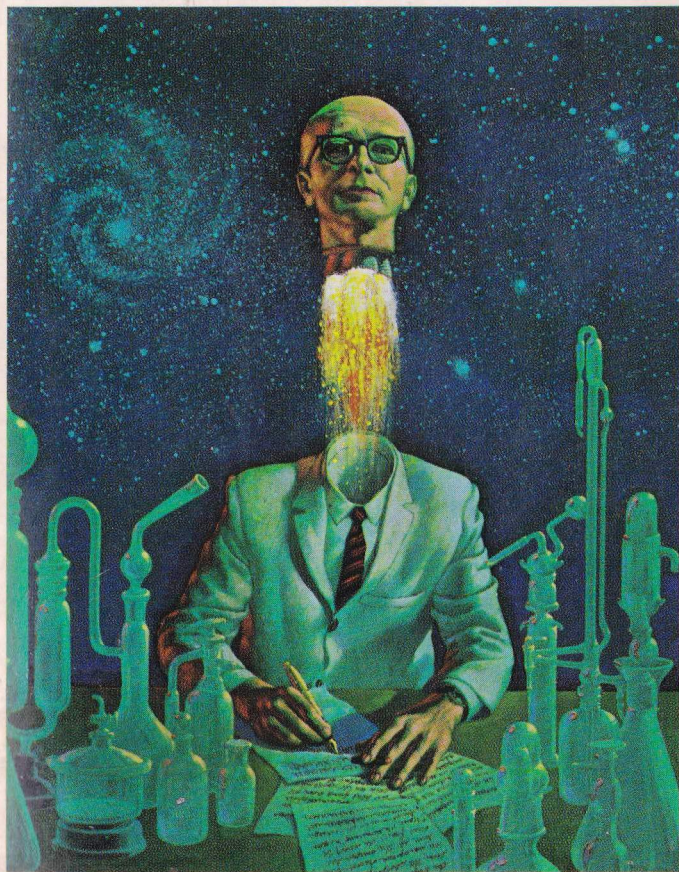


GREAT SCIENCE FICTION BY SCIENTISTS

EDITED, AND WITH AN INTRODUCTION BY GROFF CONKLIN

Imaginative tales by the men who make science:
including Arthur C. Clarke, Isaac Asimov, Norbert
Wiener, Julian Huxley, J. B. S. Haldane, and many more.



Great Science Fiction by Scientists

EDITED WITH AN INTRODUCTION AND STORY PREFACES
BY GROFF CONKLIN



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Introduction

On Science Fiction by Scientists

UNTIL I BEGAN, through the pleasant processes of association and friendship, reading and listening, to learn a little about what science really involves, I used to wonder why more scientists did not write better science fiction, and—vice versa—why better scientists did not write more science fiction. Scientists have all that invaluable knowledge about the physical, chemical, biological, psychological worlds of which we are a part: why, I used to wonder, did they not occasionally extrapolate from their basic facts and take off into the wild blue yonder?

On becoming more familiar with how scientists operate, however, I soon found the answer. They *do* take off into the wild blue yonder and the result is—*science!* It takes a completely different train of thought, trend of mind, from that of the professional scientist to write an adventure story or a satire in which some scientific idea or imaginary apparatus plays a role, important or otherwise. Scientists, on the whole, are far too enthralled with their scientific work to want to go off on side-trails that involve plot, characterization, and all that. Fiction writing is a wholly different skill. Scientists like to *read* science fiction, many of them, but just as much to escape from the humdrum, nuts-and-bolts aspect of scientific research and application as do nonscientists who need it to escape from the often tedious and dull practicalities of their own daily occupations.

However, although the enormous preponderance of all science fiction is written by professional writers who may (or may not!) know a little about one or more of the sciences, once in a while a professional scientist has turned his hand to a scientific extrapolation that turns out to be pure science fiction. A great deal of such writing by scientists, it may be added, is what you might call “in-group palaver”—spoofs, parodies, take-offs on some of the more solemn idiocies of

organized scientific procedure or organized social behavior. An example in this book is Dr. Ralph Cooper's dead-pan news story on the neutrino bomb; it is included here mainly because of its rapierlike point, but also as an example of the kind of fantasy many scientists indulge in. It is not true fiction—science fiction or otherwise. By definition, fiction should have a plot, or a development of some sort, characters that act or do something, a climax or anticlimax—some kind of a story. This the neutrino bomb article does not have, for the technique of fiction is as foreign a skill to the typical trained scientist as differential equations or nucleonics are to the skilled novelist.

There have been only a handful of scientists who have even tried to do much fiction, and almost none who have done much successful *science* fiction. One contemporary who has turned from science to the novel and other forms of writing is C. P. Snow (who has written no true science fiction!); and another scientist who has also achieved the unusual distinction of writing a couple of first-rate science fiction novels is Fred Hoyle, the astronomer. (But, alas, he has written no short stories, so he is not represented in this collection.) His *The Black Cloud* and *Ossian's Ride*—particularly the latter—are exciting and genuine science fiction concepts.

On the whole, then, full-time scientists who experiment with science fiction ideas are and always have been few. Almost all of them limit themselves to one or two (or a handful) of short stories, usually written to express moral or ethical points of view on science and its possible misuse. It is unfortunate that the stories by such men—and in this collection I am thinking particularly of those by Julian Huxley, J. B. S. Haldane, Louis Ridenour, and Norbert Wiener—have been thought of by their readers more as fantasies produced by great minds in moments of relaxation, rather than as the strong and pertinent warnings that they are on the dangers to society in certain applications of science or technology. It is also too bad that these men, once they had written their fictionalized danger signals, then ceased story writing entirely, perhaps because they felt defeated by the lack of impact of their first efforts at education through fiction.

Understandably, too, almost all scientists who have dabbled

in science fiction are modern scientists of the past twenty-five years or so, when technology has made its greatest impact on the daily lives of the average Western man. Indeed, all but three of the writers included in this book—Eric Temple Bell, Miles J. Breuer, and Louis Ridenour—were alive and working at the time this introduction was written. As a matter of fact, to the best of my knowledge, no practicing scientist from Johannes Kepler early in the seventeenth century until well into the twentieth wrote what we would call today a science fantasy or a science fiction novel or short story—not, at least, one that is part of the known literature of the pseudoscientific imagination.

Kepler's posthumous *Somnium*, which was written in Latin and published in 1634, four years after his death, was based partly upon his actual knowledge of the moon as he saw it through his own telescope and partly on what he had learned about it from the researches of his contemporary, Galileo Galilei. Curiously enough, Kepler refused to go along with Galileo in making his imaginary moon airless and waterless. Perhaps in order to "make a story," he provided his lunar world with an atmosphere and water supplies. Actually, Kepler's *Somnium* (which was later translated in German, and only in 1950 into English) describes the moon's "seasons" quite as we know them today. On the other hand, he supplied it with plant life that grew monstrously and died all within the space of one lunar "day," and with huge serpentlike creatures that thrived in the sunlight and took protection from the night temperatures in caverns. On the whole, the story—including its basic assumption that it was a dream about the son of a witch who in the dream took him to the moon by witchcraft—is hardly what we would call "science fiction" by current standards, but it was the nearest thing to it that a scientist wrote for almost three hundred years.

After Kepler, the writing of such fantastic tales was usually done by English and European men of letters (many of them parsons) whose interests were more moral than scientific, more satirical than imaginative. True, Bishop Francis Godwin's *The Man in the Moone* (1638—and the first tale of a moon voyage to be written in English) is sheer adventure and fantasy, but the works of satirists like Swift, Voltaire, and

even Cyrano de Bergerac, to name a few of the better-known early fantasists, usually had some moral, ethical, or critical motive for being written. As for the scientists of the last three centuries, most of them have been much too busy creating new worlds of knowledge to try their hands at creating new worlds of fantasy or science fiction.

Even today, it is rare indeed to find scientists who have either the time or the inclination to apply their imaginations in this genre. I believe that this book contains stories by at least 75 per cent of all the established scientists who have ever turned their hand to science fiction in the English language. There are a good many younger practicing scientists who have also written some science fiction but who are not included; I cover that glaring omission with the rather snobbish phrase "established scientists"—a phrase that also alibis the exclusion of certain engineers and technicians who have done some science fiction, too.

In my generalization I am, of course, bypassing several scientists who have written fantasies, from Charles Lutwidge Dodgson (Lewis Carroll), a practicing mathematician, to Bertrand Russell, also a mathematician and a philosopher as well. I do not feel that either an excerpt from *Alice in Wonderland* or a tale from *Satan in the Suburbs* belongs here.

In several instances, the book contains, as far as my researches have been able to uncover, the *only* science-fiction stories turned out by their scientist-authors. For example, I believe that Julian Huxley's "The Tissue Culture King," which first appeared in England in the *Cornhill Magazine* and in America in *The Yale Review*, both in 1926, is his only piece of fiction—certainly his only piece of what we would call science fiction.

The same thing goes for the thriller by J. B. S. Haldane, "The Gold-Makers." Like Huxley, Haldane has been a prolific writer on science, technology, society, and various other matters of import, and I cannot be positive that this is his only fiction. However, it seems to be his only science fiction.*

Norbert Wiener's "The Brain" is one of two short pieces of fiction he has published; the other was a fantasy; and he

*Except for that delicious collection of children's fantasies with "scientific" overtones, *My Friend Mr. Leakey*.

has, in addition, published a straight, traditional novel. Louis Ridenour's "Pilot Light of the Apocalypse," originally published by *Fortune* magazine less than six months after the first atomic bomb was dropped on Hiroshima in August, 1945, was, as far as my knowledge goes, his only piece of imaginative writing. Ridenour, who died in 1959, was famed as a nuclear physicist; all the more wonder how effective his little playlet is.

On the other hand, several other scientists included in this collection are as well known for their science fiction as for their scientific or technological activities. The late Eric Temple Bell, noted mathematician and historian of mathematics, also wrote during the 1920s and 1930s a series of science-horror novels under the pseudonym of John Taine; and Leo Szilard, of course, only last year had a small collection of science fantasies and satires published, to general acclaim. And then there are the younger men whose scientific careers are as lively as their science fiction writing: people like the anthropologist Chad Oliver, the mathematician Chandler Davis, the psychologist James McConnell, the biochemist Isaac Asimov, and so on.

It is, thus, a pleasure to have been able to put together a collection of first-rate science fiction by men who are primarily scientists and only secondarily fiction writers. Some, it is true, have turned from the laboratory to science popularization, science teaching, and the like, but they still are primarily scientists, with only one or two exceptions, no matter what their current reputations, occupations, or preoccupations. (Arthur Clarke's basic scientific survey of the space between the planets—and the stars—called *Exploration of Space*, first published in 1952, was reissued in a thoroughly modernized edition only a few years ago. This scientific publication does not prevent him from being an extremely active partner in a professional company of skin diving experts located in Ceylon!) And so it goes. This is a book by men who definitely know what they are doing in science, some of whom would strongly deny writing any science fiction at all. As to labels, I will leave it up to you to judge. I am sure you will find every story in this collection wonderful reading, reading that will stretch your imaginative horizons, which is the true func-

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tion of good science fiction, whether the tale is called by that name or not.

A word on arrangement. With so many stars in the cast, it was found literally impossible to order the stories in any but the most impersonal way: alphabetically by the authors' last names. That this also happens to give a maximum of variety to the book as you read it is fortuitous. When you find a well-known astronomer writing on an android sparring partner for a boxer, as you do with Robert S. Richardson, and the Director of Research on Communications Principles for the Bell Telephone Laboratories doing a stunning piece on an antiscience world of tomorrow, as you do with John R. Pierce, you can see why any rational attempt to organize the stories by scientific disciplines was bound to fail. So—begin with A for Asimov and end up with W for Wiener and have a thoroughly enjoyable time in the process!

GROFF CONKLIN

Great Science Fiction by Scientists

WHAT IF . . .

Isaac Asimov

ISAAC ASIMOV

Isaac Asimov, Associate Professor of Biochemistry at Boston University School of Medicine and joint author of a standard textbook on biochemistry, in September 1961 published his forty-second book—one more than the total years of his life, for this remarkable writer-scientist was born in 1920. Of these books, a considerable number have been first-rate popular science books, including the outstanding two-volume Intelligent Man's Guide to Science and The Bloodstream—River of Life. More numerous, however, have been his science fiction novels and short-story collections, many of which were written at the same time that the author was engaged in cancer research at the Boston University School of Medicine.

Out of all this flood of writing, one of his very rare fantasies (with only a touch of "science") has been selected for this book. The reasons? There are two. First, the story is so completely charming. And second, even more persuasive, it is by Asimov. This, to many of his faithful readers, will seem almost impossible. But it only goes to show that the inventor of the "positronic robot" and the "Three Laws of Robotics," standard items in science fiction for years, and the creator of the complex of warring intergalactic societies controlled by the sociopsychological mystery known as "The Foundation," can also play it gentle, lovely, and simple—as he has done in this entrancing little tale.

What If . . .

NORMAN AND LIVVY were late, naturally, since catching a train is always a matter of last-minute delays, so they had to take the only available seat in the coach. It was the one toward the front; the one with nothing before it but the seat that faced the wrong way, with its back hard against the front partition. While Norman heaved the suitcase onto the rack, Livvy found herself chafing a little.

If a couple took the wrong-way seat before them, they would be staring self-consciously into each others' faces all the hours it would take to reach New York; or else, which was scarcely better, they would have to erect synthetic barriers of newspaper. Still, there was no use in taking a chance on there being another unoccupied double seat elsewhere in the train.

Norman didn't seem to mind, and that was a little disappointing to Livvy. Usually they held their moods in common. That, Norman claimed, was why he remained sure that he had married the right girl.

He would say, "We fit each other, Livvy, and that's the key fact. When you're doing a jigsaw puzzle and one piece fits another, that's it. There are no other possibilities, and of course there are no other girls."

And she would laugh and say, "If you hadn't been on the streetcar that day, you would probably never have met me. What would you have done then?"

"Stayed a bachelor. Naturally. Besides, I would have met you through Georgette another day."

"It wouldn't have been the same."

"Sure it would."

"No, it wouldn't. Besides, Georgette would never have introduced me. She was interested in you herself, and she's the type who knows better than to create a possible rival."

"What nonsense."

Livvy asked her favorite question: "Norman, what if you had been one minute later at the streetcar corner and had

taken the next car? What *do* you suppose would have happened?"

"And what if fish had wings and all of them flew to the top of the mountains? What would we have to eat on Fridays then?"

But they *had* caught the streetcar, and fish *didn't* have wings, so that now they had been married five years and ate fish on Fridays. And because they had been married five years, they were going to celebrate by spending a week in New York.

Then she remembered the present problem. "I wish we could have found some other seat."

Norman said, "Sure. So do I. But no one has taken it yet, so we'll have relative privacy as far as Providence, anyway."

Livvy was unconsoled, and felt herself justified when a plump little man walked down the central aisle of the coach. Now, where had he come from? The train was halfway between Boston and Providence, and if he had had a seat, why hadn't he kept it? She took out her vanity and considered her reflection. She had a theory that if she ignored the little man, he would pass by. So she concentrated on her light brown hair which, in the rush of catching the train, had become disarranged just a little; at her blue eyes, and at her little mouth with the plump lips which Norman said looked like a permanent kiss.

Not bad, she thought.

Then she looked up, and the little man was in the seat opposite. He caught her eye and grinned widely. A series of lines curled about the edges of his smile. He lifted his hat hastily and put it down beside him on top of the little black box he had been carrying. A circle of white hair instantly sprang up stiffly about the large bald spot that made the center of his skull a desert.

She could not help smiling back a little, but then she caught sight of the black box again and the smile faded. She yanked at Norman's elbow.

Norman looked up from his newspaper. He had startlingly dark eyebrows that almost met above the bridge of his nose, giving him a formidable appearance at first sight. But they

and the dark eyes beneath bent upon her now with only the usual look of pleased and somewhat amused affection.

He said, "What's up?" He did not look at the plump little man opposite.

Livvy did her best to indicate what she saw by a little unobtrusive gesture of her hand and head. But the little man was watching, and she felt a fool, since Norman simply stared at her blankly.

Finally she pulled him closer and whispered, "Don't you see what's printed on his box?"

She looked again as she said it, and there was no mistake. It was not very prominent, but the light caught it slantingly and it was a slightly more glistening area on a black background. In flowing script it said, "What If."

The little man was smiling again. He nodded his head rapidly and pointed to the words and then to himself several times over.

Norman said in an aside, "Must be his name."

Livvy replied, "Oh, how could that be anybody's name?"

Norman put his paper aside. "I'll show you." He leaned over and said, "Mr. If?"

The little man looked at him eagerly.

"Do you have the time, Mr. If?"

The little man took out a large watch from his vest pocket and displayed the dial.

"Thank you, Mr. If," said Norman. And again in a whisper, "See, Livvy."

He would have returned to his paper, but the little man was opening his box and raising a finger periodically as he did so, to enforce their attention. It was just a slab of frosted glass that he removed—about six by nine inches in length and width, and perhaps an inch thick. It had beveled edges, rounded corners, and was completely featureless. Then he took out a little wire stand on which the glass slab fitted comfortably. He rested the combination on his knees and looked proudly at them.

Livvy said, with sudden excitement, "Heavens, Norman, it's a picture of some sort."

Norman bent close. Then he looked at the little man. "What's this? A new kind of television?"

The little man shook his head, and Livvy said, "No, Norman, it's *us*."

"What?"

"Don't you see? That's the streetcar we met on. There you are in the back seat wearing that old fedora I threw away three years ago. And that's Georgette and myself getting on. The fat lady's in the way. Now! Can't you see us?"

He muttered, "It's some sort of illusion."

"But you see it too, don't you? That's why he calls this 'What If.' It will *show* us what if. What if the streetcar hadn't swerved . . ."

She was sure of it. She was very excited and very sure of it. As she looked at the picture in the glass slab, the late afternoon sunshine grew dimmer, and the inchoate chatter of the passengers around and behind them began fading.

How she remembered that day. Norman knew Georgette and had been about to surrender his seat to her when the car swerved and threw Livvy into his lap. It was such a ridiculously corny situation, but it had worked. She had been so embarrassed that he was forced first into gallantry and then into conversation. An introduction from Georgette was not even necessary. By the time they got off the streetcar, he knew where she worked.

She could still remember Georgette glowering at her, sulkily forcing a smile when they themselves separated. Georgette said, "Norman seems to like you."

Livvy replied, "Oh, don't be silly! He was just being polite. But he is nice-looking, isn't he?"

It was only six months after that that they married.

And now here was that same streetcar again, with Norman and herself and Georgette. As she was thinking this, the smooth train noises, the rapid clack-clack of the wheels, vanished completely. Instead, she was in the swaying confines of the streetcar. She had just boarded it with Georgette at the previous stop.

Livvy shifted weight with the swaying of the streetcar, as did forty others, sitting and standing, all to the same monotonous and rather ridiculous rhythm. She said, "Somebody's motioning at you, George. Do you know him?"

"At me?" Georgette directed a deliberately casual glance over her shoulder. Her artificially long eyelashes flickered. She said, "I know him a little. What do you suppose he wants?"

"Let's find out," said Livvy. She felt pleased and a little wicked. Georgette had a well-known habit of hoarding her male acquaintances, and it was rather fun to annoy her this way. And besides, this one seemed quite . . . interesting.

She snaked past the line of standees, and Georgette followed without enthusiasm. It was just as Livvy arrived opposite the young man's seat that the streetcar lurched heavily as it rounded a curve. Livvy snatched desperately in the direction of the straps. Her fingertips caught and she held on. It was a long moment before she could breathe. For some reason, it had seemed that there were no straps close enough to be reached. Somehow, she felt that by all the laws of nature she should have fallen.

The young man did not look at her. He was smiling at Georgette and rising from his seat. He had astonishing eyebrows that gave him a rather competent and self-confident appearance. Livvy decided that she definitely liked him.

Georgette was saying, "Oh, no, don't bother. We're getting off in about two stops."

They did. Livvy said, "I thought we were going to Sach's."

"We are. There's just something I remember having to attend to here. It won't take a minute."

"Next stop, Providence!" the loud-speakers were blaring. The train was slowing and the world of the past had shrunk into the glass slab once more. The little man was still smiling at them.

Livvy turned to Norman. She felt a little frightened. "Were you through all that, too?"

He said, "What happened to the time? We *can't* be reaching Providence yet?" He looked at his watch. "I guess we are." Then, to Livvy, "You didn't fall that time."

"Then you *did* see it?" She frowned, "Now, that's like Georgette. I'm sure there was no reason to get off the streetcar except to prevent my meeting you. How long had you known Georgette before then, Norman?"

