pierced with tall archways that opened into inner mystery. Above black walls and crimson colonnades, Cyclopean against the blue, misty sky, loomed a dome of intensely glowing purple.

"Gogok exhausted every resource of the planet to make this dwelling for himself," said the sphere. "For a million years, every being slaved toward its completion. While the whole is immense, every individual part is far smaller than your cube—and each a perfect jewel!"

And Ivec perceived that, while the large outlines were artistically simple, the detail was infinitely elaborate. There were clustered smaller towers, intricacies of windows, many-pillared balconies, patterned niches, sculptured architraves—and every jewellike surface engraved with a minute and exquisite perfection.

The sphere was motionless for a little time, while its milky luster dimmed with the effort of sensation.

"Gogok and his guest are together," said Lakne, "in a guarded, inmost chamber, beneath the dome. It may be possible for us to approach undetected close enough for you to observe the operation of the energy process—if we are very fortunate."

Again they flitted forward, close above the pale-violet moss. The very stone beneath them, Ivec perceived, had been molded into the perfect foundation for these landscapes of exotic loveliness. They passed a hedge of shrubs, whose rose-colored swordlike leaves defended great freakish blooms of utter black. Beyond, they were among tall, yellow cones, plumed with crimson, whose low-clustered leaves were like nests of gray, hideous, flat-headed serpents.

WHEN the mountainous mass of the building was near, gleaming, wondrous, incredible, Ivec saw living creatures of a different sort. Busy little gray things

were clinging to crimson columns and graven ebon walls and even to the glowing dome. They had many limbs, equipped with the suction cups with which they clung to the jewellike surface, or with brushes and polishing pads that bore their own wax-secreting glands. With an intense and mindless activity, they were cleaning and polishing interminably—the caretakers of Gogok's dwelling.

The opalescent sphere paused again, to regard them solemnly. The slow thought came: "These, also, are the children of my people. And such the people of your Earth will be, if either Gogok or Barthu wins the coming struggle—the dead-alive tools of absolutism."

"Come!" The green cube quivered with dread. "We must hasten."

Flitting out of the gardens, the two darted between colossal scarlet pillars, and through a pointed ebon arch into a long, colossal hall of darkness. Silently, upon swift wings of apprehension, they flashed through that tremendous dark corridor, and upward through a maze of gem-gleaming passages and of lofty empty spaces, cold with dead and austere splendor.

They paused, at last, in a well of darkness, above a lofty balcony. Beyond it was an elaborate trefoil window, whose crystal panes burned with an intense and radiant purple.

"There!" Lakne's radiation was tremulous with excitement. "That is the place we seek!"

The glowing crystal panels, Ivec perceived, were, in reality, the surface of the great purple dome, continued beneath the roof of the building. Actually, it was simply a vacuum tube, incredibly immense. Within, he sensed the vast, confusing bulks of tremendous elements, the interplay of terrific energy beams, and the white, burning intensity of the Sunlike central vortex, where matter was broken down into rivers of unimaginable power.

The green cube quivered to deep elation.

"Here it is! And it is wonderful! No engineer on Earth has dreamed of such things as these. This will advance our technology a thousand years!" Ivec's exclamations were checked by the stern chill of fear. "But I have no time to study all this! It will take me weeks, months, to analyze it all, and deduce the principle of the catalyst—simple as it probably is. Long before I can succeed, Gogok and Barthu will probably have——"

Ivec was interrupted by a screaming vibration of frantic terror from the sphere. With them, upon the dark, high balcony, he was abruptly aware of a third being—a formless, many-tentacled thing of intense white radiance, whose burning arms had already seized his companion.

"I am taken!" came Lakne's urgent, frightened warning. "Fly! Quickly! This is Gogok's creature—sent to take us both!"

X.

WITHIN THE GLOOM that pressed thick upon the lofty balcony, in that vast and silent space, the green cube flashed to the aid of the pearly sphere. The globe was wrapped, helpless, in clinging amoeboid tentacles of flowing white flame. Ivec struggled with field effects to tear them away, but the light creature's strength proved far beyond his own. He directed an intense energy beam against the shining form—a ray strong enough to fuse any material substance. But it was deflected harmlessly away.

"Go!" Lakne warned again. "You cannot liberate me. This is a photon creation of Gogok's. It can tap the power of the matter converter. It has boundless energy——"

But Ivec stepped up the intensity of his stabbing beam. Without the aid and knowledge of the sphere, he knew, he

was surely doomed. Nor even otherwise would he willingly have abandoned it. But still the photon creature seemed unharmed by his attack, and he knew that his energies were near ultimate exhaustion.

He was aware, abruptly, of a vast and increasing lassitude. That, he realized in sick despair, was a warning of the end. The cube's energy had been limited from the beginning. He had drawn deep upon it on the long flight out to Persephone, and in the desperate struggle to escape the nebula's sucking vortices. Again he had spent precious energy, to fight free of the Blue Spot's radiation trap, and to liberate Lakne from her prison. He had shared the scant remainder of his energy with her, had expended still more to cut their way here. The limit was now at hand.

Dread numbed him with the realization that, even if he were now free, with full knowledge of the energy catalyst, he had no strength left for the long journey back to Earth—not enough even to escape the feeble gravitation of Persephone.

All hope fled away, left him inert, leaden, paralyzed.

When a flaming tentacle reached out from the photon being, he made an effort to resist. But its strength was far greater than his own. He yielded to it. Cube and sphere were lifted in the burning, shapeless arms, carried downward through the vast and splendid spaces of Gogok's dwelling, and into a central inner room.

This chamber, beneath the power dome, was circular, lofty and immense. Ebony and scarlet gleamed darkly from the floor, in intricate inlay. The tall, slim columns were a flawless white. The vaulted ceiling shone purple, with transmitted light from the dome.

The chamber was empty, save for a massive black pillar that stood in the center of the floor. Upon its crest, as if upon a black throne, lay two shining be-

ings. One was a globe—similar to Lakne's globe, save that it was not white, but a hot, malefic scarlet—that, Ivec knew, was the infamous Gogok. Beside it, glowing with a clear, cold green, was the small photon cube that had been appropriated by Barthu Jildo.

The thing of flowing light brought its two helpless prisoners near, floating through the air.

The green cube stirred upon the pillar, and Ivec distinguished the mocking voice of Barthu Jildo: "Greetings, young Andre! And thanks to you for having followed me here. For it is because of your coming that I have been able to conclude, with Gogok, the master of this planet, here beside me, an agreement which allows me to carry back to Earth the energy catalyst which we sought.

"With it, I shall be master of Earth, as he is of Persephone. Men shall live to do me honor, or perish—like that!"

He paused to allow Ivec to observe a small gray being near the base of the throne, polishing at the black-and-scarlet floor with a mindless and infinite diligence. Then a dazzling ray jetted from the cube upon the throne, and the gray toiler became a mass of smoking, twitching flesh.

"You, clever Andre!," Barthu Jildo continued mockingly, "shall also perish. For it is my aid in destroying you and the rest of your proud family, which Gogok is to reward with knowledge of the secret——"

Beside Ivec, suspended helpless in the luminous tentacles of Gogok's photon slave, the small globe of Lakne stirred and flushed with opalescent color.

"Fool!" her warning thought was radiated to the green cube on the throne. "I know Gogok of old. And he seeks but to bend you to his own ends, and to destroy you, as he does all beings. He plans to cause you to exhaust your own energies in a struggle with Ivec Andre! —and then to obliterate you."

THE SCARLET GLOBE of Gogok flamed with angry color, and a burning red ray stabbed at the opalescent sphere of Lakne.

"Stop, Gogok!" The green cube of Barthu Jildo darted from the throne, poised in the path of the red ray, to deflect it from Lakne. His voice demanded, harsh with alarm. "You—can you prove that charge?"

"I know Gogok of old," the milky sphere repeated. "And I, who loved him, am the one who has suffered most dreadfully from his evil cunning. Let him prove that he is dealing fair. Ask him to reveal the secret of the catalyst, now."

The scarlet globe lifted angrily above the tall, black throne.

"Lakne is my oldest enemy," it radiated swiftly. "Your fellow being from Earth has set her free from prison. Don't you believe her lies. And let us destroy her, for her liberty is a menace to both our lives."

The green cube, poised in the air, seemed hesitant, doubtful.

"If Gogok is honest with you," Lakne put in again, "he will give you the secret, now."

And Barthu Jildo demanded of the red sphere: "Reveal the principle of the catalyst, so that I may know."

The red globe made no reply, but swelled suddenly with surrounding zones of defensive radiation.

"Tell me," the green cube demanded again, "or I shall join the others."

"Join them!" flamed the sphere. "And perish with them!"

A narrow blade of burning red leaped at the green cube. An invisible barrier deflected it. It cut in twain a colossal white pillar at the side of the room, which toppled with appalling deliberation.

Gogok's white, shapeless photon creature released Ivec and Lakne, flung to attack Barthu Jildo. The green cube

met it with a white sword of radiance. It vanished in a flare of blinding light.

But when the light had gone, the green cube of Barthu Jildo was fast upon the red-and-ebon floor, held motionless with invisible fields of force. Gogok's scarlet sphere hovered over it, malevolently.

"Perish!" The vibrations of the scarlet sphere were cold, snarling, ruthless. "All you three who desire my power. For it is mine—forever!"

And Ivec, still hanging in the air beside the sphere of Lakne, sensed the swift up-building of terrific potential forces about the crimson globe that menaced all their lives. He tried to draw back, with Lakne, but Gogok's expanding energy fields already held him powerless.

Staggered by a deadly burden of despair, he waited. It was now too late to struggle. They were all to be destroyed by the release of material energy—a power that nothing could resist. No recourse was left.

Fleeting, before his reeling mind, passed a vision of horror unutterable. He saw the stricken Earth, darkened and helpless before the nebula's cold, seized in the dread tentacles of Gogok's power. Saw it transformed into the mindless living death of abject slavery to this eternal tyrant. The white, dead loveliness of Thadre Jildo looked at him, the wide glazed eyes beseeching, terrible with the accusation of his failure.

OVERWHELMED by the sense of terrific hostile forces rising, he prepared to die.

Beside him, however, the nacerous sphere of Lakne struggled in the web of resistless energy fields. Her challenge flashed at the red globe, clear and strong: "Hold, Gogok! Remember that all you have, I have given you. Remember that you were afraid and mortal and about to die, beside that last salt sea, when I gave you that body of death-

less energy. Remember that my father's life was sacrificed for yours. Remember that I have seen you crush my people into slavery more cruel than death. Remember the ages of imprisonment that I endured, because of my old love for you."

"I remember," the scarlet globe radiated coldly. "But you will not, any longer."

Still suspended beside Ivec, the sphere of Lakne shone with a serene and steady light.

"Destroy me if you will," it returned, "for I am long since weary of the mockery of life. And obliterate your kindred selfish being, Barthu Jildo. That will be a service to the universe."

"Gladly," interrupted the red globe, still hovering evilly over the helpless green cube on the floor.

"But you must spare Ivec Andrel, who set me free from prison and shared with me his vital strength." The voice of the milky globe seemed, now, to Ivec more commanding than entreating. "Give him knowledge of the catalyst. And restore his lost energy, so that he may carry it back to preserve his threatened people."

"Thus, you may live on here, unharmed. Ivec Andrel will give his pledge not to attack you. And Earth may, also, survive, with the catalyst secure against the menace of the nebula and against your selfish schemes."

The radiations of the opalescent were now stern, commanding—and yet, Ivec thought, somehow touched with infinite pity and blackest regret, as they finished.

"Gogok, do that!"

But the red globe had continued to build up its tremendous reservoirs of threatening energy. Its swift reply came, cold and deadly: "You are foolish to appeal to any sentiment in me. Love and generosity in others I can use, but my own weak feelings I conquered long ago, in my bitter youth by that salt

sea. And yours can now serve me no longer. So die——"

The thing that happened was too swift for the senses of the cube to follow. But Ivec knew that Gogok had released his vast, accumulated tide of destructive forces. He was aware that Lakne moved quickly beside him, made some abrupt, terrific effort of her own.

Then free radiation struck him, with a violent, stunning impact. The senses of the cube were numbed. It was flung into an abyss of searing fire; it spun in endless, hurtling flight, through infinitudes of flaming radiance. Terrific forces wrenched and battered at it.

XI.

WHEN THE LIGHT was gone, and the cube was at rest again, Ivec found that he lay upon a field of shattered, colossal boulders. The space about him was airless, frozen, dark. The sky above was black again, and half covered with the hideous spirals of the nebula.

From the degree of the stellar cloud's advance, and the positions of the distant planets, Ivec perceived that more than three months had passed since he left Earth—although the period had seemed far shorter, due to the retardation of time associated with the velocity of his outward flight, and the space-time warp caused by the terrific etheric vortices in which he had been meshed. There was now no time to return before Earth was lost in the maw of the nebula, he thought wearily, even if he had the catalyst and the energy for the journey.

But he lifted the cube, nevertheless, to take stock of his surroundings. At first he had thought himself flung to some distant part of the barren planet. Then he was aware that these shattered boulders still radiated a trace of heat. He saw the delicate curve that faced one near-by broken mass. He then perceived that each boulder was formed of

myriad tiny jewels, exquisitely cut and cemented.

These riven masses, he knew then, were the fragments of Gogok's dwelling. The building had been destroyed, with its fantastic gardens and the queer, mindless slaves that tended them. The radiant haze was gone. And the glowing purple dome—with the priceless secret of material energy.

The Blue Spot was gone. Persphone was dead—as soon, now, Earth would be—

"Ivec Andrel, here I am!" He recognized the faint thought emanation from Lakne's sphere. "Come to me."

With a weary and painful effort, for the cube was near total exhaustion, Ivec rose above that boulder field of utter desolation. He caught the faint gleam of the opalescent sphere, dropped beside it. Half covered with debris, it burned with a feeble, uncertain glow.

"Ivec," it radiated weakly, "my energy is spent. I am dying."

"Share mine again," Ivec invited. "I can give you life for a time."

"No," returned Lakne. "You are too generous; you have none to spare. And it is my wish to die—for I have destroyed the one that I loved once, and hated."

"Gogok?" Ivec asked. "You killed him?"

"Yes—I killed him," Lakne said. "I have known the use of the energy catalyst from the beginning. I did not tell you that, lest you demand that I use it, or perhaps unwittingly betray me to Gogok. But the keen senses of this photon globe discovered the nature of the catalyst from observing the apparatus of the five troglodytes, even before they disclosed it to Gogok."

"I could have slain him then, or when he imprisoned me, or when he murdered my father, or at any time since—for my mastery of the process was more complete than his own, and the quanta struc-

ture and energy fields of the sphere afforded all the equipment I needed.

