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THE WITCHES OF KARRES
By James H. Schmitz

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Editor
JOHN W. CAMPBELL, JR.
W2ZGU

Assistant Editor
C. TARRANT

COVER BY ZBOYAN

Illustrations by Cartier, Orban and Rogers

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AST—1N

DIGITAL COMPUTER

Dr. Warren S. McCulloch is a neuropsychologist at the University of Illinois—and one of the few specialists in the field who can talk electronics with the best of the electronic calculator machine specialists. He delivered a talk on the human brain before a meeting of the American Institute of Electrical Engineers a while back that, taken in conjunction with some of the articles we have run recently on such calculating machines, makes fascinating reading.

The best of the modern calculators are electronic relay-type devices, using ten thousand vacuum tube relays or so. These, says Dr. McCulloch gently, have approximately as many relays as the "brain" of a flatworm. The flatworm is about the lowest creature on the evolutionary scale that bothers to distinguish one end of its body from the other. The human brain, on the other hand, contains about ten billion relays.

The brain-relays are battery-operated, each relay having its own built-in battery, which operates on a sugar-oxygen to water-carbon dioxide chemistry. The entire ten billion relays operates on a power input of approximately 2.4 watts, or roughly two ten-thousandths of a milliwatt per relay.

These individual relays—neurones, or nerve cells, of course—operate on a true, relay basis. They have two conditions, fire or not-fire. The whole operation of the brain is precisely like that of a digital calculator of the relay-computer type.

As recent articles in this magazine have indicated, the great problem in modern calculators is number-storage, or memory devices. Three basic types are used in modern machines; the soldered-in memory, the punched-card memory, and the delay-line memory. Each has its advantage for certain types of function.

The "soldered-in memory" is used for such things as multiplication tables that are basic necessities, requiring continuous availability and frequent use.

The punch-card memory is used for reference data tables, special instructions that may frequently be referred to, and for storing for later use solutions to problems that have already been solved and which may be needed in the handling of future problems.

The delay-line type memory is a short-term fast memory; riffling through punched cards to select the desired item takes time, and it takes time to punch cards. If the machine is multiplying 127 by 34—well, the digital calculators "do arithmetic in

their heads". If you were doing that problem, you'd mentally multiply 127 by 4, remember the product, then multiply 127 by 30, remember that product, then add the two products mentally, remembering each digit so obtained, then read off from memory the sum as your finished answer. The machine must do the same thing; for such short-term memory, the delay-line memory system is used commonly. Numbers obtained in multiplying are fed into an amplifier which sends them as sharp pulses of sound waves down the length of a column of mercury metal; the passage through the mercury takes time. At the other end a pick-up device reads the pulses, passes them to an amplifier which feeds them back to the input amplifier for another merry-go-round. Each trip round takes time; that gives the time-function implied in the term "memory".

The human brain has three types of memory; the "soldered in" type, the punch-card type, and the delay-line type. Apparently, every item of data received goes first into a delay-line memory—where it can be held as long as eight hours—and is automatically transferred also to the punched-card type memory. In the human brain, hundreds of the "soldered-in memory" circuits are used; the machine is originally constructed with these circuits wired in place for constant reference and operation. Such circuits are involved in calculation and control of body temperature, blood-ion concentration, blood oxygen and CO_2 balance control, and the like. In addition, certain "soldered-in" circuits are built into the machine at first to serve certain original relatively short-term functions that must be performed perfectly at the start, without possibility of experience or learning. The incredibly complex switching system involved in mammals at birth, where the umbilical blood circulation must be closed off completely, and the lung blood circulation channels started, obviously has to be of the wired-in-instruction variety. The sucking reflex of the new-born mammal equally must be wired in.

The delay-line memory in man works almost exactly as it does in calculating machines. You used yours a moment back there when you mentally did the arithmetic suggested. But where the calculator machine has to use mercury delay-lines to get the time factor, the brain uses chains of neurones. A vacuum tube will change from not-fired to fired in fractions of a microsecond; to achieve a useful delay with such super-speed devices, thousands of tubes would be required in a chain. Neurones, on the other hand, are considerably slower acting—and much, much cheaper and more plentiful. A chain involving a few thousand neurones would be quite practical—after all, the brain has enough neurones to set up ten million thousand-neurone chains! Actually, smaller numbers are quite sufficient, because a neurone takes something like five hun-

dred microseconds to respond. A few hundred can repeat signals around and around in a circle, maintaining the accuracy of the repeated data with surprising fidelity—because the data is simply "yes" or "no". Apparently this circulating delay-line type memory is good up to eight hours.

But it's in the punched-card type memory that the brain takes all prizes. The punched-card memory of a calculator machine is limited by several factors. First, it's slow, because it takes time to punch-in the data on the card, takes more time to find the desired card in the mass of filed cards, and then takes additional time to read it off. Second, the punched-card memory gets bulky, and the greater the bulk, the longer time it take to find a desired card. Third, you won't find the card at all unless you look for it under one of the half-dozen or so punched-in indexing marks. It would be difficult, for instance, to get sufficient indexing on a punched card so that the concept "box" could be found under "something to sit on," "ersatz speaker's platform", "handy lumber around the house", "chassis for junior's scooter", and "nail for hanging Aunt Mathilda's picture", as well as all the more customary functional associations of "box". But the human brain is a wonderful gadget—and its memory system is terrifically effective. Even yet we don't realize all the capabilities of that incomparable instrument.

For instance, I'll give you the bald statistic "13.6". I'm willing to bet that several thousand of the readers of this page can, with a moment's hesitation, correctly associate that figure. Meterologists, physicists, and chemists have the best chance, of course; it's the density of metallic mercury. Now remembering the several billion individual data that you must have tucked away in your memory, the ability to spot the complex association of mercury—rapid business of recalling its appearance, physical and chemical properties, principal uses, plus a few dozen personal memories of your own associations with the stuff—from the tiny index-clue of 13.6 indicates that whatever punched-card filing system the brain uses, it's a dilly when it comes to cross-index markings.

But evidently that punched-card memory system uses something almost incredibly compact. Dr. Heinz von Foerster, in Vienna, has developed some beautiful work on the subject. Obviously, the limiting smallness of any "punched card" would be a "punched molecule". That, apparently, is what the brain uses. An individual protein molecule, knotted like a code-string, to record the desired data. Von Foerster's data goes further; he finds that the memory data are stored as quantized alterations of protein molecules, some 10^{21} in number. That the total energy required for maintenance of this punched-molecule memory file is about one one-hundredth of a watt, and that the energy involved in

THE WITCHES OF KARRES

BY JAMES H. SCHMITZ

***This** is true science fiction about three real witches who cast curses and perform magic. And it's a delightful little yarn!*

Illustrated by Rogers

I.

It was around the hub of the evening on the planet of Porlumma that Captain Pausert, commercial traveler from the Republic of Nikkeldepain, met the first of the witches of Karres.

It was just plain fate, so far as he could see.

He was feeling pretty good as he left a high-priced bar on a cobbly street near the spaceport, with the intention of returning straight to his ship. There hadn't been an argument, exactly. But someone grinned

broadly, as usual, when the captain pronounced the name of his native system; and the captain had pointed out then, with considerable wit, how much more ridiculous it was to call a planet Porlumma, for instance, than to call it Nikkeldepain.

He proceeded to collect a gradually increasing number of pained stares by a detailed comparison of the varied, interesting and occasionally brilliant role Nikkeldepain had played in history with Porlumma's obviously dull and dumpy status as a sixth-rate Empire outpost.

In conclusion, he admitted frankly that he wouldn't care to be found dead on Porlumma.

Somebody muttered loudly in Imperial Universum that in that case it might be better if he didn't hang around Porlumma too long. But the captain only smiled politely, paid for his two drinks and left.

There was no point in getting into a rhubarb on one of these border planets. Their citizens still had an innocent notion that they ought to act like frontiersmen—but then the Law always showed up at once.

He felt pretty good. Up to the last four months of his young life, he had never looked on himself as being particularly patriotic. But compared to most of the Empire's worlds, Nikkeldepain was downright attractive in its stuffy way. Besides, he was returning there solvent—would they ever be surprised!

And awaiting him, fondly and eagerly, was Illyla, the Miss Onswud, fair daughter of the mighty Councilor Onswud, and the captain's secretly affianced for almost a year. She alone had believed in him!

The captain smiled and checked at a dark cross-street to get his bearings on the spaceport beacon. Less than half a mile away— He set off again. In about six hours, he'd be beyond the Empire's space borders and headed straight for Illyla.

Yes, she alone had believed! After the prompt collapse of the captain's first commercial venture—a miffel-fur farm, largely on capital borrowed from Councilor Onswud—the future had looked very black. It had even included a probable ten-year stretch of penal servitude for "willful and negligent abuse of intrusted monies". The laws of Nikkeldepain were rough on debtors.

"But you've always been looking for someone to take out the old *Venture* and get her back into trade!" Illyla reminded her father tearfully.

"Hm-m-m, yes! But it's in the blood, my dear! His great-uncle Threbus went the same way! It would be far better to let the law take its course," Councilor Onswud said, glaring at Pausert who remained sulkily silent. He had *tried* to explain that the mysterious epidemic which suddenly wiped out most of the stock of miffels wasn't his fault. In fact, he more than suspected the tricky hand of young Councilor Rapport who had been wagging futilely around Illyla for the last couple of years!

"The *Venture*, now—!" Councilor Onswud mused, stroking his long,

craggy chin. "Pausert can handle a ship, at least," he admitted.

That was how it happened. Were they ever going to be surprised! For even the captain realized that Councilor Onswud was unloading all the dead fish that had gathered the dust of his warehouses for the past fifty years on him and the *Venture,* in a last, faint hope of getting *some* return on those half-forgotten investments. A value of eighty-two thousand maels was placed on the cargo; but if he'd brought even three-quarters of it back in cash, all would have been well.

Instead—well, it started with that lucky bet on a legal point with an Imperial Official at the Imperial capitol itself. Then came a six-hour race fairly won against a small, fast private yacht—the old *Venture 7333* had been a pirate-chaser in the last century and could still produce twice as much speed as her looks suggested. From there on, the captain was socially accepted as a sporting man and was in on a long string of jovial parties and meets.

Jovial and profitable—the wealthier Imperials just couldn't resist a gamble; and the penalty the captain always insisted on was that they had to buy!

He got rid of the stuff right and left! Inside of twelve weeks, nothing remained of the original cargo except two score bundles of expensively-built but useless tinklewood fishing poles and one dozen gross bales of useful but unattractive allweather cloaks. Even on a bet, nobody would take them! But the captain had a strong hunch those items had been hopefully added to the cargo from his own stocks by Councilor Rapport; so his failure to sell them didn't break his heart.

He was a neat twenty percent net ahead, at that point—

And finally came this last-minute rush-delivery of medical supplies to Porlumma on the return route. That haul alone would have repaid the miffel-farm losses three times over!

The captain grinned broadly into the darkness. Yes, they'd be surprised—but just where was he now?

He checked again in the narrow street, searching for the port-beacon in the sky. There it was—off to his left and a little behind him. He'd got turned around somehow!

He set off carefully down an excessively dark little alley. It was one of those towns where everybody locked their front doors at night and retired to lit-up, inclosed courtyards at the backs of the houses. There were voices and the rattling of dishes nearby, and occasional whoops of laughter and singing all around him; but it was all beyond high walls which let little or no light into the alley.

It ended abruptly in a cross-alley and another wall. After a moment's debate, the captain turned to his left again. Light spilled out on his new route a few hundred yards ahead, where a courtyard was opened on the alley. From it, as he approached, came the sound of doors being vio-

lently slammed, and then a sudden, loud mingling of voices.

"Yeeee-eep!" shrilled a high, childish voice. It could have been mortal agony, terror, or even hysterical laughter. The captain broke into an apprehensive trot.

"Yes, I see you up there!" a man shouted excitedly in Universum. "I caught you now—you get down from those boxes! I'll skin you alive! Fifty-two customers sick of the stomachache—YOW!"

The last exclamation was accompanied by a sound as of a small, loosely-built wooden house collapsing, and was followed by a succession of squeals and an angry bellowing, in which the only distinguishable words were: ". . . . threw the boxes on me!" Then more sounds of splintering wood.

"Hey!" yelled the captain indignantly from the corner of the alley.

All action ceased. The narrow courtyard, brightly illuminated under its single overhead bulb, was half covered with a tumbled litter of what appeared to be empty wooden boxes. Standing with his foot temporarily caught in one of them was a very large, fat man dressed all in white and waving a stick. Momentarily cornered between the wall and two of the boxes, over one of which she was trying to climb, was a smallish, fair-haired girl dressed in a smock of some kind, which was also white. She might be about fourteen, the captain thought—a helpless kid, anyway.

"What *you* want?" grunted the fat man, pointing the stick with some dignity at the captain.

"Lay off the kid!" rumbled the captain, edging into the courtyard.

"Mind your own business!" shouted the fat man, waving his stick like a club. "I'll take care of her! She—"

"I never did!" squealed the girl. She burst into tears.

"Try it, Fat and Ugly!" the captain warned. "I'll ram the stick down your throat!"

He was very close now. With a sound of grunting exasperation, the fat man pulled his foot free of the box, wheeled suddenly and brought the end of the stick down on the top of the captain's cap. The captain hit him furiously in the middle of the stomach.

There was a short flurry of activity, somewhat hampered by shattering boxes everywhere. Then the captain stood up, scowling and breathing hard. The fat man remained sitting on the ground, gasping about ". . . the law!"

Somewhat to his surprise, the captain discovered the girl standing just behind him. She caught his eye and smiled.

"My name's Maleen," she offered. She pointed at the fat man. "Is he hurt bad?"

"Huh—no!" panted the captain. "But maybe we'd better—"

It was too late! A loud, self-assured voice became audible now at the opening to the alley:

"Here, here, here, here, here!" it said in the reproachful, situation-

under-control tone that always seemed the same to the captain, on whatever world and in whichever language he heard it.

"What's all this about?" it inquired rhetorically.

"You'll all have to come along!" it replied.

Police Court on Porlumma appeared to be a business conducted on a very efficient, around-the-clock basis. They were the next case up.

Nikkeldepain was an odd name, wasn't it, the judge smiled. He then listened attentively to the various charges, countercharges, and denials.

Bruth the Baker was charged with having struck a citizen of a foreign government on the head with a potentially lethal instrument—produced in evidence. Said citizen had admittedly attempted to interfere as Bruth was attempting to punish his slave Maleen—also produced in evidence—whom he suspected of having added something to a batch of cakes she was working on that afternoon, resulting in illness and complaints from fifty-two of Bruth's customers.

Said foreign citizen had also used insulting language—the captain admitted under pressure to "Fat and Ugly."

Some provocation could be conceded for the action taken by Bruth, but not enough. Bruth paled.

Captain Pausert, of the Republic of Nikkeldepain—everybody but the prisoners smiled this time—was charged (a) with said attempted interference, (b) with said insult, (c) with having frequently and severely struck Bruth the Baker in the course of the subsequent dispute.

The blow on the head was conceded to have provided a provocation for charge (c)—but not enough.

Nobody seemed to be charging the slave Maleen with anything. The judge only looked at her curiously, and shook his head.

"As the Court considers this regrettable incident," he remarked, "it looks like two years for you, Bruth; and about three for you, captain. Too bad!"

The captain had an awful sinking feeling. He had seen something and heard a lot of Imperial court methods in the fringe systems. He could probably get out of this three-year rap; but it would be expensive.

He realized that the judge was studying him reflectively.

"The Court wishes to acknowledge," the judge continued, "that the captain's chargeable actions were due largely to a natural feeling of human sympathy for the predicament of the slave Maleen. The Court, therefore, would suggest a settlement as follows—subsequent to which all charges could be dropped:

"That Bruth the Baker resell Maleen of Karres—with whose services he appears to be dissatisfied—for a reasonable sum to Captain Pausert of the Republic of Nikkeldepain."

Bruth the Baker heaved a gusty sigh of relief. But the captain hesitated. The buying of human slaves by private citizens was a very seri-

ous offense in Nikkeldepain! Still, he didn't have to make a record of it. If they weren't going to soak him too much—

At just the right moment, Maleen of Karres introduced a barely audible, forlorn, sniffling sound.

"How much are you asking for the kid?" the captain inquired, looking without friendliness at his recent antagonist. A day was coming when he would think less severely of Bruth; but it hadn't come yet.

Bruth scowled back but replied with a certain eagerness: "A hundred and fifty m—" A policeman standing behind him poked him sharply in the side. Bruth shut up.

"Seven hundred maels," the judge said smoothly. "There'll be Court charges, and a fee for recording the transaction—" He appeared to make a swift calculations. "Fifteen hundred and forty-two maels—" He turned to a clerk: "You've looked him up?"

The clerk nodded. "He's right!"

"And we'll take your check," the judge concluded. He gave the captain a friendly smile. "Next case."

The captain felt a little bewildered.

There was something peculiar about this! He was getting out of it much too cheaply. Since the Empire had quit its wars of expansion, young slaves in good health were a high-priced article. Furthermore, he was practically positive that Bruth the Baker had been willing to sell for a tenth of what the captain actually had to pay!

Well, he wouldn't complain. Rapidly, he signed, sealed and thumbprinted various papers shoved at him by a helpful clerk; and made out a check.

"I guess," he told Maleen of Karres, "we'd better get along to the ship."

And now what was he going to do with the kid, he pondered, padding along the unlighted streets with his slave trotting quietly behind him. If he showed up with a pretty girl-slave in Nikkeldepain, even a small one, various good friends there would toss him into ten years or so of penal servitude—immediately after Illyla had personally collected his scalp. They were a moral lot.

Karres—?

"How far off is Karres, Maleen?" he asked into the dark.

"It takes about two weeks," Maleen said tearfully.

Two weeks! The captain's heart sank again.

"What are you blubbering about?" he inquired uncomfortably.

Maleen choked, sniffed, and began sobbing openly.

"I have two little sisters!" she cried.

"Well, well," the captain said encouragingly. "That's nice—you'll be seeing them again soon. I'm taking you home, you know!"

Great Patham—now he'd said it! But after all—

But this piece of good news seemed to be having the wrong ef-

fect on his slave! Her sobbing grew much more violent.

"No, I won't," she wailed. "They're here!"

"Huh?" said the captain. He stopped short. "Where?"

"And the people they're with are mean to them, too!" wept Maleen.

The captain's heart dropped clean through his boots. Standing there in the dark, he helplessly watched it coming:

"You could buy them awfully cheap!" she said.

II.

In times of stress, the young life of Karres appeared to take to the heights. It might be a mountainous place.

The Leewit sat on the top shelf of the back wall of the crockery and antiques store, strategically flanked by two expensive-looking vases. She was a doll-sized edition of Maleen; but her eyes were cold and gray instead of blue and tearful. About five or six, the captain vaguely estimated. He wasn't very good at estimating them around that age.

"Good evening," he said, as he came in through the door. The Crockery and Antiques Shop had been easy to find. Like Bruth the Baker's, it was the one spot in the neighborhood that was all lit up.

"Good evening, sir!" said what was presumably the store owner, without looking around. He sat with his back to the door, in a chair approximately at the center of the store and facing the Leewit at a distance of about twenty feet.

". . . and there you can stay without food or drink till the Holy Man comes in the morning!" he continued immediately, in the taut voice of a man who has gone through hysteria and is sane again. The captain realized he was addressing the Leewit.

"Your other Holy Man didn't stay very long!" the diminutive creature piped, also ignoring the captain. Apparently, she had not yet discovered Maleen behind him.

"This is a stronger denomination—much stronger!" the store owner replied, in a shaking voice but with a sort of relish. *"He'll* exorcise you, all right, little demon—you'll whistle no buttons off him! Your time is up! Go on and whistle all you want! Bust every vase in the place—"

The Leewit blinked her gray eyes thoughtfully at him.

"Might!" she said.

"But if you try to climb down from there," the store owner went on, on a rising note, "I'll chop you into bits—into little, little bits!"

He raised his arm as he spoke and weakly brandished what the captain recognized with a start of horror as a highly ornamented but probably still useful antique battle-ax.

"Ha!" said the Leewit.

"Beg your pardon, sir!" the captain said, clearing his throat.

"Good evening, sir!" the store owner repeated, without looking around. "What can I do for you?"

"I came to inquire," the captain said hesitantly, "about that child."

The store owner shifted about in his chair and squinted at the captain with red-rimmed eyes.

"You're not a Holy Man!" he said.

"Hello, Maleen!" the Leewit said suddenly. "That him?"

"We've come to buy you," Maleen said. "Shut up!"

"Good!" said the Leewit.

"Buy it? Are you mocking me, sir?" the store owner inquired.

"Shut up, Moonell!" A thin, dark, determined-looking woman had appeared in the doorway that led through the back wall of the store. She moved out a step under the shelves; and the Leewit leaned down from the top shelf and hissed. The woman moved hurriedly back into the doorway.

"Maybe he means it," she said in a more subdued voice.

"I can't sell to a citizen of the Empire," the store owner said defeatedly.

"I'm not a citizen," the captain said shortly. This time, he wasn't going to name it.

"No, he's from Nikkel—" Maleen began.

"Shut up, Maleen!" the captain said helplessly in turn.

"I never heard of Nikkel," the store owner muttered doubtfully.

"Maleen!" the woman called shrilly. "That's the name of one of the others—Bruth the Baker got her. He means it, all right! He's buying them—"

"A hundred and fifty maels!" the captain said craftily, remembering Bruth the Baker. "In cash!"

The store owner looked dazed.

"Not enough, Moonell!" the woman called. "Look at all it's broken! Five hundred maels!"

There was a sound then, so thin the captain could hardly hear it. It pierced at his eardrums like two jabs of a delicate needle. To right and left of him, two highly glazed little jugs went *"Clink-clink!"*, showed a sudden veining of cracks, and collapsed.

A brief silence settled on the store. And now that he looked around more closely, the captain could spot here and there other little piles of shattered crockery—and places where similar ruins apparently had been swept up, leaving only traces of colored dust.

The store owner laid the ax down carefully beside his chair, stood up, swaying a little, and came towards the captain.

"You offered me a hundred and fifty maels!" he said rapidly as he approached. "I accept it here, now, see—before witnesses!" He grabbed the captain's right hand in both of his and pumped it up and down vigorously. "Sold!" he yelled.

Then he wheeled around in a leap and pointed a shaking hand at the Leewit.

"And NOW," he howled, "break something! Break anything! You're his! I'll sue him for every mael he ever made and ever will!"

"Oh, do come help me down, Maleen!" the Leewit pleaded prettily.

For a change, the store of Wansing, the jeweler, was dimly lit and very quiet. It was a sleak, fashionable place in a fashionable shopping block near the spaceport. The front door was unlocked, and Wansing was in.

The three of them entered quietly, and the door sighed quietly shut behind them. Beyond a great crystal display-counter, Wansing was moving about among a number of opened shelves, talking softly to himself. Under the crystal of the counter, and in close-packed rows on the satin-covered shelves, reposed a many-colored gleaming and glittering and shining. Wansing was no piker.

"Good evening, sir!" the captain said across the counter.

"It's morning!" the Leewit remarked from the other side of Maleen.

"Maleen!" said the captain.

"We're keeping out of this," Maleen said to the Leewit.

"All right," said the Leewit.

Wansing had come around jerkily at the captain's greeting, but had made no other move. Like all the slave owners the captain had met on Porlumma so far, Wansing seemed unhappy. Otherwise, he was a large, dark, sleek-looking man with jewels in his ears and a smell of expensive oils and perfumes about him.

"This place is under constant visual guard, of course!" he told the captain gently. "Nothing could possibly happen to me here. Why am I so frightened?"

"Not of me, I'm sure!" the captain said with an uncomfortable attempt at geniality. "I'm glad your store's still open," he went on briskly. "I'm here on business—"

"Oh, yes, it's still open, of course," Wansing said. He gave the captain a slow smile and turned back to his shelves. "I'm making inventory, that's why! I've been making inventory since early yesterday morning. I've counted them all seven times—"

"You're very thorough," the captain said.

"Very, very thorough!" Wansing nodded to the shelves. "The last time I found I had made a million maels. But twice before that, I had lost approximately the same amount. I shall have to count them again, I suppose!" He closed a shelf softly. "I'm sure I counted those before. But they move about constantly. Constantly! It's horrible."

"You've got a slave here called Goth," the captain said, driving to the point.

"Yes, I have!" Wansing said, nodding. "And I'm sure she understands by now I meant no harm! I do, at any rate. It was perhaps a little—but I'm sure she understands now, or will soon!"

"Where is she?" the captain inquired, a trifle uneasily.

"In her room perhaps," Wansing suggested. "It's not so bad when she's there in her room with the door closed. But often she sits in the dark and looks at you as you go past—" He opened another drawer, and closed it quietly again. "Yes, they do move!" he whispered, as if confirming an earlier suspicion. "Constantly—"

"Look, Wansing," the captain said in a loud, firm voice. "I'm not a citizen of the Empire. I want to buy this Goth! I'll pay you a hundred and fifty maels, cash."

Wansing turned around completely again and looked at the captain. "Oh, you do?" he said. "You're not a citizen?" He walked a few steps to the side of the counter, sat down at a small desk and turned a light on over it. Then he put his face in his hands for a moment.

"I'm a wealthy man," he muttered. "An influential man! The name of Wansing counts for a great deal on Porlumma. When the Empire suggests you buy, you buy, of course—but it need not have been I who bought her! I thought she would be useful in the business—and then, even I could not sell her again within the Empire. She has been here for a week!"

He looked up at the captain and smiled. "One hundred and fifty maels!" he said. "Sold! There are records to be made out—" He reached into a drawer and took out some printed forms. He began to write rapidly. The captain produced identifications.

Maleen said suddenly: "Goth?"

"Right here," a voice murmured. Wansing's hand jerked sharply, but he did not look up. He kept on writing.

Something small and lean and bonelessly supple, dressed in a dark jacket and leggings, came across the thick carpets of Wansing's store and stood behind the captain. This one might be about nine or ten.

"I'll take your check, captain!" Wansing said politely. "You must be an honest man. Besides, I want to frame it."

"And now," the captain heard himself say in the remote voice of one who moves through a strange dream, "I suppose we could go to the ship."

The sky was gray and cloudy; and the streets were lightening. Goth, he noticed, didn't resemble her sisters. She had brown hair cut short a few inches below her ears, and brown eyes with long, black lashes. Her nose was short and her chin was pointed. She made him think of some thin, carnivorous creature, like a weasel.

She looked up at him briefly, grinned, and said: "Thanks!"

"What was wrong with *him?*" chirped the Leewit, walking backwards for a last view of Wansing's store.

"Tough crook," muttered Goth. The Leewit giggled.

"You premoted this just dandy, Maleen!" she stated next.

"Shut up," said Maleen.

"All right," said the Leewit. She glanced up at the captain's face. "You been fighting!" she said virtuously. "Did you win?"

"Of course, the captain won!" said Maleen.

"Good for you!" said the Leewit.

"What about the take-off?" Goth asked the captain. She seemed a little worried.

"Nothing to it!" the captain said stoutly, hardly bothering to wonder how she'd guessed the take-off was the one operation on which he and the old *Venture* consistently failed to co-operate.

"No," said Goth, "I meant, when?"

"Right now," said the captain. "They've already cleared us. We'll get the sign any second."

"Good," said Goth. She walked off slowly down the hall towards the back of the ship.

The take-off was pretty bad, but the *Venture* made it again. Half an hour later, with Porlumma dwindling safely behind them, the captain switched to automatic and climbed out of his chair. After considerable experimentation, he got the electric butler adjusted to four breakfasts, hot, with coffee. It was accomplished with a great deal of advice and attempted assistance from the Leewit, rather less from Maleen, and no comments from Goth.

"Everything will be coming along in a few minutes now!" he announced. Afterwards, it struck him there had been a quality of grisly prophecy about the statement.

"If you'd listened to me," said the Leewit, "we'd have been done eating a quarter of an hour ago!" She

was perspiring but triumphant—she had been right all along.

"Say, Maleen," she said suddenly, "you premoting again?"

Premoting? The captain looked at Maleen. She seemed pale and troubled.

"Spacesick?" he suggested. "I've got some pills—"

"No, she's premoting," the Leewit said scowling. "What's up, Maleen?"

"Shut up," said Goth.

"All right," said the Leewit. She was silent a moment, and then began to wriggle. "Maybe we'd better—"

"Shut up," said Maleen.

"It's all ready," said Goth.

"What's all ready?" asked the captain.

"All right," said the Leewit. She looked at the captain. "Nothing," she said.

He looked at them then, and they looked at him—one set each of gray eyes, and brown, and blue. They were all sitting around the control room floor in a circle, the fifth side of which was occupied by the electric butler.

What peculiar little waifs, the captain thought. He hadn't perhaps really realized until now just how *very* peculiar. They were still staring at him.

"Well, well!" he said heartily. "So Maleen 'premotes' and gives people stomach-aches."

Maleen smiled dimly and smoothed back her yellow hair.

"They just thought they were getting them," she murmured.

"Mass history," explained the Leewit, offhandedly.

"Hysteria," said Goth. "The Imperials get their hair up about us every so often."

"I noticed that," the captain nodded. "And little Leewit here—she whistles and busts things."

"It's *the* Leewit," the Leewit said, frowning.

"Oh, I see," said the captain. "Like *the* captain, eh?"

"That's right," said the Leewit. She smiled.

"And what does little Goth do?" the captain addressed the third witch.

Little Goth appeared pained. Maleen answered for her.

"Goth teleports mostly," she said.

"Oh, she does?" said the captain. "I've heard about that trick, too," he added lamely.

"Just small stuff really!" Goth said abruptly. She reached into the top of her jacket and pulled out a cloth-wrapped bundle the size of the captain's two fists. The four ends of the cloth were knotted together. Goth undid the knot. "Like this," she said and poured out the contents on the rug between them. There was a sound like a big bagful of marbles being spilled.

"Great Patham!" the captain swore, staring down at what was a cool quarter-million in jewel stones, or he was still a miffel-farmer.

"Good gosh," said the Leewit, bouncing to her feet. "Maleen, we better get at it right away!"

The two blondes darted from the

room. The captain hardly noticed their going. He was staring at Goth.

"Child," he said, "don't you realize they hang you without trial on places like Porlumma, if you're caught with stolen goods?"

"We're not on Porlumma," said Goth. She looked slightly annoyed. "They're for you. You spent money on us, didn't you?"

"Not that kind of money," said the captain. "If Wansing noticed —They're Wansing's, I suppose?"

"Sure!" said Goth. "Pulled them in just before take-off!"

"If he reported, there'll be police ships on our tail any—"

"Goth!" Maleen shrilled.

Goth's head came around and she rolled up on her feet in one motion. "Coming," she shouted. "Excuse me," she murmured to the captain. Then she, too, was out of the room.

But again, the captain scarcely noticed her departure. He had rushed to the control desk with a sudden awful certainty and switched on all screens.

There they were! Two sleek, black ships coming up fast from behind, and already almost in gun-range! They weren't regular police boats, the captain recognized, but auxiliary craft of the Empire's frontier fleets. He rammed the *Venture's* drives full on. Immediately, red-and-black fire blossoms began to sprout in space behind him—then a finger of flame stabbed briefly past, not a hundred yards to the right of the ship.

But the communicator stayed dead. Porlumma preferred risking the sacrifice of Wansing's jewels to giving them a chance to surrender! To do the captain justice, his horror was due much more to the fate awaiting his three misguided charges than to the fact that he was going to share it.

He was putting the *Venture* through a wildly erratic and, he hoped, aim-destroying series of sideways hops and forward lunges with one hand, and trying to unlimber the turrets of the nova guns with the other, when suddenly—!

No, he decided at once, there was no use trying to understand it—There were just no more Empire ships around. The screens all blurred and darkened simultaneously; and, for a short while, a darkness went flowing and coiling lazily past the *Venture*. Light jumped out of it at him once, in a cold, ugly glare, and receded again in a twisting, unnatural fashion. The *Venture's* drives seemed dead.

Then, just as suddenly, the old ship jerked, shivered, roared aggrievedly, and was hurling herself along on her own power again!

But Porlumma's sun was no longer in evidence. Stars gleamed and shifted distantly against the blackness of deep space all about. The patterns seemed familiar, but he wasn't a good enough navigator to be sure.

The captain stood up stiffly, feel-

ing heavy and cold. And at that moment, with a wild, hilarious clacking like a metallic hen, the electric butler delivered four breakfasts, hot, one after the other, right onto the center of the control room floor.

The first voice said distinctly: "Shall we just leave it on?"

A second voice, considerably more muffled, replied: "Yes, let's! You never know when you need it—"

The third voice, tucked somewhere in between them, said simply: *"Whew!"*

Peering about the dark room in bewilderment, the captain realized suddenly that the voices had come from the speaker of an intership communicator, leading to what had once been the *Venture's* captain's cabin.

He listened; but only a dim murmuring came from it now, and then nothing at all. He started towards the hall, then returned and softly switched off the communicator. He went quietly down the hall until he came to the captain's cabin. Its door was closed.

He listened a moment, and opened it suddenly.

There was a trio of squeals:

"Oh, don't! You spoiled it!"

The captain stood motionless. Just one glimpse had been given him of what seemed to be a bundle of twisted black wires arranged loosely like the frame of a truncated cone on —or was it just above?—a table in the center of the cabin. Where the tip of the cone should have been burned a round, swirling, orange fire. About it, their faces reflecting its glow, stood the three witches.

Then the fire vanished; the wires collapsed. There was only ordinary light in the room. They were looking up at him variously—Maleen with smiling regret, the Leewit in frank annoyance, Goth with no expression at all.

"What out of Great Patham's Seventh Hell was that?" inquired the captain, his hair bristling slowly.

The Leewit looked at Goth; Goth looked at Maleen. Maleen said doubtfully: "We can just tell you its name—"

"That was the Sheewash Drive," said Goth.

"The what-drive?" asked the captain.

"Sheewash," repeated Maleen.

"The one you have to do it with yourself," the Leewit said helpfully.

"Shut up," said Maleen.

There was a long pause. The captain looked down at the handful of thin, black, twelve-inch wires scattered about the table top. He touched one of them. It was dead-cold.

"I see," he said. "I guess we're all going to have a long talk." Another pause. "Where are we now?"

"About three light-years down the way you were going," said Goth. "We only worked it thirty seconds."

"Twenty-eight!" corrected Maleen, with the authority of her years. "The Leewit was getting tired."

"I see," said Captain Pausert

carefully. "Well, let's go have some breakfast."

III.

They ate with a silent voraciousness, dainty Maleen, the exquisite Leewit, supple Goth, all alike. The captain, long finished, watched them with amazement and—now at last—with something like awe.

"It's the Sheewash Drive," explained Maleen finally, catching his expression.

"Takes it out of you!" said Goth.

The Leewit grunted affirmatively and stuffed on.

"Can't do too much of it," said Maleen. "Or too often. It kills you sure!"

"What," said the captain, "*is* the Sheewash Drive?"

They became reticent. People did it on Karres, said Maleen, when they had to go somewhere else fast. Everybody knew how there.

"But of course," she added, "we're pretty young to do it right!"

"We did it pretty good!" the Leewit contradicted positively. She seemed to be finished at last.

"But how?" said the captain.

Reticence thickened almost visibly. If you couldn't do it, said Maleen, you couldn't understand it either.

He gave it up, for the time being.

"I guess I'll have to take you home next," he said; and they agreed.

Karres, it developed, was in the Iverdahl System. He couldn't find any planet of that designation listed in his maps of the area, but that meant nothing. The maps were old and often inaccurate, and local names changed a lot.

Barring the use of weird and deadly miracle-drives, that detour was going to cost him almost a month in time—and a good chunk of his profits in power used up. The jewels Goth had illegally teleported must, of course, be returned to their owner, he explained. He'd intended to look severely at the culprit at that point; but she'd meant well, after all! They were extremely peculiar children, but still children—they couldn't really understand.

He would stop off en route to Karres at an Empire planet with banking facilities to take care of that matter, the captain added. A planet far enough off so the police wouldn't be likely to take any particular interest in the *Venture*.

A dead silence greeted this schedule. It appeared that the representatives of Karres did not think much of his logic.

"Well," Maleen sighed at last, "we'll see you get your money back some other way then!"

The junior witches nodded coldly.

"How did you three happen to get into this fix?" the captain inquired, with the intention of changing the subject.

They'd left Karres together on a jaunt of their own, they explained. No, they hadn't run away—he got the impression that such trips were standard procedure for juveniles in that place. They were on another planet, a civilized one but beyond the

borders and law of Empire, when the town they were in was raided by a small fleet of slavers. They were taken along with most of the local youngsters.

"It's a wonder," the captain said reflectively, "you didn't take over the ship."

"Oh, brother!" exclaimed the Leewit.

"Not that ship!" said Goth.

"That was an Imperial Slaver!" Maleen informed him. "You behave yourself every second on those crates."

Just the same, the captain thought as he settled himself to rest in the control room on a couch he had set up there, it was no longer surprising that the Empire wanted no young slaves from Karres to be transported into the interior! Oddest sort of children— But he ought to be able to get his expenses paid by their relatives. Something very profitable might even be made of this deal—

Have to watch the record-entries though! Nikkeldepain's laws were explicit about the penalties invoked by anything resembling the purchase and sale of slaves.

He'd thoughtfully left the intership communicator adjusted so he could listen in on their conversation in the captain's cabin. However, there had been nothing for some time beyond frequent bursts of childish giggling. Then came a succession of piercing shrieks from the Leewit. It appeared she was being forcibly washed behind the ears by Maleen and obliged to brush her teeth, in preparation for bedtime.

It had been agreed that he was not to enter the cabin, because—for reasons not given—they couldn't keep the Sheewash Drive on in his presence; and they wanted to have it ready, in case of an emergency. Piracy was rife beyond the Imperial borders, and the *Venture* would keep beyond the border for a good part of the trip, to avoid the more pressing danger of police pursuit instigated by Porlumma. The captain had explained the potentialities of the nova guns the *Venture* boasted, or tried to. Possibly, they hadn't understood. At any rate, they seemed unimpressed.

The Sheewash Drive! Boy, he thought in sudden excitement, if he could just get the principles of that. Maybe he would!

He raised his head suddenly. The Leewit's voice had lifted clearly over the communicator:

". . . . not such a bad old dope!" the childish treble remarked.

The captain blinked indignantly.

"He's not so old," Maleen's soft voice returned. "And he's certainly no dope!"

He smiled. Good kid, Maleen.

"Yeah, yeah!" squeaked the Leewit offensively. "Maleen's sweet onthu-ulp!"

A vague commotion continued for a while, indicating, he hoped, that someone he could mention was being smothered under a pillow.

He drifted off to sleep before it was settled.

If you didn't happen to be thinking of what they'd done, they seemed more or less like normal children. Right from the start, they displayed a flattering interest in the captain and his background; and he told them all about everything and everybody in Nikkeldepain. Finally, he even showed them his treasured pocket-sized picture of Illyla—the one with which he'd held many cozy conversations during the earlier part of his trip.

Almost at once, though, he realized that was a mistake. They studied it intently in silence, their heads crowded close together.

"Oh, brother!" the Leewit whispered then, with entirely the wrong kind of inflection.

"Just what did you mean by that?" the captain inquired coldly.

"Sweet!" murmured Goth. But it was the way she closed her eyes briefly, as though gripped by a light spasm of nausea.

"Shut up, Goth!" Maleen said sharply. "I think she's very swee . . . I mean, she looks very nice!" she told the captain.

The captain was disgruntled. Silently, he retrieved the maligned Illyla and returned her to his breast pocket. Silently, he went off and left them standing there.

But afterwards, in private, he took it out again and studied it worriedly. His Illyla! He shifted the picture back and forth under the light. It wasn't really a very good picture of her, he decided. It had been bungled! From certain angles, one might even say that Illyla did look the least bit insipid.

What was he thinking, he thought, shocked.

He unlimbered the nova gun turrets next and got in a little firing practice. They had been sealed when he took over the *Venture* and weren't supposed to be used, except in absolute emergencies. They were somewhat uncertain weapons, though very effective, and Nikkeldepain had turned to safer forms of armament many decades ago. But on the third day out from Nikkeldepain, the captain made a brief notation in his log:

"Attacked by two pirate craft. Unsealed nova guns. Destroyed one attacker; survivor fled—"

He was rather pleased by that crisp, hard-bitten description of desperate space-adventure, and enjoyed rereading it occasionally. It wasn't true, though. He had put in an interesting four hours at the time pursuing and annihilating large, craggy chunks of substance of a meteorite-cloud he found the *Venture* plowing through. Those nova guns were fascinating stuff! You'd sight the turrets on something; and so long as it didn't move after that, it was all right. If it did move, it got it—unless you relented and deflected the turrets first. They were just the thing for arresting a pirate in midspace.