"Not very long. Just enough to be able to recognize her at sight and to feel that I ought to offer her my seat."

Livvy curled her lip.

Norman grinned, "You can't be jealous of a might-have-been, kid. Besides, what difference would it have made? I'd have been sufficiently interested in you to work out a way of meeting you."

"You didn't even look at me."

"I hardly had the chance."

"Then how would you have met me?"

"Some way. I don't know how. But you'll admit this is a rather foolish argument we're having."

They were leaving Providence. Livvy felt a trouble in her mind. The little man had been following their whispered conversation, with only the loss of his smile to show that he understood. She said to him, "Can you show us more?"

Norman interrupted, "Wait now, Livvy. What are you going to try to do?"

She said, "I want to see our wedding day. What it would have been if I had caught the strap."

Norman was visibly annoyed. "Now, that's not fair. We might not have been married on the same day, you know."

But she said, "Can you show it to me, Mr. If?" and the little man nodded.

The slab of glass was coming alive again, glowing a little. Then the light collected and condensed into figures. A tiny sound of organ music was in Livvy's ears, without there actually being sound.

Norman said with relief, "Well, there I am. That's our wedding. Are you satisfied?"

The train sounds were disappearing again, and the last thing Livvy heard was her own voice saying, "Yes, there *you* are. But where am *I*?"

Livvy was well back in the pews. For a while she had not expected to attend at all. In the past months she had drifted further and further away from Georgette, without quite knowing why. She had heard of her engagement only through a mutual friend, and, of course, it was to Norman. She remembered very clearly that day, six months before, when she

had first seen him on the streetcar. It was the time Georgette had so quickly snatched her out of sight. She had met him since on several occasions, but each time Georgette was with him, standing between.

Well, she had no cause for resentment; the man was certainly none of hers. Georgette, she thought, looked more beautiful than she really was. And *he* was very handsome indeed.

She felt sad and rather empty, as though something had gone wrong—something that she could not quite outline in her mind. Georgette had moved up the aisle without seeming to see her, but earlier she had caught *his* eyes and smiled at him. Livvy thought he had smiled in return.

She heard the words distantly as they drifted back to her, "I now pronounce you—"

The noise of the train was back. A woman swayed down the aisle, herding a little boy back to their seats. There were intermittent bursts of girlish laughter from a set of four teenage girls halfway down the coach. A conductor hurried past on some mysterious errand.

Livvy was frozenly aware of it all.

She sat there, staring straight ahead, while the trees outside blended into a fuzzy, furious green, and the telephone poles galloped past.

She said, "It was *she* you married."

He stared at her for a moment and then one side of his mouth quirked a little. He said lightly, "I didn't really, Olivia. You're still my wife, you know. Just think about it for a few minutes."

She turned to him. "Yes, you married me—because I fell in your lap. If I hadn't, you would have married Georgette. If she hadn't wanted you, you would have married someone else. You would have married *anybody*. So much for your jigsaw-puzzle pieces."

Norman said very slowly, "Well—I'll—be—darned!" He put both hands to his head and smoothed down the straight hair over his ears where it had a tendency to tuft up. For the moment it gave him the appearance of trying to hold his head together. He said, "Now, look here, Livvy, you're making

a silly fuss over a stupid magician's trick. You can't blame me for something I haven't done."

"You would have done it."

"How do you know?"

"You've seen it."

"I've seen a ridiculous piece of—of hypnotism, I suppose." His voice suddenly raised itself into anger. He turned to the little man opposite. "Off with you, Mr. If, or whatever your name is. Get out of here. We don't want you. Get out before I throw your little trick out the window and you after it."

Livvy yanked at his elbow. "Stop it. *Stop it!* You're in a crowded train."

The little man shrank back into the corner of the seat as far as he could go and held his little black bag behind him. Norman looked at him, then at Livvy, then at the elderly lady across the way who was regarding him with patent disapproval.

He turned pink and bit back a pungent remark. They rode in frozen silence to and through New London.

Fifteen minutes past New London, Norman said, "Livvy!"

She said nothing. She was looking out the window but saw nothing but the glass.

He said again, "Livvy! Livvy! Answer me!"

She said dully, "What do you want?"

He said, "Look, this is all nonsense. I don't know how the fellow does it, but even granting it's legitimate, you're not being fair. Why stop where you did? Suppose I *had* married Georgette, do you suppose *you* would have stayed single? For all I know, you were already married at the time of my supposed wedding. Maybe that's why I married Georgette."

"I wasn't married."

"How do you know?"

"I would have been able to tell. I knew what my own thoughts were."

"Then you would have been married within the next year."

Livvy grew angrier. The fact that a sane remnant within her clamored at the unreason of her anger did not soothe her. It irritated her further, instead. She said, "And if I did, it would be no business of yours, certainly."

"Of course it wouldn't. But it would make the point that in the world of reality we can't be held responsible for the 'what ifs.' "

Livvy's nostrils flared. She said nothing.

Norman said, "Look! You remember the big New Year's celebration at Winnie's place year before last?"

"I certainly do. You spilled a keg of alcohol all over me."

"That's beside the point, and besides, it was only a cocktail shaker's worth. What I'm trying to say is that Winnie is just about your best friend and had been long before you married me."

"What of it?"

"Georgette was a good friend of hers too, wasn't she?"

"Yes."

"All right, then. You and Georgette would have gone to the party regardless of which one of you I had married. I would have had nothing to do with it. Let him show us the party as it would have been if I had married Georgette, and I'll bet you'd be there with either your fiancé or your husband.

Livvy hesitated. She felt honestly afraid of just that.

He said, "Are you afraid to take the chance?"

And that, of course, decided her. She turned on him furiously. "No, I'm not! And I hope I *am* married. There's no reason I should pine for you. What's more, I'd like to see what happens when you spill the shaker all over Georgette. She'll fill both your ears for you, and in public, too. I know *her*. Maybe you'll see a certain difference in the jigsaw pieces then." She faced forward and crossed her arms angrily and firmly across her chest.

Norman looked across at the little man, but there was no need to say anything. The glass slab was on his lap already. The sun slanted in from the west, and the white foam of hair that topped his head was edged with pink.

Norman said tensely, "Ready?"

Livvy nodded and let the noise of the train slide away again.

Livvy stood, a little flushed with recent cold, in the door-

way. She had just removed her coat, with its sprinkling of snow, and her bare arms were still rebelling at the touch of open air.

She answered the shouts that greeted her with "Happy New Years" of her own, raising her voice to make herself heard over the squealing of the radio. Georgette's shrill tones were almost the first thing she heard upon entering, and now she steered toward her. She hadn't seen Georgette or Norman in weeks.

Georgette lifted an eyebrow, a mannerism she had lately cultivated, and said, "Isn't anyone with you, Olivia?" Her eyes swept the immediate surroundings and then returned to Livvy.

Livvy said indifferently, "I think Dick will be around later. There was something or other he had to do first." She felt as indifferent as she sounded.

Georgette smiled tightly. "Well, Norman's here. That ought to keep you from being lonely, dear. At least, it's turned out that way before."

And as she said so, Norman sauntered in from the kitchen. He had a cocktail shaker in his hand, and the rattling of ice cubes castanetted his words. "Line up, you rioting revelers, and get a mixture that will really revel your riots—Why Livvy!"

He walked toward her, grinning his welcome. "Where've you been keeping yourself? I haven't seen you in twenty years, seems like. What's the matter? Doesn't Dick want anyone else to see you?"

"Fill my glass, Norman," said Georgette sharply.

"Right away," he said, not looking at her. "Do you want one too, Livvy? I'll get you a glass." He turned, and everything happened at once.

Livvy cried, "Watch out!" She saw it coming, even had a vague feeling that all this had happened before, but it played itself out inexorably. His heel caught the edge of the carpet; he lurched, tried to right himself, and lost the cocktail shaker. It seemed to jump out of his hands, and a pint of ice-cold liquor drenched Livvy from shoulder to hem.

She stood there, gasping. The noises muted about her, and for a few intolerable moments she made futile brushing ges-

tures at her gown, while Norman kept repeating, "Damnation!" in rising tones.

Georgette said coolly, "It's too bad, Livvy. Just one of those things. I imagine the dress can't be very expensive."

Livvy turned and ran. She was in the bedroom, which was at least empty and relatively quiet. By the light of the fringe-shaded lamp on the dresser, she poked among the coats on the bed, looking for her own.

Norman had come in behind her. "Look, Livvy, don't pay any attention to what she said. I'm really devilishly sorry. I'll pay—"

"That's all right. It wasn't your fault." She blinked rapidly and didn't look at him. "I'll just go home and change."

"Are you coming back?"

"I don't know. I don't think so."

"Look, Livvy . . ." His warm fingers were on her shoulders—

Livvy felt a queer tearing sensation deep inside her, as though she were ripping away from clinging cobwebs and—

—and the train noises were back.

Something *did* go wrong with the time when she was in there—in the slab. It was deep twilight now. The train lights were on. But it didn't matter. She seemed to be recovering from the wrench inside her.

Norman was rubbing his eyes with thumb and forefinger. "What happened?"

Livvy said, "It just ended. Suddenly."

Norman said uneasily, "You know, we'll be putting into New Haven soon." He looked at his watch and shook his head.

Livvy said wonderingly, "You spilled it on me."

"Well, so I did in real life."

"But in real life I was your wife. You ought to have spilled it on Georgette this time. Isn't that queer?" But she was thinking of Norman pursuing her; his hands on her shoulders. . . .

She looked up at him and said with warm satisfaction, "I wasn't married."

"No, you weren't. But was that Dick Reinhardt you were going around with?"

"Yes."

"You weren't planning to marry him, were you, Livvy?"

"Jealous, Norman?"

Norman looked confused. "Of that? Of a slab of glass? Of course not."

"I don't think I would have married him."

Norman said, "You know, I wish it hadn't ended when it did. There was something that was about to happen, I think." He stopped, then added slowly, "It was as though I would rather have done it to anybody else in the room."

"Even to Georgette."

"I wasn't giving two thoughts to Georgette. You don't believe me, I suppose."

"Maybe I do." She looked up at him. "I've been silly, Norman. Let's—let's live our real life. Let's not play with all the things that just might have been."

But he caught her hands. "No, Livvy. One last time. Let's see what we would have been doing right now, Livvy! This very minute! If I had married Georgette."

Livvy was a little frightened. "Let's not, Norman." She was thinking of his eyes, smiling hungrily at her as he held the shaker, while Georgette stood beside her, unregarded. She didn't *want* to know what happened afterward. She just wanted this life now, this *good* life.

New Haven came and went.

Norman said again, "I want to try, Livvy."

She said, "If you want to, Norman." She decided fiercely that it wouldn't matter. Nothing could matter. Her hands reached out and encircled his arm. She held it tightly, and while she held it she thought: "Nothing in the make-believe can take him from me."

Norman said to the little man, "Set 'em up again."

In the yellow light the process seemed to be slower. Gently the frosted slab cleared, like clouds being torn apart and dispersed by an unfelt wind.

Norman was saying, "There's something wrong. That's just the two of us, exactly as we are now."

He was right. Two little figures were sitting in a train on the seats which were farthest toward the front. The field was enlarging now—they were merging into it. Norman's voice was distant and fading.

"It's the same train," he was saying. "The window in back is cracked just as—"

Livvy was blindingly happy. She said, "I wish we were in New York."

He said, "It will be less than an hour, darling." Then he said, "I'm going to kiss you." He made a movement, as though he were about to begin.

"Not here! Oh, Norman, people are looking."

Norman drew back. He said, "We should have taken a taxi."

"From Boston to New York?"

"Sure. The privacy would have been worth it."

She laughed. "You're funny when you try to act ardent."

"It isn't an act." His voice was suddenly a little somber. "It's not just an hour, you know. I feel as though I've been waiting five years."

"I do, too."

"Why couldn't I have met you first? It was such a waste."

"Poor Georgette," Livvy sighed.

Norman moved impatiently. "Don't be sorry for her, Livvy. We never really made a go of it. She was glad to get rid of me."

"I know that. That's why I say 'Poor Georgette.' I'm just sorry for her for not being able to appreciate what she had."

"Well, see to it that *you* do," he said. "See to it that you're immensely appreciative, infinitely appreciative—or more than that, see that you're at least half as appreciative as I am of what *I've* got."

"Or else you'll divorce me, too?"

"Over my dead body," said Norman.

Livvy said, "It's all so strange. I keep thinking, 'What if you hadn't spilt the cocktails on me that time at the party?' You wouldn't have followed me out; you wouldn't have told me; I wouldn't have known. It would have been so different . . . everything."

"Nonsense. It would have been just the same. It would have all happened another time."

"I wonder," said Livvy softly.

Train noises merged into train noises. City lights flickered outside, and the atmosphere of New York was about them. The coach was astir with travelers dividing the baggage among themselves.

Livvy was an island in the turmoil until Norman shook her.

She looked at him and said, "The jigsaw pieces fit after all."

He said, "Yes."

She put a hand on his. "But it wasn't good, just the same. I was very wrong. I thought that because we had each other, we should have all the *possible* each others. But all the possibles are none of our business. The real is enough. Do you know what I mean?"

He nodded.

She said, "There are millions of other *what ifs*. I don't want to know what happened in any of them. I'll never say 'What if' again."

Norman said, "Relax, dear. Here's your coat." And he reached for the suitcases.

Livvy said with sudden sharpness, "Where's Mr. If?"

Norman turned slowly to the empty seat that faced them. Together they scanned the rest of the coach.

"Maybe," Norman said, "he went into the next coach."

"But why? Besides, he wouldn't leave his hat." And she bent to pick it up.

Norman said, "What hat?"

And Livvy stopped, her fingers hovering over nothingness. She said, "It was here—I almost touched it." She straightened and said, "Oh, Norman, what if—"

Norman put a finger on her mouth. "Darling . . ."

She said, "I'm sorry. Here, let me help you with the suitcases."

The train dived into the tunnel beneath Park Avenue, and the noise of the wheels rose to a roar.

THE ULTIMATE CATALYST

Eric Temple Bell

ERIC TEMPLE BELL

Eric Temple Bell's name is an honored one among American mathematicians. He was Professor of Mathematics at the California Institute of Technology for many years, and produced some notable works on mathematics and its history. He was born in Aberdeen, Scotland, in 1883, and obtained his mathematics Ph.D. in the United States in 1912, after having been in this country for ten years. He died in December, 1960.

But Eric Bell led a double life—at least for a considerable number of years. During these decades he wrote a series of science-horror fantasies, mainly of novel length, under the pseudonym "John Taine." These gothic tales were about as far from the logic and discipline of mathematics as can be imagined; and they thus probably expressed the imaginative, "dark" side of Bell's nature in a way that numbers and symbols never could.

Almost the only short story—and certainly the only one worth reprinting—that Bell "Taine" ever wrote is the one appearing here. "The Ultimate Catalyst" is, as you will see, a thoroughly ghastly concept with a fine pseudoscientific machinery, and also a sharply pointed commentary on the social organization of mankind. Would that the state of affairs in regard to dictators were today as Bell described it in this pre-World War II tale!

The Ultimate Catalyst

THE DICTATOR shoved his plate aside with a petulant gesture. The plate, like the rest of the official banquet service, was solid gold with the Dictator's monogram, K. I—Kadir Imperator, or Emperor Kadir—embossed in a design of machine guns round the edge. And, like every other plate on the long banquet table, Kadir's was piled high with a colorful assortment of raw fruits.

This was the dessert. The guests had just finished the main course, a huge plateful apiece of steamed vegetables. For an appetizer they had tried to enjoy an iced tumblerful of mixed fruit juices.

There had been nothing else at the feast but fruit juice, steamed vegetables, and raw fruit. Such a meal might have sustained a scholarly vegetarian, but for soldiers of a domineering race it was about as satisfying as a bucketful of cold water.

"Vegetables and fruit," Kadir complained. "Always vegetables and fruit. Why can't we get some red beef with blood in it for a change? I'm sick of vegetables. And I hate fruit. Blood and iron—that's what we need."

The guests stopped eating and eyed the Dictator apprehensively. They recognized the first symptoms of an imperial rage. Always when Kadir was about to explode and lose control of his evil temper, he had a preliminary attack of the blues, usually over some trifle.

They sat silently waiting for the storm to break, not daring to eat while their Leader abstained.

Presently a middle-aged man, halfway down the table on Kadir's right, calmly selected a banana, skinned it, and took a bite. Kadir watched the daring man in amazed silence. The last of the banana was about to disappear when the Dictator found his voice.

"Americano!" he bellowed like an outraged bull. "Mister Beetle!"

"*Doctor Beetle*, if you don't mind, *Senhor Kadir*," the

offender corrected. "So long as every other white man in Amazonia insists on being addressed by his title, I insist on being addressed by mine. It's genuine too. Don't forget that."

"Beetle!" the Dictator began roaring again.

But Beetle quietly cut him short. "'Doctor' Beetle, please. I insist."

Purple in the face, Kadir subsided. He had forgotten what he intended to say. Beetle chose a juicy papaya for himself and a huge, greenish plum for his daughter, who sat on his left. Ignoring Kadir's impotent rage, Beetle addressed him as if there had been no unpleasantness. Of all the company, Beetle was the one man with nerve enough to face the Dictator as an equal.

"You say we need blood and iron," he began. "Do you mean that literally?" the scientist said slowly.

"How else should I mean it?" Kadir blustered, glowering at Beetle. "I always say what I mean. I am no theorist. I am a man of action, not words!"

"All right, all right," Beetle soothed him. "But I thought perhaps your 'blood and iron' was like old Bismarck's—blood and sabers. Since you mean just ordinary blood, like the blood in a raw beefsteak, and iron not hammered into sabers, I think Amazonia can supply all we need or want."

"But beef, red beef—" Kadir expostulated.

"I'm coming to that in a moment." Beetle turned to his daughter. "Consuelo, how did you like that greenbeefo?"

"That *what*?" Consuelo asked in genuine astonishment.

Although as her father's laboratory assistant she had learned to expect only the unexpected from him, each new creation of his filled her with childlike wonderment and joy. Every new biological creation her father made demanded a new scientific name. But, instead of manufacturing new scientific names out of Latin and Greek, as many reputable biologists do, Beetle used English, with an occasional lapse into Portuguese, the commonest language of Amazonia. He had even tried to have his daughter baptized Buglette, as the correct technical term of the immature female offspring of a Beetle. But his wife, a Portuguese lady of irreproachable family, had objected, and the infant was named Consuelo.

"I asked how you liked the greenbeefo," Beetle repeated. "That seedless green plum you just ate."

"Oh, so that's what you call it." Consuelo considered carefully, like a good scientist, before passing judgment on the delicacy. "Frankly, I didn't like it a little bit. It smelt like underdone pork. There was a distinct flavor of raw blood. And it all had a rather slithery wet taste, if you get what I mean."

"I get you exactly," Beetle exclaimed. "An excellent description." He turned to Kadir. "There! You see we've already done it."

"Done what?" Kadir asked suspiciously.

"Try a greenbeefo and see."

Somewhat doubtfully, Kadir selected one of the huge greenish plums from the golden platter beside him and slowly ate it. Etiquette demanded that the guests follow their Leader's example.

While they were eating the greenbeefos, Beetle watched their faces. The women of the party seemed to find the juicy flesh of the plums unpalatable. Yet they kept on eating and several, after finishing one, reached for another.

The men ate greedily. Kadir himself disposed of the four greenbeefos on his platter and hungrily looked about for more. His neighbors on either side, after a grudging look at their own diminishing supplies, offered him two of theirs. Without a word of thanks, Kadir devoured the offerings.

As Beetle sat calmly watching their greed, he had difficulty in keeping his face impassive and not betraying his disgust. Yet these people were starving for flesh. Possibly they were to be pardoned for looking more like hungry animals than representatives of the conquering race at their first taste in two years of something that smelt like flesh and blood.

All their lives, until the disaster which had quarantined them in Amazonia, these people had been voracious eaters of flesh in all its forms from poultry to pork. Now they could get nothing of the sort.

The dense forests and jungles of Amazonia harbored only a multitude of insects, poisonous reptiles, gaudy birds, spotted cats, and occasional colonies of small monkeys. The cats and

the monkeys eluded capture on a large scale, and after a few half-hearted attempts at trapping, Kadir's hardy followers had abandoned the forests to the snakes and the stinging insects.

The chocolate-colored waters of the great river skirting Amazonia on the north swarmed with fish, but they were inedible. Even the natives could not stomach the pulpy flesh of these bloated mudsuckers. It tasted like the water of the river, a foul soup of decomposed vegetation and rotting wood. Nothing remained for Kadir and his heroic followers to eat but the tropical fruits and vegetables.