"Yet I spared him because I once had loved him, and because even when I hated him, his life was vital to mine. It was enough to know that he was in my power, that even from the prison I could destroy him."

"But you had risked grave danger to set me free; you had shared your very life with me; I could not allow him to destroy you. Nor did I like to see a brave young world slain to make a monument to him, as this planet was."

"Therefore, I destroyed the one whom I loved and hated. And hence my own life is done." Ivec began a protest, but the urgent, fading radiations cut him off. "I am perishing; there is no more time. Now, here is the secret of the energy catalyst, which you must strive to take back to Earth."

THE faint emanations brought him the long-sought information, the treasured knowledge of the five murdered troglodytes, the key to Gogok's immemorial power; a simple modulation of continuum field tensions, expressed in a few brief equations.

When Ivec had committed them to memory, he perceived that the small sphere, lying upon the black, shattered debris beside him, had grown dim. Its milky light was flickering feebly.

"Farewell, Ivec," came the dying voice of Lakne, Sardoc's daughter. "I am weary—glad to go. Use your power—generously—"

The outlines of the opalescent globe grew misty. It burst into a flying wisp of silver vapor. It vanished. Lakne, who had lived since before Earth was born, was dead.

The green cube of Ivec Andrel lay for a little while alone upon the broken stones, weary and saddened. It had been tragic to watch the death of a world's last being. But it came to him, slowly, that his sorrow was less for

Lakne than for Thadre Jildo, whom he had left upon the menaced Earth, weeping upon his own dead body.

He stirred among the ruins, as if to launch himself upward into space. But it came to him again, with a sickness of ultimate frustration, that he had far too little energy for the return to Earth, nor time for the journey, unless the cube could be made far swifter than it had ever been.

Yet, he thought wearily, he must try—for Thadre Jildo's sake—

"Stay, young Andrel!"

It was the heavy, harsh voice of Barthu Jildo—who, Ivec realized with a sickening dread, had also escaped the cataclysm. The other green sphere was suddenly hanging over him, paler now, itself flickering and unstable.

Yet even here there might be hope, Ivec thought desperately—if he could touch some fiber of reason in the mad mind of the cube. Some spark of humanity must linger in this thing that had been a man.

"Barthu," he begged, "will you aid me? I have been given knowledge of the catalyst. If I can reach home with it, our Earth may yet be saved from cold. Earth—and Thadre! With your help—"

"I knew all Andrels were fools," rasped the thick voice. "But I am not—not fool enough to give you fame and honor, and let you make all men scorn the name of Jildo. I am injured. I must soon expire—but you shall perish with me!"

A harsh and mocking laugh grated from the green cube. It was wholly insane, Ivec realized—a dread machine of doom. And this would be a duel to the death.

A white needle stabbed at him. Ivec set up a deflecting field—at an energy cost that staggered him. Fighting a numbness of scarlet pain, straining the weakened cube to the point of disruption, he generated a counterray.

The other cube turned it aside harmlessly, and agony fell like a dazing hammer upon Ivec. The black, writhing arms of the nebula swept over all the sky. Frozen Persephone dropped away, and he was lost in a void of pain.

"Die," gasped the faint, triumphant voice of Barthu Jildo. "You are the last Andrel. There is another Jildo—"

Another Jildo—that was Thadre. Her name, and the sweet memory of her, stirred Ivec to a last, grim effort. Abandoning his defense, reckless of a shattering pain, he concentrated all his energy in one intense, jetting ray.

That white needle cleft the cube of Barthu Jildo, and it vanished in a flood of blinding light.

IVEC ANDREL lay alone again upon the black, riven face of Persephone. The green cube was flawed, now, with forked lines of black, its radiance very dim, unsteady. Twice it sought to lift itself, and fell back upon the broken debris.

Ivec tried to laugh, at the bitter mockery of circumstance. The ultimate jest. The catalyst he possessed was the key to all the energy of the universe—yet he was too weak to lift the cube's remaining featherweight, even against Persephone's feeble gravity.

The warning scarlet tide of pain rose higher. Soon it would submerge all his being. The cube would shatter from its ancient flaw. Knowledge of the catalyst would be lost, as free photons scattered. Earth would fall beneath the cold and the horror of the nebula. And Thadre Jildo—

Sense of his surroundings, somehow, had grown vague. Black sky and black boulders were lost. And suddenly, altogether incredibly, the girl was beside him.

He saw again the slim grace of her tall body, her skin milk-white and clear, light glinting in her copper hair. He saw the blue of her eyes, greenish and

cool, dancing with malice—and yet soft with a new, tender warmth of love.

Her hand stretched toward him in the darkness. It touched him, warm, life-giving. It lifted him. A strong, living current flowed into him from her body. He relaxed, and she supported him. Her contact eased his pain.

"Ivec!" Her voice was low and rich and anxious. "Ivec, do you hear me?"

Her voice, he knew suddenly, was no illusion. A quick flood of strength restored his senses. Again he was aware of grim, barren Persephone—and now of a green, pale cube beside him, like his own. It was the strong flow of vital energy, from it, that had revived him.

"Ivec, you are alive?"

Her voice came again, out of the cube—and he knew then that it was Thadre. Thadre Jildo, whom he had left sobbing upon his body, back in the laboratory on far-off Earth.

"I am, Thadre, thanks to you," he said. "But if you came to find your uncle, he is dead."

"I came for you, Ivec," she answered. "And I have more energy for you—enough so we may both safely return to Earth."

Gratefully, he drank it in. The cube glowed stronger, with new, throbbing strength. The pain of the old weakness grew less, ceased. A deep peace filled him. At last he was satisfied.

"This is Cube One," Thadre explained, "the first model your father made. He improved it after you were gone, made it far stronger, and supplied it with a reserve of strength for you. I brought it to you."

Her voice trembled uncertainly.

"I am sorry for aiding my uncle, Ivec. When you were gone from your body, I knew I loved you. I came to seek you, to share all your efforts and dangers, to aid you and be with you—always."

"You gave up your body?" Ivec asked. "For me?"

"I did," she said. "Our bodies now lie side by side, in a vault upon the mountain. But we can live forever, now, or so long as we will. For these photon cubes can be renewed with material energy. We can range all space together, for adventure. And our powers can do many things to aid the progress of mankind."

Beside her, Ivec mounted into a loftier rapture than he had ever known. The remarkable senses of the cube were keenly attuned, until he felt the pulsing life of every sun, knew the wondrous rhythm of every ray in space, shared the life dance of every atom through all the universe.

Thadre Jildo was beside him. She was his, he hers. And all the universe was theirs, its wonder, its mystery, its beauty—theirs to explore, to know, to love. Peril there would be yet, effort, and pain, but none greater than had passed. None too great to be spice and salt to living—

"Come," Thadre was saying, beside him. "The nebula is rushing on. We have time and strength to reach Earth with the knowledge you have gained. But we must not delay."

And the twin green cubes rose up together from dead Persephone and flashed away Sunward, carrying life to the waiting Earth.

NEXT MONTH:

DAWN OF CONQUEST SPACE

By WILLEY LEY

An outstanding article on Rockets.

COSMIC FEVER

*Heat—96° Fahrenheit—in what
was practically outer space!*

by A. R. Long

PAT MARSH turned at the foot of the short rope ladder that led to the opening of the gondola of the stratosphere balloon, and held out his hand to little, silver-haired Professor Anthony.

"Well; I guess we're all set, professor," he said, with his boyish grin. "Wish me luck."

"With all my heart, lad." The older man gripped the young scientist's hand fervently. Then a shadow flitted across his scholarly features. "You're sure everything is all right, Pat?" he asked anxiously. "There's no danger this time of any—accident?"

Pat Marsh nodded his fair head reassuringly, but there was an expression of grimness in his blue eyes. "I made another check-up just before you got here," he replied. "Everything is in perfect condition. What's more, I know definitely this time that there's nothing in the gondola except the instruments that I put there myself. If it's possible to be sure of anything in this world, I'm positive that there can be no repetition of what happened the other two times."

On two former occasions, Pat had attempted to send sounding balloons into the upper regions of the earth's atmosphere. Each of these had consisted of the usual two gas bags, a smaller inside a larger. It had been estimated that the outer bag would burst at an altitude of sixty miles, well into the nitrogen layer that exists above the stratosphere proper. When this occurred, the smaller, inner

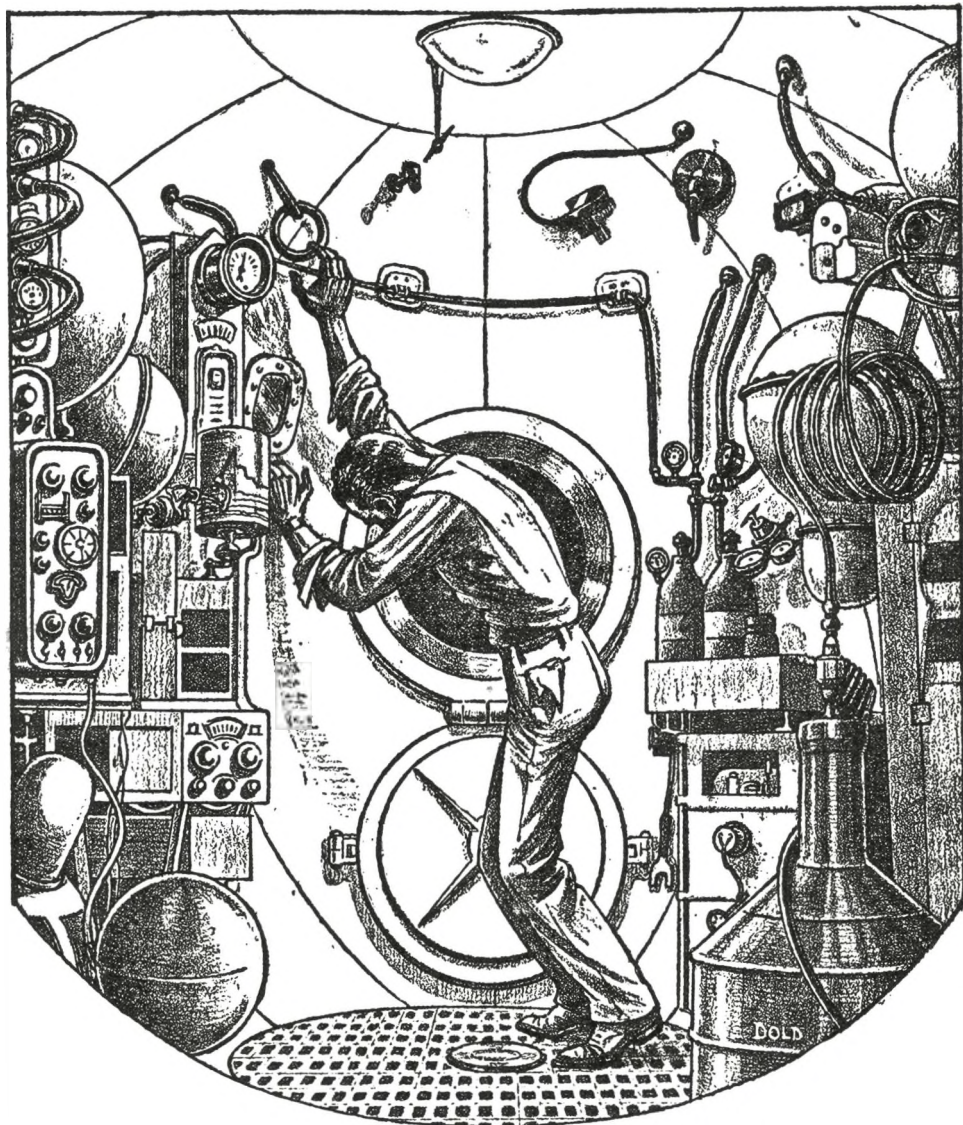
bag would act as a parachute, and descend gently, with its attached container, in which Pat had placed his newly improved set of instruments for the recording of cosmic-ray activity.

On the first occasion, the container had been recovered four days later in the prairie section of the Middle West; but when it had been opened, the records upon the drums were found charred beyond legibility, while some of the more delicate instruments were warped and twisted into uselessness.

Concluding that some unforeseen accident had taken place, the American Institute of Technology, which was financing the experiment, had backed Pat in the construction of a second set of instruments and the release of another sounding balloon. But when again a mysterious fire within the three-foot container had destroyed the records and wrecked hundreds of dollars' worth of instruments, the directors of the institute had lost patience. Such an accident could not occur twice in succession, they argued, unless the apparatus itself was at fault.

Pat had protested, in vain, that his instruments had been in no way responsible for the combustion. His inventions had been condemned as impractical by the institute's committee, while he himself had been pronounced a failure.

But there had been one man who had not been satisfied with the committee's findings. Professor Roy Anthony, Pat's old friend and teacher, now head of the



Pat beheld drum, electroscope, everything within his range of vision, swim before his eyes in a distorting heat haze. He fumbled—

institute's department of astrophysics, was convinced that there was more behind the mysterious fires than appeared upon superficial examination. And so, in order to prove his faith in his young protégé, he had offered to privately finance the building of a third balloon, for a final test.

At Pat's suggestion, this one was to

be different from its two predecessors. Instead of the small sounding balloon, with its attached case of instruments, it was to be large enough to support a spherical gondola similar to those used by Piccard and other stratosphere explorers, in which Pat himself would accompany his instruments into the upper atmosphere.

This, he had pointed out, was the only possible way to discover the cause of the trouble—whether it was, indeed, the fault of the mechanism or, as one of the more sensation-loving newspapers had begun to hint, the work of some inimical outside agency. There were, the paper had observed, certain foreign governments intensely interested in stratosphere flights, who might prefer to keep the field exclusively to themselves.

FOR the following six months, Pat and two trusted assistants had isolated themselves in the lonely plateau land of New Mexico, where the gondola was assembled and equipped. None of the three ever left the grounds, while the only person allowed to visit them was Professor Anthony. At last came the day when all preparations had been completed, and the ascent into the regions of the superstratosphere, a height never before dared by man, was about to be attempted.

With a wave of his hand to the assembled newspapermen, photographers, and news-reel cameramen at the edge of the field, Pat climbed into the gondola and drew the short ladder up after him. A kick of his foot threw over the lever that closed the heavy sliding door, sealing him in the hollow sphere. Casting a quick glance through one of the observation windows, to make sure that Professor Anthony and the two workmen had got clear, he stepped to the tiny table built against the wall, and, with a hand that trembled slightly, pressed the key of an electric switch box, touching off the detonation caps that were to cut loose all of the ground moorings at once, thus allowing the balloon to rise evenly into the air.

The dull boom that followed was inaudible to him in his soundproof compartment, but he felt the quick tug as the four great cables parted. Then all sensation of motion vanished, as the bal-

loon shot upward into the resistless atmosphere.