The *Venture* dipped back into the Empire's borders four days later and headed for the capitol of the local province. Police ships challenged

them twice on the way in; and the captain found considerable comfort in the awareness that his passengers foregathered silently in their cabin on these occasions. They didn't tell him they were set to use the Sheewash Drive—somehow it had never been mentioned since that first day; but he knew the queer orange fire was circling over its skimpy framework of twisted wires there and ready to act.

However, the space police waved him on, satisfied with routine identification. Apparently, the *Venture* had not become generally known as a criminal ship, to date.

Maleen accompanied him to the banking institution that was to return Wansing's property to Porlumma. Her sisters, at the captain's definite request, remained on the ship.

The transaction itself went off without a visible hitch. The jewels would reach their destination in Porlumma within a month. But he had to take out a staggering sum in insurance—"Piracy, thieves!" smiled the clerk. "Even summary capital punishment won't keep the rats down." And, of course, he had to register name, ship, home planet, and so on. But since they already had all that information in Porlumma, he gave it without hesitation.

On the way back to the spaceport, he sent off a sealed message by radio-relay to the bereaved jeweler, informing him of the action taken, and regretting the misunderstanding.

He felt a little better after that, though the insurance payment had been a severe blow! If he didn't manage to work out a decent profit on Karres somehow, the losses on the miffel farm would hardly be covered now.

Then he noticed that Maleen was getting uneasy.

"We'd better hurry!" was all she would say, however. Her face grew pale.

The captain understood. She was having another premonition! The hitch to this premoting business was, apparently, that when something was brewing you were informed of the bare fact but had to guess at most of the details. They grabbed an air-cab and raced back to the spaceport.

They had just been cleared there when he spotted a small group of uniformed men coming along the dock on the double. They stopped short and then scattered, as the *Venture* lurched drunkenly sideways into the air. Everyone else in sight was scattering, too.

That was a very bad take-off—one of the captain's worst! Once afloat, however, he ran the ship promptly

into the nightside of the planet and turned her nose towards the border. The old pirate-chaser had plenty of speed when you gave her the reins; and throughout the entire next sleep-period, he let her use it all.

The Sheewash Drive was not required that time.

Next day, he had a lengthy private talk with Goth on the Golden Rule and the Law, with particular reference to individual property rights. If Councilor Onswud had been monitoring the sentiments expressed by the captain, he could not have failed to rumble surprised approval. The delinquent herself listened impassively; but the captain fancied she showed distinct signs of being rather impressed by his earnestness.

It was two days after that—well beyond the borders again—when they were obliged to make an unscheduled stop at a mining moon. For the captain discovered he had badly miscalculated the extent to which the prolonged run on overdrive after leaving the capitol was going to deplete the *Venture's* reserves. They would have to juice up—

A large, extremely handsome Sirian freighter lay beside them at the Moon station. It was half a battlecraft really, since it dealt regularly beyond the borders. They had to wait while it was being serviced; and it took a long time. The Sirians turned out to be as unpleasant as their ship was good-looking—a snooty, conceited, hairy lot who talked only their own dialect and pretended to be unfamiliar with Imperial Universum.

The captain found himself getting irked by their bad manners—particularly when he discovered they were laughing over his argument with the service superintendent about the cost of repowering the *Venture.*

"You're out in deep space, captain!" said the superintendent. "And you haven't juice enough left even to travel back to the Border. You can't expect Imperial prices here!"

"It's not what you charged *them!*" The captain angrily jerked his thumb at the Sirian.

"Regular customers!" the superintendent shrugged. "You start coming by here every three months like they do, and we can make an arrangement with you, too."

It was outrageous—it actually put the *Venture* back in the red! But there was no help for it.

Nor did it improve the captain's temper when he muffed the take-off once more—and then had to watch the Sirian floating into space, as sedately as a swan, a little behind him!

An hour later, as he sat glumly before the controls, debating the chance of recouping his losses before returning to Nikkeldepain, Maleen and the Leewit hurriedly entered the room. They did something to a port screen.

"They sure are!" the Leewit exclaimed. She seemed childishly pleased.

"Are what?" the captain inquired

absently.

"Following us," said Maleen. She did not sound pleased. "It's that Sirian ship, Captain Pausert—"

The captain stared bewilderedly at the screen. There *was* a ship in focus there. It was quite obviously the Sirian and, just as obviously, it was following them.

"What do they want?" he wondered. "They're stinkers but they're not pirates. Even if they were, they wouldn't spend an hour running after a crate like the *Venture!*"

Maleen said nothing. The Leewit observed: "Oh, brother! Got their bow-turrets out now—better get those nova guns ready!"

"But it's all nonsense!" the captain said, flushing angrily. He turned suddenly towards the communicators. "What's that Empire general beam-length?"

".0044," said Maleen.

A roaring, abusive voice flooded the control room immediately. The one word understandable to the captain was *"Venture."* It was repeated frequently, sometimes as if it were a question.

"Sirian!" said the captain. "Can you understand them?" he asked Maleen.

She shook her head. "The Leewit can—"

The Leewit nodded, her gray eyes glistening.

"What are they saying?"

"They says you're for stopping," the Leewit translated rapidly, but apparently retaining much of the original sentence-structure. "They says you're for skinning alive . . . ha! They says you're for stopping right now and for only hanging. They says—"

Maleen scuttled from the control room. The Leewit banged the communicator with one small fist.

"Beak-Wock!" she shrilled. It sounded like that, anyway. The loud voice paused a moment.

"Beak-Wock?" it returned in an aggrieved, demanding roar.

"Beak-Wock!" the Leewit affirmed with apparent delight. She rattled off a string of similar-sounding syllables. She paused.

A howl of inarticulate wrath responded.

The captain, in a whirl of outraged emotions, was yelling at the Leewit to shut up, at the Sirian to go to Great Patham's Second Hell—the worst—and wrestling with the nova gun adjustors at the same time. He'd had about enough! He'd—

SSS-whoosh!

It was the Sheewash Drive.

"And where are we now?" the captain inquired, in a voice of unnatural calm.

"Same place, just about," said the Leewit. "Ship's still on the screen. Way back though—take them an hour again to catch up." She seemed disappointed; then brightened. "You got lots of time to get the guns ready!"

The captain didn't answer. He was marching down the hall towards the rear of the *Venture*. He passed the captain's cabin and noted the

door was shut. He went on without pausing. He was mad clean through—he knew what had happened!

After all he'd told her, Goth had teleported again.

It was all there, in the storage. Items of half a pound in weight seemed to be as much as she could handle. But amazing quantities of stuff had met that one requirement—bottles filled with what might be perfume or liquor or dope, expensive-looking garments and cloths in a shining variety of colors, small boxes, odds, ends and, of course, jewelry!

He spent half an hour getting it loaded into a steel space crate. He wheeled the crate into the rear lock, sealed the inside lock and pulled the switch that activated the automatic launching device.

The outside lock clicked shut. He stalked back to the control room. The Leewit was still in charge, fiddling with the communicators.

"I could try a whistle over them," she suggested, glancing up. She added: "But they'd bust somewheres, sure."

"Get them on again!" the captain said.

"Yes, sir," said the Leewit surprised.

The roaring voice came back faintly.

"SHUT UP!" the captain shouted in Imperial Universum.

The voice shut up.

"Tell them they can pick up their stuff—it's been dumped out in a crate!" the captain told the Leewit. "Tell them I'm proceeding on my course. Tell them if they follow me one light-minute beyond that crate, I'll come back for them, shoot their front end off, shoot their rear end off, and ram 'em in the middle."

"Yes, SIR!" the Leewit sparkled. They proceeded on their course.

Nobody followed.

"Now I want to speak to Goth," the captain announced. He was still at a high boil. "Privately," he added. "Back in the storage—"

Goth followed him expressionlessly into the storage. He closed the door to the hall. He'd broken off a two-foot length from the tip of one of Councilor Rapport's overpriced tinklewood fishing poles. It made a fair switch.

But Goth looked terribly small just now! He cleared his throat. He wished for a moment he were back on Nikkeldepain.

"I warned you," he said.

Goth didn't move. Between one second and the next, however, she seemed to grow remarkably. Her brown eyes focused on the captain's Adam's apple; her lip lifted at one side. A slightly hungry look came into her face.

"Wouldn't try that!" she murmured.

Mad again, the captain reached out quickly and got a handful of leathery cloth. There was a blur of motion, and what felt like a small explosion against his left kneecap. He grunted with anguished surprise and fell back on a bale of Councilor

Rapport's all-weather cloaks. But he had retained his grip—Goth fell half on top of him, and that was still a favorable position. Then her head snaked around, her neck seemed to extend itself; and her teeth snapped his wrist.

Weasels don't let go—

"Didn't think he'd have the nerve!" Goth's voice came over the communicator. There was a note of grudging admiration in it. It seemed that she was inspecting her bruises.

All tangled up in the job of bandaging his freely bleeding wrist, the captain hoped she'd find a good plenty to count. His knee felt the size of a sofa pillow and throbbed like a piston engine.

"The captain is a brave man," Maleen was saying reproachfully. "You should have known better—"

"He's not very *smart,* though!" the Leewit remarked suggestively.

There was a short silence.

"Is he? Goth? Eh?" the Leewit urged.

"Perhaps not very," said Goth.

"You two lay off him!" Maleen ordered. "Unless," she added meaningly, "you want to *swim* back to Karres—on the Egger Route!"

"Not me," the Leewit said briefly.

"You could still do it, I guess," said Goth. She seemed to be reflecting. "All right—we'll lay off him. It was a fair fight, anyway."

IV.

They raised Karres the sixteenth day after leaving Porlumma. There had been no more incidents; but then, neither had there been any more stops or other contacts with the defenseless Empire. Maleen had cooked up a poultice which did wonders for his knee. With the end of the trip in sight, all tensions had relaxed; and Maleen, at least, seemed to grow hourly more regretful at the prospect of parting.

After a brief study, Karres could be distinguished easily enough by the fact that it moved counterclockwise to all the other planets of the Iverdahl System.

Well, it would, the captain thought.

They came soaring into its atmosphere on the dayside without arousing any visible interest. No communicator signals reached them; and no other ships showed up to look them over. Karres, in fact, had all the appearance of a completely uninhabited world. There were a larger number of seas, too big to be called Lakes and too small to be oceans, scattered over its surface. There was one enormously towering ridge of mountains that ran from pole to pole, and any number of lesser chains. There were two good-sized ice caps; and the southern section of the planet was speckled with intermittent stretches of snow. Almost all of it seemed to be dense forest.

It was a handsome place, in a wild, somber way.

They went gliding over it, from noon through morning and into the dawn fringe—the captain at the con-

trols, Goth and the Leewit flanking him at the screens, and Maleen behind him to do the directing. After a few initial squeals, the Leewit became oddly silent. Suddenly the captain realized she was blubbering.

Somehow, it startled him to discover that her homecoming had affected the Leewit to that extent. He felt Goth reach out behind him and put her hand on the Leewit's shoulder. The smallest witch sniffled happily.

"'S beautiful!" she growled.

He felt a resurge of the wondering, protective friendliness they had aroused in him at first. They must have been having a rough time of it, at that. He sighed; it seemed a pity they hadn't got along a little better!

"Where's everyone hiding?" he inquired, to break up the mood. So far, there hadn't been a sign of human habitation.

"There aren't many people on Karres," Maleen said from behind his shoulder. "But we're going to The Town—you'll meet about half of them there!"

"What's that place down there?" the captain asked with sudden interest. Something like an enormous lime-white bowl seemed to have been set flush into the floor of the wide valley up which they were moving.

"That's the Theater where . . . *ouch!*" the Leewit said. She fell silent then but turned to give Maleen a resentful look.

"Something strangers shouldn't be told about, eh?" the captain said tolerantly. Goth glanced at him from the side.

"We've got rules," she said.

He let the ship down a little as they passed over "the Theater where—" It was a sort of large, circular arena, with numerous steep tiers of seats running up around it. But all was bare and deserted now.

On Maleen's direction, they took the next valley fork to the right and dropped lower still. He had his first look at Karres animal life then. A flock of large, creamy-white birds, remarkably Terrestrial in appearance, flapped by just below them, apparently unconcerned about the ship. The forest underneath had opened out into a long stretch of lush meadow land, with small creeks winding down into its center. Here a herd of several hundred head of beasts was grazing—beasts of mastodonic size and build, with hairless, shiny black hides. The mouths of their long, heavy heads were twisted up into sardonic, crocodilian grins as they blinked up at the passing *Venture*.

"Black Bollems," said Goth, apparently enjoying the captain's expression. "Lots of them around; they're tame. But the gray mountain ones are good hunting."

"Good eating, too!" the Leewit said. She licked her lips daintily. "Breakfast—!" she sighed, her thoughts diverted to a familiar track. "And we ought to be just in time!"

"There's the field!" Maleen cried, pointing. "Set her down there, captain!"

The "field" was simply a flat meadow of close-trimmed grass running smack against the mountainside to their left. One small vehicle, bright blue in color, was parked on it; and it was bordered on two sides by very tall, blue-black trees.

That was all.

The captain shook his head. Then he set her down.

The town of Karres was a surprise to him in a good many ways. For one thing, there was much more of it than you would have thought possible after flying over the area. It stretched for miles through the forest, up the flanks of the mountain and across the valley—little clusters of houses or individual ones, each group screened from all the rest and from the sky overhead by the trees.

They liked color on Karres; but then they hid it away! The houses were bright as flowers, red and white, apple-green, golden-brown—all spick and span, scrubbed and polished and aired with that brisk, green forest-smell. At various times of the day, there was also the smell of remarkably good things to eat. There were brooks and pools and a great number of shaded vegetable gardens to the town. There were risky-looking treetop playgrounds, and treetop platforms and galleries which seemed to have no particular purpose. On the ground was mainly an enormously confusing maze of paths—narrow trails of sandy soil snaking about among great brown tree roots and chunks of gray mountain rock, and half covered with fallen needle leaves. The first six times the captain set out unaccompanied, he'd lost his way hopelessly within minutes, and had to be guided back out of the forest.

But the most hidden of all were the people! About four thousand of them were supposed to live in the town, with as many more scattered about the planet. But you never got to see more than three or four at any one time—except when now and then a pack of children, who seemed to the captain to be uniformly of the Leewit's size, would burst suddenly out of the undergrowth across a path before you, and vanish again.

As for the others, you did hear someone singing occasionally; or there might be a whole muted concert going on all about, on a large variety of wooden musical instruments which they seemed to enjoy tootling with, gently.

But it wasn't a real town at all, the captain thought. They didn't live like people, these Witches of Karres—it was more like a flock of strange forest birds that happened to be nesting in the same general area. Another thing: they appeared to be busy enough—but what was their business?

He discovered he was reluctant to ask Toll too many questions about it. Toll was the mother of his three witches; but only Goth really resembled her. It was difficult to picture Goth becoming smoothly matured and pleasantly rounded; but that was

Toll. She had the same murmuring voice, the same air of sideways observation and secret reflection. And she answered all the captain's questions with apparent frankness; but he never seemed to get much real information out of what she said.

It was odd, too! Because he was spending several hours a day in her company, or in one of the next rooms at any rate, while she went about her housework. Toll's daughters had taken him home when they landed; and he was installed in the room that belonged to their father—busy just now, the captain gathered, with some sort of research of a geological nature elsewhere on Karres. The arrangement worried him a little at first, particularly since Toll and he were mostly alone in the house. Maleen was going to some kind of school; she left early in the morning and came back late in the afternoon; and Goth and the Leewit were just plain running wild! They usually got in long after the captain had gone to bed and were off again before he turned out for breakfast.

It hardly seemed like the right way to raise them! One afternoon, he found the Leewit curled up and asleep in the chair he usually occupied on the porch before the house. She slept there for four solid hours, while the captain sat nearby and leafed gradually through a thick book with illuminated pictures called "Histories of Ancient Yarthe." Now and then, he sipped at a cool, green, faintly intoxicating drink Toll had placed quietly beside him some while

before, or sucked an aromatic smoke from the enormous pipe with a floor rest, which he understood was a favorite of Toll's husband.

Then the Leewit woke up suddenly, uncoiled, gave him a look between a scowl and a friendly grin, slipped off the porch and vanished among the trees.

He couldn't quite figure that look! It might have meant nothing at all in particular, but—

The captain laid down his book then and worried a little more. It was true, of course, that nobody seemed in the least concerned about his presence. All of Karres appeared to know about him, and he'd met quite a number of people by now in a casual way. But nobody came around to interview him or so much as dropped in for a visit. However, Toll's husband presumably would be returning presently, and—

How long had he been here, anyway?

Great Patham, the captain thought, shocked. He'd lost count of the days!

Or was it weeks?

He went in to find Toll.

"It's been a wonderful visit," he said, "but I'll have to be leaving, I guess. Tomorrow morning, early—"

Toll put some fancy sewing she was working on back in a glass basket, laid her thin, strong witch's hands in her lap, and smiled up at him.

"We thought you'd be thinking that," she said, "and so we— You know, captain, it was quite difficult to find a way to reward you for bringing back the children?"

"It was?" said the captain, suddenly realizing he'd also clean forgotten he was broke! And now the wrath of Onswud lay close ahead.

"Gold and jewel stones would have been just right, of course!" she said, "but unfortunately, while there's no doubt a lot of it on Karres somewhere, we never got around to looking for it. And we haven't money—none that you could use, that is!"

"No, I don't suppose you do," the captain agreed sadly.

"However," said Toll, "we've all been talking about it in the town, and so we've loaded a lot of things aboard your ship that we think you can sell at a fine profit!"

"Well now," the captain said gratefully, "that's fine of—"

"There are furs," said Toll, "the very finest furs we could fix up—two thousand of them!"

"Oh!" said the captain, bravely keeping his smile. "Well, that's wonderful!"

"And essences of perfume!" said Toll. "Everyone brought one bottle of their own, so that's eight thousand three hundred and twenty-three bottles of perfume essences—all different!"

"Perfume!" said the captain. "Fine, fine—but you really shouldn't —"

"And the rest of it," Toll concluded happily, "is the green Lepti liquor you like so much, and the

Wintenberry jellies!" She frowned. "I forget just how many jugs and jars," she admitted, "but there were a lot. It's all loaded now. And do you think you'll be able to sell all that?" she smiled.

"I certainly can!" the captain said stoutly. "It's wonderful stuff, and there's nothing like it in the Empire."

Which was very true. They wouldn't have considered miffelfurs for lining on Karres. But if he'd been alone he would have felt like he wanted to burst into tears.

The witches couldn't have picked more completely unsalable items if they'd tried! Furs, cosmetics, food and liquor—he'd be shot on sight if he got caught trying to run that kind of merchandise into the Empire. For the same reason that they couldn't use it on Nikkeldepain—they were that scared of contamination by goods that came from uncleared worlds!

He breakfasted alone next morning. Toll had left a note beside his plate, which explained in a large, not too legible script that she had to run off and catch the Leewit; and that if he was gone before she got back she was wishing him good-by and good luck.

He smeared two more buns with Wintenberry jelly, drank a large mug of cone-seed coffee, finished every scrap of the omelet of swan hawk eggs and then, in a state of pleasant repletion, toyed around with his slice of roasted Bollem liver. Boy, what food! He must have put on fifteen pounds since he landed on Karres.

He wondered how Toll kept that sleek figure.

Regretfully, he pushed himself away from the table, pocketed her note for a souvenir, and went out on the porch. There a tear-stained Maleen hurled herself into his arms.

"Oh, captain!" she sobbed. "You're leaving—"

"Now, now!" the captain murmured, touched and surprised by the lovely child's grief. He patted her shoulders soothingly. "I'll be back," he said rashly.

"Oh, yes, do come back!" cried Maleen. She hesitated and added: "I become marriageable two years from now. Karres time—"

"Well, well," said the captain, dazed. "Well, now—"

He set off down the path a few minutes later, with a strange melody tinkling in his head. Around the first curve, it changed abruptly to a shrill keening which seemed to originate from a spot some two hundred feet before him. Around the next curve, he entered a small, rocky clearing full of pale, misty, early-morning sunlight and what looked like a slow-motion fountain of gleaming rainbow globes. These turned out to be clusters of large, vari-hued soap bubbles which floated up steadily from a wooden tub full of hot water, soap and the Leewit. Toll was bent over the tub; and the Leewit was objecting to a morning bath, with only that minimum of interruptions

required to keep her lungs pumped full of a fresh supply of air.

As the captain paused beside the little family group, her red, wrathful face came up over the rim of the tub and looked at him.

"Well, Ugly," she squealed, in a renewed outburst of rage, "who you staring at?" Then a sudden determination came into her eyes. She pursed her lips.

Toll up-ended her promptly and smacked the Leewit's bottom.

"She was going to make some sort of a whistle at you," she explained hurriedly. "Perhaps you'd better get out of range while I can keep her head under. And good luck, captain!"

Karres seeemd even more deserted than usual this morning. Of course, it was quite early. Great banks of fog lay here and there among the huge dark trees and the small bright houses. A breeze sighed sadly far overhead. Faint, mournful bird-cries came from still higher up—it could have been swan hawks reproaching him for the omelet.

Somewhere in the distance, somebody tootled on a wood-instrument, very gently.

He had gone halfway up the path to the landing field, when something buzzed past him like an enormous wasp and went *CLUNK!* into the bole of a tree just before him.

It was a long, thin, wicked-looking arrow. On its shaft was a white card; and on the card was printed in red letters:

STOP, MAN OF NIKKELDEPAIN!

The captain stopped and looked around slowly and cautiously. There was no one in sight. What did it mean?

He had a sudden feeling as if all of Karres were rising up silently in one stupendous, cool, foggy trap about him. His skin began to crawl. What was going to happen?

"Ha-ha!" said Goth, suddenly visible on a rock twelve feet to his left and eight feet above him. "You did stop!"

The captain let his breath out slowly.

"What else did you think I'd do?" he inquired. He felt a little faint.

She slid down from the rock like a lizard and stood before him. "Wanted to say good-by!" she told him.

Thin and brown, in jacket, breeches, boots, and cap of gray-green rock-lichen color, Goth looked very much in her element. The brown eyes looked up at him steadily; the mouth smiled faintly; but there was no real expression on her face at all. There was a quiverful of those enormous arrows slung over her shoulder, and some arrow-shooting gadget—not a bow—in her left hand.

She followed his glance.

"Bollem hunting up the mountain," she explained. "The wild ones. They're better meat—"

The captain reflected a moment. That's right, he recalled; they kept the tame Bollem herds mostly for milk, butter, and cheese. He'd learn-

ed a lot of important things about Karres, all right!

"Well," he said, "good-by, Goth!"

They shook hands gravely. Goth was the real Witch of Karres, he decided—more so than her sisters, more so even than Toll. But he hadn't actually learned a single thing about any of them.

Peculiar people!

He walked on, rather glumly.

"Captain!" Goth called after him. He turned.

"Better watch those take-offs," Goth called, "or you'll kill yourself yet!"

The captain cussed softly all the way up to the *Venture.*

And the take-off was terrible! A few swan hawks were watching but, he hoped, no one else.

V.

There wasn't the remotest possibility, of course, of resuming direct trade in the Empire with the cargo they'd loaded for him. But the more he thought about it now, the less likely it seemed that Councilor Onswud was going to let a genuine fortune slip through his hands on a mere technicality of embargoes. Nikkeldepain knew all the tricks of interstellar merchandising; and the councilor himself was undoubtedly the slickest unskinned miffel in the Republic.

More hopefully, the captain began to wonder whether some sort of trade might not be made to develop eventually between Karres and Nikkeldepain. Now and then, he also thought of Maleen growing marriageable two years hence, Karres time. A handful of witch-notes went tinkling through his head whenever that idle reflection occurred.

The calendric chronometer informed him he'd spent three weeks there. He couldn't remember how their year compared with the standard one.

He found he was getting remarkably restless on this homeward run; and it struck him for the first time that space travel could also be nothing much more than a large hollow period of boredom. He made a few attempts to resume his sessions of small-talk with Illyla, via her picture; but the picture remained aloof.

The ship seemed unnaturally quiet now—that was the trouble! The captain's cabin, particularly, and the hall leading past it had become as dismal as a tomb.

But at long last, Nikkeldepain II swam up on the screen ahead. The captain put the *Venture 7333* on orbit, and broadcast the ship's identification number. Half an hour later, Landing Control called him. He repeated the identification number, and added the ship's name, his name, owner's name, place of origin and nature of cargo.

The cargo had to be described in detail.

"Assume Landing Orbit 21,203 on your instruments," Landing Control instructed him. "A customs ship will come out to inspect."

He went on the assigned orbit and gazed moodily from the vision ports

at the flat continents and oceans of Nikkeldepain II as they drifted by below. A sense of equally flat depression overcame him unexpectedly. He shook it off and remembered Illyla.

Three hours later, a ship ran up next to him; and he shut off the orbital drive. The communicator began buzzing. He switched it on.

"Vision, please!" said an official-sounding voice. The captain frowned, located the vision-stud of the communicator screen and pushed it down. Four faces appeared in vague outline on the screen, looking at him.

"Illyla!" the captain said.

"At least," young Councilor Rapport said unpleasantly, "he's brought back the ship, Father Onswud!"

"Illyla!" said the captain.

Councilor Onswud said nothing. Neither did Illyla. They both seemed to be staring at him, but the screen wasn't good enough to permit the study of expression in detail.

The fourth face, an unfamiliar one above a uniform collar, was the one with the official-sounding voice.

"You are instructed to open the forward lock, Captain Pausert," it said, "for an official investigation."

It wasn't till he was releasing the outer lock to the control room that the captain realized it wasn't Customs who had sent a boat out to him, but the police of the Republic.

However, he hesitated for only a moment. Then the outer lock gaped wide.

He tried to explain. They wouldn't listen. They had come on board in contamination-proof repulsor suits, all four of them; and they discussed the captain as if he weren't there. Illyla looked pale and angry and beautiful, and avoided looking at him.

However, he didn't want to speak to her before the others anyway.

They strolled back to the storage and gave the Karres cargo a casual glance.

"Damaged his lifeboat, too!" Councilor Rapport remarked.

They brushed past him down the narrow hallway and went back to the control room. The policeman asked to see the log and commercial records. The captain produced them.

The three men studied them briefly. Illyla gazed stonily out at Nikkeldepain II.

"Not too carefully kept!" the policeman pointed out.

"Surprising he bothered to keep them at all!" said Councilor Rapport.

"But it's all clear enough!" said Councilor Onswud.

They straightened up then and faced him in a line. Councilor Onswud folded his arms and projected his craggy chin. Councilor Rapport stood at ease, smiling faintly. The policeman became officially rigid.

Illyla remained off to one side, looking at the three.

"Captain Pausert," the policeman said, "the following charges—substantiated in part by this preliminary investigation—are made against you—"

"Charges?" said the captain.

"Silence, please!" rumbled Councilor Onswud.

"First: material theft of a quarter-million value of maels of jewels and jeweled items from a citizen of the Imperial Planet of Porlumma—"

"They were returned!" the captain protested.

"Restitution, particularly when inspired by fear of retribution, does not affect the validity of the original charge," Councilor Rapport quoted, gazing at the ceiling.

"Second," continued the policeman. "Purchase of human slaves, permitted under Imperial law but prohibited by penalty of ten years to lifetime penal servitude by the laws of the Republic of Nikkeldepain—"

"I was just taking them back where they belonged!" said the captain.

"We shall get to that point presently," the policeman replied. "Third, material theft of sundry items in the value of one hundred and eighty thousand maels from a ship of the Imperial Planet of Lepper, accompanied by threats of violence to the ship's personnel—"

"I might add in explanation of the significance of this particular charge," added Councilor Rapport, looking at the floor, "that the Regency of Sirius, containing Lepper, is allied to the Republic of Nikkeldepain by commercial and military treaties of considerable value. The Regency has taken the trouble to point out that such hostile conduct by a citizen of the Republic against citizens of the Regency is likely to have an adverse effect on the duration of the treaties. The charge thereby becomes compounded by the additional charge of a treasonable act against the Republic—"

He glanced at the captain. "I believe we can forestall the accused's plea that these pilfered goods also were restored. They were, in the face of superior force!"

"Fourth," the policeman went on patiently, "depraved and licentious conduct while acting as commercial agent, to the detriment of your employer's business and reputation—"

"WHAT?" choked the captain.

"—involving three of the notorious Witches of the Prohibited Planet of Karres—"

"Just like his great-uncle Threbus!" nodded Councilor Onswud gloomily. "It's in the blood, I always say!"

"—and a justifiable suspicion of a prolonged stay on said Prohibited Planet of Karres—"

"I never heard of that place before this trip!" shouted the captain.

"Why don't you read your Instructions and Regulations then?" shouted Councilor Rapport. "It's all there!"

"Silence, please!" shouted Councilor Onswud.

"Fifth," said the policeman quietly, "general willful and negligent actions resulting in material damage and loss to your employer to the value of eighty-two thousand maels."

"I've still got fifty-five thousand. And the stuff in the storage," the

captain said, also quietly, "is worth half a million, at least!"

"Contraband and hence legally valueless!" the policeman said. Councilor Onswud cleared his throat.

"It will be impounded, of course," he said. "Should a method of resale present itself, the profits, if any, will be applied to the cancellation of your just debts. To some extent, that might reduce your sentence." He paused. "There is another matter—"

"The sixth charge," the policeman said, "is the development *and* public demonstration of a new type of space drive, which should have been brought promptly and secretly to the attention of the Republic of Nikkeldepain!"

They all stared at him—alertly and quite greedily.

So *that* was it—the Sheewash Drive!

"Your sentence may be greatly reduced, Pausert," Councilor Onswud said wheedlingly, "if you decide to be reasonable now. What have you discovered?"

"Look out, father!" Illyla said sharply.

"Pausert," Councilor Onswud inquired in a fading voice, "what is that in your hand?"

"A Blythe gun," the captain said, boiling.

There was a frozen stillness for an instant. Then the policeman's right hand made a convulsive movement.

"Uh-uh!" said the captain warningly.

Councilor Rapport started a slow step backwards.

"Stay where you are!" said the captain.

"Pausert!" Councilor Onswud and Illyla cried out together.

"Shut up!" said the captain.

There was another stillness.

"If you'd looked," the captain said, in an almost normal voice, "you'd have seen I've got the nova gun turrets out. They're fixed on that boat of yours. The boat's lying still and keeping its little yap shut. You do the same—"

He pointed a finger at the policeman. "You got a repulsor suit on," he said. "Open the inner port lock and go squirt yourself back to your boat!"

The inner port lock groaned open. Warm air left the ship in a long, lazy wave, scattering the sheets of the *Venture's* log and commercial records over the floor. The thin, cold upper atmosphere of Nikkeldepain II came eddying in.

"You next, Onswud!" the captain said.

And a moment later: "Rapport, you just turn around—"

Young Councilor Rapport went through the port at a higher velocity than could be attributed reasonably to his repulsor units. The captain winced and rubbed his foot. But it had been worth it.

"Pausert," said Illyla in justifiable apprehension, "you are stark, staring mad!"

"Not at all, my dear," the captain said cheerfully. "You and I are

now going to take off and embark on a life of crime together."

"But, Pausert—"

"You'll get used to it," the captain assured her, "just like I did. It's got Nikkeldepain beat every which way."

"Pausert," Illyla said, white-faced, "we told them to bring up revolt ships!"

"We'll blow them out through the stratosphere," the captain said belligerently, reaching for the port-control switch. He added, "But they won't shoot anyway while I've got you on board!"

Illyla shook her head. "You just don't understand," she said desperately. "You can't make me stay!"

"Why not?" asked the captain.

"Pausert," said Illyla, "I am Madame Councilor Rapport."

"Oh!" said the captain. There was a silence. He added, crestfallen: "Since when?"

"Five months ago, yesterday," said Illyla.

"Great Patham!" cried the captain, with some indignation. "I'd hardly got off Nikkeldepain then! We were engaged!"

"Secretly . . . and I guess," said Illyla, with a return of spirit, "that I had a right to change my mind!"

There was another silence.

"Guess you had, at that," the captain agreed. "All right—the port's still open, and your husband's waiting in the boat. Beat it!"

He was alone. He let the ports slam shut and banged down the oxygen release switch. The air had become a little thin.

He cussed.

The communicator began rattling for attention. He turned it on.

"Pausert!" Councilor Onswud was calling in a friendly but shaking voice. "May we not depart, Pausert? Your nova guns are still fixed on this boat!"

"Oh, that—" said the captain. He deflected the turrets a trifle. "They won't go off now. Scram!"

The police boat vanished.

There was other company coming, though. Far below him but climbing steadily, a trio of revolt ships darted past on the screen, swung around and came back for the next turn of their spiral. They'd have to get a good deal closer before they started shooting; but they'd try to stay under him so as not to knock any stray chunks out of Nikkeldepain.

He sat a moment, reflecting. The revolt ships went by once more. The captain punched in the *Venture's* secondary drives, turned her nose towards the planet and let her go. There were some scattered white puffs around as he cut through the revolt ships' plane of flight. Then he was below them, and the *Venture* groaned as he took her out of the dive.

The revolt ships were already scattering and nosing over for a countermaneuver. He picked the nearest one and swung the nova guns towards it.

"—and ram them in the middle!"

he muttered between his teeth.

SSS-whoosh!

It was the Sheewash Drive—but, like a nightmare now, it kept on and on!

VI.

"Maleen!" the captain bawled, pounding at the locked door of the captain's cabin. "Maleen—shut it off! Cut it off! You'll kill yourself. Maleen!"

The *Venture* quivered suddenly throughout her length, then shuddered more violently, jumped and coughed; and commenced sailing along on her secondary drives again. He wondered how many light-years from everything they were by now. It didn't matter!

"Maleen!" he yelled. "Are you all right?"

There was a faint *thump-thump* inside the cabin, and silence. He lost almost a minute finding the right cutting tool in the storage. A few seconds later, a section of door panel sagged inwards; he caught it by one edge and came tumbling into the cabin with it.

He had the briefest glimpse of a ball of orange-colored fire swirling uncertainly over a cone of oddly bent wires. Then the fire vanished, and the wires collapsed with a loose rattling to the table top.

The crumpled small shape lay behind the table, which was why he

didn't discover it at once. He sagged to the floor beside it, all the strength running out of his knees.

Brown eyes opened and blinked at him blearily.

"Sure takes it out of you!" Goth grunted. "Am I hungry!"

"I'll whale the holy, howling tar out of you again," the captain roared, "if you ever—"

"Quit your bawling!" snarled Goth. "I got to eat."

She ate for fifteen minutes straight, before she sank back in her chair, and sighed.

"Have some more Wintenberry jelly," the captain offered anxiously. She looked pretty pale.

Goth shook her head. "Couldn't —and that's about the first thing you've said since you fell through the door, howling for Maleen. Ha-ha! Maleen's *got* a boy friend!"

"Button your lip, child," the captain said. "I was thinking." He added, after a moment: "Has she really?"

"Picked him out last year," Goth nodded. "Nice boy from town—they get married as soon as she's marriageable. She just told you to come back because she was upset about you. Maleen had a premonition you were headed for awful trouble!"

"She was quite right, little chum," the captain said nastily.

"What were you thinking about?" Goth inquired.

"I was thinking," said the captain, "that as soon as we're sure you're going to be all right, I'm taking you straight back to Karres!"

"I'll be all right now," Goth said. "Except, likely, for a stomach-ache. But you can't take me back to Karres."

"Who will stop me, may I ask?" the captain asked.

"Karres is gone," Goth said.

"Gone?" the captain repeated blankly, with a sensation of not quite definable horror bubbling up in him.

"Not blown up or anything," Goth reassured him. "They just moved it! The Imperials got their hair up about us again. But this time, they were sending a fleet with the big bombs and stuff, so everybody was called home. But they had to wait then till they found out where we were—me and Maleen and the Leewit. Then you brought us in; and they had to wait again, and decide about you. But right after you'd left . . . *we'd* left, I mean . . . they moved it."

"Where?"

"Great Patham!" Goth shrugged. "How'd I know? There's lots of places!"

There probably were, the captain admitted silently. A scene came suddenly before his eyes—that lime-white, arenalike bowl in the valley, with the steep tiers of seats around it, just before they'd reached the town of Karres—"the Theater where—"

But now there was unnatural night-darkness all over and about that world; and the eight thousand-some Witches of Karres sat in circles around the Theater, their heads

bent towards one point in the center, where orange fire washed hugely about the peak of a cone of curiously twisted girders.

And a world went racing off at the speeds of the Sheewash Drive! There'd be lots of places, all right. What peculiar people!

"Anyway," he sighed, "if I've got to start raising you—don't say 'Great Patham' any more. That's a cuss word!"

"I learned it from you!" Goth pointed out.

"So you did, I guess," the captain acknowledged. "I won't say it either. Aren't they going to be worried about you?"

"Not very much," said Goth. "We don't get hurt often—especially when we're young. That's when we can do all that stuff like teleporting, and whistling, like the Leewit. We lose it mostly when we get older—they're working on that now so we won't. About all Maleen can do right now is premote!"

"She premotes just dandy, though," the captain said. "The Sheewash Drive—they can all do that, can't they?"

"Uh-huh!" Goth nodded. "But that's learned stuff . That's one of the things they already studied out." She added, a trace uncomfortably: "I can't tell you about that till you're one yourself."

"Till I'm what myself?" the captain asked, becoming puzzled again.

"A witch, like us," said Goth. "We got our rules. And that won't be for four years, Karres time."

"It won't, eh?" said the captain. "What happens then?"

"That's when I'm marriageable age," said Goth, frowning at the jar of Wintenberry jelly. She pulled it towards her and inspected it carefully. "I got it all fixed," she told the jelly firmly, "as soon as they started saying they ought to pick out a wife for you on Karres, so you could stay. I said it was me, right away; and everyone else said finally that was all right then—even Maleen, because she had this boy friend."

"You mean," said the captain, stunned, "this was all planned out on Karres?"

"Sure," said Goth. She pushed the jelly back where it had been standing, and glanced up at him again. "For three weeks, that's about all everyone talked about in the town! It set a perceedent—"

She paused doubtfully.

"That would explain it," the captain admitted.

"Uh-huh," Goth nodded relieved, settling back in her chair. "But it was my father who told us how to do it so you'd break up with the people on Nikkeldepain. He said it was in the blood."

"What was in the blood?" the captain said patiently.

"That you'd break up with them. That's Threbus, my father," Goth informed him. "You met him a couple of times in the town. Big man with a blond beard—Maleen and the Leewit take after him."

"You wouldn't mean my great-

uncle Threbus?" the captain inquired. He was in a state of strange calm by now.

"That's right," said Goth. "He liked you a lot."

"It's a small Galaxy," said the captain philosophically. "So that's where Threbus wound up! I'd like to meet him again some day."

"We'll start after Karres four years from now, when you learn about those things," Goth said. "We'll catch up with them all right. That's still thirteen hundred and seventy-two Old Sidereal days," she added, "but there's a lot to do in between. You want to pay the money you owe back to those people, don't you? I got some ideas—"

"None of those teleporting tricks now!" the captain warned.

"Kid stuff!" Goth said scornfully. "I'm growing up. This'll be fair swapping. But we'll get rich."

"I wouldn't be surprised," the captain admitted. He thought a moment. "Seeing we've turned out to be distant relatives, I suppose it is all right, too, if I adopt you meanwhile—"

"Sure," said Goth. She stood up.

"Where you going?" the captain asked.

"Bed," said Goth. "I'm tired." She stopped at the hall door. "About all I can tell you about us till then," she said, "you can read in those Regulations, like the one man said—the one you kicked off the ship. There's a lot about us in there. Lots of lies, too, though!"

"And when did you find out about the communicator between here and the captain's cabin?" the captain inquired.

Goth grinned. "A while back," she admitted. "The others never noticed!"

"All right," the captain said. "Good night, witch—if you get a stomach-ache, yell and I'll bring the medicine."

"Good night," Goth yawned. "I will, I think."

"And wash behind your ears!" the captain added, trying to remember the bedtime instructions he'd overheard Maleen giving the junior witches.

"All right," said Goth sleepily. The hall door closed behind her—but half a minute later, it was briskly opened again. The captain looked up startled from the voluminous stack of "General Instructions and Space Regulations of the Republic of Nikkeldepain" he'd just discovered in one of the drawers of the control desk. Goth stood in the doorway, scowling and wide-awake.

"And you wash behind yours!" she said.