Luckily for the invaders, the original white settlers from the United States had cleared enough of the jungle and forest to make intensive agriculture possible. When Kadir arrived, all of these settlers, with the exception of Beetle and his daughter, had fled. Beetle remained, partly on his own initiative, partly because Kadir insisted that he stay and "carry on" against the snakes. The others traded Kadir their gold mines in exchange for their lives.

The luscious greenbeefos had disappeared. Beetle suppressed a smile as he noted the flushed and happy faces of the guests. He remembered the parting words of the last of the mining engineers.

"So long, Beetle. You're a brave man and may be able to handle Kadir. If you do, we'll be back. Use your head, and make a monkey of this dictating brute. Remember, we're counting on you."

Beetle had promised to keep his friends in mind. "Give me three years. If you don't see me after that, shed a tear and forget me."

"*Senhorina Beetle!*" It was Kadir roaring again. The surfeit of greenbeefos restored his old bluster.

"Yes?" Consuelo replied politely.

"I know now why your cheeks are always so red," Kadir shouted.

For a moment neither Consuelo nor her father got the drift of Kadir's accusation. They understood; just as Kadir started to enlighten them.

"You and your traitorous father are eating while we starve."

Beetle kept his head. His conscience was clear, so far as the greenbeefos were concerned, and he could say truthfully that they were not the secret of Consuelo's rosy cheeks and his own robust health. He quickly forestalled his daughter's reply.

"The meat-fruit, as you call it, is not responsible for Consuelo's complexion. Hard work as my assistant keeps her fit. As for the greenbeefos, this is the first time anyone but myself has tasted one. You saw how my daughter reacted. Only a great actress could have feigned such inexperienced distaste. My daughter is a biological chemist, not an actress."

Kadir was still suspicious. "Then why did you not share these meat-fruits with us before?"

"For a very simple reason. I created them by hybridization only a year ago, and the first crop of my fifty experimental plants ripened this week. As I picked the ripe fruit, I put it aside for this banquet. I thought it would be a welcome treat after two years of vegetables and fruit. And," Beetle continued, warming to his invention, "I imagined a taste of beef—even if it is only green beef, 'greenbeefo'—would be a very suitable way of celebrating the second anniversary of the New Freedom in Amazonia."

The scientist's sarcasm anent the "new freedom" was lost upon Kadir, nor did Kadir remark the secret bitterness in Beetle's eyes. What an inferior human being a dictator was, the scientist thought! What stupidity, what brutality! So long as a single one remained—and Kadir was the last—the Earth could not be clean.

"Have you any more?" Kadir demanded.

"Sorry. That's all for the present. But I'll have tons in a month or less. You see," he explained, "I'm using hydroponics to increase production and hasten ripening."

Kadir looked puzzled but interested. Confessing that he was merely a simple soldier, ignorant of science, he deigned to ask for particulars. Beetle was only too glad to oblige.

"It all began a year ago. You remember asking me, when you took over the country, to stay and go on with my work at the antivenin laboratory? Well, I did. But what was I to do with all the snake venom we collected? There was no way

of getting it out of the country now that the rest of the continent has quarantined us. We can't send anything down the river, our only way out to civilization—"

"Yes, yes," Kadir interrupted impatiently. "You need not remind anyone here that the mountains and the jungles are the strongest allies of our enemies. What has all this to do with the meat-fruit?"

"Everything. Not being able to export any venom, I went on with my research in biochemistry. I saw how you people were starving for flesh, and I decided to help you out. You had slaughtered and eaten all the horses at the antivenin laboratory within a month of your arrival. There was nothing left, for this is not a cattle country, and it never will be. There was nothing to do but try chemistry. I already had the greenhouses left by the engineers. They used to grow tomatoes and cucumbers before you came."

"So you made these meat-fruits chemically?"

Beetle repressed a smile at the Dictator's scientific innocence.

"Not exactly. But really it was almost as simple. There was nothing startlingly new about my idea. To see how simple it was, ask yourself what the main differences are between the higher forms of plant life and the lower forms of animal life.

"Both are living things. But the plants cannot move about from place to place at will, whereas the animals can. A plant is, literally, 'rooted to the spot.'

"There are apparent exceptions, of course, like water hyacinths, yeast spores, and others that are transported by water or the atmosphere, but they do not transport themselves as the living animal does. Animals have a 'dimension' of freedom that plants do not have."

"But the beef—"

"In a moment. I mentioned the difference between the freedoms of plants and animals because I anticipate that it will be of the utmost importance in the experiments I am now doing. However, this freedom was not, as you have guessed, responsible for the greenbeefos. It was another, less profound, difference between plants and animals that suggested the 'meat-fruit.' "

Kadir seemed to suspect Beetle of hidden and unflattering meanings, with all this talk of freedom in a country dedicated to the "New Freedom" of Kadir's dictatorship. But he could do nothing about it, so he merely nodded as if he understood.

"Plants and animals," Beetle continued, "both have a 'blood' of a sort. The most important constituents in the 'blood' of both differ principally in the metals combined chemically in each.

"The 'blood' of a plant contains chlorophyll. The blood of an animal contains haemoglobin. Chemically, chlorophyll and haemoglobin are strangely alike. The metal in chlorophyll is magnesium; in haemoglobin, it is iron.

"Well, it occurred to chemists that if the magnesium could be 'replaced' chemically by iron, the chlorophyll could be converted into haemoglobin! And similarly for the other way about: replace the iron in haemoglobin by magnesium, and get chlorophyll!

"Of course it is not all as simple or as complete as I have made it sound. Between haemoglobin and chlorophyll is a long chain of intermediate compounds. Many of them have been formed in the laboratory, and they are definite links in the chain from plant blood to animal blood."

"I see," Kadir exclaimed, his face aglow with enthusiasm at the prospect of unlimited beef from green vegetables. He leaned over the table to question Beetle.

"It is the blood that gives flesh its appetizing taste and nourishing strength. You have succeeded in changing the plant blood to animal blood?"

Beetle did not contradict him. In fact, he evaded the question.

"I expect," he confided, "to have tons of greenbeefos in a month, and thereafter a constant supply as great as you will need. Tray-culture—hydroponics—will enable us to grow hundreds of tons in a space no larger than this banquet hall."

The "banquet hall" was only a ramshackle dining room that had been used by the miners before Kadir arrived. Nevertheless, it could be called anything that suited the Dictator's ambition.

"Fortunately," Beetle continued, "the necessary chemicals

for tray-culture are abundant in Amazonia. My native staff has been extracting them on a large scale for the past four months, and we will have ample for our needs."

"Why don't you grow the greenbeefos in the open ground?" one of Kadir's officers inquired a trifle suspiciously.

"Too inefficient. By feeding the plants only the chemicals they need directly, we can increase production several hundredfold and cut down the time between successive crops to a few weeks. By properly spacing the propagation of the plants, we can have a constant supply. The seasons cut no figure."

They seemed satisfied, and discussion of the glorious future in store for Amazonia became general and animated. Presently Beetle and Consuelo asked the Dictator's permission to retire. They had work to do at the laboratory.

"Hydroponics?" Kadir enquired jovially. Beetle nodded, and they bowed themselves out of the banquet hall.

Consuelo withheld her attack until they were safe from possible eavesdroppers.

"Kadir is a lout," she began, "but that is no excuse for your filling him up with a lot of impossible rubbish."

"But it *isn't* impossible, and it *isn't* rubbish," Beetle protested. "You know as well as I do—"

"Of course I know about the work on chlorophyll and haemoglobin. But you didn't make those filthy green plums taste like raw pork by changing the chlorophyll of the plants into haemoglobin or anything like it. How did you do it, by the way?"

"Listen, Buglette. If I tell you, it will only make you sick. You ate one, you know."

"I would rather be sick than ignorant. Go on, you may as well tell me."

"Very well. It's a long story, but I'll cut it short. Amazonia is the last refuge of the last important dictator on earth. When Kadir's own people came to their senses a little over two years ago and kicked him out, he and his top men and their women came over here with their 'new freedom.' But the people of this continent didn't want Kadir's brand of freedom. Of course a few thousand crackpots in the larger cities

welcomed him and his gang as their 'liberators,' but for once in history the mass of the people knew what they did not want. They combined forces and chased Kadir and his cronies up here.

"I never have been able to see why they did not exterminate Kadir and company as they would any other pests. But the presidents of the United Republics agreed that to do so would only be using dictatorial tactics, the very thing they had united to fight. So they let Kadir and his crew live—more or less—in strict quarantine. The temporary loss of a few rich gold mines was a small price to pay, they said, for world security against dictatorships.

"So here we are, prisoners in the last plague spot of civilization. And here is Kadir. He can dictate to his heart's content, but he can't start another war. He is as powerless as Napoleon was on his island.

"Well, when the last of our boys left, I promised to keep them in mind. And you heard my promise to help Kadir *out*. I am going to keep that promise, if it costs me my last snake."

They had reached the laboratory. Juan, the night-nurse for the reptiles, was going his rounds.

"Everything all right, Juan?" Beetle asked cordially.

He liked the phlegmatic Portuguese who always did his job with a minimum of talk. Consuelo, for her part, heartily disliked the man and distrusted him profoundly. She had long suspected him of being a stoolpigeon for Kadir.

"Yes, Dr. Beetle. Good night."

"Good night, Juan."

When Juan had departed, Consuelo returned to her attack.

"You haven't told me yet how you made these things taste like raw pork."

She strolled over to the tank by the north window where a luxuriant greenbeefo, like an overdeveloped tomato vine, grew rankly up its trellis to the ceiling. About half a dozen of the huge greenish "plums" still hung on the vine.

Consuelo plucked one and was thoughtfully sampling its quality.

"This one tastes all right," she said. "What did you do to the others?"

"Since you really want to know, I'll tell you. I took a hypo-

dermic needle and shot them full of snake blood. My pet constrictor had enough juice in him to do the whole job without discomfort to himself or danger to his health."

Consuelo hurled her half-eaten fruit at her father's head, but missed. She stood wiping her lips with the back of her hand.

"So you can't change the chlorophyll in a growing plant into anything like haemoglobin? You almost had me believing you could."

"I never said I could. Nor can anybody else, so far as I know. But it made a good story to tell Kadir."

"But why?"

"If you care to analyze one of these greenbeefos in your spare time, you will find their magnesium content extraordinarily high. That is not accident, as you will discover if you analyze the chemicals in the tanks. I shall be satisfied if I can get Kadir and his friends to gorge themselves on greenbeefos when the new crop comes in. Now, did I sell Kadir the greenbeefo diet, or didn't I? You saw how they all fell for it. And they will keep on falling as long as the supply of snake blood holds out."

"There's certainly no scarcity of snakes in this charming country," Consuelo remarked. "I'm going to get the taste of one of them out of my mouth right now. Then you can tell me what you want me to do in this new culture of greenbeefos you've gone in for."

So father and daughter passed their days under the last dictatorship. Beetle announced that in another week the lush crop of greenbeefos would be ripe. Kadir proclaimed the following Thursday "Festal Thursday" as the feast day inaugurating "the reign of plenty" in Amazonia.

As a special favor, Beetle had requested Kadir to forbid any sightseeing or other interference with his work.

Kadir had readily agreed, and for three weeks Beetle had worked twenty hours a day, preparing the coming banquet with his own hands.

"You keep out of this," he had ordered Consuelo. "If there is any dirty work to be done, I'll do it myself. Your job is to

keep the staff busy as usual, and see that nobody steals any of the fruit. I have given strict orders that nobody is to taste a greenbeefo till next Thursday, and Kadir has issued a proclamation to that effect. So if you catch anyone thieving, report to me at once."

The work of the native staff consisted in catching snakes. The workers could see but little sense in their job, as they knew that no venom was being exported. Moreover, the eccentric Doctor Beetle had urged them to bring in every reptile they found, harmless as well as poisonous, and he was constantly riding them to bestir themselves and collect more.

More extraordinary still, he insisted every morning that they carry away the preceding day's catch and dump it in the river. The discarded snakes, they noticed, seemed half dead. Even the naturally most vicious put up no fight when they were taken from the pens.

Between ten and eleven every morning Beetle absented himself from the laboratory, and forbade anyone to accompany him. When Consuelo asked him what he had in the small black satchel he carried with him on these mysterious trips, he replied briefly, "A snake. I'm going to turn the poor brute loose."

And once, to prove his assertion, he opened the satchel and showed her the torpid snake.

"I must get some exercise, and I need to be alone," he explained, "or my nerves will snap. Please don't pester me."

She had not pestered him, although she doubted his explanation. Left alone for an hour, she methodically continued her daily inspection of the plants till her father returned, when she had her lunch and he resumed his private business.

On the Tuesday before Kadir's Festal Thursday, Consuelo did not see her father leave for his walk, as she was already busy with her inspection when he left. He had been gone about forty minutes when she discovered the first evidence of treachery.

The foliage of one vine had obviously been disturbed since the last inspection. Seeking the cause, Consuelo found that two of the ripening fruits had been carefully removed from

their stems. Further search disclosed the theft of three dozen in all. Not more than two had been stolen from any one plant.

Suspecting Juan, whom she had always distrusted, Consuelo hastened back to her father's laboratory to await his return and report. There she was met by an unpleasant surprise.

She opened the door to find Kadir seated at Beetle's desk, his face heavy with anger and suspicion.

"Where is your father?"

"I don't know."

"Come, come. I have made women talk before this when they were inclined to be obstinate. Where is he?"

"Again I tell you I don't know. He always takes his exercise at this time, and he goes alone. Besides," she flashed, "what business is it of yours where he is?"

"As to that," Kadir replied carelessly, "everything in Amazonia is my business."

"My father and I are not citizens—or subjects—of Amazonia."

"No. But your own country is several thousand miles away, Senhorina Beetle. In case of impertinent questions I can always report—with regrets, of course—that you both died by one of the accidents so common in Amazonia. Of snakebite, for instance."

"I see. But may I ask the reason for this sudden outburst?"

"So you have decided to talk? You will do as well as your father, perhaps better."

His eyes roved to one of the wire pens.

In it were half a dozen small red snakes.

"What do you need those for, now that you are no longer exporting venom?"

"Nothing much. Just pets, I suppose."

"Pets? Rather an unusual kind of pet, I should say." His face suddenly contorted in fear and rage. "Why is your father injecting snake blood into the unripe meat-fruit?" he shouted.

Consuelo kept her head. "Who told you that absurdity?"

"Answer me!" he bellowed.

"How can I? If your question is nonsense, how can anybody answer it?"

"So you refuse. I know a way to make you talk. Unlock that pen."

"I haven't the key. My father trusts nobody but himself with the keys to the pens."

"No? Well, this will do." He picked up a heavy ruler and lurched over to the pen. In a few moments he had sprung the lock.

"Now you answer my question or I force your arm into that pen. When your father returns, I shall tell him that someone had broken the lock and that you had evidently been trying to repair it when you got bitten. He will have to believe me. You will be capable of speech for just about three minutes after one of those red beauties strikes. Once more, why did your father inject snake blood into the green meat-fruits?"

"And once more I repeat that you are asking nonsensical questions. Don't you dare—"

But he did dare. Ripping the sleeve of her smock from her arm, he gripped her bare wrist in his huge fist and began dragging her toward the pen. Her frantic resistance was no match for his brutal strength. Instinctively she resorted to the only defense left her. She let out a yell that must have carried half a mile.

Startled in spite of himself, Kadir paused, but only for an instant. She yelled again.

This time Kadir did not pause. Her hand was already in the pen when the door burst open. Punctual as usual, Beetle had returned exactly at eleven o'clock to resume his daily routine.

The black satchel dropped from his hand.

"What the hell—" A well-aimed laboratory stool finished the sentence. It caught the Dictator squarely in the chest. Consuelo fell with him, but quickly disengaged herself and stood panting.

"You crazy fool," Beetle spat at the prostrate man. "What do you think you are doing? Don't you know that those snakes are the deadliest of the whole lot?"

Kadir got to his feet without replying and sat down heavily on Beetle's desk. Beetle stood eying him in disgust.

"Come on, let's have it. What were you trying to do to my daughter?"

"Make her talk," Kadir muttered thickly. "She wouldn't—"

"Oh, she wouldn't talk. I get it. Consuelo! You keep out of this. I'll take care of our friend. Now, Kadir, just what did you want her to talk about?"

Still dazed, Kadir blurted out the truth.

"Why are you injecting snake blood into the unripe meat-fruit?"

Beetle eyed him curiously. With great deliberation he placed a chair in front of the Dictator and sat down.

"Let us get this straight. You ask why I am injecting snake blood into the greenbeefos. Who told you I was?"

"Juan. He brought three dozen of the unripe fruit to show me."

"To show you what?" Beetle asked in deadly calm. Had that fool Juan brains enough to look for the puncture marks made by the hypodermic needle?

"To show me that you are poisoning the fruit."

"And did he show you?"

"How should I know? He was still alive when I came over here. I forced him to eat all three dozen."

"You had to use force?"

"Naturally. Juan said the snake blood would poison him."

"Which just shows how ignorant Juan is." Beetle sighed his relief. "Snake blood is about as poisonous as cow's milk."

"Why are you injecting—"

"You believed what that ignorant fool told you? He must have been drinking again and seeing things. I've warned him before. This time he goes. That is, if he hasn't come to his senses and gone already of his own free will."

"Gone? But where could he go from here?"

"Into the forest, or the jungle," Beetle answered indifferently. "He might even try to drape his worthless hide over a raft of rotten logs and float down the river. Anyhow, he will disappear after having made such a fool of himself. Take my word for it, we shan't see Juan again in a month of Sundays."

"On the contrary," Kadir retorted with a crafty smile, "I think we shall see him again in a very few minutes." He glanced at the clock. It showed ten minutes past eleven. "I

have been here a little over half an hour. Juan promised to meet me here. He found it rather difficult to walk after his meal. When he comes, we can go into the question of those injections more fully."

For an instant Beetle looked startled, but quickly recovered his composure.

"I suppose as you say, Juan is slow because he has three dozen of those unripe greenbeefos under his belt. In fact I shouldn't wonder if he were feeling rather unwell at this very moment."

"So there is a poison in the fruits?" Kadir snapped.

"A poison? Rubbish! How would you or anyone feel if you had been forced to eat three dozen enormous green apples, to say nothing of unripe greenbeefos? I'll stake my reputation against yours that Juan is hiding in the forest and being very sick right now. And I'll bet anything you like that nobody ever sees him again. By the way, do you know which road he was to follow you by? The one through the clearing, or the cut-off through the forest?"

"I told him to take the cut-off, so as to get here quicker."

"Fine. Let's go and meet him—only we shan't. As for what I saw when I opened that door, I'll forget it if you will. I know Consuelo has already forgotten it. We are all quarantined here together in Amazonia, and there's no sense in harboring grudges. We've got to live together."

Relieved at being able to save his face, Kadir responded with a generous promise.

"If we fail to find Juan, I will admit that you are right, and that Juan has been drinking."

"Nothing could be fairer. Come on, let's go."

Their way to the Dictator's "palace"—formerly the residence of the superintendent of the gold mines—lay through the tropical forest.

The road was already beginning to choke up in the gloomier stretches with a rank web of trailing plants feeling their way to the trees on either side, to swarm up their trunks and ultimately choke the life out of them. Kadir's followers, soldiers all and new to the tropics, were letting nature take its course. Another two years of incompetence would see the painstaking labor of the American engineers smothered in rank jungle.

Frequently the three were compelled to abandon the road and follow more open trails through the forest till they again emerged on the road. Dazzling patches of yellow sunlight all but blinded them temporarily as they crossed the occasional barren spots that seem to blight all tropical forests like a leprosy. Coming out suddenly into one of these blinding patches, Kadir, who happened to be leading, let out a curdling oath and halted as if he had been shot.

"What's the matter?" Consuelo asked breathlessly, hurrying to overtake him. Blinded by the glare, she could not see what had stopped the Dictator.

"I stepped on it." Kadir's voice was hoarse with disgust and fear.

"Stepped on what?" Beetle demanded. "I can't see in this infernal light. Was it a snake?"

"I don't know," Kadir began hoarsely. "It moved under my foot. Ugh! I see it now. Look."

They peered at the spot Kadir indicated, but could see nothing. Then, as their eyes became accustomed to the glare, they saw the thing that Kadir had stepped on.

A foul red fungus, as thick as a man's arm and over a yard long, lay directly in the Dictator's path.

"A bladder full of blood and soft flesh," Kadir muttered, shaking with fright and revulsion. "And I stepped on it."