From the little group on the edge of the field a lusty cheer went up, and cameras clicked madly as the great silver gas bag, with its bulging top and steeply sloping, still uninflated lower portion—that gave it the appearance of an inverted, giant drop of mercury—rose higher and higher, carrying the comparatively tiny gondola with it, until, with the increasing altitude, the two dwindled into one single, shining speck. For a moment that speck seemed to hover almost directly overhead, like a belated morning star; then it vanished completely into the fathomless blue.

FROM the observation window of the gondola, Pat Marsh saw the earth drop from beneath him, saw the panorama of plateaus, valleys, and mountain peaks spread out like a giant relief map. A moment or so he watched it, with a sort of half fascination; then he turned away from it to his instruments.

The altimeter was climbing steadily. One mile, two miles, two and a half—Presently the light began to take on a grayish, silvery luminescence, and he knew that he was entering the earth's ragged cloud blanket. This lasted for only a few minutes. Then, suddenly, it was gone, and vivid sunshine, almost dazzling in its brilliance, took its place.

Again he looked out of the window. Beneath him spread a billowing, nebulous sea, flecked with turquoise and amethyst shadows. A feeling of tremendous loneliness swept over him. Although he had often flown above the clouds in an ordinary airplane, it had never been quite like this. It was now as though a door had been closed upon him, blotting out a familiar face.

For the next half hour or so he busied himself with his instruments. The air in the gondola was beginning to grow stale, and he turned on his oxygen tank to replenish it. The balloon was now

nine miles up, almost into the stratosphere. Already the sky had begun to grow dark, but not quite dark enough for the stars to be visible. Pat looked at his electroscope, and saw that it indicated a noticeable increase in the presence of cosmic rays.

Another half hour, and he was well into the stratosphere. Glancing downward, he could discern the curvature of the earth, its edges faintly shining in the reflected light of the sun. The balloon was still rising rapidly; for, although the atmosphere was much thinner, the gravitational pull of the earth was decreasing as the distance between it and the balloon increased. The gondola had now attained an altitude of twenty-one and a half miles—higher than man had ever before ventured.

The sky was taking on the familiar blue-black of night, with the stars breaking through in clustered brilliance. To the north, the Great and Little Dippers swung in their eternal march around the polestar, while against the zenith was set the mighty constellation of Orion, with the orange glory of Betelgeuse, giant of the heavens, flashing from his right shoulder. In front of him, the beautiful cluster of the Hyades marked the head of Taurus, whose red eye, the fiery Aldebaran, glowed balefully. And between and beyond these and all the other familiar sky marks, a hundred thousand lesser stars, ordinarily invisible to the naked eye, gleamed in lambent splendor.

Pat peered through the observation window on his left, and beheld the awesome phenomenon of the sun blazing in a black sky, the angry red of its chromosphere pulsating like the inflamed rim of a bloodshot eye, from which the fiery tentacles of its protuberances writhed and darted into the roseate pearl of its corona. The dazzling spectacle of that unveiled majesty was endurable only for an instant; then he pressed his hands over his face in fear of blindness.

WHEN the brilliant afterimage, caused by that brief glance into the sun's dazzling face, had vanished from before his eyes, he returned once more to his instruments. The leaves of the electroscope were wide apart, while the inked line on the automatically revolving drum rose steadily, indicating the continued increase of cosmic rays. The balloon had now attained an altitude of twenty-six miles.

Outside, the temperature registered minus 134 degrees, Fahrenheit—almost fifty degrees colder than the lowest temperature ever recorded on earth. Yet, oddly enough, Pat experienced no discomfort. On the contrary, he was growing too warm, heavy beads of perspiration were forming upon his forehead and the back of his neck.

He unbuttoned his coat and removed it. For some time he had been vaguely conscious of the rising temperature inside the gondola, but he had been so engrossed by the panorama of the heavens unrolling before him that he had paid it scant attention. Now he glanced at the thermometer on the wall in front of him. It registered ninety-six degrees, Fahrenheit, the temperature of an exceedingly hot summer day on earth!

"That's funny," he muttered half aloud. "It isn't possible that the absorption from the sun's rays could be so great through these heavily insulated walls."

He examined the little electric heater that had been installed in case of emergency, to ascertain whether it could have been turned on by accident. But no; it was not even connected. The only heat being generated inside the sphere was the practically negligible amount incidental to the running of the electric drums.

He looked again from one of the observation windows, this time almost fearfully, half expecting to see some flaming, giant meteor that was responsible for the condition. Yet, as he looked,

his scientist's reason told him that this was out of the question. Even had it been possible for such a body to become more than faintly incandescent in this highly rarefied atmosphere, his instruments would have warned him of its approach long ago. Moreover, the meteor belt was down in the tropopause, now almost twenty miles below him.

The balloon was now over twenty-nine miles up, in the very outer fringes of the stratosphere. In another minute it would have entered the nitrogen layer beyond. Then would come the real test of his experiment, for it was doubtful whether even the great hydrogen balloon could carry his weight and that of the gondola much farther; since, although the atomic weight of nitrogen is 14.008, while that of hydrogen is only 1.0077, the atmospheric pressure at that great height was dropping rapidly.

Pat was bending tensely over his instruments. Already the degree of ascent was slowing perceptibly. The altimeter now registered thirty and a quarter miles, while the pressure gauge indicated a swift drop from 1.84 to nearly 0.403 millimeters. He turned to the electroscope and its revolving drum; one of the most important pieces of apparatus on board, so far as the purpose of the expedition was concerned. If his calculations and those of other scientists were correct, the number of cosmic rays should now begin to increase with even greater rapidity than it had done in the stratosphere.

With a feeling of exultation, he saw the line being traced on the drum scud higher and higher. Then, with a suddenness that was startling, the stylus shot almost vertically toward the top of the slowly moving graph paper! The next instant Pat beheld drum, electroscope, everything within his range of vision, swim before his eyes in a distorting heat haze, while at the same time the air about him became like the stifling breath of a furnace. With trembling

hands, he fumbled for the rip cord that opened the outer balloon, while the sweat ran in rivers into his eyes, totally blinding him——

"TELL ME, LAD," Professor Anthony entreated, as he sat opposite Pat Marsh twenty-four hours later in the young man's hotel room, "why did you decide to come down when you had reached only one half of your intended altitude? You say nothing went wrong with the apparatus; then what happened? Was the balloon unable to rise higher in the nitrogen layer?"

Pat shook his head slowly. He was still weak and a trifle shaky, having been found unconscious inside the gondola when the balloon had drifted back to earth.

"Oh, it would have continued to go up, all right," he replied. "That is," he added with a grim smile, "if it hadn't exploded on the way."

"Exploded?" Professor Anthony repeated. "You mean that the outer balloon was in danger of bursting through the lessening of the atmospheric pressure? But I thought that possibility had been taken into account in the construction of the bag."

"It was," Pat answered. "I didn't mean that." An expression of apprehension came into his tired eyes. "My records!" he exclaimed abruptly. "Were they all right?"

"They were," the little professor assured him. "And even from my brief examination of them, I am confident that they are going to add materially to our knowledge of cosmic rays. But there was one thing about them that puzzled me: part of the paper was slightly discolored, as if it had been exposed to heat or intense sunlight. I can't account for it."

"I can." Little, grim lines appeared at the corners of Pat Marsh's mouth. "It *was* heat, sir, heat that was increasing so rapidly that, if I had gone on, it

would have caused spontaneous combustion in the gondola, and exploded the hydrogen in both the inner and outer balloons, just as it did the two other times."

"What!" The professor stared incredulously through the thick lenses of his spectacles. "Heat in what is practically outer space? But that is impossible. Pat. Why, your own temperature records showed——"

"Yes, I know," Pat interrupted. "It sounds impossible, but it's true, nevertheless. We should have suspected it long ago. Why, the clue was in our hands as early as 1931, when Piccard made his first ascent into the stratosphere."

"But I—I don't understand." Professor Anthony passed a thin hand through his silvery hair in a gesture of bewilderment.

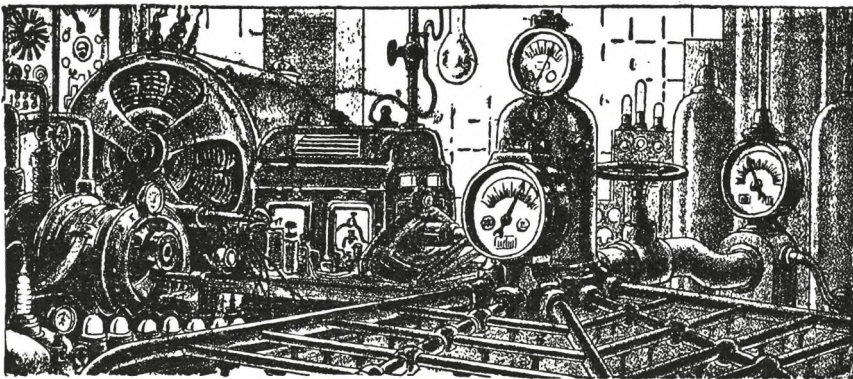
"You'll remember," Pat explained, "how, when Piccard made that ascent, the temperature of the gondola rose so high that he had to lick drops of moisture from the inner walls to assuage his thirst. I believe this rise in temperature was explained as absorption of the sun's rays; but that was only a very small part of the real story. The true explanation lay in the very phenomenon that he was attempting to study."

"You mean," the professor began, "that the cosmic rays themselves——"

"Exactly." Pat nodded. "Cosmic rays are pure cosmic energy, bombarding our earth from outer space. And energy, as we both learned in our very first course in elemental physics, is anything which, under the proper conditions, can be converted into heat. The dense atmosphere of the earth serves to refract most of these rays, just as it does ordinary heat and light rays from the sun. But up there at a height of over thirty miles, where there is no protective atmosphere, they struck the gondola with their full intensity, and, with their almost incalculable powers of penetration, passed straight through its walls. The almost pure oxygen within furnished the proper conditions for converting them into heat."

"Amazing!" Professor Anthony exclaimed. "And yet, as you say, Pat, we should have suspected the truth long ago." Then his face fell. "I suppose," he said with a sigh, "that puts an end to man's explorations in the earth's upper atmosphere, and an end to his dreams of future space flight as well."

"Looks that way," Pat agreed; then he added with a grin, "Unless he can figure out some way to insure himself against the hazard of fire from beyond."



The Stellar Exodus

Far out in space Miza-131 watched the dwindling image of the third planet

by Oliver E. Saari

MIZA-131 could not repress a shiver as he contemplated the thought image he was receiving from the mechanical eye outside the caverns. A convulsive ripple passed over his fluid, spherical body, and his glistening surface film became dulled for a moment.

For he was viewing a landscape enshrouded in glacial cold. Sharp spires of frozen matter thrust themselves into the sky with painful ruggedness; even the life-giving silicon compounds, which had once flowed in great rivers on the surface of the planet, had now succumbed to the cold. Already the atmosphere of mercury vapor was condensing, dotting the land with frigid pools, and an atmosphere of lighter gases had taken its place. Indeed the temperature outside was approaching that of outer space!

The planet was dying! The weak rays of a waning Sun were no longer able to support life upon it. Only in deep, insulated caverns did the last remnants of life survive; and it was necessary to heat these refuges with atomic engines, the fuel for which was rapidly becoming exhausted.

The history of Miza's people was a tale of continuous struggle with cold; for heat was life to them, the only source of their bodily energy. Many ages ago, when the Sun was young, they had lived on the outermost of the system's nine planets. There they had risen from savagery to civilization; they had discovered science. A few thousand years—and the years of that planet had

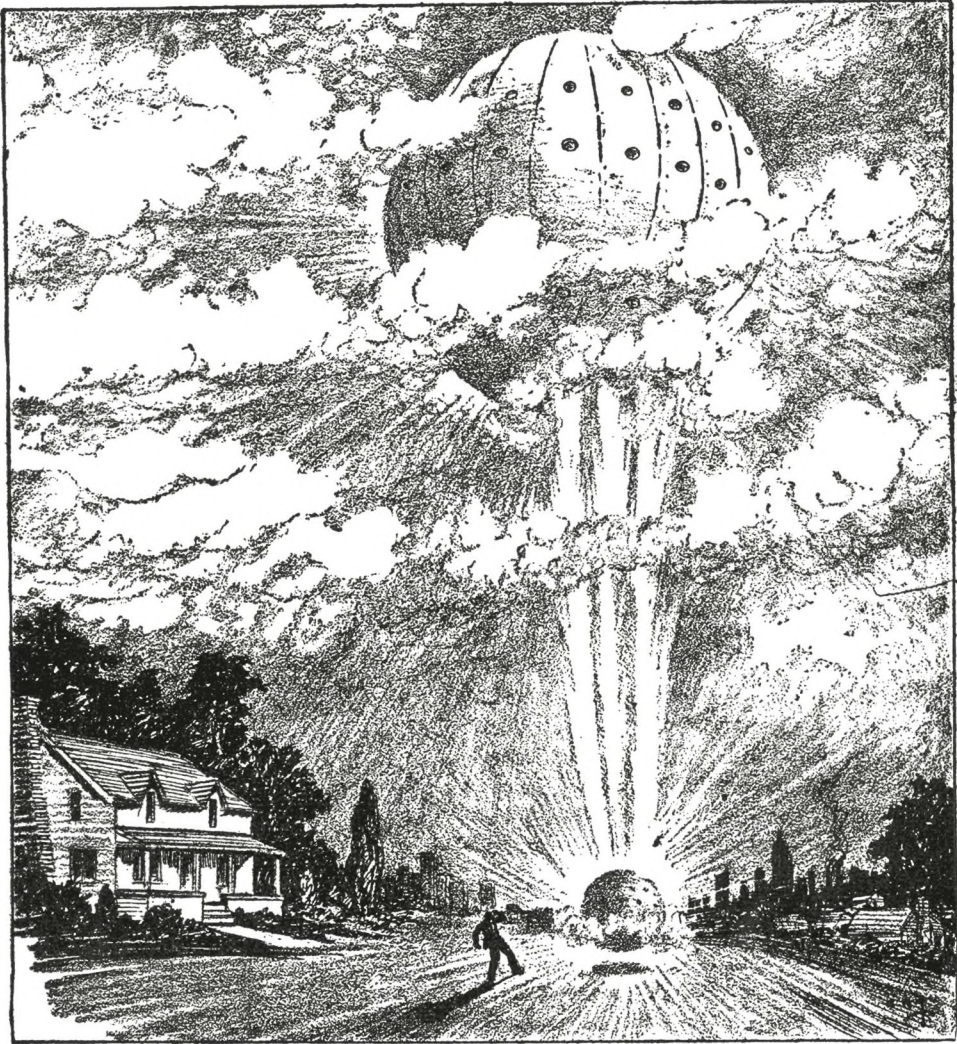
been long indeed—of scientific endeavor had brought forth the discovery of atomic energy as liberated from radium, which practically freed the race from nature, and enabled them to fly to other planets.