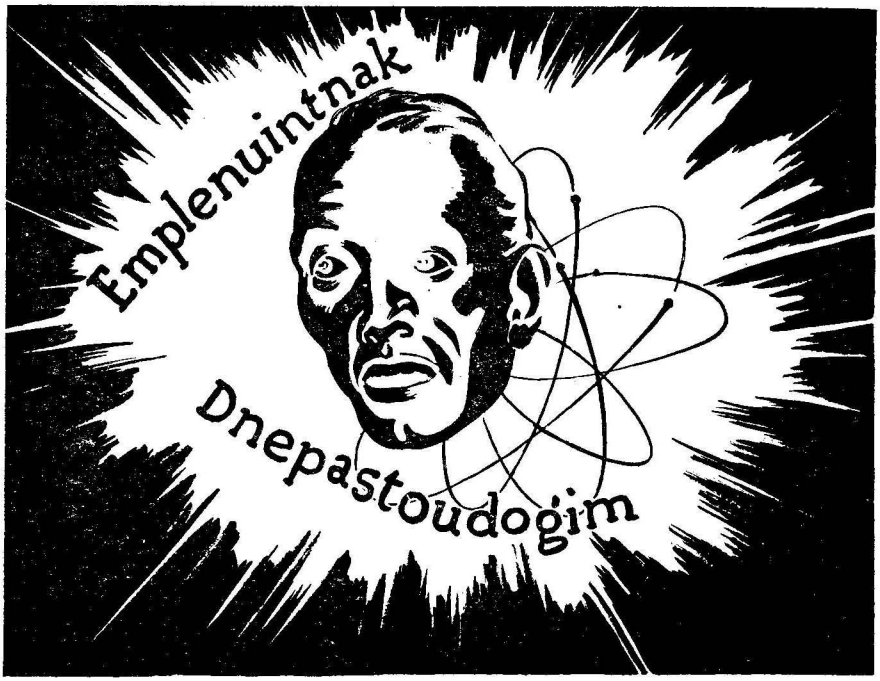
"Huh?" said the captain. He reflected a moment. "All right," he said. "We both will, then."

"Right," said Goth, satisfied.

The door closed once more.

The captain began to run his finger down the lengthy index of K's—or could it be under W?

THE END



REVERSION

BY M. C. PEASE

There's an old wish applicable to this idea—but taken literally, the accident that produced the effect was totally catastrophic to the man affected!

Illustrated by Orban

Dr. Marvin Drake sat idly in his office peeling the wrapping from a cigar. A slender man in a gray jacket and brown trousers, he looked more the part of a diplomat than a professor. But his eyes were penetrating, and faintly disturbing, as if they saw a little too much. They were impassive as they watched the people file into the office.

With gentle precision, he cut and lit the cigar. It was only when everyone was settled that he cleared his throat.

"Ladies and gentlemen," he announced, "you all know each other, I think. You are all either friends and co-workers of Michael Stern, or are doctors and other professional men who have studied him.

"I have asked you here to discuss with you my theory regarding his present tragic condition. I ask your careful attention while I present it. When I am through, I shall be glad to hear any comments you may have. If you can show me where I might be wrong, please do so. Frankly, my theory makes me shudder.

"Not to keep you in suspense, if I am right, the situation is completely hopeless. The only treatment I can suggest is to try to duplicate the accident, hoping to either cure or kill. There is no other rational method of approach—nor any possibility even of any improvement."

The professor stopped to puff his cigar. The people listening stirred uneasily but said nothing.

"Let me start from the beginning," he went on. "It will, I hope make more sense that way."

The others nodded consent.

"The accident," Dr. Drake started, "occurred about ten months ago. Precisely what happened, I have not been told. Since Stern was a nuclear physicist, I presume it had to do with radioactive processes. In fact, the medical men tell me he shows some signs of radiation burns."

Two of the men present nodded.

"I am also told," he continued, "that nobody really knows what did happen. I gather that several people in neighboring laboratories were knocked out with no discernible aftereffects. There has been some mention of meters all over the place twisting their pivots. Apparently, the total picture is somewhat confusing."

A young, lanky chap with unruly hair and bloodshot eyes barked a short laugh. He sounded frustrated.

"A genius for understatement," he murmured.

The professor smiled at him.

"This is a case for understatement," Dr. Drake answered. "I find I must save all my superlatives for the end.

"But, to get back to my story, Stern was found unconscious in the middle of a certain amount of wreckage. He was taken to the hospital and examined with considerable care. No gross physical damage was found. He was diagnosed as suffering from concussion. The initial prognosis was favorable.

"His early response bore this out. He began to recover consciousness reasonably soon, reaching a state of nearly total daze. He was able, however, to make some response to his environment. His eyes, for instance, would follow a light. He rapidly acquired what seemed to be a normal amount of muscular articulation, although without any signs of purpose. He even uttered sounds. They were unintelligible, but had the gross appearance of speech. What is known as 'double-talk'.

"He was kept under close observation during this phase, in the expectation that he would either pull out of it satisfactorily, or have a relapse. It was some time before the people responsible recognized that he had reached a truly static state. As you all know, Stern, today, is in essentially the same condition."

With deliberation, the professor knocked the ash from his cigar.

"The second phase," he resumed, "may be called the 'neurological phase'. It is an arbitrary division I am using. Dr. Klystman, here, the staff neurologist, was, of course, called in as soon as a diagnosis of concussion was made. But during this phase, the neurological investigation became intensive. So far as I know, every test that might, even remotely be of value, was tried. All results were essentially negative."

The bearded man on the speaker's left nodded.

"Nothing at all," the neurologist interrupted. "Or, at least, nothing to account for his condition."

"Exactly," Dr. Drake acknowledged. "The main thought of the study was that he might have a peculiarly localized oedema of the brain—a series of minute hemorrhages scattered throughout some area. Some of the classic symptoms were lacking, of course. The apparent functioning of the optics. The lack of any evidence of pain, particularly in the head. But it was the likeliest possibility. When everything else had been tried, a decompression operation was performed in the hope that it might do some good. No observable change was recorded.

"I shan't give a full history. It would take me several hours to detail all the tests and mention their significance. I fear it would bore you, and I know it would me. Since none of them contributed anything except negative results, it doesn't seem necessary.

"I might cite, as an example of their completeness, however, the fact that even a ventriculographic examination was performed. This involves replacing a small quantity of cebro-spinal fluid from the lateral ventricle by air. The shape of the ventricle may then be studied by X rays. It is chiefly useful against tumors. The results of such tests are notoriously puzzling, but this particular case offered no difficulties of interpretation. No significant abnormalities were noted.

"The full range of tests that were performed was truly astonishing. I can only congratulate his family on

their good fortune that the government, as his employer, is paying the bills."

The ripple of laughter over the room broke the tension, slightly.

"The third phase," the professor resumed, "was psychological. When it began to be clear that the chances of obtaining a pathological basis for diagnosis were remote, my good friend, Dr. Parker, was called in." He nodded at a young man whose eyes, like the professor's, looked as if they saw a little too much.

"He very promptly recognized that this was not according to the recognized textbooks. On his recommendation, other psychiatric consultants were brought in. It was not until they had eliminated, at least as probabilities, the usual psychoses that I was consulted. That is not a criticism. I am a research man, not a practicing doctor.

"But I get ahead. Anyway, they closely investigated the psychological aspects of the patient's condition. I am happy to report that, contrary to the medical results, they found very definite symptoms."

Again, a ripple of wry amusement slid over the audience.

"However," he held up his hand, "these symptoms fitted no known pattern. Superficially, they suggested a schizophrenic type of psychosis. There is the dead apathy that is the norm of the patient. Sometimes, he exhibits definite waxy immobility—where he tends to hold any position in which he is placed. Both of these are definite schizophrenic symptoms— With, however, complications.

"In particular, there are some very striking exceptions to the general condition of apathy. I mentioned that his eyes will often follow a light or other moving object. Occasionally, his hand responds, reaching towards an object. This is further complicated, however. His hand has never been observed to actually reach its objective. It starts out with apparent sureness. But, before it gets there, the motion breaks up into wildly erratic jerks. This slowly dies off as the hand slowly returns to the bed.

"This sounds like trouble in the nervous system. The neurologists, however, had long ago thought of that. But his reflexes are quite normal. There was—and is—no direct evidence of any nerve damage."

The professor studied his papers a moment, puffing the cigar.

"To the observer," he resumed, "one of the most convincing evidences that the case is extremely unusual lies in the occasional complete breaks that occur in the general apathy. It does happen, once in a while, that the mask falls. When it does, it is to reveal a quite terrifyingly extreme fear. Or horror. I don't know which. It is trite, perhaps, to say so, but it is quite impossible to adequately describe one of these episodes. I assure you it is one of the most horrible things I have ever seen. In one case, we had to shift the nurse, afterwards. A nurse we considered—and still do

—as reasonably stable. Two others have asked for transfers. As an expression of pure emotion, it far surpasses anything I have ever seen."

The professor studied his hands a moment.

"This is unusual. A schizophrenic is so because he cannot face reality. If he does, momentarily, the terror or horror he is escaping returns to him and drives him back into his shell. But note the timing. He returns to reality. Then the terror returns. Then he registers it. There is a definite time lag. But in this case, all who have ever observed one of these episodes agree that it is an immediate response. He either brings the terror or horror back with him from his dreamland, or finds it in the structure of his reality itself. He is, indeed, the tortured soul *behind* the mask.

"Then, too, there's the curious fact that the terror seems to weaken as time goes by.

"This is subjective argument, yes. But it is a powerful one to those who have made the direct observation."

The professor leaned back, watching, for a minute, the smoke from his cigar. No one said anything. Finally, he shrugged.

"To skip over various other details," he resumed, "one of the most interesting features of the case—to me, at least—was the 'double-talk' I mentioned. It does not happen often. Usually, he just lies there completely dumb and unresponsive. Occasionally, he starts talking. Usually, it is in a monotone, like hypnotic verbalization. In fact, I believe much of it is actually sleep-talk. Hard to say, of course, just when is he awake and when asleep. But, at least it is often done when his eyes are closed.

"Once in a while, it is different. This is when it's the aftermath of one of his emotional breakdowns. During some of these lapses from apathy, he screams. The screams become excited 'talking', which gradually fade off through sleep-talk, back into apathy.

Dr. Drake's lips tightened with the effort to maintain scientific objectivity. He shuddered.

"This verbalization, of course," he resumed, "is the reason I was consulted. My specialty is the psychology of communication. I fear I was informed of the case more because my friends knew I would be interested than from any real hope. However, that is unimportant.

"The first thing that struck me was its remarkable similarity to speech. It appeared meaningless, of course, but, in its gross sound content, it was nearly perfect. It was even possible to write it down in ordinary syllables. I have one such, here. It is an early example—made before we had any sort of a theory."

The professor got up, walked to a blackboard, and, consulting his notes, wrote on it:

"Emplenuinetnak. Dnepastoudogim."

He returned to his seat.

"We kept a wire-recorder constantly ready beside his bed. All the nurses had explicit instructions to turn it on at the first signs. They cooperated beautifully.

"We managed to collect a fair number of fragments. I gave them to Don Lancester, here." He nodded at a serious looking young man. "Don is a graduate student working with me on the degree of redundancy in normal and abnormal speech. I had the idea these might be useful to him as random sequences. I confess I had little hope he would discover anything of diagnostic value in them. He fooled me.

"The first thing he pointed out was that their inflection sounded wrong, somehow. We tried by quite a number of methods to pin down exactly what it was—such as cutting out various frequency bands, and superimposing narrow band noise. However, we were still unable to precisely define the difference.

"The application of statistical methods to the various sounds in the different specimens carried us further. We had only about twenty samples at the time, so the statistical base was not broad enough for precision. Nevertheless, we hoped to be able to form a working hypothesis.

"Certain peculiarities were immediately noted. I shan't go into full details but, as an example, sentences—if I may call them that—seemed to end too frequently in vowels. Again, there were such syllables as the 'dne' that shows in the sample on the board. That is not a common sound in the English language.

"Incidentally, we did not ignore the obvious possibility that this was a foreign language. We at least determined it meant nothing to any of the language faculty.

"We then considered the possibility of some kind of oral inversion. That he was thinking one sound and saying another. For quite a period we became more of a cryptographic laboratory than anything else.

"When that got us nowhere, we tried other ridiculous ideas. We had finally about decided it was a random substitution, when Don came up with the most ridiculous idea of all—which happened to be correct!

"Before telling you what it was, I am going to play a wire-recording for you. The voice is Stern's. The original recording was made about a month ago."

Dr. Drake turned to a machine on his desk. No one broke the silence while he fitted a small spool into it. He flipped a switch and the wire began to feed through. Then a voice came from the loud-speaker. It was dull and muted, as if the speaker's mouth were partially gagged.

"Where am I? What's happened? Why are things so different? Why? Why?"

The voice drifted off.

The people listening looked at each other with unspoken horror. The tragedy in the voice was stark and

naked. It struck at the roots of the soul.

The professor turned the machine off. He silently puffed his cigar until it glowed back into full life. His eyes roamed from one person to another, gauging their reactions.

"That recording," he announced, finally, "is exactly as it was made—except that it was played backwards." His voice was quiet. It had the effect of a delayed action bomb. As the import of his words sank in, the room erupted with startled exclamations. When silence was re-established, the professor went on.

"Yes—backwards. Don realized that that was the easiest way to make the statistics fit. 'D-N-E' is a very rare sound in English, but 'E-N-D' is quite common. Sentences start with vowel sounds much more often than they end with them. And all the rest of it. Besides, it was a very easy idea to try out with the wire-recordings.

"We found they all made sense on that basis. The one I've written on the board, there, if you read it backwards, phonetically, is 'What's happened? Can't anyone help me?"

He stopped while the audience studied the blackboard. When their attention returned, he went on. His voice was quiet.

"Just how it happened, I haven't the least idea. The explosion, or whatever it was, must have been a very unusual one. It struck at centers so deep within the brain that I doubt if it *will* be understood until science progresses into fields completely unimagined as yet. But the rough outlines of the results, at least, are clear. Somehow, Stern's consciousness of time-flow became reversed! The past to us has become the future to him!"

"I don't think any of us can fully appreciate the full impact of such a reversal. I have spent a good many hours trying. I can't say I've succeeded very well. It may be just as well. I'm not sure my sanity would stand it!

"It's like trying to visualize the fourth dimension. You can deduce the logical implications. But to try to picture it is simply to induce a headache.

"Yet Stern is living in reversed time!"

The professor's voice was dead and mute. His eyes were full of mixed horror and pity.

"Certain of his functions," he went on, "are not too seriously affected. He can breathe and his heart can beat. These are automatic functions. He could digest if he could eat.

"He can talk because that involves the simple decision to utter a sound. Only the decisions are reversed so the words are backwards.

"On the other hand, many of his relations to the outer world are hopelessly confused. It is obviously impossible for him to eat. To him, it would involve the regurgitation of his food.

"At first glance, you might think he would be able to reach for things.

However, this action is far more complicated than you may realize. According to modern theory, what you do in reaching for an object, is to start your hand moving. Your brain then receives continual information as to where your hand is, calculates the error in its direction and velocity, and sends out corrective orders until the error is reduced to zero. If your eyes are watching, part of the information is visual. More important is the kinesthetic—or, better, proprioceptive—information, from nerves in the joints. If this 'feedback' circuit is broken and you lose the sense of where the hand is, or the ability to calculate the necessary correction, your condition becomes that known as 'ataxia'.

"If you think of this process in terms of a time reversal, you will see the disastrous results. The correcting orders sent out by the brain will be exactly wrong. Their effect will be to *increase* the error. And the harder he tries, the worse it becomes!

"From his point of view, he gives the order to reach out. He observes the error and decides the correction needed. It turns out wrong and increases the error. His brain makes a stupendous effort, and reverses its orders. But, as his hand swings back on course, the automatic machinery in his brain suddenly reinforces the corrected orders, and the hand overshoots with amplification. The oscillations build up violently until he gives up and slams his arm back on the bed. This last is a single order, with no subsequent correction needed. Hence, it is successful.

"We see this sequence in the reverse direction. What to him is slamming the arm back, to us is shooting it out. We then see his arm suddenly go into violent oscillations which gradually die out as his arm slowly falls back. To him, that is the period of oscillation build-up.

"Do you follow me?"

His audience nodded. Some, however, looked a bit doubtful.

"The philosophic implications of the patient's predicament," he resumed, "are most interesting. Can he 'remember' what, to us, is the future? If we could answer that positively in the affirmative, even if only over a matter of seconds, it would be tremendously important. However, I don't think we can. Obviously, since he talks, he can 'remember' what he is, himself, from our point of view, 'going' to do. But that is under his control. It does not answer the question. What we would like to know is whether or not he can 'remember' anything outside of himself. I have found no evidence that he can.

"I can see no reason for believing his condition is not that of the perpetually awakening sleeper. The state normal people assume, often, for a few minutes, after being awakened from a sound sleep when they are aware of their surroundings but unable to integrate it. When you

look at even the commonest thing without knowing what it is or how it got there.

"Certainly this would account for his apathy, if any explanations are needed. Quite possibly it accounts for the fact that he has any mind left at all. And *that*, it seems to me, does require explanation."

Thoughtfully, Dr. Drake pulled on his cigar. His eyes were bleak.

"The situation is completely hopeless, you see. For one thing, a person's time sense runs one way or the other. There is no intermediate. There is no possibility of a partial cure. And, then, too, I know of no way of attacking the problem of finding a total cure. Except, as I mentioned at the start, trying to duplicate the initial accident in the hope that it would knock him around again."

The doctor spread his hands in an expression of complete futility.

One of the men stirred in his chair.

"I don't want to be brutal about this," he said, "but, as you mentioned, there are many important philosophic questions Stern could answer for us. Can't we get the answers before trying any such drastic treatment as you suggest?"

"Yes, why not?" another added. "You could at least make him feel better in his predicament. And people with ataxia *can* be educated into fairly complete control."

"No!" Dr. Drake's voice was decisive. "That's perhaps the crucial point of Stern's dilemma. We can *not*, by any conceivable means, communicate with him. If he should answer any question we put to him, it would mean he was giving the answer before he heard the question, on his time scale.

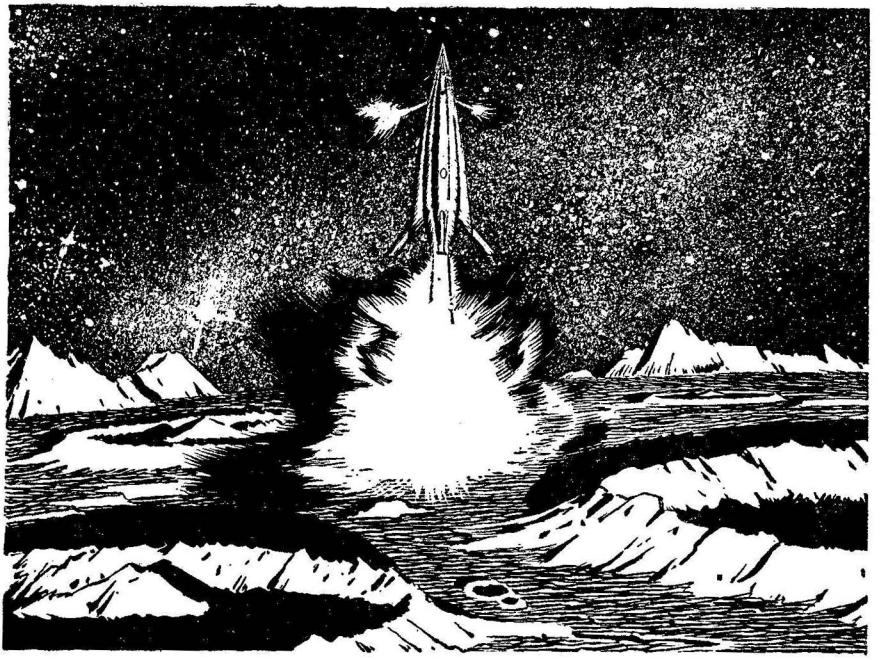
"Nor can we educate him in any conceivable way. For, if he did learn anything, he would be applying it, either in his time or in ours, before he had learned it. I doubt if he has any appreciable memory. If he has, then he has not—on his time—or will not on ours—learned very much!

"No, the only possibility of our learning anything directly from him is if we can turn him back, rightways to, and then ask our questions." The professor peered at his questioners, who nodded thoughtfully.

"Furthermore," Dr. Drake went on, "by the Law of the Essential Perversity of Nature and the Human Mind, I consider it practically a certainty that, if we should happen to succeed in blasting him rightside out, his memory of the intervening time will prove to be totally blacked out!"

Carefully the professor laid the finished cigar in the ashtray.

THE END



GULF

BY ROBERT A. HEINLEIN

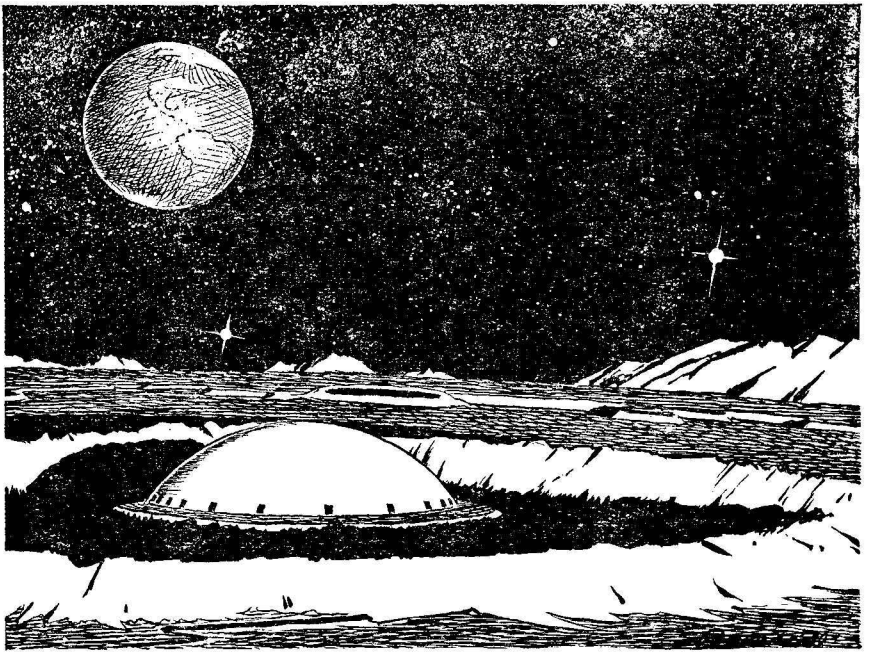
***Second** of Two Parts. Supermen they might be, super criminals perhaps—but the game they played meant the thin edge of death for them and life for a world.*

Illustrated by Rogers

SYNOPSIS

SCENE: THE UNITED STATES, after World War III, after the communist interregnum, after the revolution which tossed out the commissars. It is a new world, brighter, faster, richer than before, but obviously no better. Worse, in fact.

JOEL ABNER, commercial trav-



eler, arrives from the Moon. On the tube trip to the city he changes to CAPTAIN GILEAD, explorer and lecturer. On arriving at the metropolis he accepts the services of a runner for the NEW AGE HOTEL, catches the runner trying to steal his wallet, and dismisses him. The incident alerts him; he decides to get rid of, at once, the incredibly valuable load he has fetched down from the Moon—a spool of microfilm. He goes at once to the post office, beating off an attack on the way, and mails three such spools—all, apparently to one address; in fact, the spool that matters has been mailed to another address known only to him.

At the New Age Hotel his clothes and money are stolen; he assaults a bellhop, grabs his clothes, attempts to escape, is arrested and knocked unconscious with a Markheim—paralyzer—gun. He "comes to" in a jail cell. He has a cellmate whom he believes to be Dr. Hartley Baldwin, prominent physicist, but who identifies himself convincingly as KETTLE BELLY BALDWIN, helicopter tycoon.

By means of a phony card game Baldwin tells him that the "jail" is no jail but a part of the New Age Hotel, reveals that he knows about the spool of microfilm, and offers to help Abner-Gilead to escape. Be-

fore he can test the truth of Baldwin's assertions he is taken out of the cell. Believing that he has only minutes to live, his last act is to stack the playing cards to include a message which may be read by Baldwin as meaning: "Tell Federal Bureau of Security—Post Office Box Number 1060, Chicago," the address to which he has mailed the microfilm.

After he is gone, Baldwin reads the message, then restacks the playing cards back to the exact order in which Abner-Gilead had left them.

Abner-Gilead is hauled before MRS. KEITHLEY, incredibly rich and respectable owner of the hotel. She has the two dummy spools, as well as the items he discarded in the tube train; she wants the third spool, attempts to bribe him, then examines him by torturing to death a girl in his presence. He does not crack, is returned to his cell. Baldwin and he undertake to crush out.

The two men are remarkably alike in temperament, each being capable of fast, logical decisions and an unflinching willingness to act on logic—but of the two, Baldwin is a split second faster and even more dangerously violent in a pinch. They escape, with Baldwin taking the lead. They reach Baldwin's business office and Abner-Gilead-"Greene" is outfitted with clothes and cash. He reports to his chief in New Washington by a safely secret circuit, then reports in person. His bureau chief, BONN, informs him that P.O. Box 1060 was empty when bureau operatives opened it. The spool of microfilm, containing the only *record of the "Nova Effect", a means of creating atomic fission in a planetary mass, is missing through the failure of Security Operative Joseph Briggs (Abner-Gilead-Greene). He refuses to believe Briggs' report and accuses him of selling out.*

Briggs assaults his boss, escapes, assumes the personality of "Jack Gillespie", a laborer, and gets out of the capitol on a cargo Diesel. He gets himself fired and calls Baldwin, for he has concluded that the known facts permit no explanation other than that the microfilm record of the Nova Effect is now in Baldwin's hands.

He is delivered to a ranch which Baldwin owns, is treated as a guest. The ranch appears to be a dude ranch, but the guests are not the common run of vacationers. Among other things he hears a very odd language being spoken and meets a young woman—GAIL—who laughs at him, threatens to marry him, and refuses to explain the strange language. Baldwin sends for him.

Baldwin offers to pay him well for the loss of his career; Briggs demands explanations. While they are talking, the Federal Bureau of Security raids the ranch. Baldwin hides from the government men, forces Briggs to hide, too, and lets Briggs see that he has the spool of microfilm—then lets him see it destroyed. Baldwin admits that he is both Dr. Baldwin, atomic physicist, and Kettle Belly Baldwin, King of the Kopters. He tells Briggs that

the Nova Effect has been tried, that it works, and that it is much too dangerous to be intrusted to anyone, even to the government.

He warns Briggs that the only way to get the explanations Briggs wants is for Briggs to join up with the organization of which Baldwin is a part and warns him further that to do so is a very dangerous matter—they would kill him at once at the first slight suspicion. Briggs already realizes this truth; he tells Baldwin to go ahead.

Baldwin cautions him to take what he is about to say quite seriously, then announces soberly, almost sheepishly, that he, Baldwin, is a chief in an organization of "supermen".

Briggs answers: "I thought so."

Part 2

"Eh? How long have you known?"

"Things added up. The card game, your reaction time. I *knew* it when you destroyed the films."

"Joe, what is a superman?"

Gilead did not answer.

"Very well, let's chuck the term," Baldwin went on. "It's been overused and misused and beat up until it has mostly comic connotations. I used it for shock value and it didn't shock you. The term 'superman' has come to have a fairy-tale meaning, conjuring up pictures of x-ray eyes, odd sense organs, double hearts, uncuttable skin, steel muscles—an adolescent's dream of the dragon-killing hero. Tripe, of course. Joe, what is a *man?* What is man that makes him more than animal? Settle that and we'll take a crack at defining a superman—or New Man, Homo novis, who must displace Homo sapiens—*is* displacing him—because he is better able to survive than is Homo sap. I'm not trying to define *myself,* I'll leave it up to my associates and the inexorable processes of time as to whether or not I am a superman, a member of the new species of man—same test to apply to you."

"Me?"

"You. You show disturbing symptoms of being Homo novis, Joe, in a sloppy, ignorant, untrained fashion. Not likely, but you just might be one of the breed. Now—what is man? What is the one thing he can do better than animals which outweighs all the things that animals of one sort or another can do much better than he can?"

"He can think."

"I fed you that answer; no prize for it. O.K., you pass yourself off as a man; let's see you do some thinking. What is the one possible conceivable factor—or factors, if you prefer—which the hypothetical superman could have, by mutation or magic or any means, and which could be added to this advantage which man already has and which has enabled him to dominate this planet against the unceasing opposition of a million other species of fauna? Some factor that would make the domination of man by his successor as inevitable as your domina-

tion over a hound dog? Think, Joe. What is the *necessary* direction of evolution to the next dominant species?"

Gilead engaged in contemplation for what was for him a long time. There were so many lovely attributes that a man might have: to be able to see both like telescope and microscope, to see the insides of things, to see throughout the spectrum, to have hearing of the same order, to be immune to disease, to grow a new arm or leg, to fly through the air without needing silly gadgets like helicopters or jets, to walk unharmed the ocean bottom, to work without tiring—

Yet the eagle could fly and he was nearly extinct, even though his eyesight was keener than man's. A dog has better smell and hearing; seals swim better, balance better, and furthermore can store oxygen. Rats survive where men would starve or die of hardship; they are smart, and pesky hard to kill. Rats could—

Wait! Could tougher, smarter rats displace man? No, it just wasn't in them; too small a brain.

"To be able to think *better,*" Gilead answered almost instantly.

"Hand the man a cigar! Supermen are superthinkers; anything else is a side issue. I'll allow the possibility of super-somethings which might exterminate or dominate mankind other than by outsmarting him in his own racket—thought. But I deny that it is possible for a *man* to conceive in discrete terms what such a super-something would be or how it would win out. New Man will beat out Homo sap in Homo-sap's own specialty—rational thought, the ability to recognize data, store them, integrate them, evaluate correctly the result, and arrive at a correct decision. That is how man got to be champion; the creature who can do it better is the coming champion. Sure, there are other survival factors, good health, good sense organs, fast reflexes, but they aren't comparable, as our long, rough history has proved over and again—Marat in his bath, Roosevelt in his wheelchair, Caesar with epilepsy and a bad stomach, Nelson with one eye and one arm, blind Milton; when the chips are down it's *brain* that wins, not the body's tools."

"Stop a minute," said Gilead. "How about E. S. P.?"

Baldwin shrugged. "I'm not sneering at extrasensory perception any more than I would at exceptional eyesight—but E. S. P. is not in the same league with ability to think correctly. E. S. P. is a grab bag name for means other than the known sense organs by which the brain may gather data—but the trick that pays off with first prize is to make use of that data, to *reason* about it. If you want a telepathic hookup to Shanghai, I can arrange it; we've got operators at both ends—but you can get whatever data you might happen to need from Shanghai by phone with less trouble, less chance of a bad connection, and less danger of somebody listening in.

Telepaths can't pick up radio; it's not the same wave band."

"What wave band is it?"

"Later, later. You've got a lot to learn."

"I wasn't thinking only of telepathy. I was thinking of all parapsychological phenomena."

"Same reasoning. Apportation would be nice, if telekinetics ever gets that far—which it ain't. But a pickup truck will move things handily enough. Television in the hands of an intelligent man counts for more than clairvoyance in a moron. Quit wasting my time, Joe."

"Sorry."

"We defined thinking as integrating data and arriving at correct answers. Look around you. Most people do that stunt about well enough to get to the corner store and back without breaking a leg. If the average man thinks at all, he does silly things like generalizing from a single datum. He uses one-valued logics. If he is exceptional, he may use two-valued, 'either-or' logic to arrive at his wrong answers. If he is hungry, hurt, or personally interested in the answer, he can't use any sort of logic and will discard an observed fact as blithely as he will stake his life on a piece of wishful thinking. He uses the technical miracles created by superior men without wonder nor surprise, as a kitten accepts milk. Far from aspiring to higher reasoning, he is not aware that higher reasoning exists. He classes his own mental processes as being of the same sort as the genius of an Einstein. Man is not a rational animal; he is a rationalizing animal.

"To explain a universe that confuses him he seizes onto numerology, astrology, hysterical religions, and other fancy ways to go crazy. Having accepted such glorified nonsense, facts have no impression on him, even at the cost of his life. Joe, one of the hardest things to believe is the abysmal depth of human stupidity.

"That is why there is always room at the top, why a man with a *leetle* more on the ball can so easily become governor, millionaire, or college president—and why Homo sap is sure to be displaced by New Man, because there is so much room for improvement and evolution never stops.

"Here and there among ordinary men is an individual who can and does use logic in at least one field—he's often as stupid as the rest outside his study or laboratory—but he can think, if he's not disturbed or sick or frightened. This rare individual is responsible for *all* the progress made by the race; the others reluctantly adopt his results. Much as the ordinary man dislikes and distrusts and persecutes the process of thinking he is forced to accept the results occasionally, because thinking is efficient compared with his own maunderings. He may still plant his corn in the dark of the Moon but he will plant better corn developed by better men than he.

"Still rarer is the man who thinks

habitually, who applies reason, rather than habit pattern, to all his activity. Unless he masques himself, his is a dangerous life; he is regarded as queer, untrustworthy, subversive of public morals; he is a pink monkey among brown monkeys—a fatal mistake, unless the pink monkey can dye himself brown before he is caught.

"The brown monkey's instinct to kill is correct; such men are dangerous to all monkey customs.

"Rarest of all is the man who can and does reason at *all* times, quickly, accurately, inclusively, despite hope or fear or bodily distress, without egocentric bias or thalamic disturbance, with correct memory, with clear distinction between fact, assumption, and nonfact. Such men exist, Joe; they are New Man—human in all respects, indistinguishable in appearance or under the scalpel from Homo sap, yet as unlike him in action as the Sun is unlike a single candle."

Gilead said: "And you are that sort?"

"You will continue to form your own opinions."

"And you think I may be, too?"

"Could be. I'll have more data in a few days."

Gilead laughed until the tears came. "Kettle Belly, if I'm the future hope of the race, they had better send in the second team quick. Sure, I'm brighter than most of the jerks I run into, but, as you say, the competition isn't stiff. But I haven't any sublime aspirations. I've got as lecherous an eye as the next man. I enjoy wasting time over a glass of beer. I just don't *feel* like a superman."

"Speaking of beer, let's have some." Baldwin got up and obtained two cans of the brew. "Remember that Mowgli felt like a wolf. Being a New Man does not divorce you from human sympathies and pleasures. There have been New Men all through history; I doubt if most of them suspected that their differences entitled them to call themselves a different breed. Then they went ahead and bred with the daughters of men, diffusing their talents through the racial organism, preventing them from effectuating until chance brought the genetic factors together again."

"Then New Man is not a special mutation?"

"Huh? Who isn't a mutation, Joe? All of us are a collection of millions of mutations. Around the globe hundreds of mutations have taken place in our human germ plasm while we have been sitting here. No, Homo novis didn't come about because great grandfather stood too close to a cyclotron; Homo novis was not even a separate breed until he became aware of himself, organized, and decided to hang on to what his genes had handed him. You could mix New Man back into the race today and lose him; he's merely a variation becoming a species. A million years from now is another matter; I venture to predict

that New Man, that year and model, won't be able to interbreed with Homo sap—no viable offspring."

"You don't expect present man—Homo sapiens—to disappear?"

"Not necessarily. The dog adapted to man. Probably more dogs now than in umpteen B. C.—and better fed."

"And man would be New Man's dog."

"Again not necessarily. Consider the cat."

"The idea is to skim the cream of the race's germ plasm and keep it biologically separate until the two races are distinct. You chaps sound like a bunch of stinkers, Kettle Belly."

"Monkey talk."

"Perhaps. The new race would necessarily run things—"

"Do you expect New Man to decide grave matters by counting common man's runny noses?"

"No, that was my point. Postulating such a new race, it is inevitable. Kettle Belly, I confess to a monkey prejudice in favor of democracy, human dignity, and freedom. It goes beyond logic; it is the kind of a world I like. In my job I have jungled with outcasts of society, shared slumgullion by an open fire. Stupid they may be, bad they are not—I have no wish to see them become domestic animals."

For the first time the big man showed concern. His persona as "King of the Kopters", master merchandiser, slipped away; he sat in brooding majesty, a lonely and unhappy figure. "I know, Joe. They are of us; their little dignities, their nobilities, are not lessened by their sorry state. Yet it must be."

"Why? New Man will come—granted. But why hurry the process?"

"Ask yourself." He swept a hand toward the oubliette. "Ten minutes ago you and I saved this planet, all our race. It's the hour of the knife. Someone must be on guard if the race is to live; there is no one but us. To guard effectively we New Men must be organized, must never fumble any crisis like this—and must increase our numbers. We are few now, Joe; as the crises increase, we must increase to meet them. Eventually—and it's a dead race with time—we must take over and make certain that baby never plays with matches."

He stopped and brooded. "I confess to that same affection for democracy, Joe. But it's like yearning for the Santa Claus you believed in as a child. For a hundred and fifty years or so democracy, or something like it, could flourish safely. The issues were such as to be settled without disaster by the votes of common men, befogged and ignorant as their minds were. But now, if the race is simply to stay alive, political decisions depend on real knowledge of such things as nuclear physics, planetary ecology, genetic theory, even system mechanics. They aren't up to it, Joe. With goodness and more will than they possess less than one in a thousand

could stay awake over one page of nuclear physics; they *can't* learn what they *must* know."

Gilead brushed it aside. "It's up to us to brief them. Their hearts are all right; tell them the score—they'll come down with the right answers."

"No, Joe. No. We've tried it; it does not work. As you say, most of them are good, the way a dog can be noble and good. Yet there are bad ones—Mrs. Keithley and company and more like her. Reason is poor propaganda when opposed by the yammering, unceasing lies of shrewd and evil and self-serving men. The little man has no way to judge, and the shoddy lies are more attractively packaged. There is no way to offer color to a color-blind man, nor is there any way for us to give the man of imperfect brain the canny skill to distinguish a lie from a truth.

"No, Joe. The gulf between us and them is narrow, but it is very deep. We cannot close it."

"I wish," said Gilead, "that you wouldn't class me with your 'New Man'; I feel more at home on the other side."

"You will decide for yourself which side you are on, as each of us has done."

Gilead forced a change in subject. Ordinarily immune to thalamic disturbance, this issue upset him; his brain followed Baldwin's argument and assured him that it was true; his inclinations fought it. He was confronted with the sharpest of all tragedy, two equally noble and valid rights, utterly opposed. "What do you people do, aside from stealing films?"

"Many things." Baldwin relaxed, looked again like a jovial sharp businessman. "Where a push here and a touch there will keep things from going to pot, we apply pressure, by many and devious means. And we scout for suitable material and bring it into the fold when we can—we've had our eye on you for ten years."

"So?"

"Yep. That is a prime enterprise. Through public data we eliminate all but about one tenth of one percent; that thousandth individual we watch. And then there are our horticultural societies." He grinned.

"Finish your joke."

"We weed people."

"Sorry, I'm slow today."

"Joe, didn't you ever feel a yen to wipe out some evil, obscene, rotten jerk who infected everything he touched, yet was immune to legal action? We treat them as cancers; we excise them from the body social. We keep a 'Better Dead' list; when a man is clearly morally bankrupt we close his account at the first opportunity."

Gilead smiled. "If you were sure what you were doing, it could be fun."

"We are always sure, though our methods would be no good in a monkey law court. Take Mrs.

Keithley—is there doubt in your mind?"

"None."

"Why don't you have her indicted? Don't bother to answer. For example, two weeks from tonight there will be a giant powwow of the new, rejuvenated, bigger-and-better-than-ever Ku Klux Klan on a mountain top down Carolina way. When the fun is at its height, when they are mouthing obscenities, working each other up to the pogrom spirit, an act of God is going to wipe out the whole kit and kaboodle. Very sad."

"Could I get in on that?"

"You aren't even a cadet as yet." Baldwin went on, "There is the project to increase our numbers, but that is a thousand-year program; you'd need a perpetual calendar to check it. More important is keeping matches away from baby. Joe, it's been eighty-five years since we beheaded the last commissar: have you wondered why so little basic progress in science has been made in that time."

"Eh? There have been a lot of changes."

"Minor adaptations—some spectacular, almost none of them basic. Of course there was little progress made under communism; a totalitarian political religion is incompatible with free investigation. Let me digress: the communist interregnum was responsible for the New Men getting together and organizing. Most New Men are scientists, for obvious reasons. When the commissars started ruling on natural laws by political criteria—Lysenkoism and similar nonsense—it did not sit well; a lot of us went underground.

"I'll skip the details. It brought us together, gave us practice in underground activity, and gave a backlog of new research, carried out underground. Some of it was obviously dangerous; we decided to hang onto it for a while. Since then such secret knowledge has grown, for we never give out an item until it has been scrutinized for social hazards. Since much of it *is* dangerous and since very few indeed outside our organization are capable of real original thinking, basic science has been almost at a—public—standstill.

"We hadn't expected to have to do it that way. We helped to see to it that the new constitution was liberal and—we thought—workable. But the new Republic turned out to be an even poorer thing than the old. The evil ethic of communism had corrupted, even after the form was gone. We held off. Now we know that we must hold off until we can revise the whole society."

"Kettle Belly," Joe said slowly, "you speak as if you had been on the spot. How old are you?"

"I'll tell you when you are the age I am now. A man has lived long enough when he no longer longs to live. I ain't there yet. Joe, I must have your answer, or this must be continued in our next."

"You had it at the beginning—but, see here, Kettle Belly, there is one

job I want promised to me."

"Which is?"

"I want to kill Mrs. Keithley."

"Keep your pants on. When you're trained, and if she's still alive then, you'll be used for that purpose—"

"Thanks!"

"—provided you are the proper tool for it." Baldwin turned toward the mike, called out, "Gail!" and added one word in the strange tongue.