"Rot!" Beetle exclaimed contemptuously, but there was a bitter glint in his eyes. "Pull yourself together, man. That's nothing but a fungus. If there's a drop of blood in it, I'll eat the whole thing."

"But it moved," Kadir expostulated.

"Nonsense. You stepped on it, and naturally it gave beneath your weight. Come on. You will never find Juan at this rate."

But Kadir refused to budge. Fascinated by the disgusting object at his feet, the Dictator stood staring down at it with fear and loathing in every line of his face.

Then, as if to prove the truth of his assertion, the thing did move, slowly, like a wounded eel. But, unlike an eel, it did not move in the direction of its length. It began to roll slowly over.

Beetle squatted, the better to follow the strange motion. If it was not the first time he had seen such a freak of nature,

he succeeded in giving a very good imitation of a scientist observing a novel and totally unexpected phenomenon. Consuelo joined her father in his researches. Kadir remained standing.

"Is it going to roll completely over?" Consuelo asked with evident interest.

"I think not," Beetle hazarded. "In fact, I'll bet three to one it only gets halfway over. There—I told you so. Look, Kadir, your fungus is rooted to the spot, just like any other plant."

In spite of himself, Kadir stooped down and looked. As the fungus reached the halfway mark in its attempted roll, it shuddered along its entire length and seemed to tug at the decayed vegetation. But shuddering and tugging got it nowhere. A thick band of fleshy rootlets, like coarse green hair, held it firmly to the ground. The sight of that futile struggle to move like a fully conscious thing was too much for Kadir's nerves.

"I am going to kill it," he muttered, leaping to his feet.

"How?" Beetle asked with a trace of contempt. "Fire is the only thing I know of to put a mess like that out of its misery—if it is in misery. For all I know, it may enjoy life. You can't kill it by smashing it or chopping it into mincemeat. Quite the contrary, in fact. Every piece of it will start a new fungus, and instead of one helpless blob rooted to the spot, you will have a whole colony. Better leave it alone, Kadir, to get what it can out of existence in its own way. Why must men like you always be killing something?"

"It is hideous and—"

"And you are afraid of it? How would you like someone to treat you as you propose treating this harmless fungus?"

"If I were like that," Kadir burst out, "I should want somebody to put a torch to me."

"What if nobody knew that was what you wanted? Or if nobody cared? You have done some pretty foul things to a great many people in your time, I believe."

"But never anything like this!"

"Of course not. Nobody has ever done anything like this to anybody. So you didn't know how. What were you trying to do to my daughter an hour ago?"

"We agreed to forget all that," Consuelo reminded him sharply.

"Sorry. My mistake. I apologize, Kadir. As a matter of scientific interest, this fungus is not at all uncommon."

"I never saw one like it before," Consuelo objected.

"That is only because you don't go walking in the forest as I do," he reminded her. "Just to prove I'm right, I'll undertake to find a dozen rolling fungi within a hundred yards of here. What do you say?"

Before they could protest, he was hustling them out of the blinding glare into a black tunnel of the forest. Beetle seemed to know where he was going, for it was certain that his eyes were as dazed as theirs.

"Follow closely when you find your eyes," he called. "I'll go ahead. Look out for snakes. Ah, here's the first beauty! Blue and magenta, not red like Kadir's friend. Don't be prejudiced by its shape. It's color is all the beauty this poor thing has."

If anything, the shapeless mass of opalescent fungus blocking their path was more repulsive than the monstrosity that had stopped Kadir. This one was enormous, fully a yard in breadth and over five feet long. It lay sprawled over the rotting trunk of a fallen tree like a decomposing squid.

Yet, as Beetle insisted, its color was beautiful with an unnatural beauty. However, neither Consuelo nor Kadir could overcome their nausea at that living death. They fled precipitately back to the patch of sunlight. The fleshy magenta roots of the thing, straining impotently at the decaying wood which nourished them, were too suggestive of helpless suffering for endurance. Beetle followed at his leisure, chuckling to himself. His amusement drew a sharp reprimand from Consuelo.

"How can you be amused? That thing was in misery."

"Aren't we all?" he retorted lightly, and for the first time in her life Consuelo doubted the goodness of her father's heart.

They found no trace of Juan. By the time they reached the Dictator's palace, Kadir was ready to agree to anything. He was a badly frightened man.

"You were right," he admitted to Beetle. "Juan was lying, and has cleared out. I apologize."

"No need to apologize," Beetle reassured him cordially. "I knew Juan was lying."

"Please honor me by staying to lunch," Kadir begged. "You cannot? Then I shall go and lie down."

They left him to recover his nerve, and walked back to the laboratory by the long road, not through the forest. They had gone over halfway before either spoke. When Beetle broke the long silence, he was more serious than Consuelo ever remembered him being.

"Have you ever noticed," he began, "what arrant cowards all brutal men are?" She made no reply, and he continued, "Take Kadir, for instance. He and his gang have tortured and killed thousands. You saw how that harmless fungus upset him. Frightened half to death of nothing."

"Are you sure it was nothing?"

He gave her a strange look, and she walked rapidly ahead. "Wait," he called, slightly out of breath.

Breaking into a trot, he overtook her.

"I have something to say that I want you to remember. If anything should ever happen to me—I'm always handling those poisonous snakes—I want you to do at once what I tell you now. You can trust Felipe."

Felipe was the Portuguese foreman of the native workers.

"Go to him and tell him you are ready. He will understand. I prepared for this two years ago, when Kadir moved in. Before they left, the engineers built a navigable raft. Felipe knows where it is hidden. It is fully provisioned. A crew of six native river men is ready to put off at a moment's notice. They will be under Felipe's orders. The journey down the river will be long and dangerous, but with that crew you will make it. Anyhow, you will not be turned back by the quarantine officers when you do sight civilization. There is a flag with the provisions. Hoist it when you see any signs of civilization, and you will not be blown out of the water. That's all."

"Why are you telling me this now?"

"Because dictators never take their own medicine before they make someone else taste it for them."

"What do you mean?" she asked in sudden panic.

"Only that I suspect Kadir of planning to give me a dose

of his peculiar brand of medicine the moment he is through with me. When he and his crew find out how to propagate the greenbeefos, I may be bitten by a snake. He was trying something like that on you, wasn't he?"

She gave him a long doubtful look. "Perhaps," she admitted. She was sure that there was more in his mind than he had told her.

They entered the laboratory and went about their business without another word. To recover lost time, Consuelo worked later than usual. Her task was the preparation of the liquid made up by Beetle's formula, in which the greenbeefos were grown.

She was just adding a minute trace of chloride of gold to the last batch when a timid rap on the door of the chemical laboratory startled her unreasonably. She had been worrying about her father.

"Come in," she called.

Felipe entered. The sight of his serious face gave her a sickening shock. What had happened? Felipe was carrying the familiar black satchel which Beetle always took with him on his solitary walks in the forest.

"What is it?" she stammered.

For answer Felipe opened his free hand and showed her a cheap watch. It was tarnished greenish blue with what looked like dried fungus.

"Juan's," he said. "When Juan did not report for work this afternoon, I went to look for him."

"And you found his watch? Where?"

"On the cut-off through the forest."

"Did you find anything else?"

"Nothing belonging to Juan."

"But you found something else?"

"Yes. I had never seen anything like them before."

He placed the satchel on the table and opened it.

"Look. Dozens like that one, all colors, in the forest. Doctor Beetle forgot to empty this bag when he went into the forest this morning."

She stared in speechless horror at the swollen monstrosity filling the satchel. The thing was like the one that Kadir had

stepped on, except that it was not red but blue and magenta. The obvious explanation flashed through her mind, and she struggled to convince herself that it was true.

"You are mistaken," she said slowly. "Doctor Beetle threw the snake away as usual and brought this specimen back to study."

Felipe shook his head.

"No, Senhorina Beetle. As I always do when the Doctor comes back from his walk, I laid out everything ready for tomorrow. The snake was in the bag at twelve o'clock this morning. He came back at his regular time. I was busy then, and did not get to his laboratory till noon. The bag had been dropped by the door. I opened it, to see if everything was all right. The snake was still there. All its underside had turned to hard blue jelly. The back was still a snake's back, covered with scales. The head had turned green, but it was still a snake's head. I took the bag into my room and watched the snake till I went to look for Juan. The snake turned into this. I thought I should tell you."

"Thank you, Felipe. It is all right; just one of my father's scientific experiments. I understand. Goodnight, and thank you again for telling me. Please don't tell anyone else. Throw that thing away and put the bag in its usual place."

Left to herself, Consuelo tried not to credit her reason and the evidence of her senses. The inconsequential remarks her father had dropped in the past two years, added to the remark of today that dictators were never the first to take their own medicine, stole into her memory to cause her acute uneasiness.

What was the meaning of this new technique of his, the addition of a slight trace of chloride of gold to the solution? He had talked excitedly of some organic compound of gold being the catalyst he had sought for months to speed up the chemical change in the ripening fruit.

"What might have taken months the old way," he had exclaimed, "can now be done in hours. I've got it at last!"

What, exactly, had he got? He had not confided in her. All he asked of her was to see that the exact amount of chloride of gold which he prescribed was added to the solutions. Everything she remembered now fitted into its sinister place in one sombre pattern.

"This must be stopped," she thought.
It must be stopped, yes. But how?

The next day the banquet took place.

"Festal Thursday" slipped into the past, as the long shadows crept over the banquet tables—crude boards on trestles—spread in the open air. For one happy, gluttonous hour the bearers of the "New Freedom" to a benighted continent had stuffed themselves with a food that looked like green fruit but tasted like raw pork. Now they were replete and somewhat dazed.

A few were furtively mopping the perspiration from their foreheads, and all were beginning to show the sickly pallor of the gourmand who has overestimated his capacity for food. The eyes of some were beginning to wander strangely. These obviously unhappy guests appeared to be slightly drunk.

Kadir's speech eulogizing Beetle and his work was unexpectedly short. The Dictator's famous gift for oratory seemed to desert him, and he sat down somewhat suddenly, as if he were feeling unwell. Beetle rose to reply.

"Senhor Kadir! Guests and bearers to Amazonia of the New Freedom, I salute you! In the name of a freedom you have never known, I salute you, as the gladiators of ancient Rome saluted their tyrant before marching into the arena where they were to be butchered for his entertainment."

Their eyes stared up at him, only half-seeing. What was he saying? It all sounded like the beginning of a dream.

"With my own hands I prepared your feast, and my hands alone spread the banquet tables with the meat-fruits you have eaten. Only one human being here has eaten the fruit as nature made it, and not as I remade it. My daughter has not eaten what you have eaten. The cold, wet taste of the snake blood which you have mistaken for the flavor of swine-flesh, and which you have enjoyed, would have nauseated her. So I gave her uncontaminated fruit for her share of our feast."

Kadir and Consuelo were on their feet together, Kadir cursing incoherently, Consuelo speechless with fear. What insane thing had her father done? Had he too eaten of—But he must have, else Kadir would not have touched the fruit!

Beetle's voice rose above the Dictator's, shouting him down.

"Yes, you were right when you accused me of injecting snake blood into the fruit. Juan did not lie to you. But the snake blood is not what is making you begin to feel like a vegetable. I injected the blood into the fruit only to delude all you fools into mistaking it for flesh. I anticipated months of feeding before I could make of you what *should* be made of you.

"A month ago I was relying on the slow processes of nature to destroy you with my help. Light alone, that regulates the chemistry of the growing plant and to a lesser degree the chemistry of animals, would have done what must be done to rid Amazonia and the world of the threat of your New Freedom, and to make you expiate your brutal past.

"But light would have taken months to bring about the necessary *replacement of the iron in your blood by magnesium*. It would have been a slow transformation—almost, I might say, a lingering death. By feeding you greenbeefo I could keep your bodies full at all times with magnesium in chemically available form to *replace every atom of iron in your blood!*

"Under the slow action of photosynthesis—the chemical transformations induced by exposure to light—you would have suffered a lingering illness. You would not have died. No! You would have lived, but not as animals. Perhaps not even as degenerated vegetables, but as some new form of life between plants and animals. You might even have retained your memories.

"But I have spared you this—so far as I can prophesy. You will live, but you will not remember—much. Instead of walking forward like human beings, you will roll. That will be your memory.

"Three weeks ago I discovered the organic catalyst to hasten the replacement of the iron in your blood by magnesium and thus to change your animal blood to plant blood, chlorophyll. The catalyst is merely a chemical compound which accelerates chemical reactions without itself being changed.

"By injecting a minute trace of chloride of gold into the fruits, I—and the living plant—produced the necessary catalyst. I have not yet had time to analyze it and determine its exact composition. Nor do I expect to have time. For I have,

perforce, taken the same medicine that I prescribed for you!

"Not so much, but enough. I shall remain a thinking animal a little longer than the rest of you. That is the only unfair advantage I have taken. Before the sun sets we shall all have ceased to be human beings, or even animals."

Consuelo was tugging frantically at his arm, but he brushed her aside. He spoke to her in hurried jerks as if racing against time.

"I did not lie to you when I told you I could *not* change the chlorophyll in a living plant into haemoglobin. Nobody has done that. But did I ever say I could not change *the haemoglobin in a living animal into chlorophyll*? If I have not done that, I have done something very close to it. Look at Kadir, and see for yourself. Let go my arm—I must finish."

Wrenching himself free, he began shouting against time.

"Kadir! I salute you. Raise your right hand and return the salute."

Kadir's right hand was resting on the bare boards of the table. If he understood what Beetle said, he refused to salute. But possibly understanding was already beyond him. The blood seemed to have ebbed from the blue flesh, and the coarse hairs on the back of the hand had lengthened perceptibly even while Beetle was demanding a salute.

"Rooted to the spot, Kadir! You are taking root already. And so are the rest of you. Try to stand up like human beings! Kadir! Do you hear me? Remember that blue fungus we saw in the forest? I have good reason for believing that was your friend Juan. In less than an hour you and I and all these fools will be exactly like him, except that some of us will be blue, others green, and still others red—like the thing you stepped on.

"It rolled. Remember, Kadir? That red abomination was one of my pet fungus snakes—shot full of salts of magnesium and the catalyst I extracted from the fruits. A triumph of science. I am the greatest biochemist that ever lived! But I shan't roll farther than the rest of you. We shall all roll together—or try to. 'Merrily we roll along, roll along'—I can see already you are going to be a blue and magenta mess like your friend Juan."

Beetle laughed harshly and bared his right arm. "I'm going

to be red, like the thing you stepped on, Kadir. But I've stepped on the lot of you!"

He collapsed across the table and lay still. No sane human being could have stayed to witness the end. Half mad herself, Consuelo ran from the place of living death.

"Felipe, Felipe! Boards, wood—bring dry boards, quick, quick! Tear down the buildings and pile them up over the tables. Get all the men, get them all!"

Four hours later she was racing down the river through the night with Felipe and his crew. Only once did she glance back. The flames which she herself had kindled flapped against the black sky.

THE GOSTAK AND THE DOSHES

Miles J. Breuer, M.D.

MILES J. BREUER, M.D.

It is ironical that one of the "purest" science fantasies in this book, one dealing with the metaphysical imaginings of extrapolated relativity theory, was written by a man who is not a research scientist but a physician. Miles J. Breuer, who died in 1947, was a practicing doctor with a considerable reputation gained earlier in this century from his work on tuberculosis. He was also an amateur photographer of parts and, as the story that follows shows, no mean writer of science fiction. Between 1927 and 1942 he found time to write over thirty-five imaginative tales, many of them excellent, and to collaborate on several others—all this in addition to his busy professional life and his other hobbies.

It is to the point, too, that Dr. Breuer in this story chose to emphasize the power of words and slogans, and their misuse in influencing human behavior. In the more than thirty years that have passed since the tale's publication, we have seen the development of the world's history almost crucially influenced by powerful and often dangerous slogans (many of them as meaningless, at least from the point of view of honest science, as the gibberish appearing in this story), which have influenced people to do everything from buying commodities to waging war and suppressing races. The problems caused by the power of words was obviously of real concern to the story's author, as a reading will show. . . .

The Gostak and the Doshes

Let the reader suppose that somebody states: "*The gostak distims the doshes.*" You do not know what this means, nor do I. But if we assume that it is English, we know that the *doshes* are *distimmed* by the *gostak*. We know that one *distimmer* of the *doshes* is a *gostak*. If, moreover, doshes are galloons, we know that some galloons are distimmed by the *gostak*. And so we may go on, and so we often do go on.—Unknown writer quoted by Ogden and Richards, in *The Meaning of Meanings*, Harcourt Brace & Co., 1923; also by Walter N. Polakov in *Man and His Affairs*, Williams & Wilkins, 1925.

"WHY! That is lifting yourself by your own bootstraps!" I exclaimed in amazed incredulity. "It's absurd."

Woleshensky smiled indulgently. He towered in his chair as though in the infinite kindness of his vast mind there were room to understand and overlook all the foolish little foibles of all the weak little beings that called themselves men. A mathematical physicist lives in vast spaces where a light-year is a footstep, where universes are being born and blotted out, where space unrolls along a fourth dimension on a surface distended from a fifth. To him, human beings and their affairs do not loom very important.

"Relativity," he explained. In his voice there was a patient forbearance for my slowness of comprehension. "Merely relativity. It doesn't take much physical effort to make the moon move through the treetops, does it? Just enough to walk down the garden path."

I stared at him, and he continued: "If you had been born and raised on a moving train, no one could convince you that the landscape was not in rapid motion. Well, our conception of the universe is quite as relative as that. Sir Isaac Newton tried in his mathematics to express a universe as though beheld by an infinitely removed and perfectly fixed observer. Mathematicians since his time, realizing the futility

of such an effort, have taken into consideration that what things 'are' depends upon the person who is looking at them. They have tried to express common knowledge, such as the law of gravitation, in terms that would hold good for all observers. Yet their leader and culminating genius, Einstein, has been unable to express knowledge in terms of pure relativity; he has had to accept the velocity of light as an arbitrarily fixed constant. Why should the velocity of light be any more fixed and constant than any other quantity in the universe?"

"But what's that got to do with going into the fourth dimension?" I broke in impatiently.

He continued as though I hadn't spoken.

"The thing that interests us now, and that mystifies modern mathematicians, is the question of movement, or, more accurately, translation. Is there such a thing as *absolute translation*? Can there be movement—translation—except in *relation* to something else than the thing that moves? All movement we know of is movement in relation to other objects, whether it be a walk down the street or the movement of the earth in its orbit around the sun. A change of *relative* position. But the mere translation of an isolated object existing alone in space is mathematically inconceivable, for there is no such thing as space in that sense."

"I thought you said something about going into another universe—" I interrupted again.

You can't argue with Woleshensky. His train of thought went on without a break.

"By translation we understand getting from one place to another. 'Going somewhere' originally meant a movement of our bodies. Yet, as a matter of fact, when we drive in an automobile we 'go somewhere' without moving our bodies at all. The scene is changed around us; we are somewhere else; and yet we haven't *moved* at all.

"Or suppose you could cast off gravitational attraction for a moment and let the earth rotate under you; you would be going somewhere and yet not moving—"

"But that is theory; you can't tinker with gravitation—"

"Every day you tinker with gravitation. When you start upward in an elevator, your pressure, not your weight, against

the floor of it is increased; apparent gravitation between you and the floor of the elevator is greater than before—and that's like gravitation is anyway: inertia and acceleration. But we are talking about translation. The position of everything in the universe must be referred to some sort of coordinates. Suppose we change the angle or direction of the coordinates: then you have 'gone somewhere' and yet you haven't moved, nor has anything else moved."

I looked at him, holding my head in my hands.

"I couldn't swear that I understood that," I said slowly. "And I repeat it looks like lifting yourself by your own bootstraps."

The homely simile did not dismay him. He pointed a finger at me as he spoke. "You've seen a chip of wood bobbing on the ripples of a pond. Now you think the chip is moving, now the water. Yet neither is moving; the only motion is of an abstract thing called a wave.

"You've seen those 'illusion' diagrams—for instance, this one of a group of cubes. Make up your mind that you are looking down upon their upper surfaces, and indeed they seem below you. Now change your mind and imagine that you are down below, looking up. Behold, you see their lower surfaces; you are indeed below them. You have 'gone somewhere,' yet there has been no translation of anything. You have merely changed coordinates."

"Which do you think will drive me insane more quickly—if you *show* me what you mean, or if you keep on talking without showing me?"

"I'll try to show you. There are some types of mind, you know, that cannot grasp the idea of relativity. It isn't the mathematics involved that matters; it's just the inability of some types of mental organization to grasp the fact that the mind of the observer endows his environment with certain properties which have no absolute existence. Thus, when you walk through the garden at night the moon floats from one treetop to another. Is your mind good enough to invert this: make the moon stand still and let the trees move backward? Can you do that? If so, you can 'go somewhere' into another dimension."