But even then the Sun was beginning its cooling decline. The outer planet was growing cold; the people, knowing that the supply of fuel for their atomic heaters could not last indefinitely, moved Sunward to the neighboring planet, which was still in its youth.

Rather than live in sealed caverns, they tried to adjust themselves to the new conditions, with the result that the struggle took them down the evolutionary ladder to the lowest depths of savagery, and they lost all their science.

For many generations the spark of intelligence burned low, but it had not been extinguished. In the second rise to civilization the race evolved to fit the conditions of the planet; their bodies adjusted themselves to its gravity, atmosphere, and temperature. They rediscovered secrets of nature, and again liberated atomic energy—this time from uranium. But they had forgotten that the outermost planet, which was now cold and lifeless, had once been their home; and it was not until they visited there and discovered the records of the ancient race that they learned the truth.

Thus, through millions of generations, the race had clung tenaciously to life—migrating Sunward, huddling closer to the dying Sun. Now they were again on a dying planet, but this time there was no planet nearer the Sun to which



Julius' fainting senses brought him a sensation of terrific, blistering heat emanating from the sphere.

to go! They had done everything in their power to preserve the race; they had stopped the planet in its rotation so that one side faced constantly toward the Sun; and when the Sun could no longer keep this side warm enough, they had built the sealed caverns.

Again Miza-131 shuddered. But his meditation was broken by another thought message, which caused the picture of desolation to fade from his mind. The message came, with astounding vol-

ume, from a crystal globe that hung by no visible means of support over a concave mirror of some strange, silvery substance, in the center of the room.

"The council will consider your proposal now."

MIZA floated across the room to a position between the crystal globe and the mirror. He extended a pseudopod from his body and fondled a facet of the crystal. The appearance of the mir-

ror beneath him changed gradually, and soon he appeared to be floating over a black void in which hung thousands of spherical bodies, their auræ flaming magnificently. The entire planetary council was gathered here, each member sending a mental image of himself to the crystal globe from wherever he happened to be. The globe changed the mental images to visual images, projecting these upon the mirror. This was done because a visual image helped greatly in direct thought transference, variation in the color of the aura being a sort of language of these creatures.

"Greetings!" thought Miza; and this thought was carried via the globe to the multitude. "Some of you, perhaps, know why I have summoned this hearing. You know that this which I have to say is of vital importance to the future of the race; therefore, I beg your closest attendance.

"You, the supreme planetary council, know that the existing supply of atomic fuel is very limited. Thus far we have been unable to extract atomic energy from the lighter elements; only radium, uranium, thorium, and polonium can be used in our burners, and these our ancient forefathers removed from the entire solar system and brought to this last planet. Perhaps some tiny quantities of these elements remain on the other planets, but to seek them is futile. And without fuel for our atomic burners, our caverns must soon grow cold and our people perish.

"Therefore, there are three courses open to us: the first, and simplest, would be to peacefully await the end, which cannot be more than a few generations off; the second course would be to move our planet closer to the Sun. This would be both difficult and dangerous, and would prolong our life for but a few thousand generations.

"But there is a third course that, I think, would be most desirable of all. You, as the supreme council of all

knowledge, know of the star 107-6-14, which, as its numerical classification implies, is one of the younger suns, the sixth nearest star to our Sun, surrounded by fourteen planets as far as we have been able to observe. This star has a small companion of very great density, and they revolve around their common center of gravity, around which the planets also revolve.* The planet which is twelfth in order from the suns should be habitable at present.

"Should we be able to reach this star, we would be assured of a comfortable home for millions of generations to come!

"Although we have not traveled to the other planets of our solar system for ages—there having been no reason to visit the lifeless, barren worlds—we have kept up the study and improvement of space flight. I am convinced that ail of our people can be transported to this star! Those of you who have specialized in the sciences of space flight, stellar mathematics and atomic energy may check my proofs."

There was no burst of mental applause from the audience; but neither was there any sign of skepticism. The supreme council was far above such expressions of emotion. The council was wrapped in thought for an indefinable time, as its united mind and the mind of Miza merged into one. The lone scientist thought out his proofs, and the various members of the council meditated upon the factors which belonged in their special fields of science.

For a long time Miza hung beneath the crystal globe, waiting. Then came through a message that caused his aura to flame in joyous brilliance.

"The council recognizes the possibility and necessity of the venture. Work upon the ships will begin immediately!"

* The star referred to is Sirius, which is 8.65 light years distant from our Sun, and 26.3 times as bright. Man's instruments have been unable to discover the "fourteen planets," as yet.

TWENTY-SEVEN great metal spheres ripped through the planet's atmosphere and emerged into airless space. Their surfaces were polished to the n th degree, for a polished surface radiates away less heat than an unpolished one. Faint, misty beams of radiance streamed out behind the ships; particles of matter shot outward at the speed of light, or nearly so, to obtain the maximum reaction possible.

Each sphere was a little world in itself, populated with hundreds of spherical beings, who darted about amid the massive machinery, flashing out pseudopod upon pseudopod to levers and switches. Hundreds of thousands of like beings lay in suspended animation in the bowels of the great ships. The rest of the space within the spheres was taken up by fuel. What was fuel for the ship was fuel for the crew, for these creatures depended upon heat for their sustenance, and part of the fuel was converted into heat when its energy was released.

Miza-131 peered intently through a great light-amplifying telescope.

"We shall pass near the third planet of this system while we are counteracting the speed of our erstwhile planet's motion," he remarked to his single companion in the observation chamber of the space sphere. "I have caused this to happen purposely, for there are features upon the third planet's surface which puzzle me. The planet is covered mostly by liquid water, and the temperature there must be entirely too low for the remotest possibility of life. But the solid part of the surface presents a perplexing puzzle. There are variations in color which cannot be accounted for by mineral formations; moreover, the photographs show a strange regularity in parts, a series of fine, crisscross lines being sometimes visible."

JULIUS B. MILDEW was a very ordinary man. Certainly there was nothing about him to suggest that before

another day had passed he would be plunged into the strangest adventure ever to befall a human being. Even he himself, as he battled his morning grapefruit and read the paper, had no conception of what was to happen. Yet, the newspaper he held at the end of his prominent nose simply blared out the key to the whole affair. In letters an inch and a half tall the headlines screamed:

MYSTERIOUS SPHERES STILL APPROACHING

If their present speed and direction continues, Earth may expect visitors from Mercury, astronomer says.

Julius laid the paper aside. Perhaps he would have read the article if he hadn't been in a hurry, having slept late as usual.

It was when he kissed his wife a hurried good-by that it happened. From somewhere in the distance came a deep rumble, which quickly grew to a great roaring, rushing noise almost directly overhead. The ground started shaking a little, or at least the house was swaying on its foundations; and Mrs. Mildew let out a high-pitched scream as she attempted to save a prize antique vase that crashed to the floor despite her efforts. Several windows burst inward. The morning Sun was blotted out by an immense dark mass in the sky.

Bravely leaving his fainting wife—it *was* a brave act, considering what its consequences would be when the good lady regained her senses—Julius rushed out on the front porch of his cottage, which was located just outside the city limits, and gaped upward. His eyes bulged in horror at the colossal shape that hung above him.

It was a metal sphere, smooth, silvery; but its size was quite impossible. Julius would have sworn it was more than a mile in diameter, and if he had read his morning paper he would have known it was more than a mile and a

half. It was one of the mysterious spheres from Mercury!

Now, a mistiness appeared in the portion of the metal surface near him; it surrounded a black opening from which dropped a smaller sphere, an exact replica of the large one, about twenty feet in diameter. It fell like a plummet, directly toward the bald spot on Julius' head! With a scream of horror, he tried to turn about, to rush back into the house, but his muscles failed to obey.

The small sphere was quite near, now. It paused about a foot from the ground, directly in front of the man, suspended in the air by three beams of blinding radiance; then an opening appeared in its side.

Julius' fainting senses brought him a sensation of terrific, blistering heat emanating from the opening; then something seemed to snatch him off his feet as he sank into unconsciousness—

SLOWLY, he struggled back to painful consciousness. At first he could think only of the heat. His face and hands were covered with painful burns, and his clothing had begun to smolder. But it was a bit cooler now, though it was still too hot for comfort. He looked around dazedly.

He was in a cubical cage about ten feet on a side, made of some transparent substance—mica, thought Julius. Through an opening at the top a stream of cooler air was blowing, escaping through slits in the floor. He touched a wall and found it was unbearably hot.

Outside his cage billowed a strange, murky atmosphere, glowing faintly blue with a reddish tinge. Near enough to be visible through the semiopaque gas were several spherical objects about three feet in diameter, each being surrounded by an intense blue-violet aura. They darted about near his little prison, propelling themselves by no visible means.

Physically, Julius was rather above the average modern middle-aged man. Many

another would have succumbed to the extreme temperature to which he had been subjected. But the shock of his strange surroundings, added to the pain of his burns, was too much for his modest composition, and he again felt himself losing his grasp on consciousness.

"Strange being, we are from the first planet of this system. We are leaving this star because it is no longer able to support us. Your planet is cold beyond all possibility for life, and yet you live and even have an intelligence of a sort. When subjected to normal temperature, your mind registers extreme discomfort. Are there many others on this planet like you?"

Julius was quite ready to disbelieve his ears when he realized that he had not heard this strange message through them. It had been entirely mental. He passed it off as a figment of his imagination, but unconsciously he considered the question. What was that about a dying Sun? He remembered a lecture he had once heard in which the man had said: "Our Sun is in its early middle age. We can be assured that it will radiate enough heat to support life on Earth for millions of years to come." And, in answer to the last question, he thought of cities teeming with life, human and otherwise, of countrysides covered with vegetation, roamed over by animals of every size and—

For a few moments he noted a strange, agitated motion among the glowing spheres outside. One approached his mica cage and touched the transparent wall with a sort of pseudopod which it extended from the smooth surface of its body. But the extended member was quickly withdrawn.

"Your cage is cold, strange being; yet your thoughts are impregnated with sensations of extreme heat!"

This time Julius did not doubt that the message was foreign to his brain. His senses reeling, his burns forgotten,

he stared at the glowing spheres. Then again he felt the heat. Sweat was flowing from every pore in his body, and his burned skin was forming painful blisters. He sank to his knees. Vaguely, he noticed a sudden increase in the activity of the creatures outside. Then he felt a faint sense of motion, of dropping through bottomless space at inconceivable speed——

He was dreaming that a Gargantuan monster was roasting him in an oven for dinner, when next he awoke. He looked straight into the anxious eyes of his wife, who was gently adjusting the cool, white sheets between which he lay. And a white-uniformed attendant was ushering out several gentlemen, who looked very much like newspaper reporters.

Julius' wife was saying over and over: "He *must* not be disturbed."

And weeks later, when his burns had begun to heal, he was interviewed by world-famous scientists, by newspapermen, by whole scientific societies, and by representatives of film companies. For Earth's sole representative to the visitors from Mercury must receive just recognition.

A summarized account of the events of that fateful day, when the visitors from Mercury stopped upon the Earth, is as follows:

The twenty-seven great spheres, which had been under observation for several days, came within two hundred miles of the Earth's surface on June 12, 1944. There they hung motionless, while one descended into the atmosphere, to a spot over the city of Detroit, Michigan. The experiences of Julius B. Mildew, whom the Mercurians kept within their sphere for an hour, have been related elsewhere. The sphere then rejoined its companions. The twenty-seven great ships headed away from Earth at an accelerating speed. When last seen they were apparently building up speed toward the star Sirius.

FAR OUT IN SPACE Miza-131 watched the dwindling image of the third planet. He was making a complete vibratory record of the great exodus. As he recorded the discoveries he had made on the third planet of the solar system, he inserted a theory of his own in explanation of the strange form of life that had been found there.

"We had thought that we were leaving behind a lifeless solar system. To us and our form of life the Sun was aged beyond capability of supporting life upon its planets.

"But to the creatures which we found on the third planet, the Sun was young! Whereas we depend upon heat for our sustenance, these beings exist and live by means of a constant chemical action going on within their bodies; therefore, they could survive at a far lower temperature than we.

"If life has a special function in the order of things, as it must have, would it not be foolish to suppose that Nature had confined it to the very narrow limits to which we must conform?

"Perhaps sometime those beings of the third planet will also leave the system in search of a new sun; but they will not leave it lifeless; for another form of life more suited to the existing conditions will have taken their place!

"Even when the Sun has cooled to a faint cinder, there will be life upon the planets. In a temperature very near absolute zero they will exist and think of themselves as the final result of Nature's planning. Perhaps they shall discover the ultimate goal of life which we, with all our attainment, have yet been unable to do. Perhaps the Sun itself will be the final abode of life. We do not know; we can only wait and struggle to survive according to the immutable law which Nature has placed upon us!"



AN OPEN FORUM OF CONTROVERSIAL OPINION

About Atlantis.

Dear Editor:

I wish to make a few remarks regarding Mr. James A. White's letter on the alleged continents of Mu and Atlantis, in the December Astounding Stories. In fact, there are several objections that I should like to file for the sake of the record.

The first relates to the alleged nonreceptivity of the modern scientist to "radical" ideas. Not only Mr. White, but many others among your authors and correspondents, make this accusation. Now, in the first place, I have never heard a scientist—and I have lived and worked with various specimens of the breed for the last eleven years—refer to an idea, in a scientific field, as "radical." The word just isn't used in that connection. And I have never heard of any idea, merely because it was unusual, being refused publication in the usual scientific journals—within the last hundred years, at any rate.

Consider, if you please, a few examples. Some of the ideas turned out to be genuine phenomena, some of them to be lamentable flops, because, usually, of poor experimental technique. In order to avoid libel suits, I will not specify which of the ideas are which, though the readers will doubtless know.

First and foremost was the discovery of radium and some of its most startling properties, by Madame Curie. Madame Curie not only published her results, but received her first doctor's degree for the work they represented, and was hailed as producing the greatest thesis in the history of the institution (the University of Paris, I believe it was) that conferred the degree. The suppression of new ideas in this case appears to be very slight, considering the fact that she produced and described an element that violated all the accepted laws of how an element ought to act.

Then, how about Allison's papers on the magneto-optic method of analysis? Completely in contradiction to the ideas of most chemists—and yet, somehow, he seems to get them published. And space in the journals isn't unlimited, by any means. Consider, also, the case

of Dr. Louis Kablenberg, of the University of Wisconsin, who for years published articles denying the current ideas of ionization in solution. He kept on publishing them, lecturing in classes, and what not, and was never in the slightest danger of ostracism, the *auto-da-fé*, or unemployment. If he hasn't retired in the last couple of years, for age, he is still doing it.