Gail showed up promptly. "Joe," said Baldwin, "when this young lady gets through with you, you will be able to sing, whistle, chew gum, play chess, hold your breath, and fly a kite simultaneously—and all this while riding a bicycle under water. Take him, sis, he's all yours."

Gail rubbed her hands. "Oh, boy!"

"First, we must teach you to see and to hear, then to remember, then to speak, and then to think."

Joe looked at her. "What's this I'm doing with my mouth at the moment?"

"It's not talking, it's a sort of grunting. Furthermore it is not structurally suited to thinking. Shut up and listen."

In their underground classroom Gail had available several types of apparatus to record and manipulate light and sound. She commenced throwing groups of figures on a screen, in flashes. "What was it, Joe?"

"Nine-six-oh-seven-two— That was as far as I got."

"It was up there a full thousandth of a second. Why did you get only the left-hand side of the group?"

"That's as far as I had read."

"Look at *all* of it. Don't make an effort of will; just look at it." She flashed another number.

Joe's memory was naturally good; his intelligence was high—just how high he did not yet know. Unconvinced that the drill was useful, he relaxed and played along. Soon he was beginning to grasp a nine-digit array as a single *gestalt;* Gail reduced the flash time.

"What is this magic lantern gimmick?" he inquired.

"It's a Renshaw tachistoscope. Back to work."

Around World War II Dr. Samuel Renshaw at Ohio State University was proving that most people are about one-fifth efficient in using their capacities to see, hear, taste, feel, and remember. His research was swallowed in the morass of communist pseudoscience that obtained after World War III, but, after his death, his findings were preserved underground. Gail did not expose Gilead to the odd language he had heard until he had been rather thoroughly Renshawed.

However, from the time of his interview with Baldwin the other persons at the ranch used it in his presence. Sometimes someone—usually Ma Garver—would translate, sometimes not. He was flattered to feel accepted, but graveled to know that

it was at the lowest cadetship. He was a child among adults.

Gail started teaching him to hear by speaking to him single words from the odd language, requiring him to repeat them back. "No, Joe. Watch." This time when she spoke the word it appeared on the screen in sound analysis, by a means basically like one long used to show the deaf-and-dumb their speech mistakes. "Now you try it."

He did, the two arrays hung side by side. "How's that, teacher?" he said triumphantly.

"Terrible, by several decimal places. You held the final guttural too long." She pointed. "The middle vowel was formed with your tongue too high and you pitched it too low and you failed to let the pitch rise. And six other things. You couldn't possibly have been understood. I heard what you said, but it was gibberish. Try again. And don't call me 'teacher'."

"Yes, Ma'am," he answered solemnly.

She shifted the controls; he tried again. This time his analysis array was laid down on top of hers; where the two matched, they canceled. Where they did not match, his errors stood out in contrasting colors. The screen looked like a sunburst.

"Try again, Joe." She repeated the word without letting it affect the display.

"Confound it, if you would tell me what the words mean, instead of treating me the way Milton treated his daughters about Latin, I could remember them easier."

She shrugged. "I can't, Joe. You must learn to hear and to speak first. Speedtalk is a flexible language; the same word is not likely to recur. This practice word means, more or less: 'The far horizons draw no nearer.' That's not much help, is it?"

The definition seemed improbable, but he was learning not to doubt her. He was not used to women who were always two jumps ahead of him. He ordinarily felt sorry for the poor little helpless cuddly creatures; this one he often wanted to slug. He wondered if his response were what the romancers meant by "love"; he decided that it couldn't be.

"Try again, Joe." Speedtalk was a structurally different speech from any the race had ever used. Long before, Ogden and Richards had shown that eight hundred and fifty words were sufficient vocabulary to express anything that could be expressed by "normal" human vocabularies, with the aid of a handful of special words—a hundred odd—for each special field, such as horse racing or ballistics. About the same time phoneticians had analyzed all human tongues into about a hundred-odd sounds, represented by the letters of a general phonetic alphabet.

On these two propositions Speedtalk was based.

To be sure, the phonetic alphabet was much less in number than the

words in Basic English. But sounds represented by letters in the phonetic alphabet were each capable of variation several different ways—length, stress, pitch, rising, falling, et cetera. The more trained an ear was the larger the number of possible variations; Joe was amazed to find that the initial sounds in "cool", "keep", and "cot" were all different. There was no limit to variations but, without much refinement of accepted phonetic practice, it was possible to establish a one-to-one relationship with Basic English so that *one phonetic symbol* was equivalent to an entire word in a "normal" language; one Speedtalk word was equal to an entire sentence. The language consequently was learned by letter units rather than by word units—but each word was spoken and listened to as a single structured gestalt.

But Speedtalk was not "shorthand" Basic English. "Normal" languages, having their roots in days of superstition and ignorance, have in them inherently and unescapably wrong structures of mistaken ideas about the universe. One can think logically in English only by extreme effort, care, so bad it is as a mental tool. For example, the verb "to be" in English has twenty-one distinct meanings, *every single one of which is false-to-fact.*

A symbolic structure, invented instead of accepted without question, can be made similar in structure to the real-world to which it refers. Speedtalk did *not* contain the hidden errors of English; it was structured as much like the real world as the New Men could make it. For example, it did not contain the unreal distinction between nouns and verbs found in most languages. The world—the continuum known to science and including all human activity—does not contain "noun things" and "verb things"; it contains space-time events and relationships between them. The advantage in achieving truth, or something more nearly like truth, was similar to the advantage of keeping account books in Arabic numerals rather than Roman.

All other languages made scientific, multi-valued logic almost impossible to achieve; in Speedtalk it was difficult *not* to be logical. Compare the pellucid Boolean logic with the obscurities of the Aristotelian logic it supplanted.

Paradoxes are verbal, do not exist in the real world—and Speedtalk did not have such built into it. Who shaves the Spanish barber? Answer: Follow him around and see. In the syntax of Speedtalk the paradox of the Spanish barber could not even be expressed, save as a self-evident error.

But Joe Greene-Gilead-Briggs could not learn it until he had learned to hear, by learning to speak. He slaved away; the screen continued to remain lighted with his errors.

Came finally a time when Joe's pronunciation of a sentence-word blanked out Gail's sample; the screen

turned dark. He felt more triumph over that than anything he could remember.

His delight was short. By a circuit Gail had thoughfutlly added some days earlier the machine answered with a flourish of trumpets, loud applause, and then added in a cooing voice, "Mama's *good* boy!"

He turned to her. "Woman, you once spoke of matrimony. If you ever do manage to marry me, I'll beat you."

"I haven't made up my mind about you yet," she answered evenly. "Now try this word, Joe—"

Baldwin showed up that evening, called him aside. "Joe! C'mere. Listen, lover boy, you keep your mind on your work, or I'll have to find you a new teacher."

"But—"

"You heard me. Take her swimming, take her riding, after hours you are on your own. Work time—strictly business. I've got plans for you; I want you to get smarted up."

"She complained about me?"

"Don't be silly. It's my business to know what's going on."

"Hm-m-m. Kettle Belly, what is this shopping-for-a-husband she kids about? Is she serious, or is it just intended to rattle me?"

"Ask her. Not that it matters, as you won't have any choice if she means it. She has the calm persistence of the law of gravitation."

"Ouch! I had had the impression that the 'New Men' did not bother with marriage and such like, as you put it, 'monkey customs'."

"Some do, some don't. Me, I've been married quite a piece, but I mind a mousy little member of our lodge who has had nine kids by nine fathers—all wonderful genius-plus kids. On the other hand I can point out one with eleven kids—Thalia Wagner—who has never so much as looked at another man. Geniuses make their own rules in such matters, Joe; they always have. Here are some established statistical facts about genius, as shown by Armatoe's work—"

He ticked them off. "Geniuses are usually long lived. They are not modest, not honestly so. They have infinite capacity for taking pains. They are emotionally indifferent to accepted codes of morals. You seem to have the stigmata, by the way."

"Thanks for nothing. Maybe I should have a new teacher, if there is anyone else available who can do it."

"*Any* of us can do it, just as anybody handy teaches a baby to talk. She's actually a biochemist, when she has time for it."

"When she has time?"

"Be careful of that kid, son. Her real profession is the same as yours—honorable hatchet man. She's killed upwards of three hundred people." Kettle Belly grinned. "If you want to switch teachers, just drop me a wink."

Gilead-Greene hastily changed the subject. "You were speaking of

work for me: how about Mrs. Keithley? Is she still alive?"

"Yes, blast her."

"Remember, I've got dibs on her."

"You may have to go to the Moon to get her. She's reported to be building a vacation home there. Old age seems to be telling on her; you had better get on with your homework if you want a crack at her." Moon Colony even then was a center of geriatrics for the rich. The low gravity was easy on their hearts, made them feel young—and possibly extended their lives.

"O.K., I will."

Instead of asking for a new teacher Joe took a highly polished apple to their next session. Gail ate it, leaving him very little core, and put him harder to work than ever. While perfecting his hearing and pronunciation, she started him on the basic thousand-letter vocabulary by forcing him to talk simple three- and four-letter sentences, and by answering him in different word-sentences of the same phonetic letters. Some of the vowel and consonant sequences were very difficult to pronounce.

Master them he did. He had been used to doing most things easier than could those around him; now he was in very fast company. He stretched himself and began to achieve part of his own large latent capacity. When he began to catch some of the dinner-table conversation and to reply in simple Speedtalk—being forbidden by Gail to answer in English—she started him on the ancillary vocabularies.

An economical language cannot be limited to a thousand words. Although almost any idea can be expressed one way or another in a short vocabulary, higher orders of abstraction are convenient. For technical words Speedtalk employed an open expansion of sixty of the thousand-odd phonetic letters. They were letters ordinarily used as numerals; by preceding a number word with a letter used for no other purpose, such a group was designated as having a word value.

New Men numbered to the base sixty—three times four times five—a convenient, easily factored system, most economical, i. e., the symbol "100" identified the number described in English as thirty-six hundred—yet permitting quick, in-the-head translation from common notation to Speedtalk figures and vice versa.

By using these figures, each prefaced by the indicator—a voiceless Welsh or Burmese "l"—a pool of two hundred fifteen thousand nine hundred ninety-nine words—one less than the cube of sixty—was available for specialized meaning, without using more than four letters including the indicator. Most of them could be pronounced as one syllable. These had not the stark simplicity of basic Speedtalk; nevertheless words such as "ichthyophagous" and "constitutionality" were thus compressed to monosyllables. Such short-cuts can best be appreciated by

anyone who has heard a long speech in Cantonese translated into a short speech in English. Yet English is not the most terse of "normal" languages—and expanded Speedtalk is many times more economical than the briefest of "normal" tongues.

By adding one more letter—sixty to the fourth power—just short of thirteen *million* words could be added when needed—and most of them could still be pronounced as one syllable.

When Joe found that Gail expected him to learn a couple of hundred thousand new words in a matter of days, he balked. "Fancy Pants, I am not a superman. I'm in here by mistake."

"Your opinion is worthless; I think you can do it. Now listen."

"Suppose I flunk; does that put me safely off your list of possible victims?"

"If you flunk, I wouldn't have you on toast. Instead I'd tear your head off and stuff it down your throat. But you won't flunk; I *know*. However," she added, "I'm not sure you would be a satisfactory husband; you argue too much."

He made a brief and bitter remark in Speedtalk; she answered with one word which described his shortcomings in detail. They got to work.

Joe was mistaken; he learned the expanded vocabulary as fast as he heard it. He had a latent eidetic memory; the Renshawing process now enabled him to use it fully. And his mental processes, always fast, had become faster than he knew.

To learn Speedtalk at all is proof of supernormal intelligence; the use of it by such intelligence renders that mind efficient.

Even before War II, Alfred Korzybski had shown that human thought was performed, when done efficiently, only in symbols; the notion of "pure" thought, free of abstracted speech symbols, was fantasy. The brain was so constructed as to work without symbols only on the animal level; to speak of "reasoning" without symbols was to speak nonsense.

Speedtalk did not merely speed up communication—by its structures it made thought more logical; by its economy it made thought processes enormously faster, since it takes almost as long to *think* a word as to speak it.

Korzybski's monumental work went fallow during the interregnum; *Das Kapital* is a childish piece of work when analyzed by semantics; therefore the Politburo suppressed semantics—and replaced it by *ersatz* under the same name, as Lysenkoism replaced the science of genetics.

Having Speedtalk to help him learn *more* Speedtalk, Joe learned very rapidly. The Renshawing continued; he could now grasp a gestalt or configuration in many senses at once, grasp it, remember it, reason about it with great speed.

Living time is not calendar time; a man's life is the thought that flows through his brain. Any man capable

of learning Speedtalk had an association time at least three times as fast as an average man. Speedtalk itself enabled him to manipulate its symbols approxiamtely seven times as fast as English symbols could be manipulated. Seven times three is twenty-one; a New Man had an *effective* lifetime of at least sixteen hundred years, reckoned in flow of ideas.

They had time to become encyclopedic synthesists, something denied any ordinary man by the strait jacket of this sort of time.

When Joe had learned to talk, to read and write and cipher, Gail turned him over to others for his real education. But before she checked him out she played him several dirty tricks.

For three days she forbade him to eat. When it was evident that he could think and keep his temper despite low blood-sugar count, despite hunger reflex, she added sleeplessness and pain—intense, long continued and varied pain. She tried subtly to goad him into irrational action; he remained bedrock steady, his mind clicking away as dependably as an electronic computer.

"Who's not a superman?" she asked at the end of their last session.

"Yes, teacher."

"Come here, lug." She grabbed him by the ears, kissed him soundly. "So long." He did not see her again for many weeks.

His tutor in E. S. P. was an ineffectual-looking little man who had taken the protective coloration of the name Weems. Joe was not very good at producing E. S. P. phenomena. Clairvoyance he did not appear to have. He was better at precognition, but he did not improve with practice. He was best at telekinesis; he could have made a soft living with dice. But, as Kettle Belly had pointed out, from affecting the roll of dice to moving tons of freight was quite a gap—and one possibly not worth bridging.

"It may have other uses, however," Weems had said softly, lapsing into English. "Consider what might be done if one could influence the probability that a neutron would reach a particular nucleus—or change the statistical probability in a mass."

Gilead let it ride; it was an outrageous thought.

At telepathy he was erratic to exasperation. He called the Rhine cards once without a miss, then had poor scores for three weeks. More highly structured communication seemed quite beyond him, until one day, without apparent cause but during an attempt to call the cards by telepathy, he found himself hooked in with Weems for all of ten seconds—time enough for a thousand words by Speedtalk standards.

—it comes out as speech!

—why not? thought is speech.

—how do we do it?

—if we knew, it would not be so unreliable. as it is, some can do it by volition, some by accident, and some never seem to be able to do it. we know this: while thought may not

be of the physical world in any fashion we can now define and manipulate, it is similar to events in continuum in its quantal nature. you are now studying the extension of the quantum concept to all features of the continuum, you know the chronon, the mensum, and the viton, as well as the action units of quanta such as the photon. the continuum has not only structure but texture in all its features. the least unit of thought we term the psychon.

—define it. put salt on its tail.

—some day, some day. I can tell you this; the fastest possible rate of thought is one psychon per chronon; this is a basic, universal constant.

—how close do we come to that?

—less than sixty-to-the-minus-third-power of the possibility.

—!!!!!!

—better creatures than ourselves will follow us. we pick pebbles at a boundless ocean.

—what can we do to improve it?

—gather our pebbles with serene minds.

Gilead paused for a long split second of thought. *—can psychons be destroyed?*

—vitons may be transferred. psychons are—

The connection was suddenly destroyed. "As I was saying," Weems went on quietly, "psychons are as yet beyond our comprehension in many respects. Theory indicates that they may not be destroyed, that thought, like action, is persistent. Whether or not such

theory, if true, means that personal identity is also persistent must remain an open question. See the daily papers—a few hundred years from now—or a few hundred thousand." He stood up.

"I'm anxious to try tomorrow's session, Doc," Gilead-Greene almost bubbled. "Maybe—"

"I'm finished with you."

"But, Dr. Weems, that connection was clear as a phone hook up. Perhaps tomorrow—"

"We have established that your talent is erratic. We have no way to train it to dependability. Time is too short to waste, mine and yours." Lapsing suddenly into English, he added, "No."

Gilead left.

During his training in other fields Joe was exposed to many things best described as impressive gadgets. There was an integrating pantograph, a factory-in-a-box, which the New Men planned to turn over to ordinary men as soon as the social system was no longer dominated by economic wolves. It could and did reproduce almost any prototype placed on its stage, requiring only materials and power. Its power came from a little nucleonics motor the size of Joe's thumb; its theory played hob with conventional notions of entropy. One put in "sausage"; one got out "pig".

Latent in it was an economic system as different from the current one as the assembly-line economy differed from the family-shop system—and in such system lay possibilities of human freedom and dignity missing for centuries, if they had ever existed.

In the meantime New Men rarely bought more than one of anything—a pattern. Or they made a pattern.

Another useful but hardly wonderful gadget was a dictaphone-typewriter-printing-press combination. The machine's analyzers recognized each of the thousand-odd phonetic symbols; there was a type bar for each sound. It produced one or many copies. Much of Gilead's education came from pages printed by this gadget, without using up precious time of others.

The arrangement, classification, and accessibility of knowledge remains in all ages the most pressing problem. With the New Men, complete and organized memory licked most of the problem and rendered record keeping, most reading and writing—and most especially the time-destroying trouble of rereading—unnecessary. The autoscriber gadget, combined with a "librarian" machine that could "hear" that portion of Speedtalk built into it as a filing system, covered most of the rest of the problem. New Men were not cluttered with endless bits of paper. They *never* wrote memoranda.

The area under the ranch was crowded with technological wonders, all newer than next week. Incredibly tiny manipulators for micrurgy of all sorts, surgical, chemical, and biological manipulation; oddities of cybernetics only less complex than

the human brain—the list is too long to describe. Joe did not study all of them; an encyclopedic synthesist is concerned with structured shapes of knowledge; he cannot, even with Speedtalk, study details in every field.

Early in his education, when it was clear that he had the potential to finish the course, plastic surgery was started to give him a new identity and basic appearance. His height was reduced by three inches; his skull was somewhat changed; his complexion was permanently darkened. Gail picked the facial appearance he was given; he did not object. He rather liked it; it seemed to fit his new inner personality.

With a new face, a new brain, and a new outlook, he was almost in fact a new man. Before he had been a natural genius; now he was a *trained* genius.

"Joe, how about some riding?"

"Suits."

"I want to give War Conqueror some gentle exercise. The young fellow is responding to the saddle; I don't want him to forget."

"Right with you."

Kettle Belly and Gilead-Greene rode out from the ranch buildings. Baldwin let the young horse settle to a walk and began to talk. "I figure you are about ready for work, son." Even in Speedtalk Kettle Belly's speech retained his own flavor.

"I suppose so, but I still have those mental reservations."

"Not sure we are on the side of the angels?"

"I'm sure you mean to be. It's evident that the organization selects for good will and humane intentions quite as carefully as for ability. I wasn't sure at one time—"

"Yes?"

"That candidate who came here about six months ago, the one who broke his neck in a riding accident."

"Oh, yes! Very sad."

"Very opportune, you mean, Kettle Belly."

"Joe, if a bad apple gets in this far, we can't let him out." Baldwin reverted to English for swearing purposes; he maintained that it had "more juice".

"I know it. That's why I'm sure about the quality of our people."

"So it's 'our people' now?"

"Yes. But I'm not sure we are on the right track."

"What's your notion of the right track?"

"We should come out of hiding and teach the ordinary man what he can learn of what we know. He could learn a lot of it and could use it. Properly briefed and trained, he could run his affairs pretty well. He would gladly kick out the no-goods who ride on his shoulders, if only he knew how. We could show him. That would be more to the point than this business of spot assassination, now and then, here and there—mind you, I don't object to killing any man who merits killing; I simply say it's inefficient. No doubt we would have to continue to

guard against such crises as the one that brought you and me together, but, in the main, people could run their own affairs if we would stop pretending that we are so scared we can't mix with people, come out of our hole, and lend a hand."

Baldwin reined up. "Don't say that I don't mix with the common people, Joe; I sell used 'copters for a living. You can't get any commoner. And don't imply that my heart is not with them. We are not like them, but we are tied to them by the strongest bond of all, for we are all, each every one, sickening with the same certainly fatal disease—we are alive.

"As for our killings, you don't understand the principles of assassination as a political weapon. Read—" he named a Speedtalk library designation. "If I were knocked off, our organization wouldn't even hiccup, but organizations for bad purposes are different. They are personal empires; if you pick the time and method, you can destroy such organizations by killing one man—the parts that remain will be almost harmless until assimilated by another evil leader—then you kill *him.* It is not inefficient; it's quite efficient, if planned with the brain and not with the emotions.

"As for keeping ourselves separate, we are about like the U-235 in U-238, not effective unless separated. There have been *potential* New Men in every generation—but they were spread too thin.

"As for keeping our existence secret, it is utterly necessary if we are to survive and increase. There is nothing so dangerous as being the Chosen People—and in the minority. One group was persecuted for two thousand years merely for making the claim."

He again shifted to English to swear. "Joe, face up to it. This world is run the way my greataunt Susie flies a 'copter. Speedtalk or no Speedtalk, common man *can't* learn to cope with modern problems. No use to talk about the unused potential of his brain, he has not got the *will* to learn what he would have to know. We can't fit him out with new genes, so we have to lead him by the hand to keep him from killing himself—and us. We can give him personal liberty, we can give him autonomy in most things, we can give him a great measure of personal dignity—and we will, because we believe that individual freedom, at all levels, is the direction of evolution, of maximum survival value. But we can't let him fiddle with issues of racial life and death; he ain't up to it.

"No help for it. Each society develops its own ethic. We are shaping this the way we are inexorably forced to, by the logic of events. We *think* we are shaping it toward survival."

"Are we?" mused Greene-Gilead.

"Remains to be seen. Survivors survive. We'll know— Wups! Meeting's adjourned."

The radio on Baldwin's pommel was shrilling his personal emergency

call. He listened, then spoke one sharp word in Speedtalk. "Back to the house, Joe!" He wheeled and was away. Joe's mount came of less selected stock; he was forced to follow.

Baldwin sent for Joe soon after he got back. Joe went in; Gail was already there.

Baldwin's face was without expression. He said in English, "I've work for you, Joe, work you won't have any doubts about. Mrs. Keithley."

"Good."

"Not good." Baldwin shifted to Speedtalk. "We have been caught flat-footed. Either the second set of films was never destroyed, or there was a third set. We don't know; the man who could tell us is dead. But Mrs. Keithley obtained a set and has been using them.

"This is the situation. The 'fuse' of the nova effect she has had installed in the New Age Hotel. It is sealed off and can be triggered only by radio signal from the Moon —her signal. The 'fuse' has been rigged so that any attempt to break in, as long as the firing circuit is still armed will trigger it and set it off. Even to examine it by penetration wave lengths will set it off. Speaking as a physicist, it is my considered opinion that *no* plan for tackling the fuse bomb itself will work unless the arming circuit is first broken on the Moon and that no attempt should be made to get at the fuse before then, because of extreme danger to the entire planet.

"The arming circuit and the radio relay to the Earthside trigger is located on the Moon in a building inside her private dome. The triggering control she keeps with her. From the same control she can disarm the arming circuit temporarily; it is a combination dead-man switch and time-clock arrangement. She can set it to disarm for a maximum of twelve hours, to let her sleep, or possibly to permit her to order rearrangements. Unless it is switched off, any attempt to enter the building in which the arming circuit is housed will also trigger the fuse bomb circuit. While it is disarmed, the housing on the Moon may be broached by force, but this will set off alarms which will warn her to rearm and then to trigger at once. The setup is such that the following sequence of events must take place:

"First, she must be killed, and the circuit disarmed.

"Second, the building housing the arming circuit and radio relay to the trigger must be broken open and the circuits destroyed *before* the time clock can rearm and trigger. This must be done with speed, not only because of guards, but because her surviving lieutenants will attempt to seize power by possessing themselves of the controls.

"Third, as soon as word is received on Earth that the arming circuit is destroyed, the New Age Hotel must be attacked in force and the fuse bomb destroyed.

"Fourth, as soon as the bomb is

destroyed, a general roundup must be made, of all persons technically capable of setting up the nova effect from plans. This alert must be maintained until it is certain that no plans remain in existence, including the hypothetical third set of films, and further established by hypno that no competent person possesses sufficient knowledge to set it up again without plans. This alert may compromise our secret status; the risk must be taken.

"Any questions?"

"Kettle Belly," said Joe, "doesn't she know that if the Earth becomes a Nova, the Moon will be swallowed up in the disaster?"

"Crater walls shield her dome from line-of-sight with Earth; apparently she believes she is safe. Evil is essentially stupid, Joe; despite her brilliance, she believes what she wishes to believe. Or it may be that she is willing to risk her own death against the tempting prize of absolute power. Her plan is to proclaim power with some pious nonsense about being high priestess of peace—a euphemism for Empress of Earth. It is a typical paranoid deviation; the proof of its craziness lies in the fact that the physical arrangements make it certain—if we do not intervene—that Earth will be destroyed automatically a few hours after her death, a thing that can happen any time—and a compelling reason for all speed. No one has ever quite conquered all of Earth, not even the commissars. Apparently she wishes not only to conquer it, but wants to destroy it after she is gone, lest anyone else ever manage to do so again. Any more questions?"

He went on, "The plan is this:

"You two will go to the Moon to become domestic servants to Mr. and Mrs. Alexander Copley, a rich, elderly couple living at the Elysian Rest Homes, Moon Colony. They are of us. Shortly they will decide to return to Earth; you two will decide to remain, you like it. You will advertise, offering to work for anyone who will post your return bond. About this time Mrs. Keithley will have lost, through circumstances that will be arranged, two or more of her servants; she will probably hire you, since domestic service is the scarcest commodity on the Moon. If not, variation will be arranged for you.

"When you are inside her dome, you will maneuver yourselves into positions to carry out your assignments. When both of you are so placed, you will carry out procedures one and two with speed.

"A person named McGinty, already inside her dome, will help you in communication. He is not one of us but is our agent, a telepath. His ability does not extend past that. Your communication hookup will probably be, Gail to McGinty by telepathy, McGinty to Joe by concealed radio."

Joe glanced at Gail; it was the first that he had known that she was a telepath. Baldwin went on, "Gail will kill Mrs. Keithley; Joe will break into the housing and destroy

the circuits. Are you ready to go?"

Joe was about to suggest swapping the assignments when Gail answered, "Ready"; he echoed her.

"Good. Joe, you will carry your assumed I.Q. at about 85, Gail at 95; she will appear to be the dominant member of a married couple"—Gail grinned at Joe—"but you, Joe, will be in charge. Your personalities and histories are now being made up and will be ready with your identifications. Let me say again that the greatest of speed is necessary; government security forces may attempt a foolhardy attack on the New Age Hotel. We shall prevent or delay such efforts, but act with speed. Good luck."

Operation Black Widow, first phase went off as planned. Eleven days later Joe and Gail were inside Mrs. Keithley's dome on the Moon and sharing a room in the servants' quarters. Gail glanced around when first they entered it and said in Speedtalk, "Now you'll have to marry me; I'm compromised."

"Shut that up, idiot! Some one might hear you."

"Pooh! They'd just think I had asthma. Don't you think it's noble of me, Joe, to sacrifice my girlish reputation for home and country?"

"What reputation?"

"Come closer so I can slug you."

Even the servants' quarters were luxurious. The dome was a Sybarite's dream. The floor of it was gardened in real beauty save where Mrs. Keithley's mansion stood. Opposite it, across a little lake—certainly the only lake on the Moon—was the building housing the circuits; it was disguised as a little Doric Grecian shrine.

The dome itself was edge-lighted fifteen hours out of each twenty-four, shutting out the black sky and the harsh stars. At "night" the lighting was gradually withdrawn.

McGinty was a gardener and obviously enjoyed his work. Gail established contact with him, got out of him what little he knew. Joe left him alone save for contacts in character.

There was a staff of over two hundred, having its own social hierarchy, from engineers for dome and equipment, Mrs. Keithley private pilot, and so on, down to gardeners' helpers. Joe and Gail were midway, being inside servants. Gail made herself popular as the harmlessly flirtatious but always helpful and sympathetic wife of a meek and older husband. She had been a beauty parlor operator, so it seemed, before she "married" and had great skill in massaging aching backs and stiff necks, relieving headaches and inducing sleep. She was always ready to demonstrate.

Her duties as a maid had not yet brought her into close contact with their employer. Joe, however, had acquired the job of removing all potted plants to the "outdoors" during "night"; Mrs. Keithley, according to Mr. James, the butler, believed that plants should be outdoors at "night". Joe was thus in a posi-

tion to get outside the house when the dome was dark; he had already reached the point where the "night" guard at the Grecian temple would sometimes get Joe to "jigger" for him while the guard snatched a forbidden cigarette.

McGinty had been able to supply one more important fact: besides the guard at the temple building, and the locks and armor plate of the building itself, the arming circuit was booby-trapped. Even if it were inoperative as an arming circuit for the fuse bomb on Earth, it itself would blow up if tampered with. Gail and Joe discussed it in their room, Gail sitting on his lap like an affectionate wife, her lips close to his left ear. "Perhaps you could wreck it from the door, without exposing yourself."

"I've got to be sure. There is certainly some way of switching that gimmick off. She has to provide for possible repairs or replacements."

"Where would it be?"

"Just one place that matches the pattern of the rest of her planning. Right under her hand, along with the disarming switch and the trigger switch." He rubbed his other ear; it contained his short-range radio hookup to McGinty and itched almost constantly.

"Hm-m-m—then there's just one thing to be done; I'll have to wring it out of her before I kill her."

"We'll see."

Just before dinner the following "evening" she found him in their room. "It worked, Joe, it worked!"

"What worked?"

"She fell for the bait. She heard from her secretary about my skill as a masseuse; I was ordered up for a demonstration this afternoon. Now I am under strict instructions to come to her tonight."

"It's tonight, then."

McGinty waited in his room, behind a locked door. Joe stalled in the back hall, spinning out endlessly a dull tale to Mr. James.

A voice in his ear said, "She's in *her* room now."

"—and that's how my brother got married to two women at once," Joe concluded. "Sheer bad luck. I better get these plants outside before the missus happens to ask about 'em." He picked up two of the pots and waddled out.

He put them down outside and heard, "She says she's started the massage. She's spotted the radio switching unit; it's on a belt that the old gal keeps at her bedside table when she's not wearing it."

"Tell her to kill her and grab it."

"She says she wants to make her tell how to unswitch the booby-trap gimmick first."

"Tell her not to delay."

Suddenly, inside his head, clear and sweet as a bell as if they were her own spoken words, he heard her. *Joe, I can hear you; can you hear me?*

—yes, yes! Aloud he added, "Stand by the phones anyhow, Mac."

—it won't be long. I have her in intense pain; she'll crack soon.

—hurt her plenty! He began to run toward the temple building. *—Gail, are you still shopping for a husband?*

—I've found him.

—marry me and I'll beat you every Saturday night.

—the man who can beat me hasn't been born.

—I'd like to try. He slowed down before he came near the guard's station. "Hi, Jim!"

—it's a deal.

"Well, if it taint Joey boy! Got a match?"

"Here." He reached out a hand —then, as the guard fell, he eased him to the ground and made sure that he would stay out. *—Gail! it's got to be now!*

The voice in his head came back in great consternation: *—Joe! she was too tough, she wouldn't crack. she's dead!*

—good! get that belt, break the arming circuit, then see what else you find. I'm going to break in.

—it's disarmed, Joe. I could spot it; it has a time set on it. I can't tell about the others; they aren't marked and they all look alike.

He took from his pocket a small item provided by Baldwin's careful planning. *—twist them all from where they are to the other way. you'll probably hit it.*

—oh, Joe, I hope so!

He had placed the item against the lock; the metal around it turned red and started to melt away. An alarm clanged somewhere.

Gail's voice came again in his head; there was urgency in it but no fear: *—Joe! they're beating on the door. I'm trapped.*

"McGinty! be our witness!" He went on: *—I, Joseph, take thee, Gail, to be my lawfully wedded wife—*

He was answered in tranquil rhythm: *—I, Gail, take thee, Joseph, to be my lawfully wedded husband—*

—to have and to hold, he went on.

—to have and to hold, my beloved!

—for better, for worse—

—for better, for worse—

—till death do us part. I've got it open, darling; I am going in.

—till death do us part. They are breaking down the bedroom door.

—hang on! I'm almost through here.

—they have broken it down, Joe. they are coming toward me. good-by my darling! I am very happy.

Abruptly her "voice" stopped.

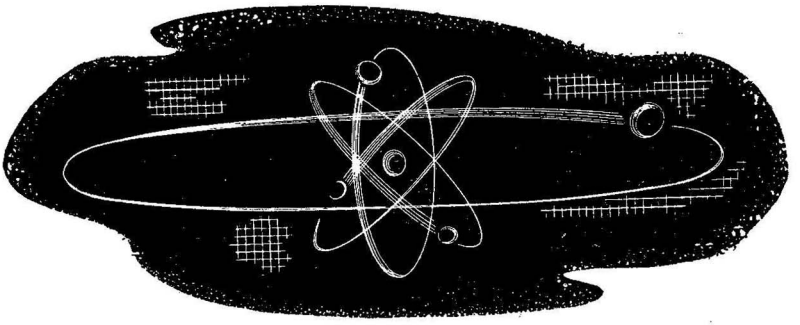
He was facing the box that housed the disarming circuit, alarms clanging in his ears; he took from his pocket another gadget and tried it.

The blast that shattered the box caught him full in the chest.

The letters on the metal marker read:

TO THE MEMORY OF
MR. AND MRS. JOSEPH GREENE
WHO, NEAR THIS SPOT,
DIED FOR ALL THEIR FELLOW MEN

THE END



IN TIMES TO COME

The January issue will have a cover by Bonestell, illustrating a Philip Latham story "The Xi Effect". And at this point, departing from standard procedure, I want to call attention to another item currently on sale with a Bonestell cover painting. The cover painting is familiar; it was our July, 1948 cover, showing a rocketship landed on the Moon, with the crew busy establishing a base about it. It is now the cover-jacket for "The Conquest of Space," with text by Willy Ley, and dozens of paintings and drawings by Bonestell. Viking Press put it out, and has done a magnificent job on the many full-color paintings; I don't often go in for editorial comment on books in the field, but this is one of those no-home-should-be-without items. How Viking has managed to turn out so beautiful a job for $3.95 is something of a mytsery, but don't miss the book. R. S. Richardson, and the Mount Wilson and Palomar Mountain staff helped Bonestell get authentic visualizations; with Willy Ley's text it is really a major landmark in the field of space travel!

But to next month's magazine; Ole Doc Methuselah's back—having trouble with artificially cultured babies that seem to have been accidentally given lion-cub culture serums by mistake. Very definitely tough babies! And the problem was even tougher than it seemed!

Poul Anderson—who has produced more than one original viewpoint in science-fiction—has a yarn called "Gypsy" that suggests a new type of difficulty in establishing a permanent human colony in an alien solar system.

And in longer range view, we have a new, remarkably powerful novel by L. Ron Hubbard coming up, starting in February. But the item that most interests me at the moment is an article on the most important subject conceivable. This is *not* a hoax article. It is an article on the *science* of the mind, of human thought. It is not an article on psychology—that isn't a science. It's not General Semantics. It is a totally new science, called *dianetics,* and it does precisely what a *science* of thought should do. Its power is almost unbelievable; it proves the mind not only can but does rule the body completely; following the sharply defined basic laws dianetics sets forth, physical ills such as ulcers, asthma and arthritis can be cured, as can all other psychosomatic ills. The articles are in preparation. It is, quite simply, impossible to exaggerate the importance of a true science of human thought.

THE EDITOR.

A CAN OF VACUUM

BY L. RON HUBBARD

The practical joke is as old as man, but not all practical jokers run up against quite so hard a customer.

Illustrated by Cartier

Bigby Owen Pettigrew reported, one fine August day, to the Nineteenth Project, Experimental Forces of the Universe, United Galaxies Navy and was apparently oblivious of the fact that ensigns, newly commissioned out of the civilian U.I.T. and utterly ignorant of military matters, were not likely to overwhelm anyone with the magnificence of their presence.

The adjutant took the orders carelessly and as careless said his routine speech: "Space Admiral Banning is busy but it will count as a call if you leave your card, Mr. Pettigrew."

Bigby Owen Pettigrew chewed for a while on a toothpick and then said: "It's all right. I'll wait. I got lots of time."

The office yeoman stared and then carefully restrained his mirth. The adjutant looked carefully at Pettigrew. There was a lot of Pettigrew to look upon and the innocent-appearing mass of it grinned a friendly grin.

The adjutant leaned back. The Universal Institute of Technology was doubtlessly a fine school so far as civilian schools went and it indubitably turned out very good recruits for the science corps. But this wasn't the first time that the adjutant had wished that a course in naval courtesy and law could be included there. The practical joking Nineteenth would probably take this boy apart, button by stripe and cell by hair. Obviously Pettigrew really thought an ensign could call on a space admiral just like that.

"Perhaps," said the adjutant, "you have some important recommendations to make concerning the way he's running the project."

Pettigrew shook his head sol-

emnly, all sarcasm lost upon him. "No. Just like to get the lay of the land, kind of."

"Are you sure," said the adjutant, "that you haven't some brilliant new theory you'd like to explain to him? Perhaps a new hypothesis for nebula testing?"

With a calm shake of his head, Pettigrew said, "Shucks no. I'm away behind on my lab work."

The yeoman at the side test was beginning to turn deep indigo with strangling mirth and managed, only at the last instant, to divert guffaws into a series of violent sneezes.

"You got a cold?" said Pettigrew.

The poor yeoman floundered out, made the inside of Number Four hangar and there was found some ten minutes later, in a state of aching exhaustion, by several solicitous mates who thought he had been having a fit. He tried for some time to communicate the cause of all this. But his mates did not laugh. They looked pityingly at him.

"Asteroid fever," said one.

"Probably got a columbar throngustu, poor fellow."

"Looks more like haliciticosis," said a third, vainly trying to feel the yeoman's pulse.

"All right," said the yeoman. "All right. You're a flock of horse faced ghouls. You wouldn't believe your mother if she said she was married! Doubt it! But he's here, I tell you. And that's what he did. And you mark my words, give that guy ten days on this station and none of you will ever be the same again."

The yeoman spoke louder and truer than he knew.

Carpdyke, the sad and suffering project assignment officer, who felt naked when he went to dinner without a couple of exploding cigars and a dematerializing pork chop, leaned casually up against the hangar door. The enlisted men had not seen him and they jumped. When they saw it was Carpdyke, they jumped again, further.

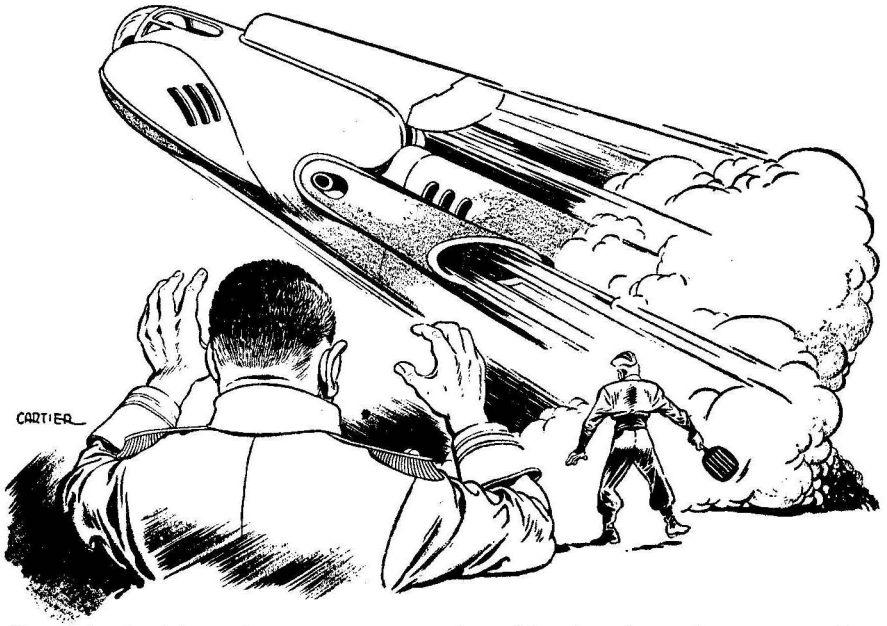
"What," said Carpdyke, "did you say this young gentleman's name was?"

"Pettigrew," said the yeoman, very nervous.

"Hm-m-m," said Carpdyke. "Well, men, I'm sure you have work to do." He was gloomy now, the way he always got just before he indulged his humor.

The group disappeared. Carpdyke went sadly back to his office and sat there for a long, long time. He might have been studying the assignment chart. It reached twelve feet up and eighteen feet across and was a three-dimensional painting of two million light-years of Universe. Here and there colored tacks marked the last known whereabouts of scout ships which were possibly going about their duties collecting invaluable fuel data and possibly not.