Woleshensky rose and walked to the window. His office was

an appropriate setting for such a modern discussion as ours—situated in a new, ultramodern building on the university campus, the varnish glossy, the walls clean, the books neatly arranged behind clean glass, the desk in most orderly array; the office was just as precise and modern and wonderful as the mind of its occupant.

"When do you want to go?" he asked.

"Now!"

"Then I have two more things to explain to you. The fourth dimension is just as much *here* as anywhere else. Right here around you and me things exist and go forward in the fourth dimension; but we do not see them and are not conscious of them because we are confined to our own three. Secondly: if we name the four coordinates as Einstein does, x , y , z , and t , then we exist in x , y , and z and move freely about in them, but are powerless to move in t . Why? Because t is the time dimension; and the time dimension is a difficult one for biological structures that depend on irreversible chemical reactions for their existence. But biochemical reactions can take place along any of the other dimensions as well as along t .

"Therefore, let us transform coordinates. Rotate the property of chemical irreversibility from t to z . Since we are organically able to exist (or at least to perceive) in only three dimensions at once, our new time dimension will be z . We shall be unconscious of z and cannot travel in it. Our activities and consciousness will take place along x , y , and t .

"According to fiction writers, to switch into the t dimension, some sort of apparatus with an electrical field ought to be necessary. It is not. You need nothing more to rotate into the t dimension than you do to stop the moon and make the trees move as you ride down the road; or than you do to turn the cubes upside down. It is a matter of *relativity*."

I had ceased trying to wonder or to understand.

"Show me!" was all I could gasp.

"The success of this experiment in changing from the z to the t coordinate has depended largely upon my lucky discovery of a favorable location. It is just as, when you want the moon to ride the treetops successfully, there have to be favorable features in the topography or it won't work. The

edge of this building and that little walk between the two rows of Norway poplars seems to be an angle between planes in the z and t dimensions. It seems to slope downward, does it not?—Now walk from here to the end and imagine yourself going upward. That is all. Instead of feeling this building behind and *above* you, conceive it as behind and *below*. Just as on your ride by moonlight, you must tell yourself that the moon is not moving while the trees ride by.—Can you do that? Go ahead, then.” He spoke in a confident tone, as though he knew exactly what would happen.

Half credulous, half wondering, I walked slowly out of the door. I noticed that Woleshensky settled himself down to the table with a pad and a pencil to some kind of study, and forgot me before I had finished turning around. I looked curiously at the familiar wall of the building and the still more familiar poplar walk, expecting to see some strange scenery, some unknown view from another world. But there were the same old bricks and trees that I had known so long, though my disturbed and wondering frame of mind endowed them with a sudden strangeness and unwontedness. Things I had known for some years, they were, yet so powerfully had Woleshensky’s arguments impressed me that I already fancied myself in a different universe. According to the conception of relativity, objects of the x, y, z universe *ought* to look different when viewed from the x, y, t universe.

Strange to say, I had no difficulty at all in imagining myself as going *upward* on my stroll along the slope. I told myself that the building was behind and below me, and indeed it seemed real that it was that way. I walked some distance along the little avenue of poplars, which seemed familiar enough in all its details, though after a few minutes it struck me that the avenue seemed rather long. In fact, it was much longer than I had ever known it to be before.

With a queer Alice-in-Wonderland feeling I noted it stretching way on ahead of me. Then I looked back.

I gasped in astonishment. The building was indeed *below* me. I looked down upon it from the top of an elevation. The astonishment of that realization had barely broken over me when I admitted that there was a building down there; but what building? Not the new Morton Hall, at any rate. It was

a long, three-story brick building, quite resembling Morton Hall, but it was not the same. And on beyond there were trees with buildings among them; but it was not the campus that I knew.

I paused in a kind of panic. What was I to do now? Here I was in a strange place. How I had gotten there I had no idea. What ought I to do about it? Where should I go? How was I to get back? Odd that I had neglected the precaution of how to get back. I surmised that I must be on the t dimension. Stupid blunder on my part, neglecting to find out how to get back.

I walked rapidly down the slope toward the building. Any hopes that I might have had about its being Morton Hall were thoroughly dispelled in a moment. It was a totally strange building, old, and old-fashioned looking. I had never seen it before in my life. Yet it looked perfectly ordinary and natural and was obviously a university classroom building.

I cannot tell whether it was an hour or a dozen that I spent walking frantically this way and that, trying to decide to go into this building or another, and at the last moment backing out in a sweat of hesitation. It seemed like a year but was probably only a few minutes. Then I noticed the people. They were mostly young people, of both sexes. Students, of course. Obviously I was on a university campus. Perfectly natural, normal young people, they were. If I were really on the t dimension, it certainly resembled the z dimension very closely.

Finally I came to a decision. I could stand this no longer. I selected a solitary, quiet-looking man and stopped him.

"Where am I?" I demanded.

He looked at me in astonishment. I waited for a reply, and he continued to gaze at me speechlessly. Finally it occurred to me that he didn't understand English.

"Do you speak English?" I asked hopelessly.

"Of course!" he said vehemently. "What's wrong with you?"

"Something's wrong with something," I exclaimed. "I haven't any idea where I am or how I got here."

"Synthetic wine?" he asked sympathetically.

"Oh, hell! Think I'm a fool? Say, do you have a good man in mathematical physics on the faculty? Take me to him."

"Psychology, I should think," he said, studying me. "Or psychiatry. But I'm a law student and know nothing of either."

"Then make it mathematical physics, and I'll be grateful to you."

So I was conducted to the mathematical physicist. The student led me into the very building that corresponded to Morton Hall, and into an office the position of which quite corresponded to that of Woleshensky's office. However, the office was older and dustier; it had a Victorian look about it and was not as modern as Woleshensky's room. Professor Vibens was a rather small, bald-headed man with a keen-looking face. As I thanked the law student and started on my story, he looked rather bored, as though wondering why I had picked on him with my tale of wonder. Before I had gotten very far he straightened up a little; and farther along he pricked up another notch; and before many minutes he was tense in his chair as he listened to me. When I finished, his comment was terse, like that of a man accustomed to thinking accurately and to the point.

"Obviously you come into this world from another set of coordinates. As we are on the z dimension, you must have come to us from the t dimension—"

He disregarded my attempts to protest at this point.

"Your man Woleshensky has evidently developed the conception of relativity further than we have, although Monpeters's theory comes close enough to it. Since I have no idea how to get you back, you must be my guest. I shall enjoy hearing about your world."

"That is very kind of you," I said gratefully. "I'm accepting because I can't see what else to do. At least until the time when I can find myself a place in your world or get back to my own. Fortunately," I added as an afterthought, "no one will miss me there, unless it be a few classes of students who will welcome the little vacation that must elapse before my successor is found."

Breathlessly eager to find out what sort of world I had gotten into, I walked with him to his home. And I may state at the outset that if I had found everything upside down and outlandishly bizarre, I should have been far less amazed and

astonished than I was. For, from the walk that first evening from Professor Vibens's office along several blocks of residence street to his solid and respectable home, through all of my goings about the town and country during the years that I remained in the t -dimensional world, I found people and things thoroughly ordinary and familiar. They looked and acted as we do, and their homes and goods looked like ours. I cannot possibly imagine a world and a people that could be more similar to ours without actually being the same. It was months before I got over the idea that I had merely wandered into an unfamiliar part of my own city. Only the actual experience of wide travel and much sight-seeing, and the knowledge that there was no such extensive English-speaking country in the world that I knew, convinced me that I must be on some other world, doubtless in the t dimension.

"A gentleman who has found his way here from another universe," the professor introduced me to a strapping young fellow who was mowing the lawn.

The professor's son was named John! Could anything be more commonplace?

"I'll have to take you around and show you things tomorrow," John said cordially, accepting the account of my arrival without surprise.

A redheaded servant girl, roast pork and rhubarb sauce for dinner, and checkers afterward, a hot bath at bedtime, the ringing of a telephone somewhere else in the house—is it any wonder that it was months before I would believe that I had actually come into a different universe? What slight differences there were in the people and the world merely served to emphasize the similarity. For instance, I think they were just a little more hospitable and "old-fashioned" than we are. Making due allowances for the fact that I was a rather remarkable phenomenon, I think I was welcomed more heartily in this home and in others later; people spared me more of their time and interest from their daily business than would have happened under similar circumstances in a correspondingly busy city in America.

Again, John found a lot of time to take me about the city and show me banks and stores and offices. He drove a little

squat car with tall wheels, run by a spluttering gasoline motor. (The car was not as perfect as our modern cars, and horses were quite numerous in the streets. Yet John was a busy businessman, the district superintendent of a life-insurance agency.) Think of it! Life insurance in Einstein's t dimension.

"You're young to be holding such an important position," I suggested.

"Got started early," John replied. "Dad is disappointed because I didn't see fit to waste time in college. Disgrace to the family, I am."

What in particular shall I say about the city? It might have been any one of a couple of hundred American cities. Only it wasn't. The electric streetcars, except for their bright green color, were perfect; they might have been brought over bodily from Oshkosh or Tulsa. The ten-cent stores with gold letters on their signs; drugstores with soft drinks; a mad, scrambling stock exchange; the blaring sign of an advertising dentist; brilliant entrances to motion-picture theaters were all there. The beauty shops did wonders to the women's heads, excelling our own by a good deal, if I am any judge; and at that time I had nothing more important on my mind than to speculate on that question. Newsboys bawled the *Evening Sun* and the *Morning Gale*, in whose curious, flat type I could read accounts of legislative doings, murders, and divorces quite as fluently as I could in my own *Tribune* at home. Strangeness and unfamiliarity had bothered me a good deal on a trip to Quebec a couple of years before; but they were not noticeable here in the t dimension.

For three or four weeks the novelty of going around, looking at things, meeting people, visiting concerts, theaters, and department stores was sufficient to absorb my interest. Professor Vibens's hospitality was so sincerely extended that I did not hesitate to accept, though I assured him that I would repay it as soon as I got established in this world. In a few days I was thoroughly convinced that there was no way back home. Here I must stay, at least until I learned as much as Woleshensky knew about crossing dimensions. Professor Vibens eventually secured for me a position at the university.

It was shortly after I had accepted the position as instructor in experimental physics and had begun to get broken into my

work that I noticed a strange commotion among the people of the city. I have always been a studious recluse, observing people as phenomena rather than participating in their activities. So for some time I noted only in a subconscious way the excited gathering in groups, the gesticulations and blazing eyes, the wild sale of extra editions of papers, the general air of disturbance. I even failed to take an active interest in these things when I made a railroad journey of three hundred miles and spent a week in another city; so thoroughly at home did I feel in this world that when the advisability arose of my studying laboratory methods in another university, I made the trip alone. So absorbed was I in my laboratory problems that I only noted with half an eye the commotion and excitement everywhere, and merely recollected it later. One night it suddenly popped into my head that the country was aroused over something.

That night I was with the Vibens family in their living room. John tuned in the radio. I wasn't listening to the thing very much; I had troubles of my own. $F = \frac{gm_1m_2}{r^2}$ was familiar

enough to me. It meant the same and held as rigidly here as in my old world. But what was the name of the bird who had formulated that law? Back home it was Newton. Tomorrow in class I would have to be thoroughly familiar with his name. Pasvieux, that's what it was. What messy surnames. It struck me that it was lucky that they expressed the laws of physics in the same form and even in the same algebraic letters, or I might have had a time getting them confused—when all of a sudden the radio blatantly bawled: "THE GOSTAK DISTURBS THE DOSHES!"

John jumped to his feet.

"Damn right!" he shouted, slamming the table with his fist.

Both his father and mother annihilated him with withering glances, and he slunk from the room. I gazed stupefied. My stupefaction continued while the professor shut off the radio and both of them excused themselves from my presence. Then suddenly I was alert.

I grabbed a bunch of newspapers, having seen none for

several days. Great sprawling headlines covered the front pages:

"THE GOSTAK DISTIMS THE DOSHES."

For a moment I stopped, trying to recollect where I had heard those words before. They recalled something to me. Ah, yes! That very afternoon there had been a commotion beneath my window on the university campus. I had been busy checking over an experiment so that I might be sure of its success at tomorrow's class, and looked out rather absently to see what was going on. A group of young men from a dismissed class was passing and had stopped for a moment.

"I say, the gostak distims the doshes!" said a fine-looking young fellow. His face was pale and strained.

The young man facing him sneered derisively, "Aw, your grandmother! Don't be a feeble—"

He never finished. The first fellow's fist caught him in the cheek. Several books dropped to the ground. In a moment the two had clinched and were rolling on the ground, fists flying up and down, smears of blood appearing here and there. The others surrounded them and for a moment appeared to enjoy the spectacle, but suddenly recollected that it looked rather disgraceful on a university campus, and after a lively tussle separated the combatants. Twenty of them, pulling in two directions, tugged them apart.

The first boy strained in the grasp of his captors; his white face was flecked with blood and he panted for breath.

"Insult!" he shouted, giving another mighty heave to get free. He looked contemptuously around. "The whole bunch of you ought to learn to stand up for your honor. The gostak distims the doshes!"

That was the astonishing incident that these words called to my mind. I turned back to my newspapers.

"Slogan Sweeps the Country," proclaimed the subheads. "Ringling Expression of National Spirit! Enthusiasm Spreads Like Wildfire! The new patriotic slogan is gaining ground rapidly," the leading article went on. "The fact that it has covered the country almost instantaneously seems to indicate

that it fills a deep and long-felt want in the hearts of the people. It was first uttered during a speech in Walkington by that majestic figure in modern statesmanship, Senator Harob. The beautiful sentiment, the wonderful emotion of this sublime thought, are epoch-making. It is a great conception, doing credit to a great man, and worthy of being the guiding light of a great people—"

That was the gist of everything I could find in the papers. I fell asleep still puzzled about the thing. I was puzzled because—as I see now and didn't see then—I was trained in the analytical methods of physical science and knew little or nothing about the ways and emotions of the masses of the people.

In the morning the senseless expression popped into my head as soon as I awoke. I determined to waylay the first member of the Vibens family who showed up, and demand the meaning of the thing. It happened to be John.

"John, what's a gostak?"

John's face lighted up with pleasure. He threw out his chest and a look of pride replaced the pleasure. His eyes blazed, and with a consuming enthusiasm he shook hands with me, as deacons shake hands with a new convert—a sort of glad welcome.

"The gostak!" he exclaimed. "Hurrah for the gostak!"

"But what is a gostak?"

"Not *a* gostak! *The* gostak. The gostak is—the distimmer of the doshes—see! He distims 'em, see?"

"Yes, yes. But what is distimming? How do you distim?"

"No, no! Only the gostak can distim. The gostak distims the doshes. See?"

"Ah, I see!" I exclaimed. Indeed, I pride myself on my quick wit. "What are doshes? Why, they are the stuff distimmed by the gostak. Very simple!"

"Good for you!" John slapped my back in huge enthusiasm. "I think it wonderful for you to understand us so well after being here only a short time. You are very patriotic."

I gritted my teeth tightly to keep myself from speaking.

"Professor Vibens, what's a gostak?" I asked in the solitude of his office an hour later.

He looked pained.

He leaned back in his chair and looked me over elaborately, and waited some time before answering.

"Hush!" he finally whispered. "A scientific man may think what he pleases, but if he says too much, people in general may misjudge him. As a matter of fact, a good many scientific men are taking this so-called patriotism seriously. But a mathematician cannot use words loosely; it has become second nature with him to inquire closely into the meaning of every term he uses."

"Well, doesn't that jargon mean anything at all?" I was beginning to be puzzled in earnest.

"To me it does not. But it seems to mean a great deal to the public in general. It's making people do things, is it not?"

I stood a while in stupefied silence. That an entire great nation should become fired up over a meaningless piece of nonsense! Yet the astonishing thing was that I had to admit there was plenty of precedent for it in the history of my own z-dimensional world. A nation exterminating itself in civil wars to decide which of two profligate royal families should be privileged to waste the people's substance from the throne; a hundred thousand crusaders marching to death for an idea that to me means nothing; a meaningless, untrue advertising slogan that sells millions of dollars' worth of cigarettes to a nation, to the latter's own detriment—haven't we seen it over and over again?

"There's a public lecture on this stuff tonight at the First Church of the Salvation," Professor Vibens suggested.

"I'll be there," I said. "I want to look into the thing."

That afternoon there was another flurry of "extras" over the street; people gathered in knots and gesticulated with open newspapers.

"War! Let 'em have it!" I heard men shout.

"Is our national honor a rag to be muddled and trampled on?" the editorials asked.

As far as I could gather from reading the papers, there was a group of nations across an ocean that was not taking the gostak seriously. A ship whose pennant bore the slogan had been refused entrance to an Engtalian harbor because it flew no national ensign. The Executive had dispatched a diplomatic

note. An evangelist who had attempted to preach the gospel of the distimmed doshes at a public gathering in Itland had been ridden on a rail and otherwise abused. The Executive was dispatching a diplomatic note.

Public indignation waxed high. Derogatory remarks about "wops" were flung about. Shouts of "Holy war!" were heard. I could feel the tension in the atmosphere as I took my seat in the crowded church in the evening. I had been assured that the message of the gostak and the doshes would be thoroughly expounded so that even the most simple-minded and uneducated people could understand it fully. Although I had my hands full at the university, I was so puzzled and amazed at the course events were taking that I determined to give the evening to finding out what the slogan meant.

There was a good deal of singing before the lecture began. Mimeographed copies of the words were passed about, but I neglected to preserve them and do not remember them. I know there was one solemn hymn that reverberated harmoniously through the great church, a chanting repetition of "The Gostak Distims the Doshes." There was another stirring martial air that began, "Oh, the Gostak! Oh, the Gostak!"—and ended with a swift cadence on "The Gostak Distims the Doshes!" The speaker had a rich, eloquent voice and a commanding figure. He stepped out and bowed solemnly.

"The gostak distims the doshes," he pronounced impressively. "Is it not comforting to know that there is a gostak; do we not glow with pride because the doshes are distimmed? In the entire universe there is no more profoundly significant fact: the gostak distims the doshes. Could anything be more complete yet more tersely emphatic! The gostak distims the doshes!" Applause. "This thrilling truth affects our innermost lives. What would we do if the gostak did not distim the doshes? Without the gostak, without doshes, what would we do? What would we think? How would we feel?" Applause again.

At first I thought this was some kind of introduction. I was inexperienced in listening to popular speeches, lectures, and sermons. I had spent most of my life in the study of physics and its accessory sciences. I could not help trying to figure out the meaning of whatever I heard. When I found

none, I began to get impatient. I waited some more, thinking that soon he would begin on the real explanation. After thirty minutes of the same sort of stuff as I have just quoted, I gave up trying to listen. I just sat and hoped he would soon be through. The people applauded and grew more excited. After an hour I stirred restlessly; I slouched down in my seat and sat up by turns. After two hours I grew desperate; I got up and walked out. Most of the people were too excited to notice me. Only a few of them cast hostile glances at my retreat.

The next day the mad nightmare began for me. First there was a snowstorm of extras over the city, announcing the sinking of a merchantman by an Engtalian cruiser. A dispute had arisen between the officers of the merchantman and the port officials, because the latter had jeered disrespectfully at the gostak. The merchantman picked up and started out without having fulfilled all the customs requirements. A cruiser followed it and ordered it to return. The captain of the merchantman told them that the gostak distims the doshes, whereupon the cruiser fired twice and sank the merchantman. In the afternoon came the extras announcing the Executive's declaration of war.

Recruiting offices opened; the university was depleted of its young men; uniformed troops marched through the city, and railway trains full of them went in and out. Campaigns for raising war loans; home-guards, women's auxiliaries, ladies' aid societies making bandages, young women enlisting as ambulance drivers—it was indeed war; all of it to the constantly repeated slogan: "The gostak distims the doshes."

I could hardly believe that it was really true. There seemed to be no adequate cause for a war. The huge and powerful nation had dreamed a silly slogan and flung it in the world's face. A group of nations across the water had united into an alliance, claiming they had to defend themselves against having forced upon them a principle they did not desire. The whole thing at the bottom had no meaning. It did not seem possible that there would actually be a war; it seemed more like going through a lot of elaborate play-acting.

Only when the news came of a vast naval battle of doubtful issue, in which ships had been sunk and thousands of lives lost, did it come to me that they meant business. Black bands

of mourning appeared on sleeves and in windows. One of the allied countries was invaded and a front line set up. Reports of a division wiped out by an airplane attack; of forty thousand dead in a five-day battle; of more men and more money needed, began to make things look real. Haggard men with bandaged heads and arms in slings appeared on the streets, a church and an auditorium were converted into hospitals, and trainloads of wounded were brought in. To convince myself that this thing was so, I visited these wards and saw with my own eyes the rows of cots, the surgeons working on ghastly wounds, the men with a leg missing or with a hideously disfigured face.