Again, was Darwin ostracized by his fellow biologists when he proposed the theory of evolution? Not by them, he wasn't. He may have been condemned as the direct agent of Beelzebub by more pious members of the community, but the reaction of his fellow workers was more in the nature of a violent and all-consuming curiosity.

And how about Dr. Rhine at Duke University, and his papers on telepathy and clairvoyance? They have not been suppressed, and are being followed by the scientific community with ever-growing interest.

And finally, consider the case of one Albert Einstein. If his ideas on space and time were not "radical," what, in the name of Isaac Newton (upon whom be peace) were they? He published his papers; scientists read them, carefully tested the experimental data upon which his theory rested, checked his mathematics, and have now come, most of them, to the same conclusions. In the early days of the theory most of them disagreed with him, but they suspended judgment and were willing to look into the matter, and to admit that Albert Einstein was right when the facts led that way.

Now, I don't claim that scientists are a collection of archangels with wings. They aren't. Not by a damned sight. I couldn't live with them if they were. There are all sorts of rows; there are bitter enmities and jealousies (most of them, however, are about salaries or rank in the scholastic hierarchy) and there is no reticence whatsoever in saying "The guy is screwy!"

But, screwy or not, he is not suppressed, and publishes what he damned well pleases. The thing that *will* keep his papers out of the journals is a bland refusal to give his experimental data or his sources, so that no one can judge their accuracy. Science is done by experiment, you know, and not by divination or by crystal gazing!

That is the trouble with Churchward. If he expected his results to be taken seriously by any one who can read without moving his lips, he should have given his sources, his methods of alleged translation, the name of, and how to reach the man who is supposed to have told him how to make the translations, and a word-by-word, letter-by-letter, symbol-by-symbol copy of said translation and the original. If he had done that he would have had no difficulty at all in getting his things into the anthropological journals. But he didn't. Therefore, nobody takes him seriously. You can hardly expect anybody to take his unsupported word for a whole continent, can you? Dr. Cook couldn't even get away with the north pole.

But enough of this "Essay in Defense of Scientists." This epistle is going to be plenty long enough without help!

And now to get down to the question of Mu and Atlantis. In the first place, please do not confuse Mu and Lemuria. Lemuria was a hypothetical continent in the Indian Ocean. See Webster's dictionary. Mu was invented by Churchward, and placed in the Pacific Ocean. So, one at a time, if you please.

Mr. White is in serious error if he believes that outside of Egypt archaeologists date no civilizations as earlier than 2000 B. C. They take a great many dates before that quite seriously, at least as approximations. I would refer him to the chronology in the latter part of the compendium of all human knowledge, Webster's dictionary, where dates earlier by fifteen hundred or two thousand years than 2000 B. C. are given. For specimens dated tentatively that far back, I would refer him to the pages of the "Illustrated London News" for the last five years or so. And the earliest Mayan civilization is dated, at present, at least as far back as 200 B. C. Below the relics of that civilization there is a gradation into the usual neolithic culture. There is no sharp break whatever, in this, or in any other archaeological record of the growth of an ancient civilization.

Of course, the Mayan calendar may go back 30,000 years. So does ours. I can give the date, November 24th, 28,064 B. C., 8:33 to 8:47 p. m., but it doesn't mean a damned thing. There is not a rule that says that a race may not count both ways from the time of the invention of their calendar. In fact, they all do. And as for the fact that the Maya glyphs are not yet translated, consider the difficulty you would have in reading English if you knew only the numerals, 1, 2, 3, etc., and a few ifs, ands and buts. Champillon took many years to translate the Rosetta stone, even with a Greek crib to go by. Give the boys a chance. They haven't been at it so long. Of course, they have translated the Aztec stuff. But that's comparatively easy, since it's mainly picture writing.

The Elephant mounds? Not so difficult. Some archaeologists think that they look like elephants, some that they look like tapirs, some that they look like parrots and some that they look like nothing on earth. Take your choice. And why not elephants in America, anyway? I myself have seen elephant teeth come up in a gold dredge bucket in Alaska—lots of them. There were four species of Proboscidea flourishing in the United States alone during Pleistocene times, and it is not beyond the bounds of probability that some of them survived almost up to historical times. (See the works of Osborn and Scott.)

There isn't any great mystery about the Easter Island monuments. Any one of the late books on Pacific archaeology tells all about them. The quarries from which the stone came have been found, on the same island as the statues, with partly cut out blocks, and some stones that were too large to lift into position. The steles themselves are probably not more than a few hundred years old, at the most. They are of rather soft stone, and would have weathered away to nothing at all in the 10,000 or 30,000 years that the Mu hypothesis requires. I might refer Mr. White to a new book, "Latest Developments in Archaeology," the name of whose author I have unfortunately forgotten; to

G. M. Brown's "The Riddle of the Pacific," (London, 1924); and above all to Toynbee, "A Study of History," (three volumes published so far, totaling 1487 pages) who gives an excellent description of the arrested civilization of Polynesia.

Egypt does not burst full grown into the story of the rise of civilization. There is no discontinuity whatever in the archaeological deposits. It ranges, without a gap, from paleolithic to neolithic to copper to bronze. The developments of the Egyptians' metallurgical technique parallels the evolution of their architecture, social organization, and theology. (See "Illustrated London News" and the works of James Harvey Breasted. Also, of course, Toynbee, and Spengler, "Der Untergang des Abendlandes." Toynbee, however, is the best source.) We have a fairly complete record of the development of the Egyptian culture and civilization for several thousand years before the reign of King Menes, the mythological founder of the First Dynasty, though Menes was, of course, as you know, a synthesis of two other kings. The net result of the investigation is to demonstrate quite conclusively that the Egyptian civilization, like all other civilizations, was born, rose, flourished, declined and died, and did not spring full-grown from the brow of Jove, or of Osiris, either. In fact, Osiris is a rather late invention in Egyptian theology. (See Toynbee and Breasted again, also Frazer, "The Golden Bough," 12 vols.)

The same is the case with Crete, where there is a complete archaeological record for at least ten thousand years, carrying the Cretans from a paleolithic culture to the height of their bronze-age civilization about 2000 B. C. and to their fall about 1000 B. C. (Toynbee, op. cit.)

There is a great deal of evidence that the American natives came from Asia via Bering Strait and the Aleutians. Dr. Ales Hrdlicka has discovered thousands of artifacts in the above regions, showing not one migration but many. Certainly, nobody in his right mind would stay in the region, and the migrations are the only possible explanation. Likewise, the American Indians are clearly of Mongolian type, in skull formation, hair structure, pigmentation, and blood grouping. What more could a reasonable man ask? Of course, there is the possibility that some Polynesian blood filtered across the Pacific via Hawaii, Easter Island, etc. (See Toynbee again.)

As for Plato's Atlantis story. There is considerable doubt that he ever expected it to be taken seriously. He said, in effect, "Let us assume that there was once a continent in the Atlantic, on which continent such and such things happened." Said continent is quite analogous to Sir Thomas More's "Utopia," to Samuel Butler's "Erewhon," and, in fact, to Aldous Huxley's "Brave New World." The story was not believed at all universally. It was merely a pleasant hypothesis at the time of its birth, and then it was forgotten for some thousands of years, until just a few years ago, comparatively, when it was revived by some optimistic souls who took it seriously.

And it could not have been widespread (the Atlantis legend) without being true? I am afraid that Mr. White deceives himself. The taller the tale, apparently, the more likely people are to believe it. Consider the atrocity stories we swallowed during the War. Consider the fact that most people once believed there were witches who rode on broomsticks, that telegony was a fact, and that there was such a thing as an "honest face." Also, consider the deluded souls who actually believe that there is an "Aryan Race." Churchward's logic may be perfect. But that hasn't anything at all to do with the correctness of his conclusions.

Where did he get his premises? It has been proven logically and incontrovertibly that the earth is flat, that a heavier body falls faster than a lighter one, and that unbaptized infants are subject to eternal damnation. I would suggest that an intensive study of E. T. Bell's "The Search for Truth" may remedy the difficulty about the logic. (Bell is, of course, John Taine of science-fiction fame.) Also, Pareto,

"*Trattato di Sociologia Generale*" (4 vols., 2033 pp.) has a few suggestive words on the subject of nonlogical beliefs.

As for the Greek gods. Why should they be racial memories of Atlantean kings rather than of Greek or Minoan kings? The latter sounds more plausible. And Frazer (op. cit.) shows that most peoples develop very much the same sort of pantheon from a given environment and social milieu. Two times two always equals four, no matter where you are.

Naturally, the flood legend is almost universal. It would be odd if it were not. Most of the ancient civilizations developed in river valleys, since community life elsewhere was impossible, and if there was ever a river that didn't have a flood once in a while it has escaped the notice of geographers.

As for the alleged similarity in names between Atlan and Atlantis, etc. There are only so many distinguishable phones, that may be produced by the human vocal organs, and it would be odd indeed, if different races didn't hit on the same noises once in a while. Otherwise there should be a profound ethnic connection between the State of Arkansas and the town of Arkhangelsk in North Russia.

In conclusion, while a continent of Atlantis may have conceivably existed, the evidence cited in support of the belief in that existence would not suffice in a court of law to convict a man of stealing a second-hand alley cat.

Finally, Mr. Tremaine, you have my sympathy in running your magazine and trying to please everybody, my admiration for doing such a good job at it, and my commiseration for receiving letters like this one.—Dr. John D. Clark, 351 West 55th Street, New York City.

Do You Like the Change?

Dear Editor:

Here's another "first letter." Have been reading science-fiction for over 7 years and like it better with every issue. Astounding Stories has made grand progress lately and I'm sure you'll keep up the good work.

Read with great interest the letter written by James White of Kansas City. Let's have more of that sort of thing. The stories were swell this issue, as in all the rest, so I'm not kicking.

The series of articles on our solar system are very interesting. Hope you keep them going.

I notice that there is also a change in Brass Tacks. Less arguments and more science.

Good luck and may all your dreams and ambitions for our "mag" be realized.—Frank R. Tuigley, 352 Norway Street, York, Pennsylvania.

Well, Here's Science Discussions!

Dear Editor:

I shall try and try again. Thus will I continue until I have had the honor of seeing one of my epistles in Brass Tacks; or will it be Science Discussions? I am in favor of the latter. However it may be, I, too, can be stubborn. I am bubbling over with certain topics which I would submit to the future Science Discussions, but, not until you print one of my letters.

Here's to the magazine in general: good—much better than your rivals in this field. I say, again, that the opposers of H. P. Lovecraft's works are imbued with a desire to "get what I want and nertz to the rest." They don't take into consideration that the magazine cannot possibly please everybody and that I who favor Lovecraft's stories also dislike certain stories that they themselves might like. By all means let's have more in the future by him. Besides, stories, no matter what the plot, are few and far between that appear in Astounding Stories as well written as Lovecraft's.

As to the stories: the sequel, *The World of Purple Light* did not disappoint me. *Frankenstein Unlimited* is a humorous little gem. Probably due to the old man's vernacular in relating the story which, in itself, was very good for a newcomer. Keep him; get more of a similar nature from him in the future. C. L. Moore's *Tryat in Time* was up to par. Leinster's *The Incredible Invasion* was outstanding. *4th-Dimensional Possibilities* intrigued me much. Campbell's series continue to be good; especially concerning Newton, who almost would have seen this world ahead many years if he had only used the slit referred to. *Expedition from Kytlim*—unusual though short. Well, cheerio, and don't forget what I said at the beginning! —James Gardner, Jr., White Sulphur Springs, West Virginia.

On Emotions and Reactions.

Dear Editor:

To present this to you and my fellow readers of Astounding Stories has taken a little courage on my part. The reason for the trepidation which has held me has been my lack of basis for the statements I intend to set forth. I must first of all make apologies for my lack of substantial study on this subject. Risking whatever reputation I may have expected to hold, I must say that I have never read sufficiently in a textbook on psychology to be able to say that I know anything of the subject other than what I have acquired through observation. And this observation has been limited to unskillful, though prolonged, self-analysis.

I would define an emotion as an impulse motivated by and being the result of an exterior influence on the perception of an individual.

Now, to make my statements clearer—and I find them much less difficult to explain in this way—may we begin with an imaginary human nervous system complete in all its parts. A system capable of all the potential experiences of the average human nerves and brain, the senses, the ability of gaining conclusions through the factors of thought and influences exerted through the nerves and the senses. Let this mind and nervous system be mature, ready to function, and entirely free from hereditary influences.

Let us install into this creation of ours the essence of life. Let it at once take on the guise of a human person, to go through a few years of ordinary human life. As the mind and the senses waken to surroundings, there will be the sense of sight. Impressions of whatever light strikes into the sight organs will be set down on the delicate recording apparatus of the brain. Then there will be the sensations of sound, of touch, of taste, of smell, and these will mix and evolve together. There will be an experience of appreciation, a thought, an emotion, and a reaction!

Then these influences will react in different ratios, the thousands of variations that each sense can record will react, and the result of each separate series or mixture of these influences will be a different emotion or thought. Then the emotions and thought will join in the chaos—and will we not have a satisfactory equivalent of the human mind, the human system of emotion and thought evolution?

The relation of the foregoing—which may appear incomprehensible for my very inability to express what I wish—to the conclusion may not be apparent to some.

I believe that the human process of thought, the sense of recollection, the ability of deduction, is but a constant, overlapped, and instantaneous series of flashes on the screen of perception from the record slides of the camera mind, with the unknown quantity—life—as the lighting apparatus.

I believe that the forever-growing catalogue of our impressions, gained from childhood to maturity, continually therefrom, and from whatever sources of heredity we may have, are not a

definite and smooth-flowing whole, but an infinite number of unmeasurable sense forces, which, segregated and regarded apart would seem just as each small part of an intricate mechanism.

Do you have any idea of what I have been trying to say? I wish I could be sure that I did. It is most probable that I have not been able to transmit the foundation of this idea, but I hope that to some extent I have done so.—Claire P. Beck, Stonybrooke, Lakeport, California.

Another for Mr. White.

Dear Editor:

I agree fully and wholeheartedly with your desire to make Brass Tacks more than a mere "likee—no likee" division of the magazine. Mr. White's letter in the current issue offers an excellent lead for a discussion on the Atlantis-Mu question, and at the risk of shooting off my big guns without sufficient ammunition, I am going to open the attack. Some of Mr. White's statements I cannot refute without quoting sources and doing a bit of reading to make my facts accurate, but if the war goes on, I will do that little thing.