Carpdyke grew sadder and sadder until he looked like a bloodhound. His chief raymaster's mate chanced to look up, saw it and very, very nervously looked down. Just what was coming, the chief knew not. He hoped it wasn't coming to him.



Carpdyke had been known to stoop so low as to rig a bridegroom's quarters with lingerie the morning of the wedding. He had even installed Limburger cheese in a spaceship's air supply. And once—well, the chief just sat and shuddered to recall it.

The door opened casually and Bigby Owen Pettigrew, garbed newly in a project blister suit less mask, the fashion there on lonely Dauphiom where beards grew in indirect proportion to the number of women, entered under the cloud of innocence.

The chief looked at Carpdyke, at Pettigrew and then at Carpdyke again. The assignment officer was growing so sad that a tear trembled on one lid. The chief stopped breathing but then when no guardian angel snatched Pettigrew away from there, the chief started again. No reason to suffocate.

"Hello," said Pettigrew cheerfully.

"You're new here, aren't you?" mourned Carpdyke.

"I just graduated from the U.I.T.," said Pettigrew. "My name's Bigby. What's yours?"

"I'm Scout Commander Carpdyke, Bigby. We always like to see our new boys happy with the place. You like your hangars?"

"Oh, sure."

"You found the transportation from the Intergalaxy comfortable and prompt?"

"Sure, sure."

"And your room? It has a lovely view?"

"Well now," said Pettigrew thoughtfully, "I don't think I noticed. But don't you bother yourself, commander. It suits me. I don't want much."

The chief was beginning to have trouble swallowing. He went to the water cooler.

"Well, now," said Carpdyke, looking very, very mournful, "I am happy to hear that. But you're sure you wouldn't want me to change quarters with you?"

"Change? Shucks, commander, that's awful nice of you but—well, no. My quarters suit me fine and no doubt you're used to yours."

The chief sprayed water over the assignment map, dived straight out the door and kept going. A ululation of indescribable pitch faded away as he grew small across the rocket field.

"Did he get sick or something?" asked Pettigrew.

"A bit touched, poor man," said Carpdyke. "Ninety missions to Nebula M-1894."

"Poor fellow," said Pettigrew. But he braced up under it. "Now, then, commander. Is there anything you want me to solve or fix up? Anything you're stuck on or deep-ended with? They put me through the whole ten years and I sure want to do well by the service." He burnished a bit at the single jag of lightning on his lapel which made him an ensign, science-corps, experimental.

"How were things at base? You left Universal Admiral Collingsby well, I presume."

"Sure, sure," said Pettigrew. "Read me my oath himself."

You and ten thousand other plebes by visograph, muttered Carpdyke.

"Beg pardon?"

"Nothing. Nothing. I was just wondering where we could best use your services, Pettigrew. We have to be careful. Don't want to waste any talent, you know."

"Sure not! I bet you have an awful time keeping up with problems, huh?" Vivid excitement manifested itself on Pettigrew's homely face for the first time.

"There," said Carpdyke, "you have struck it. Keeping up. Keeping up. Ah, the weariness of it. Pettigrew, I'll wager you have no real concept of what we're up against here at Nineteen. Mankind fairly hangs on our reports, sir."

"I'll bet they do," said Pettigrew with enthusiasm.

"Here we are," said Carpdyke, "located in the exact hub of the Universe, located for a purpose, Pettigrew. A Purpose! Every exploding star must be investigated at once. Every new shape of a nebula must be skirted and charted. Every dark cloud must be searched for harmful material. Pettigrew, the emanations of all the Universe depend upon us. Upon us, Pettigrew." And here he heaved a doleful sigh. "Ah, the weariness of it, the weariness."

"Sure now, commander. Don't take it hard. I mean to help out

all I can. Just you tell me what you want done—"

Carpdyke rose and convulsively gripped the ensign's hand. "You mean it, Pettigrew? You mean it truly? Magnificent! Absolutely magnificent!"

"Just you tell me," said Pettigrew, "and I'll do my best!"

Carpdyke's exultation gradually faded and he sank back. He slumped and then shook his head. "No, you wouldn't do that. I couldn't ask you to do that."

"Tell me," begged Pettigrew.

"Pettigrew," said Carpdyke at last, "I have to confess. There *is* a problem. I hate to ask. It's so difficult—"

"Tell me!" cried Pettigrew.

Carpdyke finally let himself be roused. Very, very sadly he said: "Pettigrew, it's the rudey rays."

"Just you . . . the what?"

"Rudey rays. Rudey rays! You've heard of them certainly."

"Well, now, commander . . . I . . . uh . . . rudey rays?"

"Pettigrew, how long were you at U.I.T.?" And Carpdyke put deep suspicion into it.

"Why, ten years, commander. But— Rudey rays. Gosh, I didn't never hear of anything like them."

"Pettigrew," said Carpdyke sternly, "rudey rays might well be the foundation of a new civilization. They emanate. They expand. They drive. But they can't be captured, Pettigrew. They can't be captured."

"Well, what—?"

"A rudey ray," said Carpdyke, "is an indefinite particular source of inherent and predynamic energy, inescapably linked to the formation of new stars. Why, Pettigrew, it is supposed that the whole Universe might have been created from the explosion of just one atom made of rudey rays!"

"Gosh. I thought—"

"You thought!" cried Carpdyke. "Ah, these professors! They pour ancient, moldy and outmoded data into the hapless heads of our poor, defenseless young and then send them out—"

"Oh, I believe you," said Pettigrew. "It's just kind of sudden. A new theory, like."

"Of course," said Carpdyke, sadly but gently. "I knew you would understand. This matter is top secret. Nay, it is *bond* top secert. Pettigrew, if we had just one quart of rudey rays—"

"One what?"

"One quart!"

Pettigrew nodded numbly. "That's what I thought you said."

"Pettigrew, with just one quart of rudey rays we could run the United Galactic Navy for a million years at full speed. All five million ships of them. We could run the dynamos of all our systems for ten thousand years without stopping. And—"

Pettigrew was wide-eyed. "Yes?"

Carpdyke leaned closer, "Pettigrew, with just one quart of rudey rays, we could make a whole new universe."

Pettigrew fanned himself uncertainly.

"Good!" said Carpdyke. "I'll give you your orders." And before another word could be spoken he scrawled across a full page of the order blank:

TO ALL ACTIVITIES:

Ensign Bigby O. Pettigrew, pursuant to verbal orders this date to the effect that he is to locate, isolate and can one quart of rudey rays, is hereby authorized to draw necessary equipment on the recommendation of supply and laboratory commands.

Carpdyke.

With a flourish he gave it over. With a hearty handshake and a huge smite upon the back, Carpdyke propelled the ensign to the door. Pettigrew was thrust out and the wind fluttered in the sheet he held. He looked at it, frowned a little and then, squaring his shoulders manfully, strode purposefully upon his way.

Behind him Carpdyke stood for a little while, devils flickering in his eyes and something like a smile on his mournful mouth. Then he sat down.

"The first thing supply will send him for is a can of vacuum," said Carpdyke. "I figure that should take him a couple of days. Then lab will want—" But he shook off these pleasures and looked moodily at his assignment blanks.

He'd have to have something new in three or four days. Pettigrew ought to be good for a solid month before he began to wise.

"Sir," said the chief raymaster's mate, "dispatches from base." He looked at them. "All routine."

"I'm busy," said Carpdyke, throwing them into the basket. He settled himself down to compound and compute the next mission of the luckless Pettigrew. "Now, then, commander," he mimicked, "is there anything you want me to solve or fix up?" He nearly chuckled. "Ah, Pettigrew, Pettigrew—" He grew mournful again and the chief looked very, very uncomfortable as time wore on.

"Sir," ventured the chief, "that top dispatch says a new batch of officers is being ordered in here. About fifteen ensigns, a couple of commanders and one captain, Congreve, to take over as exec. That's the Congreve that was cited for his work on new fuels. He'll probably make this place hot. I—"

"Shut up," said Carpdyke, "I'm busy." And to himself, "When he gets chased all over the post with that, we'll try pink Beta rays and maybe a left-handed Geiger counter. Then—"

There was a stuttering snarl out in the hangar and heavy ground vibrations as a big motor warmed. The chief scowled. He looked at his assignment sheets and let off a couple of regulation growls.

"No flights due off for a week. What's wrong with them monkeys." He went to the office door and stood there, a little blinded by the pink daylight. He saw a Number Thirty Starguide being dollied out by a tractor for a take-off. It wasn't the space admiral's barge, but a routine mis-

sion cruiser. And the peculiar thing about it was, no lab crew standing by.

When they had the Starguide into position for its launch one lone figure came shuffling out, climbed the ladder and popped into the hatch. The tractor detached itself and the tower waved all clear.

There was something reminiscently all wrong about the man who had entered that ship and the chief was almost ready to turn away when it struck him.

"Pettigrew!" He started to run into the field and then realized his complete lack of authority. He dashed back.

Carpdyke was still absorbed.

"Sir!" said the chief. "That ensign got a ship! He's about to take off!"

Carpdyke almost said, "I'm busy" and came alert and up instead. "Who?"

"Pettigrew got a ship. There!"

Carpdyke was stunned. He ran forward and then was slammed back into the door by the recoil blast of the Starguide. One moment there was a ship, the next there was the dust. Pettigrew was gone.

"You sure that was Pettigrew?" cried Carpdyke.

"I seen him."

Carpdyke breasted the flying clouds of dirt which lingered and got himself to Flight Operation.

He slammed inside. "What's going on? Who was in that ship?"

"Ensign Pettigrew," said the warrant dispatcher.

"What?" cried Carpdyke. "Where is Lieutenant Morgan?"

"Sick bay," said the warrant dispatcher. He had been scared for a moment but now he knew he was in the right. He was an old navy man. An order was an order and he had the copy right there.

"Why did you let that man get away?"

"Sir," said the warrant, "I seen your order not ten minutes back. We was to lend every assistance to Ensign Pettigrew. Well, we did!"

Carpdyke was keeping upright by holding the edge of the signal rack. A million dollars worth of spacecraft, the life of a new officer— "But he . . . but that was just—" He caught hold of himself. "That order was intended to be seen by Morgan. The man was new."

"I got the duty," said the warrant doggedly, "and I obeyed it."

Carpdyke went away from there with a complete panorama of a twelve-man court-martial board staring him unsympathetically in the eye. What had he sent that fool after? Rudey rays. Knowing less than nothing about the fiery character of luminous masses, an ensign would burn himself to bacon crispness the first one he ran through. No ensign, no ship, no further career for Carpdyke.

He had no choice but to declare himself guilty. He went into the outer office of the admiral's suite and looked sadly at the adjutant. "Is he in?"

"Sure, but—"

Carpdyke went wearily by and breasted the barricades.

Banning was rather fat, somewhat crotchety, and had a most wary eye upon his future. He had managed to live twenty-one years with the Navy without sullying his record and if he could keep one more clean he would be pleasantly selected up by his friends to some post as galactic commander with the rank of sixteen stars. Today he was musing upon his happy future, making thoughtful steeples with his fingers and watching his favorite cat, dozing in the daylight which poured in.

"Sir," said Carpdyke, remembering suddenly that he had forgotten his jacket and cap, "a new man Pettigrew just reported. An ensign. He was awful green and I sent him out with a funny order and Morgan is in sick bay today and his warrant

obeyed the order and now Pettigrew and a million dollars worth of Number Thirty Starguide are on their way some place to get fried. I am turning in my resignation and will hold myself—"

Banning's eyes went round as he attempted to digest these facts. Then he ordered a repeat and when it had been carefully told four or five times with details, he suddenly understood that sixteen stars might very well eclipse if such things were found to have happened on his base.

"Order up the cruisers! Send out ten destroyers! Man the warning net!" bawled Banning. And then he grabbed his cap and sprinted for the radio room.

Carpdyke relayed the orders and within ten minutes where peacefulness had reigned, great waves of motors began to beat and the ground quaked under the impact of emergency take-off.

The men were not quite clear on what they were to do or where they were to go. And it took Banning several minutes on the short wave to convince four or five irate commanders, who objected to leaving so fast, that they were not about to repulse a rebel attack.

Meanwhile a small, dark radioman was having no luck with Pettigrew. "Sir," he said to Banning, "he can't have any channels switched on. I've tried them all. And probably he's outraced even the ion beams by this time. I don't think—"

"Don't think!" cried Banning. "Don't ever think! Stop that ship!"

But nobody stopped that ship. For five standard days Banning's guard fleet raked and combed the surrounding space and then, because they had left without proper provisions, began to return one by one, each with negative news.

Carpdyke, miserable but not under arrest yet because Banning could not stop worrying long enough to think up the proper charges, wandered around the hangars. He received very little sympathy. Hardly anyone on the project had escaped Carpdyke's somewhat heavy wit and combined with this, all crews present had gone without liberty or relief for a week. The project was very grim. The brig was full of people who hadn't saluted properly or had demonstrated negligence in the vicinity of Space Admiral Banning. Things were confused.

At least three times a day Banning picked up his pencil to send intelligence of this hairbrained accident to the department and each time was stopped by his vision of those sixteen stars. He could court-martial Carpdyke, but then it would come out that Carpdyke was notorious and that Banning, being of the haze school himself, had never put a full astern on the practice. Banning was confused.

Ten days went by with no word of Pettigrew and out of complete weariness the project began to settle into an uncertain sort of routine. The chaplain left the bridge table long enough to inquire whether or not he should read an absentee burial for

the young officer and was told off accordingly. Scout ships returning with routine data were ignored and immediately fell under the same gloom which was downing everyone else.

Nobody spoke to Carpdyke.

When the admiral spoke to anybody they got rayburns.

The post publicity officer began to write up experimental releases about another brave young martyr of science and the master at arms inventoried the scanty baggage of Pettigrew. People began to look worn.

And then, at four o'clock of a September day, a Number Thirty Starguide, rather singed around the edges and coughing from burned out brakes, came to rest before Hangar Six and out popped a very second-hand version of Bigby Owen Pettigrew.

People stopped right where they were and stared.

"Hello," said Pettigrew.

But people just stared.

Admiral Banning had been soon told and was coming up puffing and scarlet. Carpdyke slithered out of his office and tried to seem as if he wasn't present.

"Hello, Mr. Carpdyke," said Pettigrew.

"Young man!" said Banning, "where have you been?"

"Are you Admiral Banning?" asked Pettigrew.

"Answer me!"

"Well, I guess I been all around, mostly. I scouted about three nebulas and almost lost the whole shooting match in the last one, what with the emissions and all. And I got pretty shaken up with the currents and reversed fields and—"

"What was the idea taking off that way?" cried Banning.

"Well, Mr. Carpdyke, he told me to go out and get a quart of rudey rays and I—"

"A quart!" cried Banning.

"Yes, sir. Seemed kind of funny to me, too. But he said these rudey rays was the germs of new universes so I—"

"Rudey rays!"

"No, sir, I never heard of them either, admiral. But orders is orders so I went out—"

"You young fool! You might have been killed! You might have lost that ship!"

"Admiral," said Pettigrew, "that's just the way it seemed to me, too. But when he said how powerful these rudey rays was, why I recollected when I was flying the Mail—"

"What mail? I thought you were a U.I.T. man!" said Banning.

"Oh, sure, I am, sir. But five or six years before that I was flying the Empire Mail. Then when I found that new fuel you're using, they give me a scholarship to U.I.T. which was mighty nice because back in Texas I never got much formal learning. And after I'd done some work on star clusters they said was new, why I wanted to get back to flying again so I figured this was the place to be. I ain't much of a hand about the Navy—"

This startling dissertation was abruptly punctured by the arrival of a cruiser which slammed down smartly enough to knock out a couple of windowpanes.

From it stepped a splendid young captain who approached the waiting group and saluted the admiral.

"Captain Congreve, sir, reporting to relieve the exec. I— Oh, hello Pettigrew!"

There was so much warmth in Congreve's voice that Banning was startled.

"You know this man?" cried Banning.

"I certainly do. And I can recommend him to you heartily," said Congreve. "Picked him myself after Universal Admiral Collingsby swore him in. He invented the billion light-year fuel capsule. You've heard of him, haven't you? Well you must have; I see you've been on a mission already."

"Yes, sir," said Pettigrew "I was sent off to get a quart of rudey rays."

"A . . . a what?"

"And I got 'em," said Pettigrew, pulling a flat jar from his sagging jacket. "Had quite a time and near got sizzled but they're tame enough. I saturated sponge iron with them and the filings are all here. Kind of a funny way to carry the stuff but I guess you Navy guys know what you are doing."

"Rudey rays?" said Banning.

"Thousand year half-life," said Pettigrew, "and completely harmless. Good brake fuel. Won't destroy grass. By golly, Mr. Carpdyke, it was awful smart of you to figure these things out. They ain't in any catalogue and I sure didn't know they existed."

Technicians passed the flask from hand to hand gingerly. The counters on their wrists sang power innocuous to man and sang it loud.

"That's all I could get this trip. Nebula One, right slam bang center of the universe," said Pettigrew. "Well, there she is. If you'll excuse me, I don't look much like a naval officer and I better change my clothes."

They stared after him as he went to quarters, the master at arms trotting after to break out his impounded gear.

There was a queer, dazed look about Carpdyke. But Banning was not dazed. He fired some fast, smart questions at the technicians and when they had examined the fuel in the lab, they gave him some pretty positive answers.

Banning stood looking at Carpdyke, then, but not seeing him. Banning was seeing sixteen stars blazing on the side of a flagship and maybe not a whole year away after all.

"Sir," stammered Carpdyke, "I'm sorry. It came out all right but I know I jeopardized equipment. He looked so young and green and I figured it would take a lot of roasting to make him an officer and I never intended he would actually get off the base—"

Captain Congreve looked mirth-

fully at Carpdyke, for the captain understood the situation now.

"Commander," said Congreve, "I wouldn't let this throw you. You see, the reason Collingsby swore that man in as an ensign and not as a lieutenant was because Pettigrew had something of a reputation in the Empire Mail."

"A reputation?" said Carpdyke.

"Yes," said Congreve, gently. "A reputation as a practical joker, commander, and he'd been warned about you."

"A pract . . . a practical—" began Carpdyke, feeling most ungodly faint at what this would do to his reputation everywhere.

"Carpdyke," beamed Banning, clapping him on the shoulder in a most friendly, sixteen-star-blinded way, "supposing we all go over to the club and let you buy us a drink?"

THE END

THE ANALYTICAL LABORATORY

We have two months reports to assess this time, including thus in one issue the full voting on a serial. Since the voting is, necessarily, on a relative-within-the-issue basis, no absolute scale of values can be determined; however, closely-grouped point-scores—that is, all point-scores falling in a narrow range—indicates the general reader reaction found the issue fairly uniform in quality. From my point of view, that's interesting—but somewhat frustrating. Obviously, narrow-range point-scores could mean either the issue was uniformly excellent—the millennium is here!—uniformly mediocre, or uniformly stinko. But that's the trouble with trying to apply anything remotely scientific to an art form; statistical analysis of a field that, by its nature, has no absolutes is something like attempting chemical analysis of an emotion. It remains interesting, but not absolutely convincing! Each must draw his own conclusions.

AUGUST ISSUE

Place	Story	Author	Points
1.	The Queen of Zamba	L. Sprague de Camp	2.02
2.	Trojan Horse Laugh	John D. MacDonald	2.36
3.	Tied:		
	P-Plus	Peter Phillips	3.41
	Letter To A Phoenix	Fredric Brown	3.41
4.	A Matter of Matter	L. Ron Hubbard	3.69

SEPTEMBER ISSUE

1.	The Double-Dyed Villains	Poul Anderson	1.73
2.	Hide And Seek	Arthur C. Clarke	2.46
3.	The Queen of Zamba (End)	L. Sprague de Camp	2.57
4.	Special Jobbery	H. B. Fyfe	3.19

"Progress Report" got a number of comments, but I'd like more expression of opinion on that general idea. Do you readers like the idea of slightly wacky articles, if adequately labeled as such, or not? The major task of science is separating sense from nonsense; shall we play with that problem in science-fiction or not?

THE EDITOR.

BACTERIAL TIME BOMB

BY ARTHUR DUGAN

Non-living forces dissipate and dilute energy and matter; only living forces concentrate. This fact article discusses a new and ingenious method of introducing life to concentrate to useful degree a scattered resource.

There was a time when the prevailing opinion among industrialists and politicians was that occasional wars were a good thing. The nation as a whole was benefited inasmuch as the danger of overpopulation was minimized and the destruction caused by wars was outweighed by the stimulus it gave new construction. The rate of obsolescence was accelerated, therefore replacement of antiquated by modern equipment became a must, and "progress" was insured. Only a "progressive" country had survival value.

We are fortunate that we live in an era that has obliterated these sentiments, that the world has become truly one and united. Had not man attained maturity and recognized that an international tribunal afforded the only civilized method of settling international disputes, the future would be a very unhappy one. It is interesting to speculate on the IFs of history, and how small things contain the seeds of much greater events. In particular, it is interesting to consider how, without the security provided by a workable and working United Nations, the microbe could sow the seed of a greater conflict than man has ever known.

Please don't expect to find here any terrifying accounts of the potentialities of bacteriological warfare. I am not concerned with the methods by which the fight would be fought. I merely wish to show that the microbiologist has done his small bit to plant the seed.

The experiments of Louis Pasteur laid the foundation for understanding the action of all microorganisms. Methods of their economic control are traceable to his genius. The troubles in Palestine are, therefore, directly ascribable to Pasteur! Fanciful? Perhaps, but—n-Butyl alcohol and acetone are highly desirable materials. Acetone is used in the manufacture of smokeless powder and finds wide use as a solvent in many industries; butyl alcohol, butyl acetate and other esters are sought after by the lacquer industry. Chaim Weizmann developed the *B.Y. Fermentation,* the bacterial fer-

mentation of starch to yield acetone and butanol. Those interested in the process are referred to United States Patent 1315585; British Patent 4845 (1915). The modern industrial giant in the solvents industry, Commercial Solvents Corporation, was organized to utilize this process and their first two plants were located at Terre Haute, Indiana and Peoria, Illinois in the heart of the corn belt.

Weizmann collected large royalties from his process and these royalties he poured unstintingly into the cause of Zionism, becoming head of the Zionist movement in 1920. The final success of the Zionist movement was due in no small measure, therefore, to the action of bacteria *Clostridium acetobutylicum* and *Clostridium saccharo-butylacetonicum liquefaciens*. But the success in the use of these bacteria stemmed directly from the work of Pasteur. As to the possibilities inherent in the final success of Zionism, read your daily paper or listen to the evening radio. Cannot what you read and what you hear be ascribed, at least in part, to Louis Pasteur?

Unless you have a larger map of Alberta, Canada, than the author possesses, you will not find the Horse River. It lies on or near the fifty-third degree of North Latitude. There is apparently nothing here that could possibly contain the seeds for war. Merely normally good soil supporting the normal amount and type of growth. And that's all. Or would be all were it not for United States Patent No. 2,413,278.

I first heard about United States Patent No. 2,413,278 in the June 21, 1947 issue of the *Oil and Gas Journal* (page 78). United States Patent No. 2,413,278. It has a nice innocuous sound, hasn't it? Well, let's hope it is as harmless as it sounds. For United States Patent No. 2,413,-278 is heap big medicine. Quoting from the *Oil and Gas Journal* article above referred to, it reveals the following discoveries about certain strains of bacteria:

(1) "They can strip an oil film from the outer surface of a grain of sand, apparently by rush hour subway techniques including free use of shoulder and elbow, and packing themselves so tightly around the grain that oil is displaced.

(2) "They secrete a substance which lowers the surface tension of the oil present around the sand to the point where it releases its grip and is free for recovery through the open pore spaces.

(3) "They are responsible for the production of acids or acidic substances which attack limestone or limy materials and dissolve them, releasing any oil adhering to these materials and, at the same time forming carbon dioxide gas which may further aid in recovering the released oil.

(4) "There are indications that they attack the heavier—and

therefore more viscous—hydrocarbons and split them into lighter hydrocarbons—which are less viscous and flow more freely through reservoir pore spaces."

Nothing particularly Earth-shaking about that, is there? In fact, it's rather dull, isn't it? Well, most things are interesting only in their relationship to other things. So let's relate Patent No. 2,413,278* to Horse River. Along the banks of Horse River are deposits of Athabaska oil sands. The Athabaska oil sands are merely the greatest oil deposit in the world. Proven reserves of the Athabaska deposits are estimated to be between one hundred and two hundred fifty billion barrels. (In the petroleum industry, one barrel is always equivalent to forty-two gallons). The lower figure represents a quantity equal to an optimistic estimate of the total proven reserves of the rest of the world combined. There's only one hitch. You can't get it! 'Tain't economical!

But you might think this over tonight.

The patent says in its quiet manner that ". . . . Athabaska oil sands from the Athabaska region of Canada have been found to release oil when subjected to contact with a medium of the bacteria. The bacteria attach themselves so tenaciously to solid surfaces that they cannot be flushed away by the ordinary flow of fluids in a formation."

During the war years we were subjected to a great many lessons in geography, not all of them pleasant. One lesson frequently drummed into our ears was the importance of a polar map of the world. Suppose you look at one now. The projection in front of me shows only Edmonton in the province of Alberta, but that's close enough to the Athabaskan oil sands to provide a reference point. Look south and you'll see the United States. North, just over the top of the world lies the U.S.S.R. Athabaskan oil sands, you see, are located between the only two big powers in the world today.

No, there's nothing exciting in the language of patent No. 2,413,278. But it's worth speculating on whether it may not be a time bomb!

It will, of course, be a good many years before we definitely know whether oil production in this manner is commercially sound. If it is really practical, a lot of old and abandoned wells will be producing more than they did in their heyday. Meanwhile, bearing the Athabaskan oil sands in mind, I'd like to ask an impertinent question. What are YOU doing to make United Nations work?

THE END

*Patent applied for by Dr. Claude E. ZoBell, with American Petroleum Institute designated as assignee, and A.P.I. in turn dedicating it free of royalty to the public throughout the world. It is unfortunate that space limitation prevents discussion of the work of Dr. ZoBell and staff at Scripps Institute, La Jolla, California, and the work of Dr. J. V. Beck and staff at Bradford, Pennsylvania. The *Oil and Gas Journal* article referred to above contains a very adequate outline of their accomplishments.

SCIENCE AND

BY WILLY LEY

***Under** the scientific method Truth is an absolute thing. Under Communistic method Truth is Pravda—that which agrees with your beliefs and it changes from week to week. Just now it involves the wonderful inventions of the Russians.*

"Pravda" is a Russian word which means "truth" when translated. *Pravda* is also the name of the official Russian daily newspaper. The relationship between *pravda* and *Pravda* is often straight, as for example when it is reported that Molotov vetoed a resolution of the U.N. Frequently, however, capitalist writers assert, the relationship is the same as that of an egg to an eggplant.

While all of *Pravda's* editorials and most of the news items are, naturally, of a purely political nature, science items have become more and more frequent during the last few years. And this trend has not been confined to *Pravda* itself, by coincidence *Komsomolskaya Pravda,* the daily organ of the Komsomol—the Russian Communist Youth Organization—and Tass, the official Russian wire service, have become interested in science, too. So has *Iswestia,* the other large Russian daily, the name of which means "news" when translated.

Pravda's interest in matters pertaining to science began several years ago when its readers learned that the progressive materialistic concepts of tovarishtch—or, to use *Pravda's* own abbreviation—of tov. Trofim D. Lysenko and of tov. Ivan Vladimirovitch Michurin won out easily over the reactionary-idealistic viewpoint of the reactionary German professor Weismann and the church-dominated Father Gregor Mendel S.J. who first advanced a number of so-called laws of heredity which have been enforced ever since in capitalist countries.

At that time tov. Lysenko prophetically pointed out that the capitalists would persist in their mystically inclined attitude of believing that all characteristics are inherited. His far-seeing prophesy came true, and because obstructionism continued right in Russia itself, tov. S. Kaftanov, in charge of Higher Education in all of the U.S.S.R. had to clarify the case once more in an article of only a few columns, published on September 8, 1948 in *Iswestia.*

I have to interrupt myself at this point for a moment to call to the reader's memory an item published in *Pravda* at about the same time. It was stated there that the efforts of the Russian branch of the International Esperantists are laudable in themselves—the editor no doubt recalled that tov. Lenin had praised them on occasion—but that their endeavors are now superfluous. There is no longer any need for Esperanto because the historic events of the last decade have created an international language since all progressive elements in all countries have meanwhile learned Russian.

This particular process, in itself not too noticeable in the course of the international chatter of radio hams, seems to have been somewhat delayed in the cartel-dominated USA because the newsweekly of the reactionary scientists, *Science,* felt moved in spite of Wall Street to print a full translation of the piece by tov. Kaftanov. (Issue dated January 28,

1949.) That article, incidentally, still had to close with the complaint that even in Russia the available biological textbooks "do not guarantee an education based on the progressive Michurin doctrine". Indubitably steps are being taken to remedy this deplorable situation. At any event the anti-Michurin Weismannist Russian scientists mentioned in tov. Kaftanov's article no longer actively obstruct tov. Kaftanov's orders, which have been endorsed by the All-Russian Party Congress, but have resigned their posts.

During the interval between the publication of the original in *Iswestia* and the translation in *Science,* professors Sergei Vavilov and Vassily Danilevsky fulfilled their long neglected duty of setting the record straight as far as the history of science is concerned. Professor Vavilov, president of the Soviet Academy of Science, pointed out that the law of the conservation of matter and energy was not discovered by French and German scientists, as is often taught, but that it was advanced first by the "father of Russian Science", Mikhail Vasilievich Lomonosov and that Lomonosov's phrasing was superior, simply because it is "based on the main premises of the philosophy of dialectical materialism". It has to be mentioned that Professor Vavilov was still neglectful of his full duty, while crediting Lomonosov with this discovery he failed to state that he also discovered the atmosphere of Venus. Radio Moscow filled in the omission a few days later.*

Professor Danilevsky, speaking shortly thereafter to the Leningrad Academy of Science where Lomonosov had taught, pointed out that quite a number of important inventions, usually credited to an assorted lot of Americans, Englishmen and Germans, are really of Russian origin. Among them are the telephone, electric light, the steamship and especially the ship's propeller, the stratosphere balloon, the pack parachute and jet propulsion. Professor Danilevsky based his speech to some extent on a list published in 1945 by the Society for Cultural Relations with Foreign Countries, known the world over to all progressive elements as VOKS. In that list those people who read only a short newspaper account of Professor Danilevsky's decisive speech could find a few additional dates and names. The inventor of the electric light was A. N. Lodygin, the year was 1874. The transformer had been invented in 1882 by I. F. Usagin. And the electric mine, always thought to be American, had been invented in 1854 by B. S. Jakoby of the Russian Academy of Sciences, the occasion being, of course, the Crimean War.

To the regret of all concerned typographical errors often slip in either because of neglect of type-

*This Sergei Vavilov is not the one who recently died of "mysterious causes" in Siberia. The ideologically unpopular Vavilov—Professor N. I. Vavilov—was an expert historian of cultivated plants. W. L.

setters or because of willful sabotage of right-deviationist proofreaders: *Pravda's* exposé of the Antarctica Hoax, giving just credit to its true discoverer Faddei Bellingsgausen, gave the date as January 1821. Radio Moscow caught the mistake and corrected it immediately, the date was January, 1820 and there were two discoverers: Mikhail Lazarev and Faddei Bellingsgausen.

While you are busy catching your breath after this somewhat hurried recital of Russian achievements, past and present, let me tell you two nonpolitical Russian stories which will serve as a kind of background music for illustrating the mood from which all this originates. One of these stories I got from a book by a rather famous Russian writer, Alexander Herzen—the name is supposed to be pronounced Gertzen, since the new Esperanto not only lacks the letter "h", but also the article as well as words for "leg" and "arm"—who once talked to an old Cossack. Said Cossack, when a young soldier, had been ordered to be a kind of bodyguard for a traveling German. The German was Baron Alexander von Humboldt, whose name the Cossack remembered as "Gumplot", and there had been a strict order from the Summer Palace to do anything Humboldt might ask. Humboldt, being interested in all things under the sun, wanted some water plants from a shallow lake. The Cossack obligingly waded in to get them and Humboldt asked *en passant* whether the water near the bottom was still very cold. The Cossack later told that he, upon hearing that question, said to himself: "Oh no, friend, you won't get me" and replied stiffly: "The regulations of the Service require it to be, your excellency!"

The other mood-setting story came to me directly from a ballet dancer. Some Russian music critic or merely "expert" had called her attention to the similarity of the main theme in Tchaikovsky's Swan Lake Ballet and the so-called Swan Theme in Wagner's "Lohengrin," pointing out that Wagner had used this theme for his Swan, since it was already established musically as a "swan theme". Mulling this over I could not get rid of the idea that Wagner must have lived earlier than Tchaikovsky and I did the one thing that I probably shouldn't have done: I checked. I found that the opera "Lohengrin" had been finished in 1848 and performed for the first time in 1850. Pyotr Ilyitch Tchaikovsky was born in 1840 and began to compose in 1862.

After this, friends, let's not be too surprised if Radio Moscow informs us at some future date that the hot air balloon was not invented by the Brothers Montgolfier in 1783, but by Feofil Faddeevitch Vseznaikin, village idiot of Podkammenaya Kubianka, in September 1631—correction: August 1630. There may have been such a man and he may have played around with paper bags and the smoke from a woodfire. It happens to be a fact—seriously—that

the hot air balloon was almost invented by the armorers of some German knights in the late Middle Ages. And that it was actually invented by Chinese peasants in Szechwan Province, at an uncertain date but most likely quite some time before the Montgolfiers.

Going back to that list of Russian claims I can only say that it should make pretty discouraging reading to any Russian. He reads there that a compatriot of his invented the transformer, but the actual transformers he can see have name plates saying "Siemens & Halske", or "General Electric", or "Westinghouse". Likewise Lodygin invented the electric light, but the names etched on the light bulbs say anything except Lodygin. And while Lysenko and Michurin find an unexpected defender in George Bernard Shaw that same Mr. Shaw refers to them coldbloodedly as "Neo-Lamarckists", referring, of course, to Jean Baptist, Chevalier de Lamarck who died in 1829. And if Faddei Bellingsgausen discovered Antarctica, why is there no Russian settlement or at least a Russian military base at the Antarctic Circle.

For better workability I am going to split the list of alleged Russian accomplishments into several parts. There is the single geographical discovery, then there are a number of technological developments and, finally, the two theoretical items, the "genetics controversy" and the Lomonosov claims.

Let's begin with the case of Antarctica.

Ever since antiquity there had been a belief in a gigantic southern continent, mostly for the reason that the unknown southern hemisphere needed a large land mass to counterbalance the known continents of the North. Of course there were times when the belief was not very pronounced, but after the discovery of America sailors actually began to search for this continent. Finally Abel Janszoon Tasman established that Australia was not part of it, but he saw New Zealand and that might be a northern promontory. More than a century after Tasman—who had sailed in 1642—Captain James Cook established the fact that New Zealand was not a promontory either. That was in 1769, and then Captain Cook himself sailed around the earth in as high a southerly latitude as conditions would permit. He came home with the report that there was no southern continent, unless it was all inside the Antarctic Circle. But there was a report around that a Dutchman, Dirk Gerritsz, had seen land in a very high southerly latitude—in 1599. We still don't know what he saw, it might have been the South Shetlands, it might have been Antarctica itself.

Several nations checked, among them a Russian expedition, ordered by Alexander I. and commanded by Fabian Gottlieb von Bellingshausen. Early in 1821—and 1821 is correct—the Russian frigate encountered another vessel, the sloop *Hero*. Her

master was Captain Nathaniel Brown Palmer of Stonington, Connecticut who had gone into southern waters looking for fur seals. He told Captain von Bellingshausen that in November 1820 he had found land and the commander of the Russian vessel then told him "I name the land you have discovered in honor of yourself, noble boy"—Palmer was about twenty-one years old—and the map still says "Palmer's Land", or, because of more recent information: "Palmer Archipelago". You can also find an "Alexander I. Isld." on the map. But that even Palmer's Land was actually part of a continent remained conjecture until Charles Wilkes sailed southward in 1840.

Discussion of the list of technological developments is beset by one main difficulty, the old problem of what constitutes an invention. To illustrate this difficulty I'll devote a few paragraphs to cases not claimed by the Russians. For example: In 1783 the French professor Charles invented the hydrogen balloon, but he was not the discoverer of hydrogen gas and it is now known that Henry Cavendish had shown hydrogen to be lighter than air in 1766. One Dr. Joseph Black of Edinburgh then wanted to fill a bladder with hydrogen, *as a classroom demonstration*. It so happened that he failed, but one Tiberius Cavallo tried it again later. He failed too, but then succeeded with hydrogen filled soap bubbles one year before Professor Charles. Charles, however, had made his experiment in conscious imitation of the Montgolfier's hot air balloon, substituting hydrogen.

Or take the case of radar which has a "made to order" history. In 1873 the Scottish physicist James Clerk Maxwell published his famous work in which he showed (A) that light could be explained as a wave motion, and (B) that electromagnetism and light might ultimately be the same. (Theoretical groundwork.) Thereupon the German Heinrich Hertz began to look for electric waves, found them in 1886 and proved *experimentally* that such waves were reflected by solid objects. (Experimental proof and verification.) Much later, in 1922, the Italian Guglielmo Marconi said that short radio waves should be employed in navigation for the detection of obstacles and of other ships. (Suggested specific application.) During the same year American electronics engineers found accidentally that a ship that got in the way while they experimented did distort their readings—they picked up the clue and went ahead with the actual development of the device. (Engineering development and finally production.)

These examples do not only show why Patent Offices have to assume such a stiffly formalistic attitude, they also show why after-the-event-claims can be numerous and why each may contain some justification. Finally they show that it is wrong to assume that the sequence of historical priority must coincide with the

engineering development, prior accomplishments can be, and often were, completely isolated and without provable or even probable influence on later work.

But when we take the cases of Professor Danilevsky's list it turns out that they do not even fit into the elastic framework of the attitude expressed in the preceding paragraph.

Let's begin with the stratosphere balloon. The Russians built one which they named *Stratostat* and which made a very high ascent on September 30, 1933. It does not count as a stratosphere flight officially since it crashed, killing all three balloonists. According to the rules a flight is not concluded unless somebody lands the balloon. Even if you do count it, there is no getting around a few dates. Professor Auguste Piccard had made a stratosphere flight from Zürich, Switzerland, in 1932 and before that one from Augsburg, Germany, in May 1931. In case the Russians include unmanned stratosphere flights they beat Professor Piccard, but not the Frenchmen Georges Besançon and Gustave Hermite whose first unmanned stratosphere balloon took off near Paris on March 21, 1893.

As for the pack parachute: First parachute known to history is a drawing in Leonardo da Vinci's sketchbook. (Da Vinci died in 1519.) J. P. Blanchard, a Frenchman, used a parachute to lower a dog from a balloon. That was in 1785 and it was probably the first parachute that was actually built. First human parachute jump also goes to Blanchard, the date being 1793. It was an open parachute, as it was still used by captive balloon artillery observers in World War I. The first American experiments with seat pack parachutes were made in Dayton, Ohio, in 1918, at the time when the Russian revolution was going full blast. Nothing is known about Russian work before the revolution.

It is with some glee that I see "jet propulsion" on Professor Danilevsky's list, a case where I can fall back on several shelves of books and a few filing cabinets full of other material. As regards turbojets the race was close between British and German designers during the second World War. Having the data from both sides on hand now it is easy to find that the first German jet plane was in the air about eight weeks earlier than the first British, but that the first British jet plane was somewhat better than the first German. The operational types were about equal in performance. But before it came to experimentation there were publications and patents. There is a German patent, dated October 1930 for Wilhelm Goldau, embodying the principles of the pulse jet. There are the publications of the Frenchman René Lorin—early first World War—embodying the principles of the ramjet—they were forgotten everywhere, except in Germany.

Now if you want to include compressed air jets and steam jets you

have two pamphlets of the Russian inventor Fyodor Geschwend of Kiev, the earlier one dated 1887, referring to steam jets. You have a United States patent referring to compressed air jets for General Russell Thayer of Philadelphia, issued in 1884. You have an—unpublished—memorandum of the Russian army engineer Tretesskij of 1849, referring to air jets. You have a record of a British patent for steam jet airplanes, issued to Charles Golightly in 1841. You have a British patent for steam rockets—actually built in 1824—by the Englishman James Perkins. And we have a record of steam reaction cars, actually built as small models for classroom demonstration at Leyden University, by the Dutch professor Jacob Willem s'Gravesande, in 1720. Before that we have numerous black-powder rockets, traceable back to 1232, through England, Germany, the Spanish Moors, the African Arabs, to China.