Food became restricted; there was no white bread, and sugar was rationed. Clothing was of poor quality; coal and oil were obtainable only on government permit. Businesses were shut down. John was gone; his parents received news that he was missing in action.

Real it was; there could be no more doubt of it. The thing that made it seem most real was the picture of a mangled, hopeless wreck of humanity sent back from the guns, a living protest against the horror of war. Suddenly someone would say, "The gostak distims the doshes!" and the poor wounded fragment would straighten up and put out his chest with pride, and an unquenchable fire would blaze in his eyes. He did not regret having given his all for that. How could I understand it?

And real it was when the draft was announced. More men were needed; volunteers were insufficient. Along with the rest, I complied with the order to register, doing so in a mechanical fashion, thinking little of it. Suddenly the coldest realization of the reality of it was flung at me when I was informed that my name had been drawn and that I would have to go!

All this time I had looked upon this mess as something outside of me, something belonging to a different world, of which I was not a part. Now here was a card summoning me to training camp. With all this death and mangled humanity in the background, I wasn't even interested in this world. I didn't belong here. To be called upon to undergo all the horrors of military life, the risk of a horrible death, for no reason at all! For a silly jumble of meaningless sounds.

I spent a sleepless night in maddened shock from the thing. In the morning a wild and haggard caricature of myself looked back at me from the mirror. But I had revolted. I intended to refuse service. If the words "conscientious objector" ever meant anything, I certainly was one. Even if they shot me for treason at once, that would be a fate less hard to bear than going out and giving my strength and my life for—for nothing at all.

My apprehensions were quite correct. With my usual success at self-control over a seething interior, I coolly walked to the draft office and informed them that I did not believe in their cause and could not see my way to fight for it. Evidently they had suspected something of the sort already, for they had the irons on my wrists before I had hardly done with my speech.

"Period of emergency," said a beefy tyrant at the desk. "No time for stringing out a civil trial. Court-martial!"

He said it to me vindictively, and the guards jostled me roughly down the corridor; even they resented my attitude. The court-martial was already waiting for me. From the time I walked out of the lecture at the church I had been under secret surveillance, and they knew my attitude thoroughly. That is the first thing the president of the court informed me.

My trial was short. I was informed that I had no valid reason for objecting. Objectors because of religion, because of nationality and similar reasons, were readily understood; a jail sentence to the end of the war was their usual fate. But I admitted that I had no intrinsic objection to fighting; I merely jeered at their holy cause. That was treason unpardonable.

"Sentenced to be shot at sunrise!" the president of the court announced.

The world spun around with me. But only for a second. My self-control came to my aid. With the curious detachment that comes to us in such emergencies, I noted that the court-martial was being held in Professor Vibens's office—that dingy little Victorian room where I had first told my story of traveling by relativity and had first realized that I had come to the t -dimensional world. Apparently it was also to be the last room I was to see in this same world, I had no false hopes

that the execution would help me back to my own world, as such things sometimes do in stories. When life is gone, it is gone, whether in one dimension or another. I would be just as dead in the z dimension as in the t dimension.

"Now, Einstein, or never!" I thought. "Come to my aid, O Riemann! O Lobachevski! If anything will save me it will have to be a tensor or a geodesic."

I said it to myself rather ironically. Relativity had brought me here. Could it get me out of this?

Well! Why not?

If the form of a natural law, yea, if a natural object varies with the observer who expresses it, might not the truth and the meaning of the gostak slogan also be a matter of relativity? It was like making the moon ride the treetops again. If I could be a better relativist and put myself in these people's places, perhaps I could understand the gostak. Perhaps I would even be willing to fight for him or it.

The idea struck me suddenly. I must have straightened up and some bright change must have passed over my features, for the guards who led me looked at me curiously and took a firmer grip on me. We had descended the steps of the building and had started down the walk.

Making the moon ride the treetops! That was what I needed now. And that sounded as silly to me as the gostak. And the gostak did not seem so silly. I drew a deep breath and felt very much encouraged. The viewpoint of *relativity* was somehow coming back to me. Necessity manages much. I could understand how one might fight for the idea of a gostak distimming the doshes. I felt almost like telling these men. Relativity is a wonderful thing. They led me up the slope, between the rows of poplars.

Then it all suddenly popped into my head: how I had gotten here by changing my coordinates, insisting to myself that I was going *upward*. Just like making the moon stop and making the trees ride when you are out riding at night. Now I was going upward. In my own world, in the z dimension, this same poplar was *down* the slope.

"It's downward!" I insisted to myself. I shut my eyes and imagined the building behind and *above* me. With my eyes

shut, it did seem downward. I walked for a long time before opening them. Then I opened them and looked around.

I was at the end of the avenue of poplars. I was surprised. The avenue seemed short. Somehow it had become shortened; I had not expected to reach the end so soon. And where were the guards in olive uniforms? There were none.

I turned around and looked back. The slope extended on backward above me. I had indeed walked downward. There were no guards, and the fresh, new building was on the hill behind me.

Woleshensky stood on the steps.

"Now what do you think of a t dimension?" he called out to me.

Woleshensky!

And a *new* building, modern! Vibens's office was in an old Victorian building. What was there in common between Vibens and Woleshensky? I drew a deep breath. The comforting realization spread gratefully over me that I was back in my native dimension. The gostak and the war were somewhere else. Here were peace and Woleshensky.

I hastened to pour out the story to him.

"What does it all mean?" I asked when I was through. "Somehow—vaguely—it seems that it ought to mean something."

"Perhaps," he said in his kind, sage way, "we really exist in four dimensions. A part of us and our world that we cannot see and are not conscious of projects on into another dimension, just like the front edges of the books in the bookcase, turned away from us. You know that the section of a conic cut by the y plane looks different from the section of the same conic cut by the z plane? Perhaps what you saw was our own world and our own selves intersected by a different set of coordinates. *Relativity*, as I told you in the beginning."

SUMMERTIME ON ICARUS

Arthur C. Clarke

ARTHUR C. CLARKE

According to reliable sources, this British-American, who was born in 1917, intended to become a professional astronomer, but World War II interrupted his ambitions by plunging him into various other types of scientific work, including radar. After the war, he passed with "honours," (as they spell it in England) in physics and pure and applied mathematics. During the same period he was one of the founders, later Treasurer, and still later Chairman, of the British Interplanetary Society. It was around this time that Clarke proposed the use of space satellites for communications. According to another scientist-author in this collection, John R. Pierce, who wrote a piece called "Communications Satellites" in the October, 1961, Scientific American, Clarke published in a 1945 issue of the British Wireless World a plan for placing three manned satellites in an orbit about 22,000 miles above the earth's surface. He demonstrated that these satellites would, if moving in the plane of the Equator, make communication possible with every area on the earth's surface except small regions around the poles. Today, of course, space scientists are working on a highly modified approach which involves more satellites, unmanned, at much lower altitudes; but Clarke's early paper was remarkably prophetic nevertheless.

Despite his present preoccupation with skin diving as described in the Introduction to this book, Clarke is still primarily a writer of science fiction, space nonfiction, and underwater adventure both true and fictional. For this the readers of the following thriller about the asteroid which comes closer to the sun than any yet discovered (all that part of the story is true) should be grateful. Arthur Clarke is one of the masters of modern science fiction.

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Summertime on Icarus

WHEN COLIN SHERRARD opened his eyes after the crash, he could not imagine where he was. He seemed to be lying, trapped in some kind of vehicle, on the summit of a rounded hill which sloped steeply away in all directions. Its surface was seared and blackened, as if a great fire had swept over it. Above him was a jet-black sky crowded with stars; one of them hung like a tiny, brilliant sun, low down on the horizon.

Could it be the sun? Was he so far from Earth? No—that was impossible. Some nagging memory told him that the sun was very close—hideously close—not so distant that it had shrunk to a star. And with that thought, full consciousness returned. Sherrard knew exactly where he was, and the knowledge was so terrible that he almost fainted again.

He was nearer to the sun than any man had ever been. His damaged space-pod—a miniature spaceship, only ten feet long—was lying on no hill, but the steeply-curving surface of a world only two miles in diameter. That brilliant star sinking swiftly in the west was the light of “Prometheus,” the ship that had brought him here across so many millions of miles of space. She was hanging up there among the stars, wondering why his pod had not returned like a homing pigeon to its roost. In a few minutes she would have passed from sight, dropping below the horizon in her perpetual game of hide-and-seek with the sun.

That was a game that he had lost. He was still on the night side of the asteroid, in the cool safety of its shadow, but the short night would be ending soon. The four-hour day of Icarus was spinning him swiftly towards that dreadful dawn, when a sun thirty times larger than ever shone upon Earth would blast these rocks with fire. Sherrard knew all too well why everything around him was burned and blackened. Icarus was still a week from perihelion but the temperature at noon had already reached a thousand degrees Fahrenheit.

Though this was no time for humour, he suddenly remembered Captain McClellan’s description of Icarus: “The

hottest piece of real estate in the solar system." The truth of that jest had been proved, only a few days before, by one of those simple and unscientific experiments that are so much more impressive than any number of graphs and instrument readings.

Just before daybreak, someone had propped a piece of wood on the summit of one of the tiny hills. Sherrard had been watching, from the safety of the night-side, when the first rays of the rising sun had touched the hilltop. When his eyes had adjusted to the sudden detonation of light, he saw that the wood was already beginning to blacken and char. Had there been an atmosphere here, the stick would have burst into flames; such was dawn upon Icarus.

Yet it had not been impossibly hot at the time of their first landing when they were passing the orbit of Venus five weeks ago. "Prometheus" had overtaken the asteroid as it was beginning its plunge towards the sun, had matched speed with the little world and had touched down upon its surface as lightly as a snowflake. (A snowflake on Icarus—that was quite a thought.) Then the scientists had fanned out across the fifteen square miles of jagged nickel-iron that covered most of the asteroid's surface, setting up their instruments and check points, collecting samples and making endless observations.

Everything had been carefully planned, years in advance, as part of the International Astrophysical Decade. Here was a unique opportunity for a research ship to get within a mere seventeen million miles of the sun, protected from its fury by a two-mile-thick shield of rock and iron. In the shadow of Icarus, the ship could ride safely round the central fire which warmed all the planets, and upon which the existence of all life depended. As the Prometheus of legend had brought the gift of fire to mankind, so the ship that bore his name would return to Earth with other unimagined secrets from the heavens.

There had been plenty of time to set up the instruments and make the surveys before "Prometheus" had to take off and seek the permanent shade of night. Even then, it was still possible for men in the tiny self-propelled space-pods to work on the night-side for an hour or so, as long as they were not

overtaken by the advancing line of sunrise. That had seemed a simple enough condition to meet, on a world where dawn marched forward at only a mile an hour; but Sherrard had failed to meet it, and the penalty was death.

He was still not quite sure what had happened. He had been replacing a seismograph transmitter at Station 145, unofficially known as Mount Everest because it was a full ninety feet above the surrounding territory. The job had been a perfectly straightforward one, even though he had to do it by remote control through the mechanical arms of his pod. Sherrard was an expert at manipulating these; he could tie knots with his metal fingers almost as quickly as with his flesh-and-bone ones. The task had taken little more than twenty minutes, and then the radio-seismograph was on the air again, monitoring the tiny quakes and shudders that racked Icarus in ever-increasing numbers as the asteroid approached the sun. It was small satisfaction to know that he had now made a king-sized addition to the record.

When he had checked the signals, he had carefully replaced the sun-screens around the instrument. It was hard to believe that two flimsy sheets of polished metal foil, no thicker than paper, could turn aside a flood of radiation that would melt lead or tin within seconds. But the first screen reflected more than ninety per cent of the sunlight falling upon its mirror-surface and the second turned back most of the rest, so that only a harmless fraction of the heat passed through.

He had reported completion of the job, received an acknowledgment from the ship, and prepared to head for home. The brilliant floodlights hanging from "Prometheus"—without which the night-side of the asteroid would have been in utter darkness—had been an unmistakable target in the sky. The ship was only two miles up, and in this feeble gravity he could have jumped that distance, had he been wearing a planetary-type spacesuit with flexible legs. As it was, the low-powered micro-rockets of his pod would get him there in a leisurely five minutes.

He had aimed the pod with its gyros, set the rear jets at Strength Two, and pressed the firing button. There had been a violent explosion somewhere in the vicinity of his

feet and he had soared away from Icarus—but not towards the ship. Something was horribly wrong; he was tossed to one side of the vehicle, unable to reach the controls. Only one of the jets was firing, and he was pinwheeling across the sky, spinning faster and faster under the off-balanced drive. He tried to find the cutoff, but the spin had completely disorientated him. When he was able to locate the controls, his first reaction made matters worse—he pushed the throttle over to full, like a nervous driver stepping on the accelerator instead of the brake. It took only a second to correct the mistake and kill the jet, but by then he was spinning so rapidly that the stars were wheeling round in circles.

Everything had happened so quickly that there was no time for fear, no time even to call the ship and report what was happening. He took his hands away from the controls; to touch them now would only make matters worse. It would take two or three minutes of cautious jockeying to unravel his spin, and from the flickering glimpses of the approaching rocks it was obvious that he did not have as many seconds. Sherrard remembered a piece of advice at the front of the *Spaceman's Manual*: "When you don't know what to do, *do nothing*." He was still doing it when Icarus fell upon him, and the stars went out.

It had been a miracle that the pod was unbroken, and that he was not breathing space. (Thirty minutes from now he might be glad to do so, when the capsule's heat insulation began to fail.) There had been some damage, of course. The rear-view mirrors, just outside the dome of transparent plastic that enclosed his head, were both snapped off so that he could no longer see what lay behind him without twisting his neck. This was a trivial mishap; far more serious was the fact that his radio antennae had been torn away by the impact. He could not call the ship, and the ship could not call him. All that came over the radio was a faint crackling, probably produced inside the set itself. He was absolutely alone, cut off from the rest of the human race.

It was a desperate situation, but there was one faint ray of hope. He was not, after all, completely helpless. Even if he could not use the pod's rockets—he guessed that the

starboard motor had blown back and ruptured a fuel line, something the designers said was impossible—he was still able to move. He had his arms.

But which way should he crawl? He had lost all sense of location, for though he had taken off from Mount Everest he might now be thousands of feet away from it. There were no recognizable landmarks in his tiny world; the rapidly sinking star of "Prometheus" was his best guide, and if he could keep the ship in view he would be safe. It would be only a matter of minutes before his absence was noted, if indeed it had not been discovered already. Yet without radio, it might take his colleagues a long time to find him; small though Icarus was, its fifteen square miles of fantastically rugged no man's land could provide an effective hiding-place for a ten-foot cylinder. It might take an hour to locate him—which meant that he would have to keep ahead of the murderous sunrise.

He slipped his fingers into the controls that worked his mechanical limbs. Outside the pod, in the hostile vacuum that surrounded him, his substitute arms came to life. They reached down, thrust against the iron surface of the asteroid, and levered the pod from the ground. Sherrard flexed them and the capsule jerked forward, like some weird, two-legged insect . . . first the right arm, then the left, then the right.

It was less difficult than he had feared, and for the first time he felt his confidence return. Though his mechanical arms had been designed for light precision work, very little pull was needed to set the capsule moving in this weightless environment. The gravity of Icarus was ten thousand times weaker than Earth's: Sherrard and his space-pod weighed less than an ounce here, and once he had set himself in motion he floated forward with an effortless, dreamlike ease.

Yet that very effortlessness had its dangers. He had travelled several hundred yards, and was rapidly overhauling the sinking star of the "Prometheus," when overconfidence betrayed him. (Strange how quickly the mind could switch from one extreme to the other; a few minutes ago he had been steeling himself to face death—now he was wondering if he would be late for dinner.) Perhaps the novelty of the

movement, so unlike anything he had ever attempted before, was responsible for the catastrophe; or perhaps he was still suffering from the after-effects of the crash.

Like all astronauts, Sherrard had learned to orientate himself in space, and had grown accustomed to living and working when the Earthly conceptions of Up and Down were meaningless. On a world such as Icarus, it was necessary to pretend that there was a real, honest-to-goodness planet "beneath" your feet, and that when you moved you were travelling over a horizontal plain. If this innocent self-deception failed, you were heading for space-vertigo.

The attack came without warning, as it usually did. Quite suddenly, Icarus no longer seemed to be beneath him, the stars no longer above. The universe tilted through a right angle; he was moving straight *up* a vertical cliff, like a mountaineer scaling a rock-face, and though Sherrard's reason told him that this was pure illusion, all his senses screamed that it was true. In a moment gravity must drag him off this sheer wall, and he would drop down mile upon endless mile until he smashed into oblivion.

Worse was to come; the false vertical was still swinging like a compass needle that had lost the pole. Now he was on the *underside* of an immense rocky roof, like a fly clinging to a ceiling; in another moment it would have become a wall again—but this time he would be moving straight down it, instead of up.

He had lost all control over the pod, and the clammy sweat that had begun to dew his brow warned him that he would soon lose control over his body. There was only one thing to do; he clenched his eyes tightly shut, squeezed as far back as possible into the tiny closed world of the capsule, and pretended with all his might that the universe outside did not exist. He did not even allow the slow, gentle crunch of his second crash to interfere with his self-hypnosis.

When he again dared to look outside, he found that the pod had come to rest against a large boulder. Its mechanical arms had broken the force of the impact, but at a cost that was more than he could afford to pay. Though the capsule was virtually weightless here, it still possessed its normal five hundred pounds of inertia, and it had been moving at perhaps

four miles an hour. The momentum had been too much for the metal arms to absorb; one had snapped, and the other was hopelessly bent.

When he saw what had happened, Sherrard's first reaction was not despair, but anger. He had been so certain of success, when the pod had started its glide across the barren face of Icarus. And now this, all through a moment of physical weakness. But Space made no allowance for human frailties or emotions, and a man who did not accept that fact had no right to be here.

At least he had gained precious time in his pursuit of the ship; he had put an extra ten minutes, if not more, between himself and dawn. Whether that ten minutes would merely prolong the agony, or whether it would give his shipmates the extra time they needed to find him, he would soon know.

Where were they? Surely they had started the search by now. He strained his eyes towards the brilliant star of the ship, hoping to pick out the fainter lights of space-pods moving towards him—but nothing else was visible against the slowly turning vault of heaven.

He had better look to his own resources, slender though they were. Only a few minutes were left before the "Prometheus" and her trailing lights would sink below the edge of the asteroid and leave him in darkness. It was true that the darkness would be all too brief, but before it fell upon him he might find some shelter against the coming day. This rock into which he had crashed, for example.

Yes, it would give some shade, until the sun was halfway up the sky. Nothing could protect him if it passed right overhead, but it was just possible that he might be in a latitude where the sun never rose far above the horizon at this season of Icarus' four-hundred-and-nine-day year. Then he might survive the brief period of daylight; that was his only hope, if the rescuers did not find him before dawn.

There went "Prometheus" and her lights, below the edge of the world. With her going, the now unchallenged stars blazed forth with redoubled brilliance. More glorious than any of them—so lovely that even to look upon it almost brought tears to his eyes—was the blazing beacon of Earth, with its companion moon beside it. He had been born on

one, and had walked on the other; would he see either again?

Strange that until now he had given no thought to his wife and children, and to all that he loved in the life that now seemed so far away. He felt a spasm of guilt, but it passed swiftly. The ties of affection were not weakened, even across the hundred million miles of space that now sundered him from his family. At this moment, they were simply irrelevant. He was now a primitive, self-centered animal fighting for his life, and his only weapon was his brain. In this conflict, there was no place for the heart; it would merely be a hindrance, spoiling his judgment and weakening his resolution.

And then he saw something that banished all thoughts of his distant home. Reaching up above the horizon behind him, spreading across the stars like a milky mist, was a faint and ghostly cone of phosphorescence. It was the herald of the sun—the beautiful, pearly phantom of the corona, visible on Earth only during the rare moments of a total eclipse. When the corona was rising, the sun would not be far behind, to smite this little land with fury.

Sherrard made good use of the warning. Now he could judge, with some accuracy, the exact point where the sun would rise. Crawling slowly and clumsily on the broken stumps of his metal arms, he dragged the capsule round to the side of the boulder that should give the greatest shade. He had barely reached it when the sun was upon him like a beast of prey, and his tiny world exploded into light.