Dr. Sylvanus Morley spoke at Union College last night, before a capacity-plus audience, and while no one raised the Atlantis theory, the question of connection with Egypt and Cambodia did come up, and was promptly stepped on. While my own interest in archaeology—my intelligent interest, shall we say—is concentrated on the local New York State problems on which I have first-hand information, I think that I have enough knowledge of American archaeology in general to defend it against Atlantians.

Mr. White makes the criticism of Colonel Churchward that I was about to make: he makes startling assertions and fails to back them up with references. Where have papers and photographs on Nivens' finds appeared? Lacking the chance to actually see the things of which he speaks, where can a student find reports on them, in recognized or unrecognized publications, short of Sunday supplements? The answer seems to be—nowhere. But I will come back to that later, if need be.

Let me start the rebuttal by stating my credo: all past and present native Americans, whether Indians or otherwise, are the descendants of Asiatic aborigines who migrated into the American continents via Bering Strait (possibly a land bridge at the time) and Alaska, beginning some 15,000 or 20,000 years ago and continuing for several thousands of years. I will not say that they were all Mongoloid, though most of them were. I will say that until the last thousand years or less, all cultural developments in either of the American continents were indigenous—100 per cent American—without benefit of professional assistance from Mu, Atlantis, Lemuria, and any other part of the old world.

And now to particulars:

I may skip some of Mr. White's points, because I do not understand what he is driving at or because I do not have the data at hand to quote chapter and verse in refuting them. I shall also skip around from one to the other. Whether my answers will be to his satisfaction, is something else. I have an equal right to demand that his proofs be to my satisfaction. I'm open-minded. I've even written an Atlantis story and defended Plato's yarns. Now I'm defending American archaeology.

Nos. 1 and 3: Need more explanation. For the European side of No. 1, I should say that all the place names, being Greek in origin, were dubbed after old man Atlas. Under No. 3, why can't the Greek gods be named after Greek kings and heroes?

No. 6: Where are Nivens' discoveries reported, other than in Churchward's books? Also, what makes it necessary for ruins found under lava flows to be incredibly ancient? There are twentieth-century ruins under lava flows in Hawaii and the West Indies, not to mention Pom-

peii. As for age, about two miles from where I am sitting there are eight to twelve feet of river mud over an Indian village which, unless all archaeology is haywire, can't be much over a thousand years old.

No. 7: A real argument. Of course, they've found the flood stratum at Ur, and whatever caused that may have been universal.

No. 8: Probably the Atlantic ridge was above water. Can you tell me the age of your air-crystallized lava? 10,000 years or 10,000,000?

No. 2: You can either swallow Plato whole or deny him absolutely. Neither the "Timaeus" nor the "Critias" has any supporting evidence. If this develops into a fight, I'll get them both and make pointed remarks.

No. 4: The South Sea remains were built by Polynesians. What needs explaining?

No. 5: What elephant mounds in North America? Show me a drawing or a photo of one. Tell me where it is and who has described it. By and by, elephants—mastodons and mammoths were contemporaneous with early man in this country, just after the glacial period, and may have held over as memories in the traditional art of the people who saw them. I won't stand for the dinosaur pictographs that some people talk about. Thousands of years and tens of millions are two very different things.

And now for the text of Mr. White's letter:

Last night Morley set up the five first steps of human civilization: 1. Mastery of fire. 2. Mastery of agriculture. 3. Mastery of metal. 4. Domestication of beasts of burden. 5. Discovery of the use of the wheel. If you are going to assume that Egypt, Sumeria, the civilizations of the Indus valley, and the Mayas were all contemporary colonies of Atlantis, all isolated at the time Atlantis sank, how does it happen that five thousand years ago Egypt and all the other Eurasian civilizations had all five of these things, while a thousand years ago the Mayas had only the first two, and the Incas, 500 years ago, had only four?

The Mayas, for all their wonderful accomplishments, did not have metal tools—as some North American Indians had. They had gold and copper during the late empire, but only for adornment. They were a stone-age people, and they did what they did with stone tools.

Mr. White says that there is no proof in Mexico and South America that the ancestors of the Mayas came over the Bering Strait. What proof will he accept? If he wants documentary proof, there is none and can be none. The migration took place about 20,000 years ago. At the time of Columbus there was no writing in America, save the Maya and Aztec ideographs. There are no polar-bear skins or walrus tusks in Mayan tombs. They wouldn't have lasted that long, if the forerunners of the Mayas had brought them along. The Victorian horsehair sofa in our living room is developing splits at a much younger age. If Mr. White, like many worthy lawyers, demands documentary proof that Zip-zok III crossed Bering Strait with a dog team or eyewitness proof, he won't get it, and we can't argue. Archaeology must rely wholly on the interpretation of circumstantial evidence, but it must interpret all the facts and not just a pretty few of them.

American Indian bodies are like the bodies of Asiatics. American Indian customs are like the customs of Asiatics. American Indian implements are like the implements of Asiatics. American Indian languages resemble the languages of Asiatics. Andrews finds flints in Mongolia that are duplicated in Alaska. Circumstantial, all of it—but I like it. Mr. White doesn't.

Egypt did not spring full-born into civilization. No one says so. There is a complete chain, on which scientists are still working, from paleolithic to neolithic to copper to bronze to iron. Whether or not Egypt is the oldest civilization in the world, the climate has preserved a complete chain of unwritten history marking its rise to eminence. It takes time and costs money to make excavations. Any one can write a book in a year. When as much study has been devoted to Mesopotamia, India, Cen-

tral Asia, Yucatan, as to Egypt, histories of the people will be uncovered there.

So the Polynesians have forgotten their greatness in 500 years? The New York State Iroquois have forgotten their very legends, their former way of dress, in 200. The archaeological evidence indicates that they arrived in the State some 600 years ago; they have forgotten from where. Primitive peoples forget easily. The present-day Mayans, still speaking the old language, have forgotten their greatness since the Spanish conquest. The Pueblo Indians of the Southwest are having difficulty in relearning the arts of pottery making, weaving, and basketry, that tourists demand.

Yes, archaeologists read the chronological ideographs of the Mayans, which have to do with dates and astronomy. They had the aid of one of the early Spanish bishops, who instead of destroying native records, wrote about them. If I give you a list of the Chinese ideographs for numbers, dates, planets, etc., can you read the other two thirds of Chinese? If a child learns to count, must he necessarily be able to read anything but the symbols he has learned? Egyptian was a language based on sounds, not ideas, and the Rosetta stone translated those sounds into Greek.

Why, why, why, if Le Plongeon discovered the key to all Maya symbols, didn't he tell some one else about it? Scientists would be the first to hail it, if it really worked, if the same meanings of the same symbols made sense of another manuscript. Or didn't it make sense? I can imagine a translation of any manuscript, no matter how strange in appearance, if no one is ever going to try out my system on another one. The Easter Islanders translate their mysterious wooden tablets in the same way; they have been told the story which is written down; but they remember the words of the story, not the meaning of the symbols, and after a few hundred years there have been enough changes so that the two no longer correspond.

Mr. White makes statements that demand refutation, but he does not make them definite enough to attack. If I say that this and this and this are proven not to be elephant statues, but parrots, he says, "This, which you haven't mentioned, is an elephant."

If I say that this, and this, and this word in Maya or Aztec bears no relation to Atlantis, he says, "You haven't proved anything about this other word."

Show me a seven-headed serpent in Yucatan. It may exist; I want to see it. Show me a statue of an elephant. Show me Maya words with the sounds of Atlantis. Show me the winged disk. Show me the proofs of your theory, and if I can't refute them, I'll accept them. If this is to develop into a fact-discussing controversy, as I hope it may, let's take one set of facts at a time and hammer at them, one and all. It's Mr. White's next move. Meanwhile, I'll continue to enjoy Astounding Stories.—P. Schuyler Miller, 302 S. Ten Broeck Street, Scotia, New York.

An Interesting Point.

Dear Editor:

The editorial of the November issue interested me exceedingly, and you may well imagine that I am heartily in favor of scientific discussions in the readers' pages. It is, indeed, extremely annoying to wade through the multitudes of missives such as make up the present issue. On the other hand, your new policy is going to prevent many would-be Ackermans and Darrows from getting letters printed regularly. 'Tis better so.

A question which arises concerns the topics to be discussed. I would like to offer a few suggestions. Not all of them are on pure science, but they are all of importance to the science-fiction reader.

How much license should a fiction writer have? Should known facts of science be overlooked in favor of a plot? Should the story

be more important than the science? I ask these with a definite thought in mind. Campbell, in his fascinating science series, persists in giving the cold, unpleasant facts concerning the various planets; Mars in the latest. In the past, authors writing about Mars have simply ignored these known facts in picturing life on that planet. Shall this point of view be tolerated any longer? This is a crucial question which concerns science-fiction at the present time.

What do the readers think of a Utopia, such as pictured in Offrid von Hanstein's memorable book, "Utopia Island"? Would it be possible for a group of men with foresight, intelligence, and knowledge, such as most science-fiction fans are, to set up such a community somewhere? I consider this a very practical thought, not to be discussed theoretically, but with the remote view of a someday actual achievement.

I think an appropriate discussion for the magazine would be concerning the various phases of science which go a little beyond science, and which are, therefore, called by the names of metaphysics and supernaturalism. What happens to the mind after death, considering that the mind is composed of energy, and that energy is indestructible? What actual fact is there behind stories of magic and the supernatural? What justification is there in calling things, unexplainable by ordinary science, impossible?

And a thought from the latter. Just what is the meaning of the word "impossible," and where is the boundary between the possible and the impossible?

Enough for suggestions. Now I would like to discuss various things in the November issue. When I saw that the *Dynasty of the Small* concerned biology I thought it would be a change in Fearn for the better, but was sadly disappointed. The body of the story is not so bad, but various errors in the first few pages took the flavor away. On the second page he defines a protozoan as a multicellular organism, contrary to the definition given by Hegner's College Zoology. Also, I would like to know by what means he brings about cross-breeding in amoebæ, which multiply by binary fission. Also, what kind of culture did he keep them in if the animals lived only on protozoa? Also, why did the bacteria in the first people treated not develop as did those later? Fearn is a good writer, but his carelessness with science leaves a bad taste in the mouth.

Anton Moros the Earth interested me very much. I was wondering whether the space ship could generate enough energy to move the earth that distance, so I spent a few minutes calculating it. To my surprise the thing would work, although a force in the order of ten thousand million tons would have to be applied at the long end of the lever to give the earth the acceleration of one gravity. Also, I cannot conceive very well the idea of a ray being used as a lever. An ordinary force beam or attractor ray would apply a force in a direction parallel to the direction of propagation, resulting in the ship being pushed or pulled by the earth. And I wonder what effect the business would have on the fulcrum, the sun.—Milton A. Rothman, 2113 N. Franklin Street, Philadelphia, Pennsylvania.

The Velocity of Escape.

Dear Editor:

The promise that you made to turn Brass Tacks into a forum of science discussions is the one really outstanding feature of the November issue. Now we ought to get somewhere!

My own pet line, at present, is along the practical mechanics involved in getting a craft of sorts that can actually surmount the gravity field of our planet. Lots of enthusiasts seem to trust entirely to their imaginations—which perhaps accounts for such a wide range of figures—but the only dynamic way we can learn

the facts is by means of mathematics. Naturally, the correctness of experimental data is the limiting factor controlling the accuracy of our calculations, and, unfortunately a great deal of vital data is strangely lacking, for which there just isn't any adequate excuse at all!

First, the all-important "velocity of escape-ment" may be easily obtained from the tried and tested formula:

$$A-V^2$$

—
R

Where A is the acceleration of gravity of 32 per sec. in the English system; V is the velocity in feet needed to balance A; and R is the radius of the earth (also in feet) accordingly:

32-V²

20,935,000 feet or $v=4.90$ miles per second.

One point in our favor is that the earth hands us 28 miles per second of this on a silver platter, if we take advantage of the eastward equatorial rotation! This leaves a mere 4.62 miles per second to attain in an eastward direction over the equator in order for any given mass to neutralize the earth's gravity.

No here is some pretty favorable news, and next letter I promise to have some revolutionary ideas and very encouraging figures on the proper way to attain this velocity—for it can be attained even with ordinary molecular energy.—William R. Raker, 953 Arlington Avenue, Berkeley, California.

This Asks a Lot!

Dear Editor:

A number of features of your December issue have prompted me to write, congratulating you on the trend that Astounding has taken recently.

First, I wish to comment on Mr. James White's most interesting letter which headed Brass Tacks, or shall we say Science Discussions? One long letter like this is worth twenty of the short variety. I might take issue with Mr. White on several points, but Science Discussions has not been established yet.

Next, I want to make two requests of you, and I hope every reader of the magazine will agree with me. Increase the number of pages to 200, as Mr. Calvin Fine suggests. You would have much more room for science features; you could get more advertisements; and you could have longer stories, which are far better than the many unfinished and undeveloped ones that I have seen.

Then fire all of your present interior artists, except possibly Wesso. Keep Brown on the cover, but get some one who can draw a man and a girl who look human, not like a monster or two from Mars. The two men in the illustration for the *Flame Midget*, by Flatos, are ghastly. Can't you get an artist who draws naturally, like those who illustrate the *Saturday Evening Post* and *Colliers*? This would be your first step toward the goal you are aiming at. Brown's cover was actually good, but the November drawing would keep many people away. Don't you see the difference, Mr. Tremaine? I wonder how many readers agree with me?

The science features are excellent, interesting, and thought-provoking. Campbell's style is improving greatly; he puts his ideas into a form any one can understand. Parker, the chap with the letters, has started something with his dimensional theories. I hope to see more articles like this in the future. By the way, before I go on, I want to say that Dold's illustrations, although usually much the same and too gigantic in scope, are very good until he begins to put human beings in. Then they seem unreal and peculiar.

Now, while I dislike comparing the stories

themselves, four were so outstanding as to compel special notice. I was glad to see Miss Moore has begun to write science-fiction. Everything else I have read by her was purely weird. Her story seemed real and plausible, in spite of the unusual plot. Then, *Frankenstein Unlimited* (foolish name) appealed to my sense of humor greatly. The dialect and the hits at other science-fiction stories made me hope that you are going to give us more humor from now on. Warner Van Lorne's style has improved so much over his former stories that I enjoyed *World of Purple Light* more than any piece of science-fiction for a long time. And, of course, Murray Leinster's masterpiece, which has, much to my sorrow, ended at last.

Finally, I would like to say that I hope in six months we shall see the end of just such letters as this; and that all your readers will be discussing my favorite topics: travel, space, time, and dimension. And don't forget the artists and the extra forty pages.—Richard Creecy, 6 Upland Road, Baltimore, Maryland.

A Résumé of Assets.