The ship's propeller is a slightly different case. Most books say that it started with the British ship *Archimedes,* launched in 1838. Because this ship was successful the propeller era may be said to have begun with it. But the *Archimedes* was rather late. It was based on experiments made by the English farmer Francis P. Smith, in 1835-6. However, six years earlier, in 1829, the Austrian Josef Ressel had operated his steamer *Civetta* with screws. Still earlier an American inventor named Stevens had experimented with screw propellers on the Hudson. The year was 1806. And long before that screw propellers had been in action off Governor's Island. The year was 1777 and the screw propellers had been part of the equipment of the first definitely recorded submarine, the *Turtle,* designed by Dr. David Bushnell and manned and powered by Sergeant Ezra Lee. They had actually worked, as well as one could expect with one man power behind them, especially since they were not even pedaled, but hand cranked. The use of the Archimedian screw for propulsion had been suggested earlier, in 1738, by the Swiss physicist Daniel Bernoulli. But this Daniel Bernoulli—and this is the crux of the matter, dear comrades—was born in 1700 and spent a little over seven years as professor of mathematics in St. Petersburg before he returned to Basle in 1733.

Now it is one of the curious aspects of capitalism that its adherents are divided among themselves. They are as apt as not to go to court and to sue each other and they say what they please in court, regardless of the fact that there are spectators and even reporters present. And because of this strange habit the whole history of the telephone is well known. Because as soon as the American capitalist-to-be Alexander Graham Bell had filed patents for the invention of the telephone he was sued by three other Americans: Professor A. E. Dolbear, Mr. Daniel Drawbaugh and Professor

Elisha Gray. It was what lawyers call "prolonged litigation" during which everybody read into the record what the judge would possibly permit. They all quoted from an article by the Frenchman Charles Borseul, discussing electric transmission of speech and published 1854. They all told about the experiments of the Italian Antonio Meucci made in 1857 and talked at great length about the German physicist Philipp Reis who, in 1861 had built and demonstrated to quite a number of people an instrument with which he electrically transmitted the sound of tuning forks from one room in his laboratory to another. He openly stated that he was familiar with Borseul's article. Alexander Graham Bell admitted that he had started in the same manner as Reis, transmitting steady sounds. This was done by him successfully for the first time on June 2, 1875. But Reis never progressed to speech, or gave up before he got that far, while Bell had done so on March 10, 1876.

If there had been any distinct Russian claim around at the time of those court proceedings, either the Patent Office examiner would have unearthed it or the court would have been told by one of the litigants.

As for B. S. Jakoby and his electric mine, things are off too. It is true that the Russians invented the naval mine during the Crimean war, the British, blockading Kronshtadt—the harbor of St. Petersburg—fished some up and described them. They stood twenty inches tall and had a diameter of sixteen inches. They worked, too, even though they did not happen to damage a British ship. But they were contact mines, the ship had to touch them and break an ampule. These mines were invented over again by the Confederates during the Civil War and one Confederate officer, Lieutenant Hunter Davidson, then constructed the first electric mines, ignited by an observer hidden at the river's bank. (They were used in rivers at first.) Of course the idea of the moored naval mine was Robert Fulton's, the first floating mine appears in a manuscript of the Italian engineer Joanes de Fontana, written around 1420.

Now for the electrical lamp, invented, according to the list in the VOKS Bulletin by A. N. Lodygin in 1874. Somebody didn't go back far enough in the magazine files, because Lodygin's invention was actually made in 1872. And to confront Lodygin with Edison is a deliberate attempt at confusion. It was not a filament lamp at all, but one using a V-shaped piece of graphite in a nitrogen atmosphere. This was quickly superseded by Kosloff's lamp, alike in principle but with a superior mechanical arrangement of graphite rods for automatic replacement. Kosloff's lamp—1875—found itself ousted from professional attention by Konn's lamp, made during the same year and differing essentially by operating in vacuum. Bulidgin's lamp which followed one year later, was an improved version

of Konn's lamp, but if Bulidgin had any ideas about commercial manufacture they were squelched by P. N. Yablotchkoff's "electric candle" which appeared in the same year and was sold by the thousands. It was an ingenious small arc lamp, with kaolin separating the two rods.

Edison came three years later but resembled Yablotchkoff's lamp only to the extent of operating on electric current. Edison's basic patent stresses the fact that there should be a carbon filament and that it should be thin in order to have high resistance. Because the filament was thin it had to be operated in a vacuum, because of that it had to be inclosed in a glass bulb which was fused shut. And another point which made one of the "claims" of Edison's patent, was that the wires that carry the current should be melted into the glass.

Nobody in his right mind ever said that Edison made the first electric lamp, or even the first practical electric lamp. Yablotchkoff's "candle" was practical too, especially for outdoor illumination; Edison's lamp was "merely" the first practical filament lamp. Normally it would be fairly unimportant that much earlier, in 1838, the Belgian Professor Jobard had stated that a small piece of carbon, heated to incandescence by electric current in a vacuum, should produce a fine source of illumination. But since Professor Danilevsky has started splitting hairs, well, then let's split them all the way to the bottom.

When Paul Ehrlich, long before he started his attack on *Spirochaeta pallida,* was Resident Physician of the Charité, a city-owned hospital in Berlin, it was quite generally known that he did not like to be bothered with hospital routine and that he left the patients to his fellow physicians. He himself worked hard, all day long, staining tissues. Some busybody felt obliged to "bring this to the attention" of the chief of the hospital, Professor von Frerichs. "Let Ehrlich go on staining," he answered, "science is a bird that does not sing when caged."

Some forty years later, in the same place, some nobody in a brown uniform ordered the doctors of the Charité to find a reliable test for people "suspected of Jewish blood", adding threateningly that that should not be too difficult. Scientists all over the world, including Russian scientists, howled in anguish; they all said that the Dark Ages had returned because orders were given to science.

Since this is a point where semantic confusion can hatch at a moment's notice it is necessary to clarify the meaning carefully. Of course scientists get orders all the time. The patient who wants to be rid of pain actually gives his doctor an order. And no chemist, American, English, French, German, Russian or Hindu will for a moment object when he is asked to find something in which to keep fluorine, or when he is requested to concoct an alloy which will still be structurally strong at

950° C. But scientists will, and must, rebel when ordered to "produce" findings which will support a certain philosophy and to close their eyes to anything which will fail to support it. Scientists do not mind to be ordered to find out the temperature of the water near the bottom of the lake. They also don't care whether it happens to be cold or warm, but they won't report that it is what "the regulations of the service require it to be."

In what has come to be called the "genetics controversy" Russian biologists are supposed to do just that, more specifically they are under orders to prove that acquired characteristics are inheritable. When the first repercussions of that storm, deftly manipulated by Comrade Lysenko, appeared in the professional press I moaned to myself: "Oh no, not that again." I had read all that before, five books and fifteen pamphlets of it, most of it, amusingly enough, on a bench in the garden of the same Charité where Professor von Frerichs had closed both eyes to Ehrlich's unscheduled activities.

The background is comparatively easy to tell. The idea of evolution of animals and plants had been around, on and off, for quite some time. But at about 1800 things began to get serious. Johann Wolfgang von Goethe walked around through botanical gardens, looking for the "original plant", the pure type of which all others might be just variations. And the chevalier de Lamarck in Paris, custodian and professor at the *Jardin des Plantes* wrote a book which bore the title of *"Philosophie zoologique."* Lamarck was quite certain that the living animals had evolved, relationships to him were relationships in the evolutionary sense. And since he was convinced that animals evolved he thought about the reason for this evolution—most obviously it was the desire for adaptation. There was this African mammal, the giraffe. In general design it was the same as other grass-eating mammals. But its long neck enabled it to eat the leaves off trees. Probably, Lamarck's reasoning ran, the giraffe's ancestors had eaten grass too, at one time. But then conditions changed, grass became rare. But the trees still bore leaves, the giraffe had to stretch its neck. And its neck grew longer because of the steady effort. The young had slightly longer necks to begin with and stretched them some more. And finally the long-necked giraffe of today was finished.

Lamarck's thoughts were, really and truly, what the title of the book proclaim: *Philosophie zoologique.*

Half a century later came Darwin. He was also convinced that animals had evolved and that the continuous need for adaptation had been one of the main causes. But Darwin advanced a different set of ideas about the mechanism of evolution. Using the same example and starting with the same general premises Darwin would have said that among the individuals con-

cerned there were some with accidentally somewhat longer necks, since there are always a number of small individual variations in a species. When the longer neck suddenly proved to be an advantage these individuals were more likely to survive. More important still—they were more likely to produce offspring. And that offspring, coming from long-necked parents on both sides, would have generally longer necks. And since the longer necks were a survival factor under those special conditions the process would go on and on. And on.

The trouble, now exploited to the full by Lysenko, Kaftanov and their hand-picked cohorts, started right at that point, when things had to be labeled for the sake of referring to concepts. Most people, when they said "Darwinism", meant Darwin's concept of evolution. A few people, when they said "Darwinism", meant Darwin's ideas about the *modus operandi* of evolution, as distinct from Lamarck's. To still others this was just wonderful. They would prove—more or less—that the "Darwinisms" of small individual variations was unsatisfactory, mostly because the beginnings of an adaptation might be too small to fill the need and to account for survival. Afterwards they would behave as if the "Darwinism" of evolution had collapsed. One could drag in "determinism", "fatalism", and the whole vocabulary of philosophical debate, one could say that "Darwin was no Darwinist" and generally indulge in high-sounding nonsense.

Since little about the mechanism of heredity was known then the discussion between strict "Darwinists"—in the narrow sense of the word—and the not-so-strict Darwinists—they came to be called Neo-Lamarckists—narrowed down to the problem whether acquired characteristics could be inherited. Offhand there were many arguments against such an idea. I still have to shave every morning, although my father did and my grandfather. Every Jewish boy baby still has to be circumcised, although the acquired characteristic of losing the *praeputium* has persisted in the family for about twenty-five hundred years. Every child still has to learn its own language—

Well yes, said the Neo-Lamarckists, naturally not every characteristic, else all people would be born cripples by now. There is an "inner regeneration" which fixes up the damage done by accidents. But in some cases an acquired characteristic will be inherited, especially when it is useful. For that reason the experiment performed by August Weismann—he died in 1914—of breeding more than twenty generations of mice and clipping off every mouse tail without ever getting a tailless mouse does not prove anything. The record of the experiments made in those days and the attempts to explain the findings one way or another would make a fascinating story in itself; at this point

it is only necessary to say that they did not produce a clear indication. And since at about that point Professor Hugo de Vries came across plant mutants the discussion evaporated to a good extent. But belatedly one more man appeared on the scene, a Viennese aquarist by the name of Dr. Paul Kammerer. Kammerer was a Neo-Lamarckist and he produced surprising results in his aquaria and terraria, apparently getting whole series of cases of inheritance of acquired characteristics.

Scientists, according to temperament, admired his work, revised their opinions, or shook their heads and wondered whether there was something wrong. But nobody doubted the reports themselves, until somebody stumbled across the fact that the time Kammerer had had was simply too short for the number of generations of salamanders, and newts, and midwife toads listed in his tables. Then it was found that a very important acquired thumb pad of a male midwife toad had been "acquired" by way of injection with India ink!

Kammerer was in disgrace in Vienna. And he was invited to Russia. But he committed suicide in Fall 1926. The reason he had been invited to Russia was simply that Communist ideology had urgent need for the inheritance of acquired characteristics, Michurin's writings had been exploited in that manner. "Thanks to the care of the Bolshevist Party and of the Soviet Government, as well as to the personal care of our great leaders, Lenin and Stalin, Michurin's theory has been preserved from oblivion and has become the property of the people." (Kaftanov.) Kammerer could not help them anymore, but he could still be used. Lenin's Commissar of Education, Lunatcharski, wrote a movie *"Salamandra,"* with a fine rôle for his very beautiful wife, with a short rôle for himself—playing himself on the screen—and with a persecuted hero who, in the movies, does not commit suicide but flees to Russia.

The part which Kammerer probably was supposed to play was then filled by Lysenko who openly and naïvely admits that he had to fill the Congress Hall with his supporters since the "established biologists" would not have listened to him.

Now the point is not that a professor Semyonov in Novo-sibirsk, or a professor Duplessis in Rouen or a Professor Brown in Los Angeles happen to be Neo-Lamarckists. That would be their business. The point is that a biologist in Russia must be a Michurinist, or else he has to dig ditches. He is not supposed to uncover the laws of genetics and of evolution, he is supposed to prove Michurin right. That the song of the caged birds is going to be uninspired is dead certain, because, you see, parrots do not sing well even out of doors.

In 1925 the Soviet Government issued a set of two postage stamps in celebration of the bicentenary of

the *Akademiya Na'ook,* the Academy of Science. They showed the historic building and above it a portrait of Mikhail Vasilievitch Lomonosov. Because of those stamps, which also seem to have served as posters, and because of the term "father of Russian science" many Russians are convinced that Lomonosov founded the Academy. And at least one Russian radio speaker said so in so many words.

That is not quite correct. A book published by the *Academiya Na'ook* itself in 1928 tells the story correctly. I quote—translating, of course—: "Soon after the founding of the Royal Society in London, the *Académie des Sciences* in Paris and a provincial French academy, the *Akademie der Wissenschaften* was founded in Berlin at the beginning of the eighteenth century and thereupon the *Akademiya Na'ook* in St. Petersburg. The new academy, created by order of Peter I. after the pattern of the Paris Academy and under the influence of Leibnitz had high aims . . . and many distinguished foreigners were invited as teachers." Among them were Euler, Nicholas and Daniel Bernoulli, the chemist Gmelin, G. F. Mueller and later the surgeon and traveler Peter Simon Pallas. The first Russian to teach there had the name Adadurov, "during the course of the first thirty years the academy had ten Russians as teachers, among them the great Lomonosov."

The latter is no exaggeration. Most people can name only two Russian scientists as a rule, Mendeleyev and Metchnikoff. In all justice they should add a third name, Lomonosov, who was an extraordinary character in many respects.

Born early in November, 1711 in the tiny village of Denisovka, some forty miles from Arkhangelsk, he somehow managed to find somebody who taught him to read, meanwhile working with his father who went to sea on and off. When almost twenty years old he ran away and went to Moscow, quite some distance away, to go to school. The other pupils, being much younger, laughed at him, but Lomonosov did not complain about that. He did complain that the school taught only Latin, theology and a little philosophy. In 1734 he went to Kiev where there existed a theological seminary, but he fled back to Moscow almost at once. At about the time he returned a letter arrived from the recently founded *Akademiya Na'ook,* the Empress had decided to send a number of especially gifted pupils to Germany for study. Lomonosov was one of those picked, he was sent to Marburg where he studied physics, natural history, chemistry and what was then called metallurgy—we would say applied chemistry with reference to the extraction of metals from their ores.

Meanwhile the Academy in St. Petersburg had had some trouble with its chemists. The first professor of chemistry, a German by the name of Berger, had been too drunk one night to notice that he fell out of

his sled and consequently "died from exposure". The second chemist, a German by the name of Gmelin, had talked the court into sending him on an expedition to Siberia. When he came back, several years later, he declared that he would teach botany from now on. Lomonosov, having returned from Marburg in 1741, took Gmelin's vacant chemistry chair in 1745. One of the first things he did was to introduce the art of ecclesiastical mosaics to Russia. For that colored glass was needed, so he founded a few glass factories. When it came to teaching chemistry he found, as he had suspected, that there was no textbook. Well, he would translate one from the German. Then he saw that Russian did not have the necessary vocabulary, so he created one, partly by adapting Slavonic roots, partly by transplanting German words. Having started, he continued writing and his "History of Russia" is still a worthwhile book for interested students. He also wrote a book on rhetoric and one on grammar. In fact he created the Russian literary language, much in the same manner in which Dr. Martin Luther had created a German literary language in his day.

His literary activities, many of them command performances, overshadowed his other work to such an extent that most Russians, in later years, considered him a man of letters rather than an early scientist. The fact really came to light because of a project started by the German Professor Wilhelm Ostwald. Ostwald had the idea of reprinting the important contributions to science of all times and all nations in a series of small books. Of course the whole series appeared in German. Ostwald had come across Lomonosov's name in correspondence with the mathematician Euler and inquired of Professor B. N. Menshutkin of the Russian Academy whether he would translate some of Lomonosov's original work. Menshutkin had been interested in Lomonosov to begin with and related that he had found, to his great surprise, "large numbers" of manuscripts in Lomonosov's handwriting, most of them in Latin, many of them unfinished, and all of them unpublished. It seems that only Lomonosov's Russian papers had been published. Menshutkin made a careful selection and the translation appeared in about 1908 as *"Ostwald's Klassiker, No. 178."*

The two statements by Professor Vavilov, generally considered to be "news", can both be found in this book. Lomonosov observed the transit of Venus in May, 1761, and noticed how Venus' atmosphere seemed to light up when the planet's disk touched that of the sun. He wrote then that "Venus must have an atmosphere as large as, and maybe larger than, our planet". Later writers, not knowing about Lomonosov, thought that either Herschel or Schroeter had made this discovery. Needless to say that both Herschel and Schroeter believed that they did.

As a chemist, Lomonosov was opposed to Boyle. He ridiculed the idea that heat was a specific "fluid" and described it as a movement of the "smallest particles". As an argument in favor of his concept he wrote: "red-hot iron is obviously at rest, yet it can melt other substances and evaporate others." He had taken the concept of atoms over from Daniel Bernoulli, but he always meant molecules when he wrote "atoms". He reasoned that the "atoms" of air do not touch each other, because air can be compressed. But since the "atoms" could not act upon each other without contact one had to assume that they were in steady movement. He had built his own thermometer, with 0° at the freezing point of water and 150° at its boiling point, and measured the coefficient of expansion of air for a temperature rise of one of his degrees. Converted for centigrade degrees he found a value of 0.003, the true value is 0.00367. Strangely enough he never arrived at the concept of a chemical element and although he worked much with low—natural—temperatures he never found that water expands in freezing. He knew that an iron bomb, filled with water, will burst when it freezes, but thought that the air released by the freezing water caused the pressure. When the Swedish Academy of Sciences honored him he was just working with the freezing of saline solutions and wrote a paper, in which he said that icebergs could not form in sea water. Hence there had to be large fresh water rivers somewhere in Greenland to account for the icebergs.

The anticipation of the law of conservation of matter can be found in a letter which he wrote to Euler, under the date of July 5, 1748. In this letter, written in German, he said:

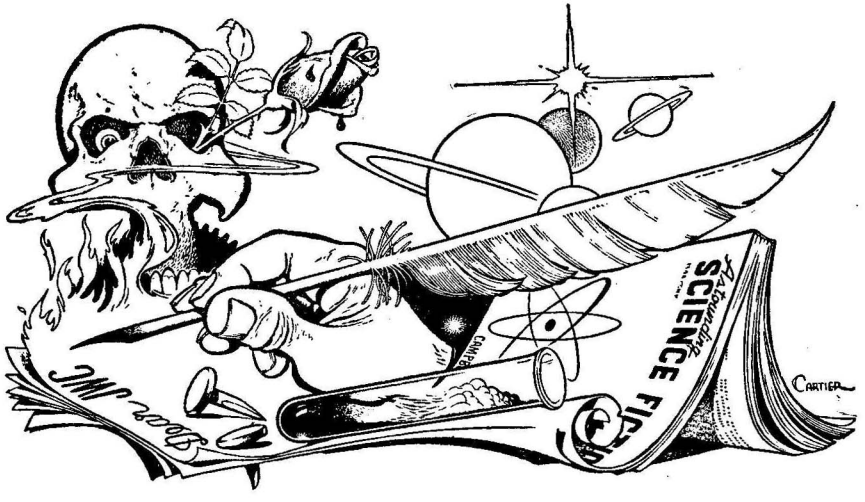
> All changes that take place in Nature are such that if somewhere something is added, somewhere else as much is taken away. As much matter is added (here) to a body, as much is being taken away (elsewhere) from another body. . . . This law is so general that it even applies to the movements of the bodies: the body which sets another one in motion by its impulse loses as much motion as it transfers to the other.

This statement was repeated, with very similar words, in a speech before the Academy in 1760; this Russian version was probably printed first.

Partly because he tried to do too many things, partly because he was not well during the latter years of his life, Lomonosov did not exert much influence on scientific thought. He died on April 4, 1765. Pushkin, asked to say something about him later, simply declared that "Lomonosov was a great man".

But one may wonder whether Kaftanov would permit him to be great, if he had been born in 1911 instead of 1711.

THE END



BRASS TACKS

More than the extra 1.5 mi. per sec. would be built up by the fall from Earth's orbit to Venus' under solar gravity.

Dear Sir:

I found Latham's "article" "The Aphrodite Project" in the June issue very entertaining, and the idea behind it quite intriguing. However, there are a few things I would like to point out:

1. The purpose of the rocket's "slow speed until about five hundred miles high" escapes me: a) air resistance is negligible on a rocket of any useful size; even the small, nearly atmosphere bound V-2 loses only about ten percent of its final velocity from air resistance. b) Although the final velocity of a rocket at burn-out is commonly given as $v = c \cdot \ln(MR)$, i.e. it equals the exhaust velocity times the natural logarithm of the mass-ratio—the relation $MR = e^{v/c}$ is equivalent to this—however, in a gravitational field the final velocity is reduced by the term $-gt$, thus $v = c \cdot \ln(MR) - gt$, where t is the burning time. Thus, it is most efficient to have the burning time as short as possible.

2. It was not pointed out that in addition to the Earth's escape velocity, about 1.5 mi/sec is needed to put the rocket in an ellipse reaching in to Venus.

3. Disregarding monetary reasons, for if they can afford a rocket capable of 8.5 mi/sec . . ., I don't see the why of the twelve inch telescope. For visual planetary observations a smaller telescope does often give more detail, because it intercepts

fewer refracting heat waves in the atmosphere; but for photographing an effectively point source, which is moving rapidly, a telescope with a much greater light gathering capacity would be preferable.

4. Not only would there be no air currents to speedily dissipate the white cloud, there would be no air molecules to hinder its "diffusion"—I'm afraid it would spread rapidly. However, since anything under two hundred fifty miles in diameter would appear a point source to that twelve-inch telescope, the cloud would have to get at least this big before its brightness dropped off at all.

5. I shall make little comment, except to mention my extreme incredulity, on things presumably written under fictional license: such as Venus' origin and rotation, the mountain's presence and origin, and the existence of the rocket itself.

I hope I do not sound too censuring, for I really thought the story to be stimulating and well written.—C. J. Goebel, Care of The University of Chicago Rocket Society, 1005 E. 60th, Chicago 37, Illinois.

Concerning UNIVAC

Dear Sir:

Our attention has been drawn to the reference to our UNIVAC SYSTEM appearing in the May 1949 issue of your publication.

We wish to point out, as is evident from the enclosed descriptive literature, that UNIVAC is a trade name of the Eckert-Mauchly Computer Corporation and that a number of UNIVAC SYSTEMS are now in the course of manufacture for delivery to several customers, including among others, the Bureau of Standards, on behalf of the Census Bureau.

It would be appreciated if the erroneous impression given by the reference article could be corrected.—Eckert-Mauchly Computer Corporation, George V. Eltgroth, Vice President.

Re "Can't kill off the heroes". Ever read "Hamlet", "Macbeth" or "Cyrano du Bergerae"?

Dear Mr. Campbell:

The May issue was generally good. The cover, I think, was one of the best in a long time. Orban is certainly improving; he may even be as good as Alejandro some day. The color and atmosphere of the sea's bottom were captured quite effectively, and the objects, for once, bore a resemblance to something recognizable.

I haven't read the serial yet. I have been a bit wary of serials since "Seetee Shock." Here are the ratings.

1. "Mother Earth," by Asimov. A fine story, up to the magazine's standards.

2. "Lost Ulysses," by Bade. Another good one, except for the ending. There's an axiom of fiction, scientific or not, which prohibits killing off the hero of heroes, and here, these great benefactors of the human race are exterminated by their own "godchildren."

3. "Prophecy," by Anderson. An extremely good short story, but its length makes it unable to compete with the novelettes. A good, thought-provoking idea, such as this was, loses much of its interest when not expounded upon at length. It reminds me of a symphony, wherein a theme is stated, perhaps repeated, and then abandoned with no development. There is the gem of a thought, but the gem is in its crude, uncut form. (Please pardon my similes.)

4. "The Conroy Diary," by Lafayette. Why doesn't he stick to Ole Doc Methuselah? This was the most pointless, useless story I've ever read. Why don't you leave things like that to the pulp magazines?

I have always wanted to write an essay on science-fiction but have always been afraid to. Seeing Mr. Savage's fine work in the May issue, however, decided me, and here is my little attempt.

Time and Space in Science-Fiction

In no field of literature does there exist a more changing factor than time and space in science-fiction. Both range from the incredibly minute to the incredibly immense. Authors change each to fit their plots and the reader often finds it difficult to change his point of view on the subject every twenty or thirty pages. In the May issue, as an example, there were extreme differences in time and space. "Mother Earth," covered the Earth, solar system, and several planets in other systems, and took place in the future over a period of many months, and perhaps years. "Lost Ulysses" was larger in both respects. Here the Earth was but a tiny planet of a tiny sun in one of innumerable galaxies. Space had expanded enormously, and so had time. The action occurred over fifty million years in the future and occupied a time of thousands of years. This is unusual as will be shown later. "Prophecy," was only a bit in the future, and the only space difference presented was the acknowledgment of the existence of several other systems. "The Conroy Diary," took place rather far in the future, but employed flashbacks to the not-so-distant future. Space had enlarged to many systems of planets. The differences are obvious, and shall be expounded shortly.

I—Space

A. Today our space is limited to our own Earth and its atmosphere. Of course we know of the immense space which surrounds us, but no fiction—or nonfiction—story which has its setting today pays much attention to this. Our actual universe is much smaller than the Earth even. There are millions of people to whom their neighborhood is their universe. How many people have ever been around the world, and for that matter, how many have been around their own country? Cosmic space is today very limited. However, going the other way, space is

getting larger. The atom has added to our impression of space greatly, and opens vistas of new subjects for science-fiction writers.

B. To the Moon. In the early days of science-fiction, stories of reaching the Moon and thus expanding the space, the setting of the story, were perhaps the only science-fiction written. Anyone can think of at least ten Moon stories. Poe's "Hans Pfaal"; although not really science-fiction, opened the door for writers on this subject. Jules Verne's two books of Moon travel, "From the Earth to the Moon," and "A Trip Around the Moon," are also notable. Getting up to modern SF, Russell's recent "Dreadful Sanctuary," managed to be good science-fiction even though the space in which the action took place did not even include the Moon. In modern SF, the main idea of Moon stories is getting there. Stories of colonization, finding alien life, et cetera on the Moon are rare nowadays, although they still are found around. H. G. Wells had his heroes walking around on, and in the Moon in his "The First Men In the Moon." We find this fantastic today, and anybody on the Moon now, in fiction, must either wear an oxygen tank or spacesuit, or live under some enormous structure designed to hold an entire city, and supply it with air.

C. To Mars and the other planets. Here, writers have a wider field to deal with. Life has been seen on Mars—plant life—and so the possibility of intelligent life there is not as farfetched as the idea of life on the Moon. Stanley G. Weinbaum's fine story of Martian life, "A Martian Odyssey," is a good example of the kinds of things an author can dream up for another planet. The story, "Loophole," by Clarke—ASF 1946—illustrates intelligent life on Mars. Usually, the next planet to be reached, which may have been the first, is Venus. O'Donnell's "Fury," takes place entirely on Venus. Mercury is rarely mentioned as supporting life, and so there is no reason to get there. Jupiter is sometimes the subject of a story, more rarely is Saturn, and almost never any of the outer planets.

D. To Centaurus and other stars. Here, space has expanded to four light-years, and given so much time in which to make the trip, an author usually creates a full-length novel from the idea. Van Vogt's classic, "Centaurus II," although a novelette, is an obvious example.

E. Organized galaxy. Space is now unbelievably large, with billions of stars as part of the setting. It is here that most of the novels are written. Van Vogt's "World and Players of null-A," E. E. Smith's "Lensmen," stories, Williamson's "With Folded Hands . . . And Searching Mind," are only a few of these. Novelettes such as Russell's "Metamorphosite,"—ASF 1946, December—are further examples of this "expanding universe" type of writing.

F. To other galaxies. Even the best of authors do not dabble in this subject too much. There is work

enough in planning one galaxy, much less than in planning millions. "Lost Ulysses," of May, is the only story on this subject I can remember.

G. Beyond this there is very little chance to expand space in science-fiction. Since SF is based on science, an author cannot write about something bigger than the galaxies because as yet, we have discovered nothing bigger. As for getting smaller instead of bigger, "He Who Shrank," which I think everyone knows, opens up space unimaginable in the atom.

II—Time

A. A science-fiction story *never* takes place today. The time of the story usually coincides with the space. The larger the space, the farther in the future. A few stories have been written on the past, a notable example of which is John Taine's "Before the Dawn." "False Dawn," by Chandler—ASF 1946 October—is another example.

B. Slightly in the future. By this I mean from ten to one hundred years. Most mutation stories take place during this time. Judith Merril's first attempt, "That Only a Mother," a very fine story illustrates this phase. I'm inclined to think that Padgett's "Gallegher" stories take place about then, too.

C. Up to one thousand years ahead. Most SF stories have their time here. All the "atomic wars" have been fought, the solar system has been conquered and man is looking to the stars. I think I need not give any examples, since almost any one you think of will fit into this category.

D. From then to infinity. Although not too often used, this time is very well known by any SF reader. Here we have a decadent civilization, perhaps already died out. The sun is now a descending yellow or red, is not so hot, and is much nearer. Wells' "Time Machine," I think illustrates this "right proper."

1. A story usually takes no more than a year to go through. However there are exceptions.

2. Immortality. When, as in "Fury," or "The Eternal Man," the main character is immortal, the story usually covers a longer period of time.

3. Teleportation, or suspended animation. A story may cover a long period of time if the character is teleporting all the time as in this month's "Lost Ulysses," or if he is held in suspended animation.

4. If the story covers the lives of many successive generations as in "Centaurus II."

I think I have shown that time and space in science-fiction are never constant, changing in every novel, novelette or short story.—Jonathan Saville, 1006 Gerard Avenue, New York 52, N. Y.

Another thing about mutations: Evolution proceeds by natural mutations. Radiation does cause more mutations. BUT IS THAT BAD? *Doesn't it simply mean a faster rate of evolution?*

Dear Mr. Campbell:

I have something to add to the discussion of mutation which has adorned the Editor's Page in February and June. First I would like to point out that you did a grave injustice—unintentionally—to Dr. Robley Evans in your June issue. I quote; "Contrary to the statement that low levels of radiation cause no mutations whatever, Dr. Muller and many other geneticists, feel that even very low levels of radiation are important." Implying, of course, that Evans assumed low levels of radiation caused no mutations. Being a physicist and being acquainted with quantum mechanics I doubt if he could make such a mistake. I think you stated his position much better in your February issue. "Radiation intensities of the order of .1 r units per day do not *appreciably*—italics mine—alter the naturally occurring mutation rate. Any increase (in mutations), if present, (are) lost in the much greater mass of 'normal' mutations." Stated in a simple fashion the low-energy radiations cause mutations which can be compared to the man dumping bucketfuls of water into the river.

The proponents of the importance of low-level radiation, I think, are a bit misled because of an excessive reliance upon fruit flies. They identify all of the fruit fly's general genetic characteristics with man's genes. For instance, we know that a fruit fly when exposed to hard radiations—beneath the level which will kill it before mating time—responds with a high degree of mutation. This is fact but it does not necessarily apply to humans for several reasons. Humans usually do not mate immediately after being exposed to such radiations; flies do. Also a man, as you pointed out, must have a stabler genetic structure than a fruit fly because the man is exposed to years of mutating influences before he mates, while the fly is merely exposed for a few days at most. Obviously we cannot study stable genetic structure via the fruit fly. This all means that though rapid breeeding insects readily mutate when exposed to hard radiations—even at a low level—such a fact is of little importance as regards human beings.

We do not know, but a man's genes *may* have a rather large tolerance to hard radiations so that it would be hard to increase the natural number of mutations very much without killing the man. *We do not know,* but a study of mice, which are certainly closer to humans than are fruit flies, seems to indicate this.

Geneticists—1949—are, generally speaking, not biochemists. They are biologists. As such they tend to neglect the fact that genes are complex protein structures. The only way they have been able to induce mutation is by hard radiation, therefore—their thinking runs—*all* mutations are likewise caused. But if we remember that genes are large protein structures we see that this is not the case—that is, if we know anything at all about large proteins.

Many exasperated biochemists will refer to the fickleness of such structures. A hydrogen ion is replaced, et cetera, a disintegration, a synthesis, a mild readjustment, et cetera occurs when it is not wanted and for seemingly no reason at all.

Large protein structures are not stable, hard radiation or no hard radiation. In order to keep them intact they have to remain in an exactingly uniform environment. The cell in a being like man is such a uniform environment and probably accounts for much of the stability in our genes but it would be foolish to suppose that the human cell is so perfect that the genes are not exposed to various altering forces now and again, outside of hard radiations. I would say it was these biochemical alterations which accounted for a great number of natural mutations.

Another interesting point is that —so far as I know, 1949—an internal alteration of the type just mentioned can be synthetic while an X-ray photon ripping through a gene can hardly be more than destructive, or at best rearranging in nature. A synthetic alteration seems, to me, to have a far better chance to turn up as beneficial than would a destructive alteration. In natural mutation we get such freaks as a man with two good hearts but I never, ever, ever heard of a super-fly coming out of an X-ray chamber.

Hm-m-m. Getting off the subject and onto artwork:

Orban's cover of December, to me, was a fine piece of work in spite of some people who didn't like it. The tearing of the hair among SF circles was, of course, caused by the terrible and utterly unexpected appearance of a spaceship of the Orban Class on the cover of all places. SF fans have cringed over the Orbanships for many years now. They have tried to repress the things into their subconscious, and never speak of them in public nor among anybody but their best friends. Consequently several thousand Orbanships staring out at the world from multitudinous mag-stands induced severe shock among the less sturdy of our members. Myself, I thought it was a rather luscious specimen. (I shall be torn apart and tossed into space.) Speaking of Orbanships I noticed in the June issue that our illustrious artist actually put fins on two spaceships and instituted other drastic model changes. Atta boy. But—sigh—an era has ended. You ought to get an Orbanship for the now dreary Contents Page—just to haunt us fans.

And by the way referring to the letter which denounces bullet-shaped spaceships there is more than one reason why they should be that way. A spaceship engineer will want to put the atomic rockets just about as far away as possible from the crew and passengers. What other shape than a needle? Even if hard radiations ain't what we use to think they was, they can at least make your hair fall out. Stay away from 'em!—Donald Kingsbury, 6294 Deacon Road, Montreal, Quebec, Canada.

Julius Unger Introduces

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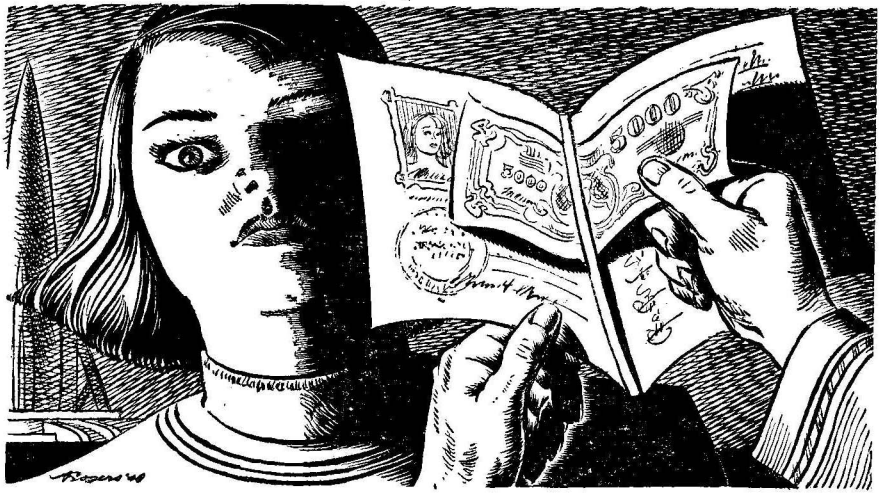


. . . AND NOW YOU DON'T

BY ISAAC ASIMOV

***Second** of Three Parts. It can't be seen and must be found—with one small girl and a few bold men to seek the menace.*

Illustrated by Rogers

In the dying days of the First Galactic Empire, the psychohistorian Hari Seldon had caused to be set up two Foundations "at opposite ends of the Galaxy" to serve as reservoirs of scientific knowledge during the anarchy that would follow the final fall of the Empire, and as sources from which a new and greater Empire would rise. The First Foundation was a world of physical scientists which gradually grew in strength and importance through the centuries, as it followed the course of a great "Plan" which had been calculated out in advance by Seldon and his school through their mathematized development of sociologic

and economic currents, and consequent ability to predict the course of future history.

The first check to that Plan occurred when a mutant, known as the Mule, with unusual mental powers, conquered the First Foundation together with much of the Galaxy. Since the Mule was a biological accident, his coming could not be dealt with by Seldon's psychohistory which was a statistical science that predicted probabilities only.

However, there still existed the Second Foundation, whose location and nature had been kept thoroughly secret through the centuries. They were the mental scientists, whose function it was to guard the Plan against just such unforeseen disturbances as the Mule. By means of a mighty effort, they succeeded in stopping the mutant, and, after his death, in reorganizing the First Foundation.

Unfortunately, this violent disruption of the calculated course of history had not been adjusted quickly enough. Seldon's original Plan had called for the foundation of a new Empire a thousand years after the fall of the old, in such a manner that mankind would finally be ready to form a society based on mental science rather than physical science. In this manner, mankind's first truly healthy and stable culture would be formed; war and misery would be forever ended. The First Foundation was intended to form the political framework of a single universal state, while the Second Foundation was to prepare a world of mental "supermen" who would form the leading class of the new Empire.

Now, in addition to the course of history having been diverted from the planned course, the Second Foundation, through the necessity of stopping the Mule, had revealed their existence to the Galaxy, in particular to the First Foundation. This was dangerous, since the Second Foundation was physically helpless and could be easily destroyed once their location was known. Everything depended on secrecy. In addition, the masses of the First Foundation, secure now in the knowledge that they would be protected against all fluctuations of history by the Second Foundation relaxed and allowed their nation to become weak and hedonistic. Worse still, to a small percentage of the First Foundation, the proven superiority of the Second aroused hostility and antagonism.

All this the Second Foundation, with their eyes on a glorious future for mankind, must combat, while maintaining their own precarious safety.

Among those of the First Foundation who were conspiring against the Second in a burst of angry and honest patriotism was Dr. Toran Darell, son of the woman, Bayta Darell, who had been the most effective opponent of the Mule, outside of those of the Second Foundation, themselves.

Dr. Darell was an encephalographic analyst and psychophysicist, who specialized in the study of the

electric currents of the brain. By this means, he hoped to develop a method of identifying any Second Foundationer through the distinctive pattern of brain-currents made inevitable through the latter's possession of unusual mental properties.

Aiding him is Pelleas Anthor, a young pupil of Dr. Darell's dead colleague, Dr. Kleise. Anthor has brought to Terminus, capital planet of the First Foundation, the results of Kleise's encephalographic researches, which indicate that the First Foundation is riddled with agents of the Second. These agents are citizens of the First Foundation who, through mental adjustment, have been Converted into unconscious assistants to the mental supermen of the Second Foundation. These "tampered" men represent some of the best of the First Foundation's business men, scientists, and intellectuals.

Darell had broken with Kleise some years previous—thus creating hard feeling between the two—in order that he might pursue his researches absolutely alone, and, therefore, with greater safety. Now, however, he felt obliged to join with a few others, all of whom were cleared of the possibility of being Second Foundation agents through studies of their brain-waves. The group decides to send one of their number to Kalgan, former capital of the Mule, where information might exist as to the investigations made by the Mule in his own futile attempts, fifty years earlier, to locate the Second Foundation. Homir Munn, librarian and antiquarian, is chosen for the task.

Arcadia Darell, Dr. Darell's fourteen year old daughter, an active, romantic, and precocious girl, has secretly overheard the discussions of the conspirators and, in search of "adventure", stows away on Munn's ship. There is no way of bringing her back since the conspirators chiefly fear attracting attention to themselves through any unusual action.

Part 2

Homir grew used to her. After a while, he was glad she was there. Eventually, he wondered how he would have made it without her. She prattled! She was excited! Most of all, she was completely unconcerned. She knew the Second Foundation was the enemy, yet it didn't bother her. She knew that on Kalgan, he was to deal with a hostile officialdom, but she could hardly wait.

Maybe it came of being fourteen.

At any rate, the week-long trip now meant conversation rather than introspection. To be sure, it wasn't a very enlightening conversation, since it concerned, almost entirely, the girl's notions on the subject of how best to treat the Lord of Kalgan. Amusing and nonsensical, and yet delivered with weighty deliberation.

Homir found himself actually capable of smiling as he listened and

wondered out of just which gem of historical fiction she got her twisted notion of the great universe.