He raised the dark filters inside his helmet, one thickness after another, until he could endure the glare. Except where the broad shadow of the boulder lay across the asteroid, it was like looking into a furnace. Every detail of the desolate land around him was revealed by that merciless light; there were no greys, only blinding whites and impenetrable blacks. All the shadowed cracks and hollows were pools of ink, while the higher ground already seemed to be on fire. Yet it was only a minute after dawn.

Now Sherrard could understand how the scorching heat of a billion summers had turned Icarus into a cosmic cinder, baking the rocks until the last traces of gas had bubbled out of them. Why should men travel, he asked himself bitterly,

across the gulf of stars at such expense and risk—merely to land on a spinning slag heap? For the same reason, he knew, that they had once struggled to reach Everest and the Poles and the far places of the Earth—for the excitement of the body that was adventure, and the more enduring excitement of the mind that was discovery. It was an answer that gave him little consolation, now that he was about to be grilled like a joint on the turning spit of Icarus.

Already he could feel the first breath of heat upon his face. The boulder against which he was lying gave him protection from direct sunlight, but the glare reflected back at him from those blazing rocks only a few yards away was striking through the transparent plastic of the dome. It would grow swiftly more intense as the sun rose higher; he had even less time than he had thought, and with the knowledge came a kind of numb resignation that was beyond fear. He would wait—if he could—until the sunrise engulfed him, and the capsule's cooling unit gave up the unequal struggle; then he would crack the pod and let the air gush out into the vacuum of space.

Nothing to do but to sit and think in the minutes that were left to him before his pool of shadow contracted. He did not try to direct his thoughts, but let them wander where they willed. How strange that he should be dying now, because back in the 1940's—years before he was born—a man at Palomar had spotted a streak of light on a photographic plate, and had named it so appropriately after the boy who flew too near the sun.

One day, he supposed, they would build a monument here for him on this blistered plain. What would they inscribe upon it? "Here died Colin Sherrard, astronics engineer, in the cause of science." That would be funny, for he had never understood half the things that the scientists were trying to do.

Yet some of the excitement of their discoveries had communicated itself to him. He remembered how the geologists had scraped away the charred skin of the asteroid, and had polished the metallic surface that lay beneath. It had been covered with a curious pattern of lines and scratches. They wrote the history of Icarus, though only a geologist could

read it. They revealed, so Sherrard had been told, that this lump of iron and rock had not always floated alone in space. At some remote time in the past, it had been under enormous pressure—and that could mean only one thing. Billions of years ago it had been part of a much larger body, perhaps a planet like Earth. For some reason that planet had blown up, and Icarus and all the thousands of other asteroids were the fragments of that cosmic explosion.

Even at this moment, as the incandescent line of sunlight came closer, this was a thought that stirred his mind. What Sherrard was lying upon was the core of a world—perhaps a world that had once known life. In a strange, irrational way it comforted him to know that his might not be the only ghost to haunt Icarus until the end of time.

The helmet was misting up; that could only mean that the cooling unit was about to fail. It had done its work well; even now, though the rocks only a few yards away must be glowing a sullen red, the heat inside the capsule was not unendurable. When failure came, it would be sudden and catastrophic.

He reached for the red lever that would rob the sun of its prey—but before he pulled it, he would look for the last time upon Earth. Cautiously, he lowered the dark filters, adjusting them so that they still cut out the glare from the rocks, but no longer blocked his view of space.

The stars were faint now, dimmed by the advancing glow of the corona. And just visible over the boulder whose shield would soon fail him was a stub of crimson flame, a crooked finger of fire jutting from the edge of the sun itself. He had only seconds left.

There was the Earth, there was the Moon. Good-by to them both, and to his friends and loved ones on each of them. While he was looking at the sky, the sunlight had begun to lick the base of the capsule, and he felt the first touch of fire. In a reflex as automatic as it was useless, he drew up his legs, trying to escape the advancing wave of heat.

What was that? A brilliant flash of light, infinitely brighter than any of the stars, had suddenly exploded overhead. Miles above him, a huge mirror was sailing across the sky, reflecting the sunlight as it slowly turned through space. Such a thing

was utterly impossible; he was beginning to suffer from hallucinations, and it was time he took his leave. Already the sweat was pouring from his body, and in a few seconds the capsule would be a furnace.

He waited no longer, but pulled on the emergency release with all his waning strength, bracing himself at the same moment to face the end.

Nothing happened; the lever would not move. He tugged it again and again before he realized that it was hopelessly jammed. There was no easy way out for him, no merciful death as the air gushed from his lungs. It was then, as the true terror of his situation struck home to him, that his nerve finally broke and he began to scream like a trapped animal.

When he heard Captain McClellan's voice speaking to him, thin but clear, he knew that it must be another hallucination. Yet some last remnant of discipline and self-control checked his screaming; he clenched his teeth and listened to that familiar, commanding voice.

"Sherrard! Hold on, man. We've got a fix on you—but keep shouting."

"Here I am," he cried, "but hurry, for God's sake. I'm burning."

Deep down in what was left of his rational mind he realized what had happened. Some feeble ghost of a signal was leaking through the broken stubs of his antennae, and the searchers had heard his screams—as he was hearing their voices. That meant they must be very close indeed, and the knowledge gave him sudden strength.

He stared through the streaming plastic of the dome, looking once more for that impossible mirror in the sky. There it was again—and now he realized that the baffling perspectives of space had tricked his senses. The mirror was not miles away, nor was it huge. It was almost on top of him, and it was moving fast.

He was still shouting when it slid across the face of the rising sun, and its blessed shadow fell upon him like a cool wind that had blown out of the heart of winter, over leagues of snow and ice. Now that it was so close he recognized it at once; it was merely a large metal-foil radiation screen, no doubt hastily snatched from one of the instrument sites. In

the safety of its shadow, his friends had been searching for him.

A heavy-duty, two-man capsule was hovering overhead, holding the glittering shield in one set of arms and reaching for him with the other. Even through the misty dome and the haze of heat that still sapped his senses, he recognized Captain McClellan's anxious face, looking down at him from the other pod.

So this was what birth was like, for truly he had been re-born. He was too exhausted for gratitude—that would come later—but as he rose from the burning rocks his eyes sought and found the bright star of Earth. "Here I am," he said silently. "I'm coming back."

Back to enjoy and cherish all the beauties of the world he had thought was lost forever. No—not all of them.

He would never enjoy summer again.

THE NEUTRINO BOMB

Ralph S. Cooper

RALPH S. COOPER

It was a close thing for a while, during September, 1961, whether or not the following satire on government secrecy and on the nuclear cold war would be included in this book at all. When the Soviets began testing their atom bombs again, the little jape about the "big bang" neutrino bomb (which was first published in Los Alamos Scientific Laboratory's LASL News for July 13, 1961) seemed to become not only academic but also to be painfully belied by the facts.

However, on second thought, it has been retained and with good reason, for in essence the little piece does show the pointlessness of weapons secrecy, when the weapons are the outcome of known, basic scientific laws. Incidentally, this bit of straight-faced foolery was taken seriously in more than one scientific quarter where people other than scientists failed to see through it. . . .

Ralph Cooper is a nuclear physicist in the theoretical division of the Los Alamos Scientific Laboratory (which is not in the Nevada desert, but, instead, very high in the wooded mountains—altitude 7,400 feet and annual snowfall around 11 inches—of the state), where he does basic work in solid-state physics, electrochemistry, nuclear rocket propulsion, and so on. He is in his early thirties, married to a professional artist whom he met when they were both at Cooper Union in New York City, and shares with her his hobbies of hiking, camping, and so on. As far as we know, this is Dr. Cooper's (Ph.D. in physics, University of Illinois, 1957) first published piece of fiction. He has had several important papers in various scientific publications, however, so that he is already an "old pro" at writing, though not at science fiction.

The Neutrino Bomb

WHILE THE UNITED STATES continues its test moratorium, delaying its work toward revolutionary new types of nuclear weapons, reliable sources indicate that the Soviet Union may have leapfrogged our neutron bomb with the development and possible tests of the ultimate in clean, blastless nuclear weapons, a neutrino bomb.

Annihilation

In this device, a plasma or soup of high temperature hydrogen is created in which the electrons and protons, particles with opposite electric charge, annihilate each other with the emission only of a flood of high energy neutral particles called neutrinos.* These have tremendous penetrating power against which no shielding is effective and which makes the ordinary neutrons seem like marshmallows in comparison. In the one-cubic-foot tactical size containing four pounds of hydrogen, over a trillion-trillion high energy neutrinos are released. Neutrinos are liberated in fission bombs but in much smaller numbers, while in the neutrino bomb, almost all the energy goes into neutrinos and virtually nothing into blast waves, gamma rays, fission fragments, or fallout.

Before discounting this as a significant weapon, two things should be considered. First the absence of any physical damage is directly in line with the so-called peaceful motives avowed by the Soviets, who are privately calling this a "peace bomb." Secondly, that the detonation is not completely without observable effects since the disappearance of the hydrogen leaves a temporary vacuum into which the surrounding air rushes with a loud bang, informing the victims in the target area that they have been had.

Microton Yield

Reports coming from the Iron Curtain countries of loud noises heard deep inside Russia indicate that they not only

* The free neutrino was first detected by Los Alamos scientists in June, 1956.

may have tested the one-cubic-foot tactical size (for which the air implosion is equivalent to about one microton of TNT) but that they may already have tested large neutrino bombs in the milliton range, containing thousands of pounds of hydrogen. This information, coupled with the possibility of underground decoupling or even of detonation inside a steel pressure vessel to prevent the air implosion, indicates we may be crucially far behind in the development of this important weapon. Indeed, experiments of the latter kind are known to have been performed in Russia, although the scientists involved claimed their only interest was in the production of a high vacuum. Whether this was the "ultimate weapon" of which Khrushchev spoke in his March, 1960, speech cannot yet be determined, but the recent disdainful attitude of the Soviet diplomats implies their extreme confidence in the Russian military posture. Thus it behooves us to take whatever steps necessary to rectify this potential imbalance of military power or face the inevitable disastrous consequences.

**LAST YEAR'S
GRAVE UNDUG**

Chan Davis

CHAN DAVIS

Dr. Chandler Davis, Ph.D., one of the editors of Mathematical Reviews, unlike our other mathematician-contributor, the late Eric Temple Bell, is not addicted to writing science fiction of the "monster" type. In general, he tends either toward the satirical-sociological-political story, or the warmly "human" type (which anyone who has read his "Letter to Ellen" will remember with real affection). There are some stories of both types still awaiting selection from the magazines; but we had even better luck. It turned out that Dr. Davis had an unpublished story about the postatomic war efforts of a handful of people to reconstruct (or rather to hold on to) some remnants of civilization, which he was willing to have used in this book. The tale is so pointed in these days of argument about fallout shelters, survival through nuclear war, and so on, that it seemed of great importance to use it instead of some of the earlier, less topical stories. The events which he describes have not, of course, happened as yet; and, with some luck and considerable effort on the part of the world's leaders, it never will. However, it is still worth pointing out some of the horrifying possibilities likely to occur in the aftermath of a world-wide nuclear war. . . .

Last Year's Grave Undug

A STRANGER STEPPED into the clearing where Andy, Dom, and the old man had camped.

The stranger had a full beard and long hair, like Andy and his partners, but he wasn't nearly as well dressed. Denim shirt and pants, very worn. Instead of shoes, soles of rope or vine, tied on with thongs over the ankles. His eyes were pale blue and staring.

He stood with his back to an oak, facing the clearing, a gun under his arm; a cold and unknown person. The three travelers got to their feet. The gun, an old 22 apparently in pretty good condition, was pointed at Andy's belly.

It had been a long road from Akron, and on the way Andy had got used to guns. He kept his hands in the air and faced the stranger, but let his eyes stray over to the left to watch for a signal from the others.

The stranger was saying something; Andy didn't pay much attention; it was the kind of thing he'd heard before. "What are you doing around my land? If you have women and want to clear some land, there's all you could want downstream from here, t'other side of the creek. If you're just wandering and looking for what you can find, pass right on through. We got no room around here for your kind. A lot of city fellows who can't work for their board . . ." and so on.

Andy watched Dom's face. The lower lip drew down till the tips of Dom's front teeth were just visible under his black mustache. Andy repeated the signal to show he'd seen.

The stranger hadn't noticed anything. He was saying, "So I don't care what your reason is, you just—"

A corner of Dom's tongue appeared at the right side of his mouth.

Instantly Andy dropped full length on the ground to the right of where he'd been standing. The stranger's finger pressed the trigger—nothing happened. At the same time Dom crashed into the stranger's shoulder and twisted his right

wrist behind his back. The stranger whirled all the way around, getting free, but now he was off balance, staggering into the bushes, and Pop had the rifle, the stock raised as a club. The stranger gathered himself to rush the old man, but with Andy back on his feet the three of them made too much to tackle. He stood looking from one to another of them, waiting.

Pop opened the rifle's breech. "Loaded," he said, and closed it again. "I think here's what we'll do. When we're ready to leave our camp here, we'll throw this squirrel gun of yours off into the brush where it'll take you a while to find it; then we'll start walking. We won't steal your gun, that might be hard on you."

The stranger said nothing. Pop went on, "You're safe from us, because we don't want what you've got. At least," his voice got sad, "I'm pretty sure you haven't got what we want, and if you have I don't know what to do about it. We're going to do just what you said: pass right on through. We just don't want you watching us with a gun in your hand, because we don't know you. Fair enough?"

They couldn't tell if he'd even been listening. Andy put out his hand; the stranger made no attempt to do anything but shake hands.

"All set?" asked the old man.

Dom looked around the clearing, verified that the fire was out, and shouldered the pack. "All set."

"Okay, let's go." He handed the rifle to Andy, who seized it at the balance and heaved it javelin-style out of the clearing. A good toss. The stranger followed it with his eyes to where it crashed in a thicket of maple saplings. Andy and his companions were toughened for walking, and this would give them as much lead as they wanted.

"Good-by, stranger," said Andy. "Good luck to your farm or whatever you've got." But the stranger had already turned in the direction of the gun.

The old man led the way upstream along the river bank, walking fast away from unfriendliness. At this point upstream was almost due east, and the early morning sun stared

them straight in the face through a screen of maple and willow leaves. The trail was still good.

After a few minutes Andy spoke in a low voice. "His rifle was on safety?" he guessed.

"Right," said Dom. "I could see it from where I stood."

It was a common mistake these days. The safety catch was twice as important now as it used to be. Not only so you wouldn't hurt anybody with an accidental shot, but also so you wouldn't waste cartridges: you might not be able to get more.

Andy trudged on, looking at Pop's back in front of him, but seeing the blank blue eyes of the stranger above the loose beard that hid the expression of his mouth. What did he really know about him? Very little.

He was startled when Dom spoke behind him. "I bet that guy's following us. I didn't like the look in his eyes. I don't know if we should have given back his rifle."

"We did what we decided to do every time," answered Pop firmly. "If we'd taken his gun, he might have another one, and we're in trouble sure. If we leave the gun with him, he probably trusts us and we're that much safer."

"Yeah, he trusts us," said Andy, thinking of those eyes. "Did he look as if he'd ever trusted anybody?"

"He said we could settle if we wanted to, didn't he?" replied Pop. "Just another farmer. Andy, you never knew any farmers, before. It's you who don't trust *them*."

"Oh, I don't know. . . . How many farmers did *you* know before?"

"A good many." This was too vague to be convincing. Even coming from the old man, and in a good solid tone of voice, it didn't go far. Pop answered Andy's silence: "I was in the Army in World War II, after all. I never knew a guy was a farmer there unless he told me. Of course I might not have had the luck to run into such a hillbilly as our buddy back there. But I figure they're pretty much like you city kids."

Dom said, "Oh, there's some difference, for sure, because of the different conditions of life. A farmer sticks to one place. A guy from the city moves around, or at least he talks to somebody who's been around, and he'll *think* about switch-

ing jobs or moving. That guy back there was probably just like all the rest: more than anything else, he just didn't want anybody to mess with anything. For that matter, you can see how he feels."

Andy decided Dom had got this opinion from a book. There had been some of Dom's crew in his union, before, and sometimes Dom was just like them. He meant well, but he was too stubborn about his ideas. Besides . . .

He said, "I don't know if farmers are so different. They used to read the same newspapers we did."

He was stopped by the realization that Dom and he had now switched sides in the argument, still disagreeing. He was mildly disgusted with both Dom and himself. His last sentence hung in the air, and he might have sent braver ones after it, except that ahead of them their trail ended.

A road cut across at right angles, leading to the ruins of a bridge sinking in the stream on the right; straight ahead, another road continued their own path. Faster walking, they could hope.

They skirted a great mound of earth covered with yard-high underbrush, then scrambled up the embankment through more of the same purple-leaved bushes to the road. The old man sat on one of the few concrete roadside posts that remained upright, Dom and Andy stood beside him. Dom rested the pack on the next post. They looked around.

Downstream they couldn't see as much as they would have liked: the height of the embankment wasn't enough to lift them above the trees they'd walked under. To the south, across the river—more trees, telling them nothing. On their own side of the stream the road halved a wilderness of waist-high shrubs; only the frequent six-foot puffs of birch kept them from seeing miles of the stuff. A couple of houses and a barn rose above the screen not too far away. Closer to, a billboard and a route sign decayed quietly: The Dowell Advertising Company and the State Department of Highways ignored them, and it was easy to do the same.

"Nobody here," said the old man, and looked eastward instead. That road was pleasanter. Little fences of brown grass marked the cracks in the pavement, ruling off rectangular

plots of concrete, and in some of the plots there were pools of softer grass. There was shade, and the stream alongside; and the road pointed at the hills.

"All right to take this way?" Dom asked, a little afraid the suggestion would sound soft.

"Safe enough," agreed Pop. He hoisted himself to his feet, and they started, walking side by side now.

"Okay," said Andy, "but if we're going to be walking out in the open this way, let's be sure to make decent time."

"Right," said the old man, and he stepped up his pace before Andy could go on complaining.

They hiked on along the green road. The grade was steadily upward. Oven birds pattered in the underbrush and red squirrels overhead. After several miles of such a nice day, Andy said, "It's a nice day."

"Nice day and a nice road," said Dom.

Pop was encouraged to try asking Dom, "You decided you think that character was okay, huh. Why? Because he had his safety on?"

"No, that was a mistake. He was a guy who could be mean if somebody was interfering with him . . . or if he thought somebody was. He wants things to go on the way they're going. Probably a few families farming together back there. Guy's probably got a wife and kids. . . ."

His voice was getting wistful. Andy interrupted him. "With a daughter for you, huh? Think we should have stayed there with him?"

Pop cut in, "How about you, Andy? Do you?" It was the same old topic—the Destination—and Pop was always willing to crank up the discussion.

"Not on your life," was Andy's answer. "I'll stick to the plan we started with: get far enough south so it won't be too hard to last through the winters, far enough up in the hills that the armies from the cities won't get to us. Find a few other people who are willing to try to live a decent life."

"So?"

"What do you mean, so?"

"I mean, you're right, that's the plan, we're with you—but how do we know where to stop? How are you so sure that

character didn't have exactly the place you're talking about?"

"You know he didn't, Pop."

The old man smiled. "I asked you, Andy."

"Well, I don't know—it's obvious. For one thing, he was too eager to get rid of us. The place I want has got to want me. I don't mind if people ask me some questions first, but they should at least hope I answer right! They can't ask me to produce a wife at the entrance gate, cause I haven't got one; also they can't cuss the goldurn city slickers, cause that's what I am. Was."

"Right," said Dom. "I think they'll probably be city slickers themselves."

"Oh yeah? You want to go back to Lexington maybe?"

"Lexington's hell," Dom agreed. "Louisville's worse. I thought for a while there was no chance anywhere *but* towns like Lexington. You know, supply of cartridges, et cetera."

"They've got the ammo all right, and they use it on each other."

"Yeah, and all the towns are probably in the same loused-up condition. No more of that for me." No need to cover up the horror in his voice. In more than one basement hiding place this group had stayed alive only by silence and luck; by now they didn't expect of each other any poses of fearlessness. Dom said, "All I meant was, I think the people we ran to the hills to look for are people who ran to the hills to look for us. See my point? City kids like us, with the same plan."

Pop said, "There better be some hayseeds around somewhere. I don't know about you, but I'm useless on a farm unless somebody tells me what to do."

"If we run into a farmer who'll feed us for a few months' work, maybe we ought to take it," said Andy.

"No good! I've done that. But does that mean I've got twenty pounds of seed corn? Does it mean I'm *really* sure what I'd do with it next spring if I had it?"

Dom said, "My grandfather grew up on a farm, but I don't know if we can get by on that either."

"And yet it's more city slickers you're looking for!"