Dear Editor:

Although I have been reading your magazine for over three years, this is the first time that I have ventured to set down my opinion in writing. Furthermore, I have resolved to write you a monthly letter telling you my ponderings on the present issue.

When I glanced through the December issue I was aware of the fact that Warner Van Lorne had written a sequel to *Strange City*, which had appeared in the January issue, and which incidentally I had not read. Having a distinct aversion to most of your sequels, I was exceedingly disgusted—but, in an effort to do justice to Van Lorne, I proceeded to read both stories. Needless to say, I changed my first, rather hastily drawn conclusion. Both stories were extraordinarily good.

I think that 1936, on the whole, was much better than 1935. Here is my list of the ten best stories of the year. (This is not complete, as I have not read Leinster's serial or any of the December short stories.)

1. *The World of Purple Light*—Warner Van Lorne: A perfect story of adventure in an unique land; the start of a series of stories, I hope. There is material here for many more stories.
2. *Redemption Cairn*—Stanley G. Weinbaum.
3. *Strange City*—Warner Van Lorne.
4. *The Chrysalis*—P. Schuyler Miller: No one seemed to like this one, but I thought it was great. Miller is a very fascinating writer.
5. *Pacifica*—Nat Schachner: Schachner is never extraordinary, but always excellent.
6. *The Cometeers*—Jack Williamson: Not Williamson's best, but good enough.
7. *Isotope Men*—Nat Schachner.
8. *Little Hercules*—Neil R. Jones. I hope you keep Jones.
9. *Trust in Time*—C. L. Moore: Her best in Astounding.
10. *Red Storm on Jupiter*—F. B. Long, Jr.: Good, but the only good story by Long this year.

How about the plans you had for Astounding Stories that you made about a year ago? I haven't heard much of them lately. I believe that the circulation of the magazine is large enough to merit one of these five changes.

1. An Astounding Stories quarterly, large size, 50c.
2. Enlarging to 200 pages, raising the price if need be. This would provide room for two serials, 30-40 page installments, running together.
3. A sister magazine of fantastic fiction, publishing stories of the Ray Cummings' or Burroughs' type.
4. A sister magazine of interplanetary stories.
5. Publishing Astounding twice a month.

I wish to say, in closing, that I am very

much interested in obtaining issues of *Astounding* before 1932 and *Argosies* before 1930; if any reader has either. I would be grateful if he would get in touch with me, stating the dates of his issues and the price.

I hope I have not bored you with this lengthy epistle: next month perhaps I will not have so much to say.—N. W. Stringer, 17710 Franklin Boulevard, Lakewood, Ohio.

Rockets Need No Resistance.

Dear Editor:

Your December issue just received, haven't read it yet, but it looks good.

1. Cover: not so hot. How about getting Wesso, Dold or Paul to do one cover—just one.

2. Inside illustrations: Wesso is great. How about more from him? Dold just as good as Wesso. Your new artist Binder looks good. Let's have more from him. C. R. Tomson, just passable. Platos, please take him out, please.

3. Your new idea about Science Discussions sounds good, but I would like to see Brass Tacks, also.

Here is an idea for Science Discussions:

A rocket ship, when out in space, does not need the constant use of its rockets to keep going, because there is no air or friction to stop it, but it needs to use its rockets to steer itself. This is O. K., but what is there for the rockets to push against? Some of the stories suggest letting out a little air before each firing of the rockets. That, I think, will not work, as the air will vanish in space before the gas from the rockets could hit it. Here is my idea: have sand dropped from a tube for the rockets to push against. I believe it is possible, as the sand is heavier than air and will stay in one place longer than the air would.

Please let me know if you are going to let Wesso do a cover, and also if you are going to put out a quarterly.—James Taurasi, care of W. C. Sommerfeld, 31 Union Square West, New York, New York.

Only Forty Pages?

Dear Editor:

I'm literally bursting with enthusiasm over the December issue. It was a high-powered issue plus.

There were three stories I'd like to see sequels to. They were: *World of Purple Light*—a series about this strange land would be swell; *Frankenstein Unlimited*—I'd sure like to see Chuth do the Brain in the neck—humanity was never made to be downed by a cold, uncemotional machine; *Trust In Time* fairly shouts for a sequel. Don't you think so? This story ends too abruptly and leaves far too many questions unanswered, the foremost being, I believe, the place the characters ended at.

By the way, Nat Schachner, in your *Infra-Universe* wouldn't the gravitation of such a small piece of earth be so slight as to necessitate moving very carefully to keep from flying off into the air, and perhaps into space?

It may be significant to note that I always read Brass Tacks right after the Editor's Page, which comes first. I got a great kick out of James A. White's letter per ancient civilizations, and his ideas on the subject coincide remarkably with mine. His questions are good. I'd sure like to see a halfway logical answer to them.

The boys are yelling that *Little Hercules* was good, but I didn't get any kick out of it at all. As for H. P. Lovecraft: his works leave me with a sense of weird uncanniness, a sensation like that after waking from a peculiarly terrifying nightmare. I would like to see more action and slightly less descriptive material by him, but as

for being a "bum" author, he plays on the emotions like a master pianist plays the piano.

Let me lift my voice in favor of an amateur authors' corner, a short-short-story idea.

Again I reiterate, no semimonthly please—in- stead, improve the monthly.

Mr. Editor, when you brought out trimmed edges, you said the magazine would be easier to file. O. K. Now here's a little item which will help indexing. I guess most of us keep *Astounding* on a shelf, back out, when we index our copies. When we wish to look for a certain issue, it's much easier to find if we can look for, say December, 1936. So what I'm requesting is that you print the year to facilitate indexing.

200 pages for 25c! Yes, sir, that would be nice, very nice. Toward the peak with *Astounding* and *Tremaine*, that's me.—Leslie A. Croutch, Parry Sound, Ontario, Canada.

Remember Brass Tacks?

Dear Editor:

The most astounding thing about *Astounding Stories* is the inflated ego of 95 per cent of the contributors to Brass Tacks.

I realize fully that writing to Brass Tacks— unless one belongs to the select society of super- egoists who manage to get their letters printed in Brass Tacks—is a complete waste of time and energy. I also realize that you only print the letters of a select few, so there is no chance of this appearing in Brass Tacks.

I have no comments to make on the stories or the illustrations, and no axes to grind. I merely wish to comment on the fact that each person whose letter is printed in Brass Tacks appears to me to think that the magazine should cater to his taste alone.

Each one offers you all sorts of advice, and tells you just how to get up the magazine. In my opinion, none of them are yet qualified to become a magazine editor, and would do better to remember that every one has his own individual preferences, and that what one dislikes, another will like.

A little careful consideration would also bring out the fact that the editor has to please a variety of people—not just the few whose letters are published in Brass Tacks. These few seem to think that they are the only ones who read the magazine. (They constitute about 10 per cent of the magazine's readers, on a conservative guess.)

It would give me a big kick to see this letter published, but I don't think that there is much chance of it.—C. W. Oshourne, 5 Hill Street, Sheldon Springs, Vermont.

Here It Is!

Dear Editor:

I have just finished reading the November issue of *Astounding Stories* and it sure is great. I have been a silent reader of your magazine for some three years, not regularly, but about every other month. Almost every time, when I am through, I read Brass Tacks. Some of those comments make me sick. I sure was glad to see that you are going to start Science Discussions. That was what made me loosen up. Personally, I have been pleased with your stories ever since one of my older brothers, now in college, brought a copy home to me.

Just a word to Mr. Francis Ellissen of England, who writes so sarcastically. I don't see where you find any evidence of *Astounding's* sliding. I read for the scientific ideas in the book, not humor. If that's what you want, buy a copy of "Famous Funnies," or something. We won't die without you.

Let's go with Science Discussions.—Jack Carpenter, 69 Oneco Avenue, New London, Connecticut.

Approval Again.

Dear Editor:

I most heartily endorse your plan to change Brass Tacks to Science Discussions. I think it will be a change for the better, but I do hope that the arguments will not get too deep, as were those that followed the story that disproved the law of conservation of energy. Most of the letters printed were too deep for me and a great many other readers, I am afraid. I also agree with James A. White about that "mythical" continent of Atlantis. The tale or myth is too universal to be only a fairy story. Also, note the many supporting facts he has for his argument.

I just finished *The Incredible Invasion*, which I read all at once. It exceeded my fondest expectations, proving to be an out-of-the-ordinary "invasion" story. *World of Purple Light* proved to be a fine sequel to *Strange City*. Van Lorne is improving with every story. I feel he will be S. G. Weinbaum's best successor. I want a lot more stories like *Frankenstein Unlimited*; they are the spice of the issue and provide a light interlude to the more heavy reading. C. L. Moore comes through with another grand story, her second for *Astounding*. May many more flow from her prolific pen—or typewriter. Still clamoring for a quarterly. I am your loyal reader.—Lymun Martin, 65 Howe Street, Marlboro, Massachusetts.

"Glorious Change."

Dear Editor:

Congratulations on your new idea. It looks like an editor has at last awakened to the fact that a reader's discussion column is not all it might be. To those who search vainly through the maze of grammar-schooler's letters each month in a hopeless search for an occasional gem such as the letter from the chap who championed Atlantis in five columns, the new Science Discussions will be a glorious change.

And here's a little something I'd like to take up, which you might be interested in using in the department. It's about the article on *4th-Dimensional Possibilities*, which appeared in your December issue. Far be it from me to contradict an A. S. M. E. & S. O. A. E., etc., but since the fourth dimension is a purely theoretical concept, it is open house for argumentative persons like me.

I wonder if Mr. Parker has ever read a book by a man named Abbot, called "Flatland"? It would, I think, clear up this idea of time as a dimension, which he is defending. A number of reasons against the concept of duration as the fourth dimension, together with a few errors which help to weaken his foundations, are listed. For instance:

1. Mr. Parker has used, to better present his hypothesis, one- and two-dimensional sight. For the sake of argument, let's consider a being who is a straight line, a being who consequently can see only the ends of lines, mathematical points, or 0 dimensions. This being is confronting the bottom of a figure, which some one has told him is two-dimensional—in other words, a plane—and he's resolved to discover what this dimension is. He starts to move toward the top of the plane, broadside. But there are an infinite number of lines in a plane, and, as a result, it will take him an infinite time to see the entire figure. After a long time he gives up in disgust and concludes that the second dimension is extinct into time, not realizing that a being who can see in two dimensions could see the entire figure at a glance. Since there are an infinite number of planes in a cube, it would similarly take a two-dimensional entity infinity to see a three-dimensional figure, leading him to conclude that the third dimension is time. Ditto three-dimensional man and his fourth dimension. See? No matter what dimension you occupy, time is always the next dimension up—never any definite dimension.

2. Consider another similar problem, this time from the standpoint of the two-dimensional being who can see a plane. (Actually speaking, only a three-dimensional being can see a whole plane, the two-dimensional one only being able to see a line, as we see a cube as a series of irregular planes. But, for purposes of argument, let's say that this two-dimensional being can see a plane.) A sphere, a three-dimensional figure, drops into his plane of sight; he is unable to comprehend its movement; he knows it is moving in the third dimension, but he cannot see this motion. All he can see is a circle, expanding and contracting as the sphere passes on down—or up. Since the only movement he can see is an expansion and contraction in two dimensions, and being unable to understand it as being a result of up-and-down movement, he naturally concludes that the only motion he can see, a fluctuation over a period of time, is the third dimension, and, therefore, that the third dimension is time.

3. Now Mr. Parker contradicts himself. First, he says time is the fourth dimension; then he says, "We are taught that it" (the first dimension) "is length—a line—but the fact that the length exists long enough to be perceived adds duration." Firstly; how exactly does one "perceive" a true line, which has no width or depth? I never saw a true one-dimensional figure yet, lines drawn with the finest pen in the world being still thick and wide; I'm sure Mr. Parker never did, either. Presuming that he did, however—which he never could—and if duration is also a dimension, how did his one-dimensional object have two dimensions? As Harry Bates once said, "I say it's spinach."

4. But lo and behold, not yet have we arrived at the conclusion of these unhappy fallacies. Mr. Parker guilelessly states that a three-dimensional object casts a two-dimensional shadow. A shadow is the area in which light is cut off by an object; it's third dimension.

5. As I mentioned before, we are three-dimensional, but because we are so, it is impossible for us to see all of a solid at once. In four dimensions we could, just as we can see all of a plane from three dimensions, but a two-dimensional being can't. This automatically sets at naught Mr. Parker's adaption of geometrical progression to the number of eyes we possess.

6. If your linotype does not know how to drop the words "dimension" and "dimensional" into place in his sleep by the time he finishes this letter, I advise you to fire him and get another.

Well, good luck on the new Science Discussions, Mr. Tremaine. However, I cannot refrain from adding that the next time you spoil a gorgeous Wesso drawing by experimenting with photo-engraving on it, I shall most certainly place you on my execution list.—Jim Blish, 91 Halsted Street, East Orange, New Jersey.

Attention Mr. Hugh McKenna.

Dear Editor:

First I want to answer Mr. Hugh McKenna, who doesn't agree on what I said about the space voyager in *Glagula*. He believes that a being from some radioactive planet, which possessed an even temperature, would know nothing about fire, frost or atmospheric differences. I maintain that any person who can conquer space would know plenty about all three things. In order to lay the foundation for space travel the heavens must be studied and understood. In this way the being would find out that planets are not all alike. If there weren't any other planet in his system for him to study, he could train his telescope on the stars. He would discover that these differ in size, mass and temperature, so he'd conclude that the same thing applied to planets.

Before constructing a space ship he would have to send up trial balloons, rockets or other

similar contrivances to acquaint him with existing conditions in the upper atmosphere. It wouldn't take him long to find out about frost then. If savages knew how to start fire by friction, surely an intelligent being would know all about combustion. There'd be friction even on a radioactive world, Mr. McKenna. So your "good point"—as the editor put it—isn't so good after all!

According to the November editorial, Brass Tacks is going to be replaced by Science Discussions. The new name sounds good. You say it's going to be an open forum for new ideas? That's good, too. But what about the stories? Aren't they going to be discussed? Wouldn't it be all right to comment on the science in the yarns? Not all of us may have original scientific theories to debate, you know. A readers' department is fundamentally designed for the discussion of the contents of a publication. Are you going to answer the letters, as so many of us want you to?

In my opinion the interplanetary tale is the best type of science-fiction story. There is nothing like breaking away from earth to go voyaging through the unknown, visiting strange worlds and having incredible adventures midst alien surroundings. However, the story must be logical. If it isn't convincing, it's worthless. Most authors make everything simple for their characters. They have them hopping about the solar system like an airplane hops over the countryside. They say nothing of how the numerous obstacles that confront space travel are overcome.