It was the evening before the last jump. Kalgan was a bright star in the scarcely-twinkling emptiness of the outer reaches of the Galaxy. The ship's telescope made it a sparkling blob of barely-perceptible diameter.

Arcadia sat cross-legged in the good chair. She was wearing a pair of slacks and a none-too-roomy shirt that belonged to Homir. Her own more feminine wardrobe had been washed and ironed for the landing.

She said: "I'm going to be a historian, you know." She was quite happy about the trip. Uncle Homir didn't the least mind listening to her and it made conversation so much more pleasant when you could talk to a really intelligent person who was serious about what you said.

She continued: "I've read books and books about all the great men of Foundation history. You know, like Seldon, Hardin, Mallow, Devers and all the rest. I've even read most of what you've written about the Mule, except that it isn't much fun to read those parts where the Foundation loses. Wouldn't you rather read a history where they skipped the silly, tragic parts?"

"Yes, I would," Munn assured her, gravely. "But it wouldn't be a fair history, would it, Arkady? You'd never get academic respect, unless you give the whole story."

"Oh, poof. Who cares about academic respect?" She found him delightful. He hadn't missed calling her Arkady for days. "My history is going to be interesting and it's going to sell and be famous. What's the use of writing books unless you sell them and become well-known? I don't want just some old professors to know me. It's got to be everybody."

Her eyes darkened with pleasure at the thought and she wriggled into a more comfortable position. "In fact, as soon as I can get Father to let me, I'm going to visit Trantor, so's I can get background material on the First Empire, you know. I was born on Trantor; did you know that?"

He did, but he said: "You were?" and put just the right amount of amazement into his voice. He was rewarded with something between a beam and a simper.

"Uh-huh. My grandmother . . . you know, Bayta Darell, you've heard of *her* . . . was on Trantor once with my grandfather. In fact, that's where they stopped the Mule, when all the Galaxy was at his feet; and my father and mother went there also when they were first married. I was born there. I even lived there till mother died, only I was just three then, and I don't remember much about it. Were you ever on Trantor, Uncle Homir?"

"No, can't say I was." He leaned back against the cold bulkhead and listened idly. Kalgan was very close, and he felt his uneasiness flooding back.

"Isn't it just the most *romantic* world? My father says that under Stannel V, it had more people than

any *ten* worlds nowadays. He says it was just one big world of metals—one big city—that was the capital of all the Galaxy. He's shown me pictures that he took on Trantor. It's all in ruins now, but it's still stu*pen*dous. I'd just *love* to see it again. In fact . . . Homir!"

"Yes?"

"Why don't we go there, when we're finished with Kalgan?"

Some of the fright hurtled back into his face, "What? Now don't start on that. This is business, not pleasure. Remember that."

"But it *is* business," she squeaked. "There might be incredible amounts of information on Trantor. Don't you think so?"

"No, I don't." He scrambled to his feet. "Now untangle yourself from the computer. We've got to make the last jump, and then you turn in." One good thing about landing, anyway; he was about fed up with trying to sleep on an overcoat on the metal floor.

The calculations were not difficult. The "Space Route Handbook" was quite explicit on the Foundation-Kalgan route. There was the momentary twitch of the timeless passage through hyperspace and the final light-year dropped away.

The sun of Kalgan was a sun now—large, bright, and yellow-white; invisible behind the portholes that had automatically closed on the sun-lit side.

Kalgan was only a night's sleep away.

VI.

Of all the worlds of the Galaxy, Kalgan undoubtedly had the most unique history. That of the planet Terminus, for instance, was that of an almost uninterrupted rise. That of Trantor, once capital of the Galaxy was that of an almost uninterrupted fall. But Kalgan—

Kalgan first gained fame as the pleasure world of the Galaxy two centuries before the birth of Hari Seldon. It was a pleasure world in the sense that it made an industry—and an immensely profitable one, at that—out of amusement.

And it was a stable industry. It was the most stable industry in the Galaxy. When all the Galaxy perished as a civilization, little by little, scarcely a feather's weight of catastrophe fell upon Kalgan. No matter how the economy and sociology of the neighboring sectors of the Galaxy changed, there was always an elite; and it is always the characteristic of an elite that it possesses leisure as *the* great reward of its elite-hood.

Kalgan was at the service, therefore, successively—and successfully—of the effete and perfumed dandies of the Imperial Court with their sparkling and libidinous ladies; of the rough and raucous warlords who ruled in iron the worlds they had gained in blood, with their unbridled and lascivious wenches; of the plump and luxurious businessmen of the Foundation, with their lush and flagitious mistresses.

It was quite undiscriminating,

since they all had money. And since Kalgan serviced all and barred none; since its commodity was in unfailing demand; since it had the wisdom to interfere in no world's politics, to stand on no one's legitimacy, it prospered when nothing else did, and remained fat when all grew thin.

That is, until the Mule. Then, somehow, it fell, too, before a conqueror who was impervious to amusement, or to anything but conquest. To him all planets were alike, even Kalgan.

So for a decade, Kalgan found itself in the strange role of Galactic metropolis; mistress of the greatest Empire since the end of the Galactic Empire itself.

And then, with the death of the Mule, as sudden as the zoom, came the drop. The Foundation broke away. With it and after it, much of the rest of the Mule's dominions. Fifty years later there was left only the bewildering memory of that short space of power, like an opium dream. Kalgan never quite recovered. It could never return to the unconcerned pleasure world it had been, for the spell of power never quite releases its hold. It lived instead under a succession of men whom the Foundation called the Lords of Kalgan, but who styled themselves First Citizen of the Galaxy, in imitation of the Mule's only title, and who maintained the fiction that they were conquerors too.

The current Lord of Kalgan had held that position for five months. He had gained it originally by virtue of his position at the head of the Kalganian navy, and through a lamentable lack of caution on the part of the previous lord. Yet no one on Kalgan was quite stupid enough to go into the question of legitimacy too long or too closely. These things happened, and are best accepted.

Yet that sort of survival of the fittest in addition to putting a premium on bloodiness and evil, occasionally allowed capability to come to the fore as well. Lord Stettin was competent enough and not easy to manage.

Not easy for his eminence, the First Minister, who, with fine impartiality, had served the last lord as well as the present; and who would, if he lived long enough, serve the next as honestly.

Nor easy for the Lady Callia, who was Stettin's more than friend, yet less than wife.

In Lord Stettin's private apartments the three were alone that evening. The First Citizen, bulky and glistening in the admiral's uniform that he affected, scowled from out the un-upholstered chair in which he sat as stiffly as the plastic of which it was composed. His First Minister Lev Meirus, faced him with a far-off unconcern, his long, nervous fingers stroking absently and rhythmically the deep line that curved from hooked nose along gaunt and sunken cheek to the point, nearly, of the graybearded chin. The Lady Callia disposed of herself gracefully on the

deeply furred covering of a foamite couch, her full lips trembling a bit in an unheeded pout.

"Sir," said Meirus—it was the only title adhering to a lord who was styled only First Citizen, "you lack a certain view of the continuity of history. Your own life, with its tremendous revolutions, leads you to think of the course of civilization as something equally amenable to sudden change. But it is not."

"The Mule showed otherwise."

"But who can follow in his footsteps. He was more than man, remember. And he, too, was not entirely successful."

"Poochie," whimpered the Lady Callia, suddenly, and then shrank into herself at the furious gesture from the First Citizen.

Lord Stettin said, harshly: "Do not interrupt, Callia. Meirus, I am tired of inaction. My predecessor spent his life polishing the navy into a finely-turned instrument that has not its equal in the Galaxy. And he died with the magnificent machine lying idle. Am I to continue that? I, an Admiral of the Navy?

"How long before the machine rusts? At present, it is a drain on the Treasury and returns nothing. Its officers long for dominion, its men for loot. All Kalgan desires the return of Empire and glory. Are you capable of understanding that?"

"These are but words that you use, but I grasp your meaning. Dominion, loot, glory—pleasant when they are obtained, but the process of obtaining them is often risky and always unpleasant. The first fine flush may not last. And in all history, it has never been wise to attack the Foundation. Even the Mule would have been wiser to refrain—"

There were tears in the Lady Callia's blue, empty eyes. Of late, Poochie scarcely saw her, and now, when he had promised the evening to her, this horrible, thin, gray man, who always looked through her rather than at her, had forced his way in. And Poochie *let* him. She dared not say anything; was frightened even of the sob that forced its way out.

But Stettin was speaking now in the voice she hated, hard and impatient. He was saying: "You're a slave to the far past. The Foundation is greater in volume and population, but they are loosely knit and will fall apart at a blow. What holds them together these days is merely inertia; an inertia I am strong enough to smash. You are hypnotized by the old days when only the Foundation had atomic power. They were able to dodge the last hammer-blows of the dying Empire and then faced only the un-brained anarchy of the warlords who could counter the Foundation's atomic vessels only with hulks and relics.

"But the Mule, my dear Meirus, has changed that. He spread the knowledge, that the Foundation had hoarded to itself, through half the Galaxy and the monopoly in science is gone forever. We can match them."

"And the Second Foundation?" questioned Meirus, coolly.

"And the Second Foundation?" repeated Stettin as coolly. "Do *you* know its intentions? It took ten years to stop the Mule, if, indeed, it was the factor, which some doubt. Are you unaware that a good many of the Foundation's psychologists and sociologists are of the opinion that the Seldon Plan has been completely disrupted since the days of the Mule? If the Plan has gone, then a vacuum exists which I may fill as well as the next man."

"Our knowledge of these matters is not great enough to warrant the gamble."

"*Our* knowledge, perhaps, but we have a Foundation visitor on the planet. Did you know that? A Homir Munn—who, I understand, has written articles on the Mule, and has expressed exactly that opinion, that the Seldon Plan no longer exists."

The First Minister nodded, "I have heard of him, or at least of his writings. What does he desire?"

"He asks permission to enter the Mule's palace."

"Indeed? It would be wise to refuse. It is never advisable to disturb the superstitions with which a planet is held."

"I will consider that—and we will speak again."

Meirus bowed himself out.

Lady Callia said tearfully: "Are you angry with me, Poochie?"

Stettin turned on her savagely: "Have I not told you before never to call me by that ridiculous name in the presence of others?"

"You *used* to like it."

"Well, I don't any more, and it is not to happen again."

He stared at her darkly. It was a mystery to him that he tolerated her these days. She was a soft, empty-headed thing, comfortable to the touch, with a pliable affection that was a convenient facet to a hard life. Yet, even that affection was becoming wearisome. She dreamed of marriage, of being First Lady.

Ridiculous!

She was all very well when he had been an admiral only—but now as First Citizen and future conqueror, he needed more. He needed heirs which could unite his future dominions, something the Mule had never had, which was why his Empire did not survive his strange nonhuman life. He, Stettin, needed someone of the great historic families of the Foundation with whom he could fuse dynasties.

He wondered testily why he did not rid himself of Callia now. It would be no trouble. She would whine a bit— He dismissed the thought. She had her points, occasionally.

Callia was cheering up now. The influence of Graybeard was gone and her Poochie's granite face was softening now. She lifted herself in a single, fluid motion and melted toward him.

"You're not going to scold me, are you?"

"No." He patted her absently. "Now just sit quietly for a while, will you? I want to think."

"About the man from the Foundation?"

"Yes."

"Poochie?" This was after a pause.

"What?"

"Poochie, the man has a little girl with him, you said. Remember? Could I see her when she comes? I never—"

"Now what do you think I want him to bring his brat with him for? Is my audience room to be a grammar school? Enough of your nonsense, Callia."

"But I'll take care of her, Poochie. You won't even have to bother with her. It's just that I hardly ever see cildren, and you know how I love them."

He looked at her sardonically. She never tired of this approach. She loved children; i.e. *his* children; i.e. his *legitimate* children; i.e. marriage. He laughed.

"This particular little piece," he said, "is a great girl of fourteen or fifteen. She's probably as tall as you are."

Callia looked crushed. "Well, could I, anyway? She could tell me about the Foundation? I've always wanted to go there, you know. My grandfather was a Foundation man. Won't you take me there, sometime, Poochie?"

Stettin smiled at the thought. Perhaps he would, as conqueror. The good nature that the thought supplied him with made itself felt in his words, "I will, I will. And you can see the girl and talk Foundation to her all you want. But not near me, understand."

"I won't bother you, honestly. I'll have her in my own rooms." She was happy again. It was not very often these days that she was allowed to have her way. She put her arms about his neck and after the slightest hesitation, she felt its tendons relax and the large head come softly down upon her shoulder.

VII.

Arcadia felt triumphant. How life had changed since Pelleas Anthor had stuck his silly face up against her window—and all because she had the vision and courage to do what needed to be done.

Here she was on Kalgan. She had been to the great Central Theater—the largest in the Galaxy—and seen *in person* some of the singing stars who were famous even in the distant Foundation. She had shopped all on her own along the Flowered Path, fashion center of the gayest world in Space. And she had made her own selections because Homir just didn't know anything about it at all. The saleswomen raised no objections at all to long, shiny dresses with those vertical sweeps that made her look so tall—and Foundation money went a long, long way. Homir had given her a ten-credit bill and when she changed it to Kalganian "Kalganids", it made a

terribly thick sheaf.

She had even had her hair redone —sort of half-short in back, with two glistening curls over each temple. And it was treated so that it looked goldier than ever; it just *shone.*

But *this;* this was best of all. To be sure, the Palace of Lord Stettin wasn't as grand and lavish as the theaters, or as mysterious and historical as the old place of the Mule—of which, so far, they had only glimpsed the lonely towers in their air flight across the planet—but, imagine, a real Lord. She was rapt in the glory of it.

And not only that. She was actually face to face with his Mistress. Arcadia capitalized the word in her mind, because she knew the role such women had played in history; knew their glamour and power. In fact, she had often thought of being an all-powerful and glittering creature, herself, but somehow mistresses weren't in fashion at the Foundation just then and besides, her father probably wouldn't let her, if it came to that.

Of course, the Lady Callia didn't quite come up to Arcadia's notion of the part. For one thing, she was rather plump, and didn't look at all wicked and dangerous. Just sort of faded and near-sighted. Her voice was high, too, instead of throaty, and—

Callia said: "Would you like more tea, child?"

"I'll have another cup, thank you, your grace,"—or was it your highness?

Arcadia continued with a connoisseur's condescension, "Those are lovely pearls you are wearing, my lady." (On the whole, "my Lady" seemed best.)

"Oh? Do you think so?" Callia seemed vaguely pleased. She removed them and let them swing milkily to and fro. "Would you like them? You can have them, if you like."

"Oh, my— You really mean—" She found them in her hand, then, repelling them mournfully, she said: "Father wouldn't like it."

"He wouldn't like the pearls? But they're quite nice pearls."

"He wouldn't like my taking them, I mean. You're not supposed to take expensive presents from other people, he says."

"You aren't? But . . . I mean, this was a present to me from Poo . . . from the First Citizen. Was that wrong, do you suppose?"

Arcadia reddened: "I didn't mean—"

But Callia had tired of the subject. She let the pearls slide to the ground and said: "You were going to tell me about the Foundation. Please do so right now."

And Arcadia was suddenly at a loss. What does one say about a world dull to tears. To her, the Foundation was a suburban town, a comfortable house, the annoying necessities of education, the uninteresting eternities of a quiet life. She said, uncertainly: "It's just like you view in the book-films, I suppose."

"Oh, do you view book-films?

They give me such a headache when I try. But do you know I always love video stories about your Traders—such big, savage men. It's always so exciting. Is your friend, Mr. Munn, one of them? He doesn't seem nearly savage enough. Most of the Traders had beards and big bass voices, and were so domineering with women—don't you think so?"

Arcadia smiled, glassily: "That's just part of history, my lady. I mean, when the Foundation was young, the Traders were the pioneers pushing back the frontiers and bringing civilization to the rest of the Galaxy. We learned all about that in school. But that time has passed. We don't have Traders any more; just corporations and things."

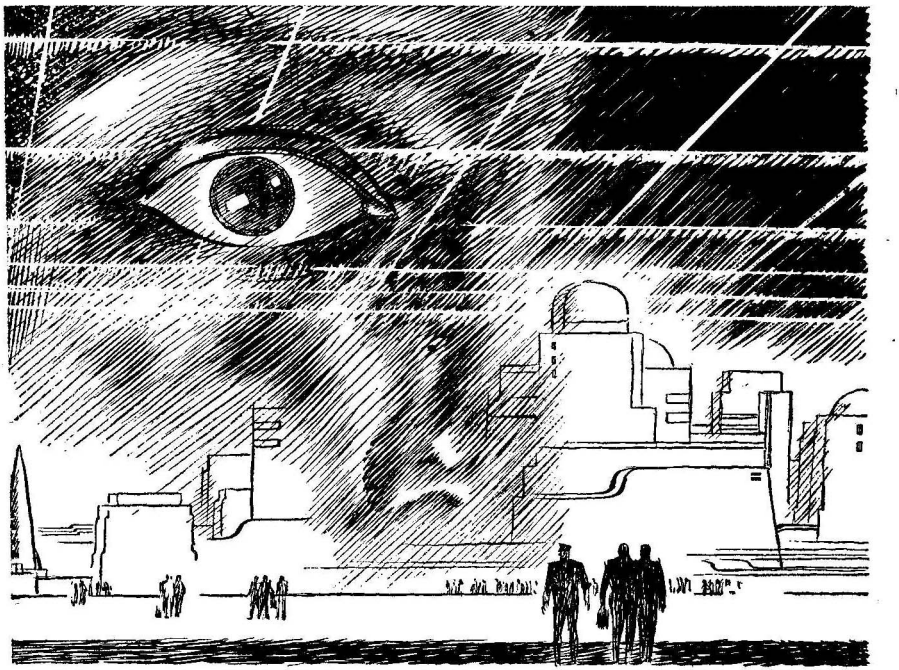
"Really? What a shame. Then what does Mr. Munn do? I mean, if he's not a Trader."

"Uncle Homir's a librarian."

Callia put a hand to her lips and tittered: "You mean he takes care of book-films. Oh, my! It seems like such a silly thing for a grown man to do."

"He's a very good librarian, my lady. It is an occupation that is very highly regarded at the Foundation." She put down the little, iridescent teacup upon the milky-metaled table surface.

Her hostess was all concern: "But my dear child. I'm sure I didn't



mean to offend you. He must be a very *intelligent* man. I could see it in his eyes as soon as I looked at him. They were so . . . so *intelligent.* And he must be brave, too, to want to see the Mule's palace."

"Brave?" Arcadia's internal awareness twitched. This was what she was waiting for. Intrigue! Intrigue! With great indifference, she asked, staring idly at her thumbtip: "Why must one be brave to wish to see the Mule's place?"

"Didn't you know?" Her eyes were round, and her voice sank. "There's a curse on it. When he died, the Mule directed that no one ever enter it until the Empire of the Galaxy is established. Nobody on Kalgan would dare even to enter the grounds."

Arcadia absorbed that, "But that's superstition—"

"Don't say that," Callia was distressed. "Poochie always says that. He says it's useful to say it isn't though, in order to maintain his hold over the people. But I notice he's never gone in himself. And neither did Thallos, who was First Citizen before Poochie." A thought struck her and she was all curiosity again: "But why does Mr. Munn want to see the Palace?"

And it was here that Arcadia's careful plan could be put into action. She knew well from the books she

had read that a ruler's mistress was the real power behind the throne, that she was the very well-spring of influence. Therefore, if Uncle Homir failed with Lord Stettin—and she was sure he would—she must retrieve that failure with Lady Callia. To be sure, Lady Callia was something of a puzzle. She didn't seem at *all* bright. But, well, all history proved—

She said: "There's a reason, my lady—but will you keep it in confidence?"

"Cross my heart," said Callia, making the appropriate gesture on the soft, billowing whiteness of her breast.

Arcadia's thoughts kept a sentence ahead of her words: "Uncle Homir is a great authority on the Mule, you know. He's written books and books about it, and he thinks that all of Galactic history has been changed since the Mule conquered the Foundation."

"Oh, my."

"He thinks the Seldon Plan—"

Callia clapped her hands, "I know about the Seldon Plan. The videos about the Traders were always all about the Seldon Plan. It was supposed to arrange to have the Foundation win all the time. Science had something to do with it, though I could never quite see how. I always get so restless when I have to listen to explanations. But you go right ahead, my dear. It's different when you explain. You make everything seem so clear."

Arcadia continued: "Well, don't you see then that when the Foundation was defeated by the Mule, the Seldon Plan didn't work and it hasn't worked since. So who will form the Second Empire?"

"The Second Empire?"

"Yes, one must be formed some day, but how? That's the problem, you see. And there's the Second Foundation."

"The *Second* Foundation?" She was quite completely lost.

"Yes, they're the planners of history that are following in the footsteps of Seldon. They stopped the Mule because he was premature, but now, they may be supporting Kalgan."

"Why?"

"Because Kalgan may now offer the best chance of being the nucleus for new Empire."

Dimly, Lady Callia seemed to grasp that: "You mean *Poochie* is going to make a new Empire."

"We can't tell for sure. Uncle Homir thinks so, but he'll have to see the Mule's records to find out."

"It's all very complicated," said Lady Callia, doubtfully.

Arcadia gave up. She had done her best.

Lord Stettin was in a more-or-less savage humor. The session with the milksop from the Foundation had been quite unrewarding. It had been worse; it had been embarrassing. To be absolute ruler of twenty-seven worlds, master of the Galaxy's greatest military machine, owner of the universe's most vaulting ambition

—and left to argue nonsense with an antiquarian.

Damnation!

He was to violate the customs of Kalgan, was he? To allow the Mule's palace to be ransacked so that a fool could write another book? The cause of science! The sacredness of knowledge! Great Galaxy! Were these catchwords to be thrown in his face in all seriousness? Besides—and his flesh prickled slightly—there was the matter of the curse. He didn't believe in it; no intelligent man could. But if he was going to defy it, it would have to be for a better reason than any the fool had advanced.

"What do *you* want?" he snapped, and Lady Callia cringed visibly in the doorway.

"Are you busy?"

"Yes. I am busy."

"But there's nobody here, Poochie. Couldn't I even speak to you for a minute?"

"Oh, Galaxy! What do you want? Now hurry."

Her words stumbled: "The little girl told me they were going into the Mule's palace. I thought we could go with her. It must be gorgeous inside."

"She told you that, did she? Well, she isn't and we aren't. Now go tend your own business. I've had about enough of you."

"But, Poochie, why not? Aren't you going to let them? The little girl said that you were going to make an Empire!"

"I don't care what she said—What was that?" He strode to Callia and caught her firmly above the elbow, so that his fingers sank deeply into the soft flesh, "What did she tell you?"

"You're hurting me. I can't remember what she said, if you're going to look at me like that."

He released her, and she stood there for a moment, rubbing vainly at the red marks. She whimpered: "The little girl made me promise not to tell."

"That's too bad. Tell me! *Now!*"

"Well, she said the Seldon Plan was changed and that there was another Foundation somewheres that was arranging to have you make an Empire. That's all. She said Mr. Munn was a very important scientist and that the Mule's Palace would have proof of all that. That's every bit of what she said. Are you angry?"

But Stettin did not answer. He left the room, hurriedly, with Callia's cowlike eyes staring mournfully after him. Two orders were sent out over the official seal of the First Citizen before the hour was up. One had the effect of sending five hundred ships of the line into space on what were officially to be termed as "war games." The other had the effect of throwing a single man into confusion.

Homir Munn ceased his preparations to leave when that second order reached him. It was, of course, official permission to enter the Palace of the Mule. He read and reread

it, with anything but joy.

But Arcadia was delighted. She knew what had happened.

Or, at any rate, she thought she did.

VIII.

Poli placed the breakfast on the table, keeping one eye on the table news-recorder which quietly disgorged the bulletins of the day. It could be done easily enough without loss of efficiency, this one-eye-absent business. Since all items of food were sterilely packed in containers which served as discardable cooking units, her duties vis-a-vis breakfast consisted of nothing more than choosing the menu, placing the items on the table, and removing the residue thereafter.

She clacked her tongue at what she saw and moaned softly in retrospect.

"Oh, people are so wicked," she said, and Darell merely hemmed in reply.

Her voice took on the high-pitched rasp which she automatically assumed when about to bewail the evil of the world, "Now why do these terrible Kalganese"—she accented the second syllable and gave it a long "a"—"do like that? You'd think they'd give a body peace. But no, it's just trouble, trouble, all the time.

"Now look at that headline: 'Mobs Riot Before Foundation Consulate.' Oh, would I like to give them a piece of my mind, if I could. That's the trouble with people; they just don't remember. They just *don't* remember, Dr. Darell—got no memory at all. Look at the last war after the Mule died—of course I was just a little girl then—and oh, the fuss and trouble. My own uncle was killed, him being just in his twenties and only two years married, with a baby girl. I remember him even yet—blond hair he had, and a dimple in his chin. I have a trimensional cube of him somewheres—

"And now his baby girl has a son of her own in the navy and most like if anything happens—

"And we had the bombardment patrols, and all the old men taking turns in the stratospheric defense—I could imagine what they would have been able to do if the Kalganese had come that far. My mother used to tell us children about the food rationing and the prices and taxes. A body could hardly make ends meet—

"You'd think if they had sense people would just never want to start it again; just have nothing to do with it. And I suppose it's not people that do it, either; I suppose even Kalganese would rather sit at home with their families and not go fooling around in ships and getting killed. It's that awful man, Stettin. It's a wonder people like that are let live. He kills the old man—what's his name—Thallos, and now he's just spoiling to be boss of everything.

"And why he wants to fight us, I don't know. He's bound to lose—like they always do. Maybe it's all in the Plan, but sometimes I'm sure it must be a wicked plan to have so much fighting and killing in it,

though to be sure I haven't a word to say about Hari Seldon, who I'm sure knows much more about that than I do and perhaps I'm a fool to question him. And the *other* Foundation is as much to blame. *They* could stop Kalgan *now* and make everything fine. They'll do it anyway in the end, and you'd think they'd do it before there's any damage done."

Dr. Darell looked up: "Did you say something, Poli?"

Poli's eyes opened wide, then narrowed angrily, "Nothing, doctor, nothing at all. I haven't got a word to say. A body could as soon choke to death as say a word in this house. It's jump here, and jump there, but just try to say a word—" and she went off simmering.

Her leaving made as little impression on Darell as did her speaking.

Kalgan! Nonsense! A merely physical enemy! Those had always been beaten!

Yet he could not divorce himself of the current foolish crisis. Seven days earlier, the mayor had asked him to be Administrator of Research and Development. He had promised an answer today.

Well—

He stirred uneasily. Why, himself! Yet could he refuse? It would seem strange, and he dared not seem strange. After all, what did he care about Kalgan. To him there was only one enemy. Always had been.

While his wife had lived, he was only too glad to shirk the task; to hide. Those long, quiet days on Trantor, with the ruins of the past about them! The silence of a wrecked world and the forgetfulness of it all!

But she had died. Less than five years, all told, it had been; and after that he knew that he could live only by fighting that vague and fearful enemy that deprived him of the dignity of manhood by controlling his destiny; that made life a miserable struggle against a foreordained end; that made all the universe a hateful and deadly chess game.

Call it sublimation; he, himself did call it that—but the fight gave meaning to his life.

First to the University of Santanni, where he had joined Dr. Kleise. It had been five years well-spent.

And yet Kleise was merely a gatherer of data. He could not succeed in the real task—and when Darell had felt that as certainty, he knew it was time to leave.

Kleise may have worked in secret, yet he had to have men working for him and with him. He had subjects whose brains he probed. He had a University that backed him. All these were weaknesses.

Kleise could not understand that; and he, Darell, could not explain that. They parted enemies. It was well; they had to. He *had* to leave in surrender—in case someone watched.

Where Kleise worked with charts: Darell worked with mathematical concepts in the recesses of his mind.

Kleise worked with many; Darell with none. Kleise in a University; Darell in the quiet of a suburban house.

And he was almost there.

A Second Foundationer is not human as far as his cerebrum is concerned. The cleverest physiologist, the most subtle neurochemist might detect nothing—yet the difference must be there. And since the difference was one of the mind, it was *there* that it must be detectable.

Given a man like the Mule—and there was no doubt that the Second Foundationers had the Mule's powers, whether inborn or acquired—with the power of detecting and controlling human emotions, deduce from that the electronic circuit required, and deduce from that the last details of the encephalograph on which it could not help but be betrayed.

And now Kleise had returned into his life, in the person of his ardent young pupil, Anthor.

Folly! Folly! With his graphs and charts of people who had been tampered with. He had learned to detect that years ago, but of what use was it. He wanted the arm; not the tool. Yet he had to agree to join Anthor, since it was the quieter course.

Just as now he would become Administrator of Research and Development. It was the quieter course! And so he remained a conspiracy within a conspiracy.

The thought of Arcadia teased him for a moment, and he shuddered away from it. Left to himself, it would never have happened. Left to himself, no one would ever have been endangered but himself. Left to himself—

He felt the anger rising—against the dead Kleise, the living Anthor, all the well-meaning fools—

Well, she could take care of herself. She was a very mature little girl.

She could take care of herself!

It was a whisper in his mind—

IX.

Yet could she?

At the moment, that Dr. Darell told himself mournfully that she could, she was sitting in the coldly austere anteroom of the Executive Offices of the First Citizen of the Galaxy. For half an hour she had been sitting there, her eyes sliding slowly about the walls. There had been two armed guards at the door when she had entered with Homir Munn. They hadn't been there the other times.

She was alone, now, yet she sensed the unfriendliness of the very furnishings of the room. And for the first time.

Now, why should that be?

Homir was with Lord Stettin. Well, was that wrong?

It made her furious. In similar situations in the book-films and the videos, the hero foresaw the conclusion, was prepared for it when it came, and she—she just sat there. *Anything* could happen. *Anything!*

And she just sat there.

Well, back again. Think it back. Maybe something would come.

For two weeks, Homir had nearly lived inside the Mule's Palace. He had taken her once, with Stettin's permission. It was large and gloomily massive, shrinking from the touch of life to lie sleeping within its ringing memories, answering the footsteps with a hollow boom or a savage clatter. She hadn't liked it.

Better the great, gay highways of the capital city; the theaters and spectacles of a world essentially poorer than the Foundation, yet spending more of its wealth on display.

Homir would return in the evening, awed—

"It's a dream-world for me," he would whisper. "If I could only chip the Palace down stone by stone, layer by layer of the aluminum sponge. If I could carry it back to Terminus— What a museum it would make."

He seemed to have lost that early reluctance. He was eager, instead; glowing. Arcadia knew that by the one sure sign; he practically never stuttered throughout that period.

One time, he said: "There are abstracts of the records of General Pritcher—"

"I know him. He was the Foundation renegade, who combed the Galaxy for the Second Foundation, wasn't he?"

"Not exactly a renegade, Arkady. The Mule had Converted him."

"Oh, it's the same thing."

"Galaxy, that combing you speak of was a hopeless task. The original records of the Seldon Convention that established both Foundations five hundred years ago, make only one reference to the Second Foundation. They say it's located 'at the other end of the Galaxy at Star's End.' That's all the Mule and Pritcher had to go on. They had no method of recognizing the Second Foundation even if they found it. What madness!

"They have records"—he was speaking to himself, but Arcadia listened eagerly—"which must cover nearly a thousand worlds, yet the number of worlds available for study must have been closer to a million. And we are no better off—"

Arcadia broke in anxiously, *"Shhh-h"* in a tight hiss.

Homir froze, and slowly recovered. "Let's not talk," he mumbled.

And now Homir was with Lord Stettin and Arcadia waited outside alone and felt the blood squeezing out of her heart for no reason at all. That was more frightening than anything else. That there seemed no reason.

On the other side of the door, Homir, too, was living in a sea of gelatin. He was fighting, with furious intensity, to keep from stuttering and, of course, could scarcely speak two consecutive words clearly as a result.

Lord Stettin was in full uniform,

six-feet-six, large-jawed, and hard-mouthed. His balled, arrogant fists kept a powerful time to his sentences.

"Well, you have had two weeks, and you come to me with tales of nothing. Come, sir, tell me the worst. Is my Navy to be cut to ribbons? Am I to fight the ghosts of the Second Foundation as well as the men of the First?"

"I . . . I repeat, my lord, I am no p . . . pre . . . predictor. I . . . I am at a complete l . . . loss."

"Or do you wish to go back to warn your countrymen? To deep Space with your play-acting. I want the truth or I'll have it out of you along with half your guts.

"I'm t . . . telling only the truth, and I'll have you re . . . remember, my l . . . lord, that I am a citizen of the Foundation. Y . . . you cannot touch me without harvesting m . . . m . . . more than you count on."

The Lord of Kalgan laughed uproariously: "A threat to frighten children. A horror with which to beat back an idiot. Come, Mr. Munn, I have been patient with you. I have listened to you for twenty minutes while you detailed wearisome nonsense to me which must have cost you sleepless nights to compose. It was wasted effort. I know you are here not merely to rake through the Mule's dead ashes and to warm over the cinders you find—you come here for more than you have admitted. Is that not true?"

Homir Munn could no more have quenched the burning horror that grew in his eyes than, at that moment, he could have breathed. Lord Stettin saw that, and clapped the Foundation man upon his shoulder so that he and the chair he sat on reeled under the impact.

"Good. Now let us be frank. You are investigating the Seldon Plan. You know that it no longer holds. You know, perhaps, that *I* am the inevitable winner now; I and my heirs. Well, man, what matters it who established the Second Empire, so long as it is established. History plays no favorites, eh? Are you afraid to tell me? You see that I know your mission."

Munn said thickly: "What is it y . . . you w . . . want?"

"Your presence. I would not wish the Plan spoiled through overconfidence. You understand more of these things than I do; you can detect small flaws that I might miss. Come, you will be rewarded in the end; you will have your fair glut of the loot. What can you expect at the Foundation? To turn the tide of a perhaps inevitable defeat? To lengthen the war? Or is it merely a patriotic desire to die for your country?"

"I . . . I—" He finally spluttered into silence. Not a word would come.

"You will stay," said the Lord of Kalgan, confidently. "You have no choice. Wait"—an almost forgotten afterthought—"I have information to the effect that your niece is of the family of Bayta Darell."

Homir uttered a startled: "Yes."

He could not trust himself at this point to be capable of weaving anything but cold truth.

"It is a family of note on the Foundation?"

Homir nodded, "To whom they would certainly b . . . brook no harm."

"Harm! Don't be a fool, man; I am meditating the reverse. How old is she?"

"Fourteen."

"So! Well, not even the Second Foundation, or Hari Seldon, himself, could stop time from passing or girls from becoming women."

With that, he turned on his heel and strode to a draped door which he threw open violently.

He thundered: "What in Space have you dragged your shivering carcass here for?"

The Lady Callia blinked at him, and said in a small voice: "I didn't know anyone was with you."

"Well, there is. I'll speak to you later of this, but now I want to see your back, and quickly."

Her footsteps were a fading scurry in the corridor.

Stettin returned: "She is a remnant of an interlude that has lasted too long. It will end soon. Fourteen, you say?"

Homir stared at him with a brand-new horror!

Arcadia started at the noiseless opening of a door—jumping at the jangling sliver of movement it made in the corner of her eye. The finger that crooked frantically at her met no response for long moments, and then, as if in response to the cautions enforced by the very sight of that white, trembling figure, she tiptoed her way across the floor.

Their footsteps were a taut whisper in the corridor. It was the Lady Callia, of course, who held her hand so tightly that it hurt, and for some reason, she did not mind following her. Of the Lady Callia, at least, she was not afraid.

Now, why was that?

They were in a boudoir now, all pink fluff and spun sugar. Lady Callia stood with her back against the door.

She said: "This was our private way to me . . . to my room, you know, from his office. His, you know." And she pointed with a thumb, as though even the thought of him were grinding her soul to death with fear.

"It's so lucky . . . it's so lucky—" Her pupils had blackened out the blue with their size.

"Can you tell me—" began Arcadia timidly.

And Callia was in frantic motion. "No, child, no. There is no time. Take off your clothes. Please. Please. I'll get you more, and they won't recognize you."

She was in the closet, throwing useless bits of flummery in reckless heaps upon the ground, looking madly for something a girl could wear without becoming a living invitation to dalliance.

"Here, this will do. It will have to. Do you have money? Here,

take it all—and this." She was stripping her ears and fingers. "Just go home—go home to your Foundation."

"But Homir . . . my uncle." She protested vainly through the muffling folds of the sweet-smelling and luxurious spun-metal being forced over her head.

"He won't leave. Poochie will hold him forever, but *you* mustn't stay. Oh, dear, don't you understand?"

"No." Arcadia forced a standstill, "I *don't* understand."

Lady Callia squeezed her hands tightly together, "You must go back to warn your people there will be war. Isn't that clear?" Absolute terror seemed paradoxically to have lent a lucidity to her thoughts and words that was entirely out of character. "Now come!"

Out another way! Past officials who stared after them, but saw no reason to stop one whom only the Lord of Kalgan could stop with impunity. Guards clicked heels and presented arms when they went through doors.

Arcadia breathed only on occasion through the years the trip seemed to take—yet from the first crooking of the white finger to the time she stood at the outer gate, with people and noise and traffic in the distance was only twenty-five minutes.

She looked back, with a sudden frightened pity, "I . . . I . . . don't know why you're doing this, my

lady, but thanks— What's going to happen to Uncle Homir?"

"I don't know," wailed the other. "Can't you leave? Go straight to the spaceport. Don't wait. He may be looking for you this very minute."

And still Arcadia lingered. She would be leaving Homir; and, belatedly, now that she felt the free air about her, she was suspicious, "But what do you care if he does?"

Lady Callia bit her lower lip and muttered: "I can't explain to a little girl like you. It would be improper. Well, you'll be growing up and I . . . I met Poochie when I was sixteen. I can't have you about, you know." There was a half-ashamed hostility in her eyes.

The implications froze Arcadia. She whispered: "What will he do to you when he finds out?"

And she whimpered back: "I don't know," and threw her arm to her head as she left at a half-run, back along the wide way to the mansion of the Lord of Kalgan.

But for one eternal second, Arcadia *still* did not move, for in that last moment before Lady Callia left, Arcadia had seen something. Those frightened, frantic eyes had momentarily—flashingly—lit up with a cold amusement.

A vast, inhuman amusement.

It was much to see in such a quick flicker of a pair of eyes, but Arcadia had no doubt of what she saw.

She was running now—running wildly—searching madly for an unoccupied public booth at which one could press a button for public conveyance.

She was not running from Lord Stettin; not from him or from all the human hounds he could place at her heels—not from all his twenty-seven worlds rolled into a single gigantic phenomenon, hallooing at her shadow.

She was running from a single, frail woman who had helped her escape. From a creature who had loaded her with money and jewels; who had risked her own life to save her. From an entity she knew, certainly and finally, to be a woman of the Second Foundation.

An air-taxi came to a soft clicking halt in the cradle. The wind of its coming brushed against Arcadia's face and stirred at the hair beneath the softly-furred hood Callia had given her.

"Where'll it be, lady?"

She fought desperately to low-pitch her voice, to make it not that of a child: "How many spaceports in the city?"

"Two. Which one ya want?"

"Which is closer?"

He stared at her: "Kalgan Central, lady."

"The other one, please. I've got the money." She had a twenty- Kalganid note in her hand. The denomination of the note made little difference to her, but the taxi-man grinned appreciatively.

"Anything ya say, lady. Sky-line cabs take ya anywhere."

She cooled her cheek against the slightly musty upholstery. The lights of the city moved leisurely below her.

What should she do? *What should she do?*

It was in that moment that she knew she was a stupid, *stupid* little girl, away from her father, and frightened. Her eyes were full of tears, and deep down in her throat, there was a small, soundless cry that hurt her insides.

She wasn't afraid that Lord Stettin would catch her. Lady Callia would see to that. Lady Callia! Old, fat, stupid, but she held on to her lord, somehow. Oh, it was clear enough, now. *Everything* was clear.

That tea with Callia at which she had been so smart. Clever little Arcadia! Something inside Arcadia choked and hated itself. That tea had been maneuvered, and then Stettin had probably been maneuvered so that Homir was allowed to inspect the Palace after all. *She,* the foolish Callia, had wanted it so, and arranged to have smart little Arcadia supply a foolproof excuse, one which would arouse no suspicions in the minds of the victims, and yet involve a minimum of interference on her part.

Then why was she free? Homir was a prisoner, of course—

Unless—

Unless she went back to the Foundation as a decoy—a decoy to lead others into the hands of . . . of *them.*

So she couldn't return to the Foundation—

"Spaceport, lady." The air-taxi had come to a halt. Strange! She hadn't even noticed.

What a dream-world it was.

"Thanks," she pushed the bill at him without seeing anything and was stumbling out the door, then running across the springy pavement.

Lights. Unconcerned men and women. Large gleaming bulletin-boards, with the moving figures that followed every single spaceship that arrived and departed.

Where was she going? She didn't care. She only knew that she wasn't going to the Foundation! Anywhere else at all would suit.

Oh, thank Seldon, for that forgetful moment—that last split-second when Callia wearied of her act because she had to do only with a child and had let her amusement spring through.

And then something else occurred to Arcadia, something that had been stirring and moving at the base of her brain ever since the flight began —something that forever killed the fourteen in her.

And she knew that she *must* escape.

That above all. Though they located every conspirator on the Foundation; though they caught her own father; she could not, dared not, risk a warning. She could not risk her own life—not in the slightest—for the entire realm of Terminus.

She was the most important person in the Galaxy. She was the *only* important person in the Galaxy.

She knew that even as she stood before the ticket-machine and wondered where to go.

Because in all the Galaxy, she and she alone, except for *they*, themselves, knew the location of the Second Foundation.

X.

There is nothing, never has been anything, quite like a busy spaceport on the outskirts of a capital city of a populous planet. There are the huge machines resting mightily in their cradles. If you choose your time properly, there is the impressive sight of the sinking giant dropping to rest or, more hair-raising still, the swiftening departure of a bubble of steel. All processes involved are nearly noiseless. The motive power is the silent surge of nucleons shifting into more compact arrangements—

In terms of area, ninety-five percent of the port has just been referred to. Square miles are reserved for the machines, and for the men who serve them and for the calculators that serve both.

Only five percent of the port is given over to the floods of humanity to whom it is the way station to all the stars of the Galaxy. It is certain that very few of the anonymous many-headed stop to consider the technological mesh that knits the spaceways. Perhaps some of them might itch occasionally at the thought of the thousands of tons represented by the sinking steel that looks so small off in the distance. One of those cyclopean cylinders could, conceivably, miss the guiding beam and crash half a mile from its expected landing point—through the glassite roof of the immense waiting room perhaps—even upon himself, so that only a thin organic vapor and some powdered phosphates would be left behind.

It could never happen, however, with the safety devices in use; and only the badly neurotic would consider the possibility for more than a moment.

Then what *do* they think about? It is not just a crowd, you see. It is a crowd with a purpose. That purpose hovers over the field and thickens the atmosphere. Lines queue up; parents herd their children; baggage is maneuvered in precise masses—people are *going* somewheres.

Consider then the complete psychic isolation of a single unit of this terribly intent mob that does not know where to go; yet at the same time feels more intensely than any of the others possibly can, the necessity of going somewheres; anywhere! Or almost anywhere!

Even lacking telepathy or any of the crudely definite methods of mind touching mind, there is a sufficient clash in atmosphere, in intangible mood, to suffice for despair.

To suffice? To overflow, and drench, and drown.

Arcadia Darell, dressed in borrowed clothes, standing on a borrowed planet in a borrowed situation of what seemed even to be a borrowed life, wanted earnestly the safety of the womb. She didn't know that was what she wanted. She only knew that the very openness of the open world was a great danger. She wanted a closed spot somewhere—somewhere far—somewhere in an unexplored nook of the universe—where no one would ever look.

And there she was, age fourteen plus, weary enough for eighty plus, frightened enough for five minus.

What stranger of the hundreds that brushed past her—actually brushed past her, so that she could feel their touch—was a Second Foundationer? What stranger could not help but instantly destroy her for her guilty knowledge—her unique knowledge—of knowing where the Second Foundation was?

And the voice that cut in on her was a thunderclap that iced the scream in her throat into a voiceless slash.

"Look, miss," it said, irritably, "are you using the ticket machine or are you just standing there?"

It was the first she realized that she was standing in front of a ticket machine. You put a high denomination bill into the clipper which sank out of sight. You pressed the button below your destination and a ticket came out together with the correct change as determined by an electronic scanning device that never made a mistake. It was a very ordinary thing and there is no cause for anyone to stand before it for five minutes.

Arcadia plunged a two-hundred credit into the clipper, and was suddenly aware of the button labeled "Trantor". Trantor, dead capital of the dead Empire—the planet on which she was born. She pressed it in a dream. Nothing happened, except that the red letters flicked on and off, reading 172.18—172.18—172.18—

It was the amount she was short. Another two-hundred credit. The ticket was spit out towards her. It came loose when she touched it, and the change tumbled out afterward.

She seized it and ran. She felt the man behind her pressing close, anxious for his own chance at the machine, but she twisted out from before him and did not look behind.

Yet there was nowhere to run. They were all her enemies.

Without quite realizing it, she was watching the gigantic, glowing signs that puffed into the air; *Steffani, Anacreon, Fermus*— There was even one that ballooned, *Terminus,* and she longed for it, but did not dare—

For a trifling sum, she could have hired a notifier which could have been set for any destination she cared and which would, when placed in her purse, make itself heard only to her,

fifteen minutes before take-off time. But such devices are for people who are reasonably secure, however; who can pause to think of them.

And then, attempting to look both ways simultaneously, she ran head-on into a soft abdomen. She felt the startled out-breath and grunt, and a hand come down on her arm. She writhed desperately but lacked breath to do more than mew a bit in the back of her throat.

Her captor held her firmly and waited. Slowly, he came into focus for her and she managed to look at him. He was rather plump and rather short. His hair was white and copious, being brushed back to give a pompadour effect that looked strangely incongruous above a round and ruddy face that shrieked its peasant origin.

"What's the matter?" he said finally, with a frank and twinkling curiosity. "You look scared."

"Sorry," muttered Arcadia in a frenzy. "I've got to go. Pardon me."

But he disregarded that entirely, and said: "Watch out, little girl. You'll drop your ticket." And he lifted it from her resistless white fingers and looked at it with every evidence of satisfaction.

"I thought so," he said, and then bawled in bull-like tones, *"Mom-muh!"*

A woman was instantly at his side, somewhat more short, somewhat more round, somewhat more ruddy. She wound a finger about a stray gray lock to shove it beneath a well-outmoded hat.

"Pappa," she said, reprovingly, "why do you shout in a crowd like that? People look at you like you were crazy. Do you think you are on the farm?"

And she smiled sunnily at the unresponsive Arcadia, and added: "He has manners like a bear." Then, sharply, "Pappa, let go the little girl. What are you doing?"

But Pappa simply waved the ticket at her. "Look," he said, "she's going to Trantor."

Mamma's face was a sudden beam, "You're from Trantor? Let go her arm, I say, Pappa." She turned the overstuffed valise she was carrying onto its side and forced Arcadia to sit down with a gentle but unrelenting pressure. "Sit down," she said, "and rest your little feet. It will be no ship yet for an hour and the benches are crowded with sleeping loafers. You are from Trantor?"

Arcadia drew a deep breath and gave in. Huskily, she said: "I was born there."

And Mamma clapped her hands gleefully, "One month we've been here and till now we met nobody from home. This is very nice. Your parents—" she looked about vaguely.

"I'm not with my parents," Arcadia said, carefully.

"All alone? A little girl like you?" Mamma was at once a blend of indignation and sympathy, "How does that come to be?"

"Mamma," Pappa plucked at her sleeve, "let me tell you. There's something wrong. I think she's frightened." His voice, though obviously intended for a whisper was quite plainly audible to Arcadia. "She was running—I was watching her—and not looking where she was going. Before I could step out of the way, she bumped into me. And you know what? I think she's in trouble."

"So shut your mouth, Pappa. Into you, anybody could bump." But she joined Arcadia on the valise, which creaked wearily under the added weight and put an arm about the girl's trembling shoulder: "You're running away from somebody, sweetheart? Don't be afraid to tell me. I'll help you."

Arcadia looked across at the kind gray eyes of the woman and felt her lips quivering. One part of her brain was telling her that here were people from Trantor, with whom she could go, who could help her remain on that planet until she could decide what next to do, where next to go. And another part of her brain, much the louder, was telling her in jumbled incoherence that she did not remember her mother, that she was weary to death of fighting the universe, that she wanted only to curl into a little ball with strong, gentle arms about her, that if her mother had lived, she might . . . she might—

And for the first time that night, she was crying; crying like a little baby, and glad of it; clutching tightly at the old-fashioned dress and dampening a corner of it thoroughly, while soft arms held her closely and a gentle hand stroked her curls.

Pappa stood helplessly looking at the pair, fumbling futilely for a handkerchief which, when produced, was snatched from his hand. Mamma glared an admonition of quietness at him. The crowds surged about the little group with the true indifference of disconnected crowds everywhere. They were effectively alone.

Finally, the weeping trickled to a halt, and Arcadia smiled weakly as she dabbed at red eyes with the borrowed handkerchief, "Golly," she whispered, "I—"

"*Shh. Shh.* Don't talk," said Mamma, fussily, "just sit and rest for a while. Catch your breath. Then tell us what's wrong, and you'll see, we'll fix it up, and everything will be all right."

Arcadia scrabbled what remained of her wits together. She could not tell them the truth. She could tell nobody the truth— And yet she was too worn to invent a useful lie.

She said, whisperingly: "I'm better, now."

"Good," said Mamma. "Now tell me why you're in trouble. You did nothing wrong? Of course, whatever you did, we'll help you; but tell us the truth."

"For a friend from Trantor, anything," added Pappa, expansively, "Eh, Mamma?"

"Shut your mouth, Pappa," was the response, without rancor.

Arcadia was groping in her purse. That, at least, was still hers, despite the rapid clothes-changing forced upon her in Lady Callia's apartments. She found what she was looking for and handed it to Mamma.

"These are my papers," she said, diffidently. It was a shiny, synthetic parchment which had been issued her by the Foundation's ambassador on the day of her arrival and which had been countersigned by the appropriate Kalganian official. It was large, florid, and impressive. Mamma looked at it helplessly, and passed it to Pappa who absorbed its contents with an impressive pursing of the lips.

He said: "You're from the Foundation?"

"Yes. But I was born in Trantor. See it says that—"

"Ah-hah. It looks all right to me. You're named Arcadia, eh? That's a good Trantorian name. But where's your uncle? It says here you came in the company of Homir Munn, uncle."

"He's been arrested," said Arcadia, drearily.

"Arrested!"—from the two of them at once. "What for?" asked Mamma. "He did something?"

She shook her head, "I don't know. We were just on a visit. Uncle Homir had business with Lord Stettin but—" She needed no effort to act a shudder. It was there.

Pappa was impressed, "With Lord Stettin. Mm-m-m, your uncle must be a big man."

"I don't know what it was all about, but Lord Stettin wanted *me* to stay—" She was recalling the last words of Lady Callia, which had been acted out for her benefit. Since Callia, as she now knew, was an expert, the story could do for a second time.

She paused, and Mamma said interestedly: "And why you?"

"I'm not sure. He . . . he wanted to have dinner with me all alone, but I said no, because I wanted Uncle Homir along. He looked at me funny and kept holding my shoulder."

Pappa's mouth was a little open, but Mamma was suddenly red and angry: "How old are you, Arcadia?"

"Fourteen and a half, almost."

Mamma drew a sharp breath and said: "That such people should be let live. The dogs in the streets are better. You're running from him, dear, is not?"

Arcadia nodded.

Mamma said: "Pappa, go right to Information and find out exactly when the ship to Trantor comes to berth. Hurry!"

But Pappa took one step and stopped. Loud metallic words were booming overhead, and five thousand pairs of eyes looked startledly upwards.

"Men and women," it said, with sharp force. "The airport is being searched for a dangerous fugitive,

and it is now surrounded. No one can enter and no one can leave. The search will, however, be conducted with great speed and no ships will reach or leave berth during the interval, so you will not miss your ship. I repeat, no one will miss his ship. The grid will descend. None of you will move outside your square until the grid is removed, as otherwise we will be forced to use our neuronic whips."

During the minute or less in which the voice dominated the vast dome of the spaceport's waiting room, Arcadia could not have moved if all the evil in the Galaxy had concentrated itself into a ball and hurled itself at her.

They could mean only her. It was not even necessary to formulate that idea as a specific thought. But why—

Callia had engineered her escape. And Callia was of the Second Foundation. Why, then, the search now? Had Callia failed? *Could* Callia fail? Or was this part of the plan, the intricacies of which escaped her?

For a vertiginous moment, she wanted to jump up and shout that she gave up, that she would go with them, that . . . that—

But Mamma's hand was on her wrist: "Quick! Quick! We'll go to the lady's room before they start."

Arcadia did not understand. She merely followed blindly. They oozed through the crowd, frozen as it was into clumps, with the voice still booming through its last words.

The grid was descending now, and Pappa, openmouthed, watched it come down. He had heard of it and read of it, but had never actually been the object of it. It glimmered in the air, simply a series of cross-hatched and tight radiation-beams that set the air aglow in a harmless network of flashing light.

It always was so arranged as to descend slowly from above in order that it might represent a falling net with all the terrific psychological implications of entrapment.

It was at waist-level now, ten feet between glowing lines in each direction. In his own hundred square feet, Pappa found himself alone, yet the adjoining squares were crowded. He felt himself conspicuously isolated but knew that to move into the greater anonymity of a group would have meant crossing one of those glowing lines, stirring an alarm, and bringing down the neuronic whip.

He waited.

He could make out over the heads of the eerily quiet and waiting mob, the far-off stir that was the line of policemen covering the vast floor area, lighted square by lighted square.

It was a long time before a uniform stepped into his square and carefully noted its co-ordinates into an official notebook.

"Papers!"

Pappa handed them over, and they were flipped through in expert fashion.

"You're Preem Palver, native of Trantor, on Kalgan for a month, returning to Trantor. Answer, yes or no."

"Yes, yes."

"What's your business on Kalgan?"

"I'm trading representative of our farm co-operative. I've been negotiating terms with the Department of Agriculture on Kalgan."

"Um-m-m. Your wife is with you? Where is she? She is mentioned in your papers."

"Please. My wife is in the—" He pointed.

"Hanto," roared the policeman. Another uniform joined him.

The first one said, dryly, "Another dame in the can, by the Galaxy. The place must be busting with them. Write down her name." He indicated the entry in the papers which gave it.

"Anyone else with you?"

"My niece."

"She's not mentioned in the papers."

"She came separately."

"Where is she? Never mind, I know. Write down the niece's name, too, Hanto. What's her name? Write down Arcadia Palver. You stay right here, Palver. We'll take care of the women before we leave."

Pappa waited interminably. And then, long, long after, Mamma was marching toward him, Arcadia's hand firmly in hers, the two policemen trailing behind her.

They entered Pappa's square, and one said: "Is this noisy old woman your wife?"

"Yes, sir," said Pappa, placatingly.

"Then you'd better tell her she's liable to get into trouble if she talks the way she does to the First Citizen's police." He straightened his shoulders angrily. "Is this your niece?"

"Yes, sir."

"I want her papers."

Looking straight at her husband, Mamma slightly, but no less firmly, shook her head.

A short pause, and Pappa said with a weak smile: "I don't think I can do that."

"What do you mean you can't do that?" The policeman thrust out a hard palm. "Hand it over."

"Diplomatic immunity," said Pappa, softly.

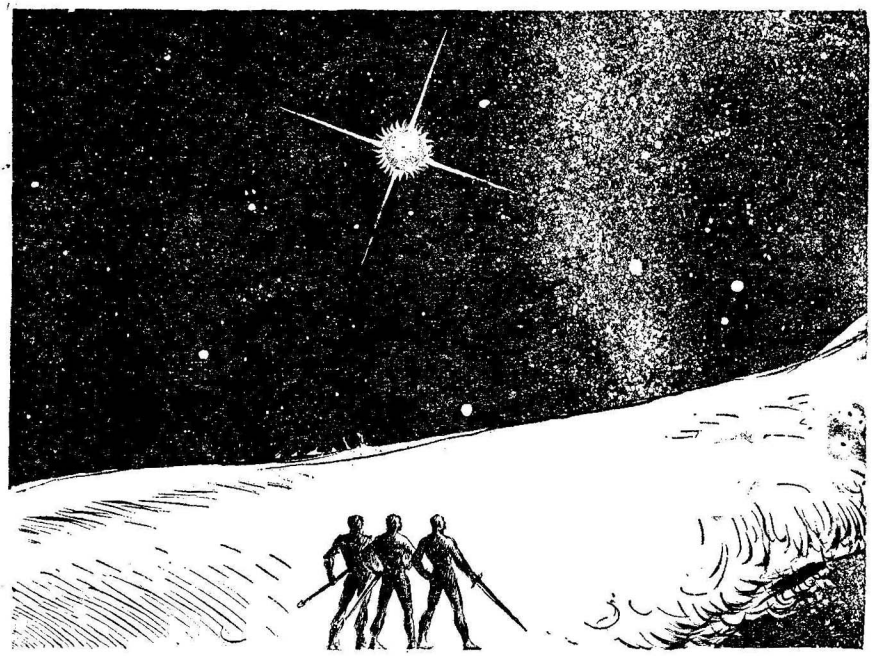
"What do you mean?"

"I said I was trading representative of my farm co-operative. I'm accredited to the Kalganian government as an official foreign representative and my papers prove it. I showed them to you and now I don't want to be bothered any more."

For a moment, the policeman was taken aback. "I've got to see your papers. It's orders."

"You go away," broke in Mamma, suddenly. "When we want you, we'll send for you, you . . . you *bum.*"

The policeman's lips tightened. "Keep your eye on them, Hanto. I'll get the lieutenant."



"Break a leg!" called Mamma after him. Someone laughed, and then choked it off suddenly.

The search was approaching its end. The crowd was growing dangerously restless. Forty-five minutes had elapsed since the grid had started falling and that is too long for best effects. Lieutenant Dirige threaded his way hastily, therefore, toward the dense center of the mob.

"Is this the girl?" he asked wearily. He looked at her and she obviously fitted the description. All this for a child.

He said: "Her papers, if you please?"

Pappa began, "I have already explained—"

"I know what you have explained, and I'm sorry," said the lieutenant, "but I have my orders, and I can't help them. If you care to make a protest later, you may. Meanwhile, if necessary, I must use force."

There was a pause, and the lieutenant waited patiently.

Then Pappa said, huskily: "Give me your papers, Arcadia."

Arcadia shook her head in panic, but Pappa nodded his head: "Don't be afraid. Give them to me."

Helplessly, she reached out and let the documents change hands. Pappa fumbled them open and looked carefully through them, then handed them over. The lieutenant in his turn looked through them

carefully. For a long moment, he raised his eyes to rest them on Arcadia, and then he closed the booklet with a sharp snap.

"All in order," he said. "All right, men."

He left, and in two minutes, scarcely more, the grid was gone, and the voice above signified a back-to-normal. The noise of the crowd, suddenly released, rose high.

Arcadia said: "How . . . how—"

Pappa said, "*Sh-h.* Don't say a word. Let's better go to the ship. It should be in the berth soon."

They were on the ship. They had a private stateroom and a table to themselves in the dining room. Two light-years already separated them from Kalgan, and Arcadia finally dared to broach the subject again.

She said: "But they *were* after me, Mr. Palver, and they must have had my description and all the details. Why did he let me go?"

And Pappa smiled broadly over his roast beef: "Well, Arcadia, child, it was easy. When you've been dealing with agents and buyers and competing co-operatives, you learn some of the tricks. I've had twenty years or more to learn them in. You see, child, when the lieutenant opened your papers, he found a five hundred credit bill inside, folded up small. Simple, no?"

"I'll pay you back— Honest, I've

got lots of money."

"Well," Pappa's broad face broke into an embarrassed smile, as he waved it away. "For a country-woman—"

Arcadia desisted, "But what if he'd taken the money and turned me in anyway. And accused me of bribery."

"And give up five hundred credits? I know these people better than you do, girl."

But Arcadia knew that he did *not* know people better. Not *these* people. In her bed that night, she considered carefully, and *knew* that no bribe would have stopped a police lieutenant in the matter of catching her unless that had been planned. They *didn't* want to catch her, yet had made every motion of doing so, nevertheless.

Why? To make sure she left? And for Trantor? Were the obtuse and soft-hearted couple she was with now only a pair of tools in the hands of the Second Foundation, as helpless as she herself?

They must be!

Or were they?

It was all so useless. How could she fight them. Whatever she did, it might only be what those terrible omnipotents wanted her to do.

Yet she had to outwit them. *Had* to. *Had* to! *Had* to!!

XI.

For reason or reasons unknown to members of the Galaxy at the time of the era under discussion, Intergalactic Standard Time defines its fundamental unit, the second, as the time in which light travels 299,776 kilometers. 86,400 seconds are arbitrarily set equal to one Intergalactic Standard Day; and 365 of these days to one Intergalactic Standard Year.

Why 299,776? —Or 86,400? —Or 365?

Tradition, says the historian, begging the question. Because of certain and various mysterious numerical relationships, say the mystics, cultists, numerologists, metaphysicists. Because the original home-planet of humanity had certain natural periods of rotation and revolution from which those relationships could be derived, say a very few.

No one really knew.

Nevertheless, the date on which the Foundation cruiser, the *Hober Mallow* met the Kalganian squadron, headed by the *Fearless,* and, upon refusing to allow a search party to board, was blasted into smoldering wreckage was 185; 11692 G.E. That is, it was the 185th day of the 11,692nd year of the Galactic Era which dated from the accession of the first Emperor of the traditional Kamble dynasty. It was also 185; 419 A.S.—dating from the birth of Seldon—or 185; 348 Y.F.—dating from the establishment of the Foundation. On Kalgan it was 185; 56 F.C.—dating from the establishment of the First Citizenship by the Mule. In each case, of course, for

convenience, the year was so arranged as to yield the same day number regardless of the actual day upon which the era began.

And, in addition, to all the millions of worlds of the Galaxy, there were millions of local times, based on the motions of their own particular heavenly neighbors.

But whichever you choose: 185; 11692-419-348-56-or anything — it was this day which historians later pointed to when they spoke of the start of the Stettinian war.

Yet to Dr. Darell, it was none of these at all. It was simply and quite precisely the thirty-second day since Arcadia had left Terminus.

What it cost Darell to maintain stolidity through those days was not obvious to everyone.

But Elvett Semic thought he could guess. He was an old man and fond of saying that his neuronic sheaths had calcified to the point where his thinking processes were stiff and unwieldy. He invited and almost welcomed the universal underestimation of his decaying powers by being the first to laugh at them. But his eyes were none the less seeing for being faded; his mind none the less experienced and wise, for being no longer agile.

He merely twisted his pinched lips and said: "Why don't you do something about it?"

The sound was a physical jar to Darell, under which he winced. He said, gruffly: "Where were we?"

Semic regarded him with grave eyes: "You'd better do something about the girl." His sparse, yellow teeth showed in a mouth that was open in inquiry.

But Darell replied coldly, "The question is: Can you get a Symes-Molff Resonator in the range required?"

"Well, I said I could and you weren't listening—"

"I'm sorry, Elvett. It's like this. What we're doing now can be more important to everyone in the Galaxy than the question of whether Arcadia is safe. At least, to everyone but Arcadia and myself, and I'm willing to go along with the majority. How big would the Resonator be?"

Semic looked doubtful, "I don't know. You can find it somewheres in the catalogues."

"About how big. A ton? A pound? A block long?"

"Oh, I thought you meant exactly. It's a little jigger." He indicated the first joint of his thumb. "About that."

"All right, can you do something like this?" He sketched rapidly on the pad he held in his lap, then passed it over to the old physicist, who peered at it doubtfully, then chuckled.

"Y'know, the brain gets calcified when you get as old as I am. What are you trying to do?"

Darell hesitated. He longed desperately, at the moment, for the physical knowledge locked in the other's brain, so that he need not put

his thought into words. But the longing was useless, and he explained.

Semic was shaking his head, "You'd need hyper-relays. The only things that would work fast enough. A thundering lot of them."

"But it can be built?"

"Well, sure."

"Can you get all the parts? I mean, without causing comment? In line with your general work."

Semic lifted his upper lip, "Can't get fifty hyper-relays? I wouldn't use that many in my whole life."

"We're on a defense project, now. Can't you think of something harmless that would use them? We've got the money."

"Hm-m-m. Maybe I can think of something."

"How small can you make the whole gadget?"

"Hyper-relays can be had micro-size . . . wiring . . . tubes— Space, you've got a few hundred circuits there."

"I know. How big?"

Semic indicated with his hands.

"Too big," said Darell. "I've got to swing it from my belt."

Slowly, he was crumpling his sketch into a tight ball. When it was a hard, yellow grape, he dropped it into the ash tray and it was gone with the tiny white flare of molecular decomposition.

He said: "Who's at your door?"

Semic leaned over his desk to the little milky screen above the door signal. He said: "The young fellow, Anthor. Someone with him, too."

Darell scraped his chair back, "Nothing about this, Semic, to the others yet. It's deadly knowledge, if *they* find out, and two lives are enough to risk."

Pelleas Anthor was a pulsing vortex of activity in Semic's office, which, somehow, managed to partake of the age of its occupant. In the slow turgor of the quiet room, the loose, summery sleeves of Anthor's tunic seemed still a-quiver with the outer breezes.

He said: "Dr. Darell, Dr. Semic— Orum Dirige."

The other man was tall. A long straight nose that lent his thin face a saturnine appearance. Dr. Darell held out a hand.

Anthor smiled slightly: "Police Lieutenant Dirige," he amplified. Then, significantly, "Of Kalgan."

And Darell turned to stare with force at the young man. "Police Lieutenant Dirige of Kalgan," he repeated, distinctly. "And you bring him here. Why?"

"Because he was the last man on Kalgan to see your daughter. Hold, man."

Anthor's look of triumph was suddenly one of concern, and he was between the two, struggling violently with Darell. Slowly, and not gently, he forced the older man back into the chair.

"What are you trying to do?" Anthor brushed a lock of brown hair

from his forehead, tossed a hip lightly upon the desk, and swung a leg, thoughtfully. "I thought I was bringing you good news."

Darell addressed the policeman directly: "What does he mean by calling you the last man to see my daughter? Is my daughter dead? Please tell me without preliminary." His face was white with apprehension.

Lieutenant Dirige said expressionlessly: " 'Last man on Kalgan' was the phrase. She's not on Kalgan now. I have no knowledge past that."

"Here," broke in Anthor, "let me put it straight. Sorry if I overplayed the drama a bit, Doc. You're so inhuman about this, I forget you have feelings. In the first place, Lieutenant Dirige is one of us. He was born on Kalgan, but his father was a Foundation man brought to that planet in the service of the Mule. I answer for the lieutenant's loyalty to the Foundation.

"Now I was in touch with him the day after we stopped getting the daily report from Munn—"

"Why?" broke in Darell, fiercely. "I thought it was quite decided that we were not to make a move in the matter. You were risking their lives and ours."

"Because," was the equally fierce retort, "I've been involved in this game for longer than you. Because I know of certain contacts on Kalgan of which you know nothing.

Because I act from deeper knowledge, do you understand?"

"I think you're completely mad."

"Will you listen?"

A pause, and Darell's eyes dropped.

Anthor's lips quirked into a half smile, "All right, doc. Give me a few minutes. Tell him, Dirige."

Dirige spoke easily: "As far as I know, Dr. Darell, your daughter is at Trantor. At least, she had a ticket to Trantor at the Eastern Spaceport. She was with a Trading Representative from that planet who claimed she was his niece. Your daughter seems to have a queer collection of relatives, doctor. That was the second uncle she had in a period of two weeks, eh? The Trantorian even tried to bribe me—probably thinks that's why they got away." He smiled grimly at the thought.

"How was she?"

"Unharmed, as far as I could see. Frightened. I don't blame her for that. The whole department was after her. I still don't know why."

Darell drew a breath for what seemed the first time in several minutes. He was conscious of the trembling of his hands and controlled them with an effort. "Then she's all right. This Trading Representative, who was he? Go back to him. What part does he play in it?"

"*I* don't know. Do you know anything about Trantor?"

"I lived there once."

"It's an agricultural world, now. Exports animal fodder and grains, mostly. High quality! They sell them all over the Galaxy. There are a dozen or two farm co-operatives on the planet and each has its representatives overseas. Shrewd sons of guns, too— I knew this one's record. He'd been on Kalgan before, usually with his wife. Perfectly honest. Perfectly harmless."

"Um-m-m," said Anthor. "Arcadia was born in Trantor, wasn't she, doc?"

Darell nodded.

"It hangs together, you see. She wanted to go away—quickly and far—and Trantor would suggest itself. Don't *you* think so?"

Darell said: "Why not back here?"

"Perhaps she was being pursued and felt that she had to double off in a new angle, eh?"

Dr. Darell lacked the heart to question further. Well, then, let her be safe on Trantor, or as safe as one could be anywhere in this dark and horrible Galaxy. He groped toward the door, felt Anthor's light touch on his sleeve, and stopped, but did not turn.

"Mind if I go home with you, doc?"

"You're welcome," was the automatic response.

By evening, the exteriormost reaches of Dr. Darell's personality, the ones that made immediate contact with other people had solidified once more. He had refused to eat

his evening meal and had, instead, with feverish insistence, returned to the inch-wise advance into the intricate mathematics of encephalographic analysis.

It was not till nearly midnight, that he entered the living room again.

Pelleas Anthor was still there, twiddling at the controls of the video. The footsteps behind him caused him to glance over his shoulder.

"Hi. Aren't you in bed yet? I've been spending hours on the video, trying to get something other than bulletins. It seems the *F.S. Hober Mallow* is delayed in course and hasn't been heard from."

"Really? What do they suspect?"

"What do you think? Kalganian skulduggery. There are reports that Kalganian vessels were sighted in the general space sector in which the *Hober Mallow* was last heard from?"

Darell shrugged, and Anthor rubbed his forehead doubtfully.

"Look, doc," he said, "why don't you go to Trantor?"

"Why should I?"

"Because you're no good to us here. You're not yourself. You can't be. And you could accomplish a purpose by going to Trantor, too. The old Imperial Library with the complete records of the Proceedings of the Seldon Commission are there—"

"No! The Library has been picked clean and it hasn't helped anyone."

"It helped Ebling Mis once."

"How do you know? Yes, he *said* he found the Second Foundation, and my mother killed him five seconds later as the only way to keep him from unwittingly revealing its location to the Mule. But in doing so, she also, you realize, made it impossible ever to tell whether Mis *really* did know the location. After all, no one else has ever been able to deduce the truth from those records."

"Ebling Mis, if you'll remember, was working under the driving impetus of the Mule's mind."

"I know that, too, but Mis' mind was, by that very token, in an abnormal state. Do you and I know anything about the properties of a mind under the emotional control of another; about its abilities and shortcomings? In any case, I will not go to Trantor."

Anthor frowned, "Well, why the vehemence? I merely suggest it as—Well, by Space, I don't understand you. You look ten years older. You're obviously having a hellish time of it. You're not doing anything of value here. If I were you, I'd go and get the girl."

"Exactly! It's what I want to do, too. *That's why I won't do it.* Look, Anthor, and try to understand. You're playing—we're both playing—with something completely beyond our powers to fight. In cold blood, if you have any, you know that, whatever you may think in your moments of quixoticism.

"For fifty years, we've known that

the Second Foundation is the real descendent and pupil of Seldonian mathematics. What that means, and you know that, too, is that nothing in the Galaxy happens which does not play a part in their reckoning. To us, all life is a series of accidents, to be met with by improvisations. To them, all life is purposive and should be met by pre-calculation.

"But they have their weakness. Their work is statistical and only the mass action of humanity is truly inevitable. Now how *I* play a part, as an individual, in the foreseen course of history, I don't know. Perhaps I have no definite part, since the Plan leaves individuals to indeterminacy and free will. But I am important and they—*they*, you understand—may at least have calculated my probable reaction. So I distrust, my impulses, my desires, my probable reactions.

"I would rather present them with an *im*probable reaction. I will stay here, despite the fact that I yearn very desperately to leave. No! *Because* I yearn very desperately to leave."

The younger man smiled sourly: "You don't know your own mind as well as *they* might. Suppose that—knowing you—they might count on what you think, merely *think*, is the improbable reaction, simply by knowing in advance what your line of reasoning would be."

"In that case, there is no escape. For if I follow the reasoning you have just outlined and go to Trantor, they may have foreseen that, too. There is an endless cycle of double-double-double-doublecrosses. No matter how far I follow that cycle, I can only either go or stay. The intricate act of luring my daughter halfway across the Galaxy cannot be meant to make me stay where I am, since I would most certainly have stayed if they had done nothing. It can only be to make me move, and so I will stay.

"And besides, Anthor, not everything bears the breath of the Second Foundation: not all events are the results of their puppeting. They may have had nothing to do with Arcadia's leave-taking, and she may be safe on Trantor when all the rest of us are dead."

"No," said Anthor, sharply, "now you are off the track."

"You have an alternative interpretation?"

"I have—if you'll listen."

"Oh, go ahead. I don't lack patience."

"Well, then—how well do you know your own daughter?"

"How well can any individual know any other? Obviously, my knowledge is inadequate."

"So is mine on that basis, perhaps even more so—but at least, I viewed her with fresh eyes. Item one: She is a ferocious little romantic, the only child of an ivory-tower academician, growing up in an unreal world of video and book-film adventure. She lives in a weird self-constructed fantasy of espionage and intrigue. Item two: She's intelligent about it;

intelligent enough to outwit us, at any rate. She planned carefully to overhear our first conference and succeeded. She planned carefully to go to Kalgan with Munn and succeeded. Item three: She has an unholy hero-worship of her grandmother—your mother—who defeated the Mule.

"I'm right so far, I think? All right, then. Now, unlike you, I've received a complete report from Lieutenant Dirige and, in addition, my sources of information on Kalgan are rather complete, and all sources check. We know, for instance, that Homir Munn, in conference with the Lord of Kalgan was refused admission to the Mule's Palace, and that this refusal was suddenly abrogated after Arcadia had spoken to Lady Callia, the First Citizen's very good friend."

Darell interrupted: "And how do you know all this?"

"For one thing, Munn was interviewed by Dirige as part of the police campaign to locate Arcadia. Naturally, we have a complete transcript of the questions and answers.

"And take Lady Callia herself. It is rumored that she has lost Stettin's interest, but the rumor isn't borne out by facts. She not only remains unreplaced; is not only able to mediate the lord's refusal to Munn into an acceptance; but can even engineer Arcadia's escape openly. Why, a dozen of the soldiers about Stettin's executive mansion testified

that they were seen together on the last evening. Yet she remains unpunished. This despite the fact that Arcadia was searched for with every appearance of diligence."

"But what is your conclusion from all this torrent of ill-connection?"

"That Arcadia's escape was arranged."

"As I said."

"With this addition. That Arcadia must have known it was arranged; that Arcadia, the bright little girl who saw cabals everywhere, saw this one and followed your own type of reasoning. They wanted her to return to the Foundation, and so she went to Trantor, instead. But why Trantor?"

"Well, why?"

"Because that is where Bayta, her idolized grandmother, escaped when *she* was in flight. Consciously or unconsciously, Arcadia imitated that. I wonder, then, if Arcadia was fleeing the same enemy."

"The Mule?" asked Darell with polite sarcasm.

"Of course not. I mean, by the enemy, a mentality that she could not fight. She was running from the Second Foundation, or such influence thereof as could be found on Kalgan."

"What influence is this you speak of?"

"Do you expect Kalgan to be immune from that ubiquitous menace? We both have come to the conclusion, somehow, that Arcadia's escape was arranged. Right? She was searched for and found, but deliberately allowed to slip away by Dirige. By Dirige, do you understand? But how was that? Because he was our man. But how did they know that? Were they counting on him to be a traitor? Eh, doc?"

"Now you're saying that they honestly meant to recapture her. Frankly, you're tiring me a bit, Anthor. Finish your say; I want to go to bed."

"My say is quickly finished." Anthor reached for a small group of photo-records in his inner pocket. It was the familiar wigglings of the encephalograph. "Dirige's brain-waves," Anthor said, casually, "taken since he returned."

It was quite visible to Darell's naked eye, and his face was gray when he looked up. "He is Controlled."

"Exactly. He allowed Arcadia to escape not because he was our man but because he was the Second Foundation's."

"Even after he knew she was going to Trantor, and not to Terminus."

Anthor shrugged: "He had been geared to let her go. There was no way *he* could modify that. He was only a tool, you see. It was just that Arcadia followed the least probable course, and is probably safe. Or at least safe until such time as the Second Foundation can modify the plans to take into account this changed state of affairs—"

He paused. The little signal light on the video set was flashing. On an independent circuit, it signified the presence of emergency news. Darell saw it, too, and with the mechanical movement of long habit turned on the video. They broke in upon the middle of a sentence but before its completion, they knew that the *Hober Mallow*, or the wreck thereof, had been found and that, for the first time in nearly half a century, the Foundation was again at war.

Anthor's jaw was set in a hard line. "All right, doc, you heard that. Kalgan has attacked; and Kalgan is under the control of the Second Foundation. Will you follow your daughter's lead and move to Trantor?"

"No. I will risk it. Here."

"Dr. Darell. You are not as intelligent as your daughter. I wonder how far you can be trusted." His long level stare held Darell for a moment, and then without a word, he left.

And Darell was left in uncertainty and—almost—despair.

Unheeded, the video was a medley of excited sight-sound, as it described in nervous detail the first hour of the war between Kalgan and the Foundation.

TO BE CONCLUDED.

Statement of the Ownership, Management, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Astounding Science Fiction published monthly, at Elizabeth, N. J., for October 1, 1949.

State of New York, County of New York (ss.)

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared H. W. Ralston, who, having been duly sworn according to law, deposes and says that he is Vice President of Street & Smith Publications, Inc., publishers of Astounding Science Fiction, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit:

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Sworn to and subscribed before me this 30th day of September, 1949. Edward F. Kasmire, Notary Public No. 60-2039700, New York County. (My commission expires March 30, 1951.)

"punching" the molecules is of the order of that involved in enzyme reactions. His theory requires that the memories, to survive, must be able to reduplicate themselves in new "punched molecules"—a property which protein molecules are known to possess. This material fits with the previously known fact that certain protein-denaturant toxins—the commonest of the class being alcohol—tend to destroy memory.

Evidently, the brain, as a calculating machine, is completely unmatchable by any machine-made device, simply by reason of sheer numbers. But no mention has been made—nor did Dr. McCulloch, in his talk, bring up the point—of the really crucial point. Locating the association with "13.6" back there a bit indicated the brain's indexing system is superb. Von Foerster's work indicates the brain has a stupendous file of "punched molecules" and molecules still to be punched. But no one yet has indicated in any way what possible mechanism the brain could use to locate and read-off the data from one of those individual molecules! How, in a file of 10^{21} punched cards, for instance, would you find any one of them—no matter how thoroughly cross-indexed the card might be—in any reasonable period of time? If you searched at the rate of a billion cards a second, it would take a million million seconds to go through the file. Since your answers to questions are, very frequently, "No, I have never heard", that answer implies that you have searched your 10^{21} memory data and drawn blank.

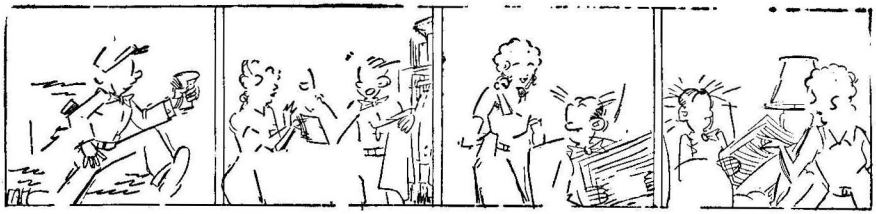
Assuming a mechanism exits which can perform the neat feat of selecting and reading off one, single protein molecule—something of a triumph in itself—by what selector search method is it organized? That bald statistic I quoted a while back must have given your filing system a nice work-out; the datum was presented with *absolutely no classification information.* It's understandable that, given enough class, sub-class, field, and sub-field data, a highly organized system could reduce the necessary field of search to a few hundred memory-cards.

Now if, somehow, the entire mass of nuerones, all ten billion of them, were able to start searching the file en masse, at the maximum neurone speed of, let's say, 0.1 milliseconds, that would be a search speed of $10^{10} \times 10^{4}$ per second, or 10^{14} inspections per second. At this rate, it would take only 10^{7} seconds—10,000,000 seconds—to search the field.

Actually, something far more efficient takes place. Of course, some classification of the random data 13.6 is possible on a purely negative level; it, by its nature, rules out the entire class of nonnumerical data, and some further narrowing of the field can then take place. But to accomplish all that, and the search, in seconds—

Competent device you've got there, isn't it? And all with a power input of 2.4 watts!

The Editor.



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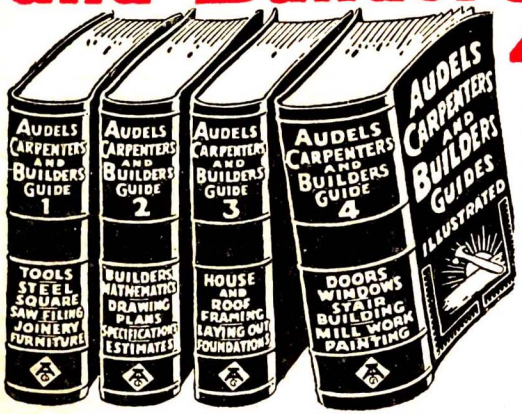

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