Before writing any more impossible tales, I advise them—and every one else interested in the conquest of space—to read *Halfway to Infinity*, a very enlightening article in the July, 1936, issue of *Forum*.

When is that ace, Frank Paul, coming to Astounding? Science-fiction just doesn't seem the same without that genius, who draws a story into his pictures.—Charles Pizzano, 11 Winthrop Street, Dedham, Massachusetts.

Collects Fan Magazines.

Dear Editor:

Just a few lines from a constant reader to thank you for the consistent high standard maintained by Astounding Stories.

Many thanks for stories on the type of *The Eternal Wanderer*, *Dead Star Station*, *Return of the Murians*, *Little Hercules*, *Glagula*, and others.

In my opinion, stories with a well-written "hack" plot are much more interesting than "thought-variant" stories which contain a lot of superscience, no human interest and a very weak plot. One exception: Murray Leinster's, *The Mole Pirate* and *The Incredible Invasion*. Leinster is always above par.

The Cometcrs didn't come up to the *Legion of Space*. Both of these stories by Jack Williamson I would call "hack" in plot, but better-written than most thought-variants, and much more readable and interesting.

Don't listen to the raving fans who pan H. P. Lovecraft. I, for one, would like to read more of the "Elder" peoples.

How about having Alex Raymond and Dick Calkins draw a full-page illustration each month showing some feature of life on Mongo or the solar system?

I wonder if you can give me any information as to the fan magazine put out in New Zealand?

If any of you fellow science-fiction fans are about to put out fan magazines any time in the future, or if you have and I have not been in contact with you, please let me know about your magazine. I collect them. Thanks.

Well, Mr. Tremaine, I must close, with hopes for a twice-a-month, a quarterly, and seeing Flash Gordon or Buck Rogers in a full-page illustration soon. Wishing you and Astounding the best of luck.—Bernard A. Seufert, 8 Kappel Place, Rochester, New York.

A New and Enthusiastic Reader.

Dear Editor:

I am practically a new reader of Astounding Stories, having read only four issues, August to November.

I have thoroughly enjoyed every story except one, which was *Finality Unlimited*. The story appeared to have no plot whatsoever, and seemed to me only a senseless jumble of words.

The science articles by John W. Campbell, Jr., are excellent. Please keep them up.

According to Brass Tacks, I am almost the only reader who liked *En Route to Pluto*, by Wallace West. I would like to read more stories by this author.

The stories that I especially enjoyed were: *The Return of the Murians*, *The Scarab*, *Little Hercules* (this story should have a sequel), *Godson of Almaru*, *Anton Moves the Earth*, and *Macklin's Little Friend*.

The Incredible Invasion, by Murray Leinster, is fine, and I am eagerly awaiting the next (and to my sorrow, the last) installment.

To sum up my opinion of Astounding Stories in a few words, you have a new, regular, and enthusiastic reader.—Billy Devenport, 2804 Magnolia Street, Texarkana, Texas.

"Three Steps to Opponents' One."

Dear Editor:

It has been my very good fortune to have followed the rise of Astounding Stories from the beginning of its new life under your rule. I have applauded every change you have made in Astounding Stories, but this latest one you are about to promote takes the cake. Next to smooth edges, changing Brass Tacks into Science Discussions is the best thing you have done to further the rise of Astounding Stories, and I think your reading public will welcome it, too.

Brass Tacks served as a good foundation, in the fact that the readers had a way in which they could let off a little steam concerning the magazine in general, but it also caused a certain condition, just as you stated, in which the readers wrote only their likes and dislikes of various stories. I feel, too, that Astounding Stories needs a new and better discussion department and shall give my fullest support to Science Discussions.

Now, as a matter of form, I shall put my views of the November issue on paper.

The Eternal Wanderer struck me as being an excellent story. *The Path* was a very good short and has a very dramatic spot in it. Fenwick must have been a scientist indeed, to keep on experimenting in the face of the sun and not trying to save himself. They could have come after him, I should think, since they got his message soon enough.

John W. Campbell's series of articles on the solar system are remaining excellent. This month's article was especially good. Campbell should be commended on his excellent way of explaining a question. We all have read shorts in which the mystery of Mars was explained, but the simple way in which Campbell does it is simply swell.

The Last Selenite was pretty good. Why couldn't the men have made a space ship while on the moon?

My favorite was *Anton Moves the Earth*. This was a very good story, using as its base Archimedes' idea of how to move the earth. I hardly think Anton could have turned his head to look at Zala when dodging the comet. Its ending was obvious from the start, though.

The Incredible Invasion is doing nicely. It seems there will be swell revolution in the enemies' camp, from the trend of this part of the story.

By the way, I should like to add that it would be a sin to produce a quarterly, but since

every one is crying for one, I might as well sin by adding my voice to the throng—but no bimonthlies.

I should also like to say that your little line above the letter of one Lyman Martin pleased me very much. It would make a swell slogan: "We set the pace—we don't follow others." From the looks of things, your taking about three steps to the opponents' one.—Calvin Fine, Headquarters Squadron, A. C. A. F. S., Kelly Field, Texas.

Likes Illustrations.

Dear Editor:

This is my first letter to *Astounding Stories*, and so I suppose you will expect a summary of the stories. Well, I'm not going to do any such thing, because I think that all the stories in your magazines are good. If a story or two ever does drop below the level set by others, there is usually another story to make up for it.

I agree fully with Robert Tangeuin in saying that taste differs. The statement of printing one story and throwing another one in the wastebasket is a lot of bunk. As I said before, the stories are all swell.

Another thing which puzzles me is the reference of many of the Brass Tackers to how good one illustrator is and how rotten another is. I have read loads of magazines whose illustrations are hardly more than a bunch of lines thrown together, yet it never affected the stories one bit. In comparison with other magazines, *Astounding* has the best illustrations.

I think that your suggestion of Science Discussions to take the place of Brass Tacks is swell, but I hope my letter gets in Brass Tacks before you change, because this surely isn't a science discussion.

I have only been reading *Astounding* for four months. I hope that you do not decide to change the size of it, because it is so much easier to file in this present size, and it is so much more compact.

Well, I guess that's all I have to say, so I will sign off for the present.—Richard Wronski, 1544 South Park Street, Red Wing, Minnesota.

Here's the Letter:

Dear Editor:

Thanks for printing my letter in the November *Astounding*.

All the stories in the December issue were pretty good except *Frankenstein Unlimited*. *The Incredible Invasion* was a dandy story and ended swell. Thanks again for the *World of Purple Light*. It was a fitting serial to *Strange City*. I say serial and not ending, because when I finished the story I was impressed by the fact that there is no ending to that type of story. Many more serials of Tom's adventures could be written.

Infra-Universe by Schachner was excellent. *Trust in Time* was very good as was the *Fourth Dynasty*. *The Flame Midget* was fair. Binder's illustration in *Trust in Time* was rotten; and the second illustration in *The Flame Midget* was terrible.

As for Henry Boernstein; he says that Campbell's articles are no good, he should be eradicated. Campbell's articles are the most interesting nonfiction articles ever to appear in *Astounding*, with the exception of Lo. How about a quarterly? Oh, yes, I wanted to tell you that *Proteus Island* was pretty poor, even though it was Weinbaum's last novel.

Please print my letter. It would warm my heart if you did. Thanks in advance.—R. L. Primoff, 430 East 86th Street, New York, New York. P. S. I should like some 14-year-old boy or girl to communicate with me.

We Counted on a Debate.

Dear Editor:

Recently I have been reading over nearly all the *Astounding Stories* issued during the last three years. Herein lies the justification for the continued existence of this incredible type of fiction. Consider the *Irrelevant* with its preposterous violation of the conservation law. I still don't quite understand it. But tell me, Mr. Editor, when you printed that story could you foretell the months of violent controversy which would ensue, to the great delight of *Astounding Stories* readers?

What can I say regarding *A Matter of Size*? A doll-sized body, with an adult mind, actually mails itself in a tooth-paste carton. Remember? Who doesn't?

The *Fourth-Dimensional Demonstrator* is always good for a laugh or two. Was humor ever present amid more bizarre surroundings?

Now we come to *Old Faithful*. Your fan mail has told us how that particular story has gone over. What makes it good? Why careful attention to detail, of course. How easy it is for the average author to lightly pass over the obvious difficulties of communication. (And that reminds me, since I am an E. E. with some knowledge of telephone circuits: why doesn't some author write about that marvelous robot, the Panel Dial System?)

Of course, Weinbaum has left his mark indelibly on contemporary S. T. F. Few authors can make an alien environment come to life as he could—and did.

Now just a word regarding Campbell's popular series of articles regarding celestial bodies and I'm through. Just one word: fine.

No brickbats, no slams—this time. The much-harried editor gets a break. After all, Mr. Editor, the most subtle compliment from your severest critics is their continued reading of *Astounding Stories*.—Robert D. Gommel, 3111 W. 95th Street, Cleveland, Ohio.

Finale.

Dear Editor:

I have just polished off the last of the December issue, and have, in consequence thereof, a couple of well-placed kicks to offer.

The first has been working up for quite a while; it's about this sequel business. This man Whitfield, it would seem, declares that *The Cosmo-Trap*, *Frictional Losses*, *The Time Decelerator* and *Little Hercules* all want sequels. And that is going to get me going!

There are some stories—notably *Strange City* by Van Lorne—which can stand a sequel very well, but the overwhelming majority are complete in themselves, and sequels detract seriously from them. Take *The Machine* by Don Stuart, for instance. It was an A-1 story until *The Invaders* and *Rebellion* spoiled it. The same goes for Gallun's sequels to *Old Faithful*. And, in more recent times, to *Mathematica*. I never did like Fearn much until I read *Mathematica*, and after I read *Mathematica Plus* I didn't like him again. The story was complete in itself; it didn't want any screwy, cyclical, music-goes-round-and-round sequel to throw it all out.

So, in the future, down with sequels!

The other kick is a minor one. It deals with the business of illustrations. Why don't we get a little coordination around here? There are five covers—count 'em!—in the year of Our Lord one thousand nine hundred and thirty-six, wherein the cover artist had altogether different ideas of a certain scene from what the inside illustrator did. And a couple portrayed scenes that never occurred. And again, take the illustration for *Trust in Time* (nice story, by the way and a new illustrator, too) which depicts the man with the time grapple, or whatever you call it, shooting a "witch" tied to a stake. Well, if he can point the gun six feet away from the aforesaid stake and still hit the "witch," all I have to say is "some gun, fella, some gun!"—R. Vickers, 626 Constance Avenue, Victoria, B. C.



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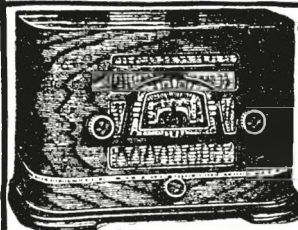
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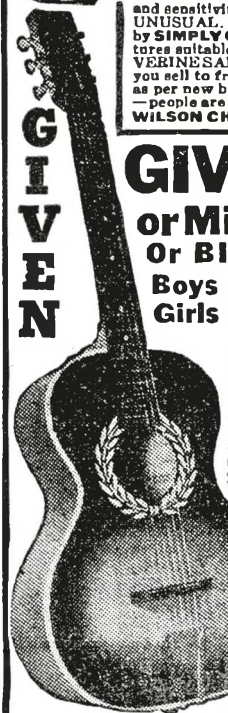
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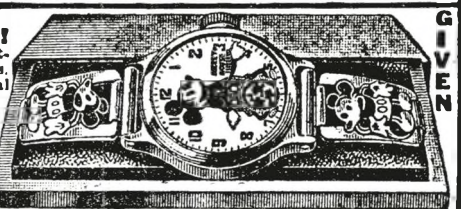
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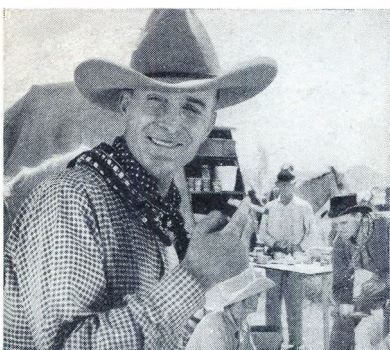


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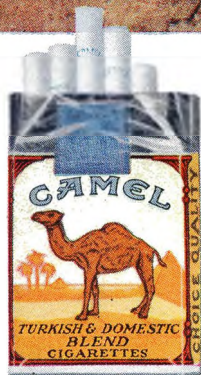
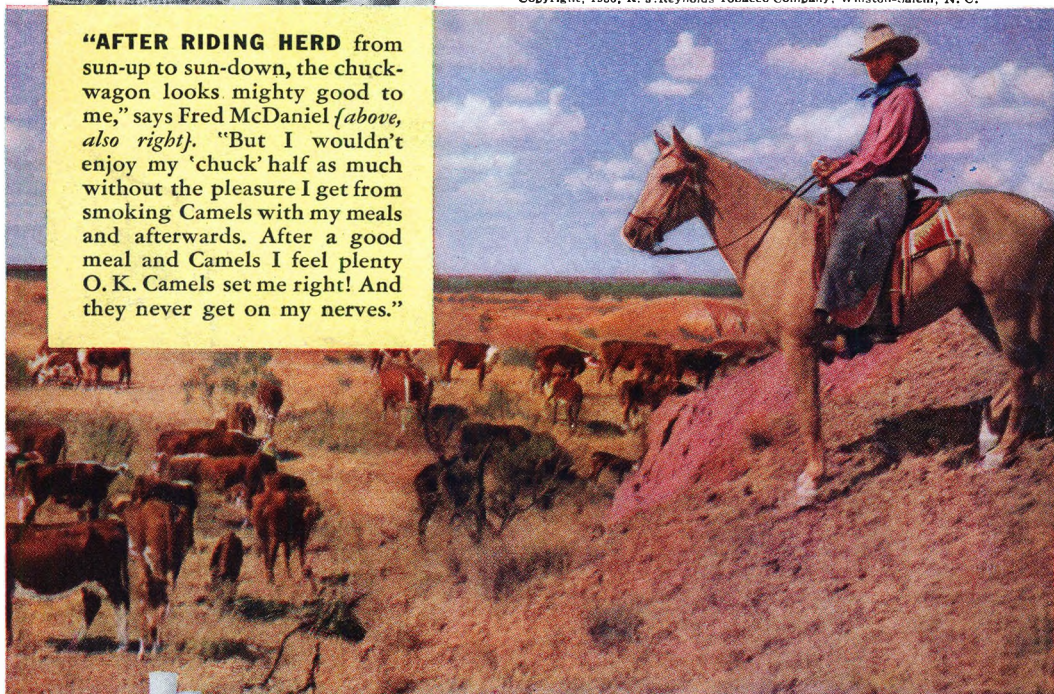


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