"I just say they're the likeliest. Your hillbilly is likely to be too ready to stay in his rut. Nothing changes his life too much, and he's agreeable."

It was the same thing he'd been maintaining a while back, and Andy's irritation was revived. "How'd you figure this out? Principles of Marxism-Leninism?"

"Could be," said Dom. "What have principles of Marxism-Leninism got to do with it?" But he couldn't pretend to have missed Andy's needling tone. "What the matter, Andy? Afraid I'm going to overthrow you by force and violence?"

This was meant to put Andy off balance, and it did, long enough for Pop to step in. "Andy, some things aren't important enough to fuss over. Didn't *you* ever make any mistakes in your life?"

Just the same, Dom was still on the defensive (so many years of the newspapers' attacks, and after that the death-faced Loyalty Legions hunting "saboteurs"). He said, "Mistakes? I don't know about that. I thought I had things pretty well figured out, before. I didn't want a war, and I guess I was right on that, okay. And—well, Marx and Lenin didn't predict anything like this mess, and neither did old Dom. The things I had figured out don't help much now."

"So forget them," said Andy.

"So don't fight about them," Dom came back.

"You're right of course." But Andy had decided too late to put a friendly tone on this, and it sounded grudging.

Dom said, "I might think *you* have a hole in your head sometimes, too."

"Even there you could be right."

Pop was perhaps chuckling but wasn't admitting it. He said, "Dom, you have a lot of your figuring out to do over again, huh? But it'll take a while. You haven't got anybody to talk to who's any help except Andy and me, and I don't help much. When you've got a roomful of people to bang the table and argue with, you can begin to get somewhere. Until then, there's one thing we *have* figured out: if we don't stay with each other, we'll be alone. We're like a family, in my language."

Dom watched his foot dribble a loose rock along the concrete. Then he said "Yeah" hastily, as if he'd just noticed an answer was called for. His face was serious. "I might have disagreed with you and Andy if I'd met you before, but I know we agree now on everything important. We're all in the

same boat. If only Andy would pull his weight in the pack-carrying . . ." He grinned.

Andy agreed, and took the pack from him, hitching it up onto his shoulders. It was also his turn to make a pledge of allegiance.

He said to Dom, "I love you like a brother." He had said that to people sarcastically a hundred times in his life and was embarrassed to find himself meaning it. So he added, "Of course back in Akron, you know, I never got along too well with my brother."

The old man let out the laugh he'd been hoarding. "How about your father, Andy?"

"He used to whip me in the back entry." They all laughed.

"Well, we start fresh now," Dom said cheerfully.

"We'd better." Andy's mood had changed again, he felt like the pictures of Atlas. "We better had. There's nothing else we can do."

The edge of the universe might be fifty miles back of them, and crumbling, but if he kept the pack on his shoulders and didn't slip, the sun would rise tomorrow.

Dom kicked another loose rock. It skidded off the road, and he found still another handy to his toe to continue the game. He said suddenly, "Gee, there's a lot of rubble on the road. Where'd it all come from? The bank to the left isn't that steep."

Pop said, "Flood, maybe. You probably didn't notice the cabin we passed back there, you were too busy being kids."

"Sure," Dom protested, "old ruined frame house, on the right, all fallen to the ground."

"Yeah, except it wasn't all that old, and it was very ruined. The roof wasn't in sight."

"Flood then, I guess. It can't have been *this* spring, though, or we'd see more signs."

Andy added, "This road is pretty high to be flooded." He looked down through the bushes to the sunny stream bed.

"It would have to be some flood," Dom agreed. "Say, remember that shambles at the bridge we passed? Could it have done that?"

"Some flood."

The next half mile showed clearer and clearer signs, though the road still rose high above water level. Finally they ran up against a roadblock—several giant trees which had fallen from the left across their way. The trunks were black and crumbling, except for one steely oak, and tiny new trees were sprouting from the wreckage.

Beyond the dark barrier the road rose steeply to a village.

Following an agreed procedure, they left the road and crept among trees to try to enter the village by the back way. They scrambled on all fours up a steep bank covered with loose shale that made silence difficult; then they stood, several yards apart, looking over a board fence at a two-story frame house. The back yard had gone back to weeds, the windows were broken, inside they saw a large walnut table lying on its side. Still the shingle roof, yellow clapboard walls, and cellar door were the same as if people lived here. They watched a long time before slipping around to the street and walking two more blocks to the center of town.

There it was even harder to believe they were alone. They could count the proofs; but the whole pattern of buildings, fire hydrants, and "Chili" signs made no sense without people. You still believed that if you dropped an envelope addressed to Chicago into the mailbox it'd be delivered—otherwise why was the mailbox there? Not that you were sure you knew anybody in Chicago, by now.

A one-story brick building was labeled "U.S. Post Office" in stone letters, while crayon-on-cardboard letters labeled it "Loyalty Legion HQ." Under new management. But now it was under *no* management.

"What's the name of this place?" asked Dom.

Andy read a sign: "Danciger."

"Danciger, K-Y, what got you? . . ."

"Suddenly I don't like small towns."

The healthy sun baked silence out of the town like pus out of a wound. They wanted to leave. Dom said, "Let's leave."

"Got to look around for food," said the old man. "Where should we try? The grocery store?"

Andy hesitated. "If we knew why everybody left, we'd

know better where to try. Were they afraid of an attack or just starved out, or what?"

"They probably went back to their cousin on the farm someplace—carting all the canned goods with them."

"They weren't flooded out," Andy realized suddenly. "There hasn't been any flood here." Everybody nodded.

"Well, the grocery store?" the old man asked again.

Dom stood as if he was fascinated, pointing at the ex-post office and its two obsolete signs. "Let's try here." Nobody felt like arguing.

The revolving door was jammed; they stepped through the broken glass. Inside the building it smelled the way the street outside had looked. Breathing through their mouths, they still had no trouble following the smell. It led to the office labeled "Postmaster" and "Legion Commandant—Keep Out," which was where the dead men were.

The travelers didn't look at the six dead men or at each other while they searched rapidly for food. It'd be here if it was anywhere; these late thugs with black holsters and olive-drab armbands outside their overcoats would have sifted the town for everything edible; but there was nothing, only a pile of empty cans in one corner.

Still they stayed a minute longer. The office looked as if desks and everything had been thrown from one wall to the other at least once, but the six bodies were laid out fairly regularly on the floor, as if they'd died in their sleep.

"How old are these, do you think?" asked Andy. "Last winter's? . . . Funny they have those armbands—same thing Beatty's Loyalty Legion wore in Lexington before Hickman's took over."

Pop suddenly bent over the nearest body and opened a few of its pockets with his left thumb and forefinger. From one of them he drew a crumbling sheet of paper, which he opened in front of Andy without looking at it.

Andy smiled sourly and began to read, mimicking Beatty's accent: "I pledge loylty to d'Constitooshn of d'United States of Americar an' to d'Way of Life f'r which it stans, an' to defend her against all enmenies foreign an' dmestic. I *am not now an' haven never been*—"

Dom snorted. "Beatty's Way of Life!" He shook his head, miserably.

But Pop just smiled. "I *thought* they were from Lexington. How would there be that many black holsters in Danciger?"

"I follow you," said Dom. "But what were they doing up here? They couldn't convince people in Lexington they were loyal by chasing saboteurs *this* far. Starving to death up in the hills—what were they bucking for, the Congressional Medal?"

"I doubt if they starved," said Pop quietly. "The holsters are empty. And if you look at the side of this guy's head—"

One look and they could see he was right. Which direction had these six men been shot from? The door? They looked around. The side windows? The back window?

Dom said for the second time, "Let's leave."

They left; gunfire over the snow in a deserted village was behind them, warm spring sun on glittering maple leaves ahead. But the old man said, "Somebody caught up with them, took them by surprise. Who was it? What do you think, Dom?"

"Not Hickman's Legion. They haven't been chasing *anybody this* far. I don't know. Geez, I thought we'd got away from the cities. . . ."

Andy needled him—"Those good old cities you like so much—" but sympathetically.

"Used to like so much."

"Yeah."

A side road cut off to the right, downhill. It was macadam, and it'd get them back to the river, so they took it without stopping to look at the toppled road sign. If they had, they'd have known what they were coming to a little sooner. As it was, they were in the middle of a discussion of when to eat lunch when they rounded a curve and Andy gasped, and they all stopped.

It started below them and a little to the right, and ran massively on across the valley: concrete, who could tell how many tons of concrete? A dam. A tremendous sheer face of dam. Beautiful.

Andy was not too stunned to notice things. Why was the concrete so stained most of the way to the top? Oh golly—we're looking at the *upstream* side. No water in the reservoir. That gap in the middle of the dam: dynamite must have started that, and the lake had done the rest while it vanished. Good-by, good-by.

He said, "Yep. It was some flood, all right. And it wasn't this year; there wouldn't be anything but grass on the bottom of the reservoir if it had been."

"Who would have done this, Andy?" asked Pop.

Dom laughed absent-mindedly. "Must have been Red agents—ask any Loyalty Legionnaire."

Andy tried to answer, though, because the old man had asked him to. "Who did it? Maybe we can figure out, at that. The Danciger patriots decided somebody downstream was an invader, and let the water loose against them. . . . Then Beatty heard about the flood and decided here were some *real* saboteurs, so six sincere jerks came up and cleaned out the town of Danciger. And after they weren't there any more, nobody had any reason to come *back* to the town of Danciger: no traffic on the road and no power from the dam for the better part of a year." It all made sense, but it didn't matter much.

He was looking at the dead dam.

Beside the dam, all the futile history of the Beattys and the Hickmans looked as minor and temporary as the stories that gangster killings used to get in the newspapers, before.

The dam, now, made him feel really bad. It was big, and all one single thing you could see at once, and it was gone. It was a tremendous monument to the past, but not at all to the future—just to the past.

He didn't want to believe it. "There must be a power station on the other side." While he spoke, he and Dom were starting on down the road again, with Pop following. "If it was above flood level, there might still be some power there—storage batteries. No, I guess not."

Dom left the road to skip down the steep bank to the left. Andy followed more gingerly because of the pack. They were below the former water level; the rocks were mossy but not slimy; they ran skidding down loose gravel to the bottom. It

was like a Sunday picnic when you were a kid, except for everybody having a full beard and nobody laughing.

They waited while the old man caught up. He walked to their right, and to his right was the shoulder of the dam. The land here had been undistinguished farmland, then had carried a lake for a decade or two; the lake had moved on, and now it was scrub and grassland again.

The little pool behind the breach in the dam was all the water the reservoir could hold now. A row of three island boulders lay across it just this side of the dam, but the pool didn't really end till you got to the gap in the concrete. There the stream spilled into dodging rapids—a lot like the ones upstream that fed the pool, except that here the rock they drenched was man-made.

In front of that tragic ruin, what could you say? Snap your fingers, "Oh heck," as if it was a cracked dish?

Andy tried picking up the pieces again. "Most of the dam's still here. Those piles of concrete will last as long as any hill; there isn't so much to patch here in the middle."

Dom burst out, "Oh sure, Andy, the *things* are mostly still here. The concrete's mostly still here, and the power station may not be wrecked too bad; as far as that goes, some of the dynamite may have been left over from this job and still be sitting in a basement up in town. A lot of good that does us."

"Well at least when somebody wants to dam this stream again he'll have a pretty good start."

"Yeah. When there's somebody to do the repairing, somebody to haul their cement . . . somebody to use the power from the station."

"Now, everybody's too busy looking for mythical invaders. Tearing apart the country looking for the saboteurs who are supposed to be tearing it apart."

"The invasion wasn't mythical," said Pop deadpan, sitting down on the rock. "The U.S. invaded itself." The other two just stared until he smiled, and they caught on. Beatty had invaded Danciger, Hickman had invaded Lexington, and on—each a hundred per cent more American than the one before.

Andy looked at the pool and swore quietly. "Shadow boxing, and we broke our neck."

Dom said, "I wonder what guys like Hickman did before. Some kind of cop, probably."

Andy answered in spite of himself. "Hickman was a union president." He bit his lip.

"No kidding! In Akron?"

"Yeah." Why hadn't he kept his mouth shut?

"I suppose he specialized in cleaning the left-wingers out of the union."

"That's right."

Andy thought, Don't ask it! But Dom did: "And I suppose when Hickman ran for local president, you voted for him."

". . . Yes. Well listen, Dom, I didn't know then what was going to happen—what's more, neither did you. And the guy that was running against him had a Taft-Hartley indictment—" He abandoned that sentence in absolute confusion.

Pop soothed him. "That union election's over long since."

Dom had to say something. "Hickman's still Hickman."

"And there are lots more like him. How long can he keep it up? Five years?"

Andy snorted. "As long as Beatty did; until a bigger liar shows up with a bigger arsenal."

"But with the same lie? How long will their lie go over? How long can they keep people excited about this 'enemy' when nobody ever sees the enemy?"

"Not much longer," Dom announced. "Ideas like that don't start from nothing. This subversive scare was made up by the corporations to keep the workers divided (guys like Andy)." Andy had something about Stalin on the tip of his tongue, but he missed the moment and Dom went on. "Now that there's no more capitalist class there's no reason for the Red scare to keep going." He didn't feel playful, but he gave Andy a dig in the ribs and said, "There's your principles of Marxism-Leninism."

The old man was thinking. "There may be no reason for it to keep going, but I wish I saw the good reason for it to stop. Everybody just has to look around him to see the truth, huh?"

"No more bosses' newspapers to fill them full of lies. Why should people be anti-Red, after they calm down? What harm are the Reds doing them?"

"Well now," said Pop, "most people think plenty of harm. Things are going lousy, and the lousier they go the more Reds there must be to cause it all, so get out a new Loyalty Legion and have another rat hunt."

"But it's such a fraud, they'll see through it. Andy saw through it."

"So did I, but—"

Andy broke in, "It wasn't such a fraud at the start. After all, places *were* atom-bombed. The newspapers didn't make that up."

"I guess there must have been a few ICBMs landed in this country. I don't think they made that up. But how do you know which side started firing them first? And if there was supposed to be a Red invasion, how come we don't see any signs of it, now that the U.S. is in no shape to defend itself?"

"Hah!" Andy was ready for that one. "Your Russian buddies are probably in the same snafu we are. They're probably all busy executing each other as agents of Wall Street. Much too busy to invade anybody even if they want to."

Dom was *not* ready for that. He had never thought of it before, and it was a crushing thought; yet already he almost believed it. There was nothing he could say.

Pop said to Andy, "All the more reason not to get bitter about who started the war. *Dom* didn't start it, for sure."

"And neither did I."

"Right. You know, if things had gone a little bit differently, the two of you might have been in different armies, fighting each other."

Silence. Dom thought about Andy, "He was a dupe, but it doesn't matter now."

Andy had thought the same thing about him many times.

Andy said, "If they left it to guys like Dom and me there wouldn't be any wars."

"Anyhow as long as there were guys like Pop around . . ." Dom kidded, his hand on the old man's shoulder.

Pop laughed. "Okay, no more wars."

Dom said wryly, "Watch that radical talk."

Pop got to his feet. "Well, enough Monday-morning quarterbacking, huh? Let's get this show on the road." The world is dead, long live the world. "Dom, how about crossing

over those three rocks to the other side? It looks like a good place for lunch, and we ought to get a few more of these trout before we leave the river."

So Dom skipped from one boulder to the other across the lip of the pool; he found the footing okay and the others followed him. It wasn't until Dom had the net spread in the pool, and Andy and Pop had a reluctant fire of reeds going that Andy asked shyly, "Say Dom, did you ever work building a dam, before?"

"No. I never worked but in the one plant."

"You, Pop?"

"Yeah, I did once." He didn't volunteer to go on.

"It must have been something."

"Like any other job, then. I was in construction work for several years when my kids were small: various buildings, one factory, and then this one dam. Oh, I guess it was more exciting than being a parking-lot attendant, but it was more dangerous too."

"Imagine building a dam or a factory."

"Yeah. Or trucks, eh Dom?"

"Trucks," said Dom, finding it ludicrous. "I was superman. Now nobody can make a truck." He pulled up the net, took out three good-sized trout, then spread the net again.

Andy jiggled the frying pan, which contained a couple of fish from this morning's catch and half a left-over can of baked beans. He said, "Well, some day . . ."

The old man began to sing:

*Oh when I was a little lad
With folly on my lips,
Fain was I for journeying
All the seas in ships;
But now I cross the southern swell
Every dawn I see
The little streams of Doone are running free,
The little streams of Doone are running free.*

Dom said, "Where do you get your songs, Pop?"

Andy wished the old man would sing some more. Andy didn't know many songs himself. He sang:

*Waiting and wishing
For the day when no more I'll roam;
Waiting and wishing
For the day when I'm turning home—*

The words sounded phony, maybe because he'd heard them too often; he went on for a few lines just humming the wistful tune.

Pop absently sang a couple of the lines he'd left out:

*Though we won't live
In luxury,
We'll be so happy,
Just you and me, when I'm through
Waiting and wishing—*

The old man chuckled, nibbling the edge of a mint leaf he'd picked. "I knew the guy who wrote that."

"You knew him?"

"Not to talk to. He lived on the same street I did in Detroit (it was a long street), and we used to see him ride by in his Buick. After that song came out, we saw him ride by in his Cadillac. Hm. He also wrote *True to You Forever*, and he divorced two wives. We all sang the songs.

"Well . . . it was a funny old world all right. But I'm not feeling picky. How about it, Dom? I'd give a lot to have it back, phonies and all."

Dom said very quietly, "You know I agree. Phonies, capitalists, and all."

"Yep. I'd take it back even if it had to be Hickman who gave it to me."

"If he would—you know I agree."

"Or," said Andy, "if it took a rescue expedition from Brazil. I even wish your Red invasion would show up to rescue us, Dom, even if it is a little behind schedule."

"No," said Dom, "it looks as if it's up to us." He roused himself with difficulty and pulled up the net again.

Andy came to himself a little too. He got up and went over to the water by the three boulders, to get a drink. He was

still seeing the pool and the living day and responsibility through a misted pane of nostalgia. When he saw a man right beside him, standing in the gap in the dam, he spoke in innocent surprise: "How long have you been there?"

The man answered the same way, "I just got here."

It was the man with the squirrel gun who was perhaps not the same as the city kids but had read the same newspapers. He was wet to the knees from the spray of the rapids, but the gun was back in his hands and his blue eyes were the same as this morning.

The stranger recovered first. Without taking his eyes off Andy, he called down to the bottom of the concrete canyon, where he'd come from, "Stay back there till I give the word, fellows."

Andy couldn't see anybody down there. A bluff? or were there reinforcements?

The stranger walked out beside the pool; Andy backed up. The stranger looked at the three of them and said, hardly opening his mouth, "I've been here long enough to hear those last couple of remarks."

(Now, let's see—what *had* they been saying?)

He turned eyes and gun on Andy. "You're a Communist."

In a sudden delirium, Andy believed in the stranger's reinforcements. Ghosts of F.B.I. men peered from behind rocks, ghosts of Loyalty Legionnaires marched on the hillsides. He whispered, "*No—not me.*"

The stranger's gun was on safety again! Andy saw it, and in a moment, in just a moment, he'd— but the stranger wasn't alone this time, he had his friends with him now.

"I got an idea you fellows are Communists like those six who came up from Lexington last winter."

This insanity drew the ghosts closer. "*Not me, stranger.*"

Eyes and gun swung to Dom. "How about you?"

"Look, friend," said an impossibly calm voice, "what difference does that Communist malarkey make now?"

Maybe he was going to go on to say something perfectly reasonable and convincing, maybe Pop had something to say, but Andy did not move and the stranger snapped the safety off and fired. Dom fell.

Andy cried, "No! No!" Andy roared, and wept, and threw

the stranger into the pool, and using the rifle butt as a threat chased the stranger up onto the boulders and down the rapids. Andy shouted, killing the ghost army, "Move! Move! Go! Faster! Run!"

The stranger twisted and danced over the tumble of water. It caught him and flushed him out violently at the bottom. Andy watched him crawling stiffly out onto the bank down there, and shouted, pointing at the ruined dam, "*Your* fault—not ours!"

That was a pointless thing to say, he realized as the stranger disappeared. Was it even true?

He put his hand to his forehead. Blame! How could he blame anything on the fools who didn't know any better?

He climbed back out of the concrete canyon. Pop was washing the wound in Dom's side. He had taken their service revolver out of the pack and laid it beside him. Dom's face was screwed up in pain, so he must be conscious at least.

Andy stood there looking at him. Blame! Blame! Did it mean anything to call it the stranger's fault? There Dom was, and Andy could have saved him.

Andy said, "Dom counted on us."

The old man spoke soothingly; the tone was mostly for Dom, the words mostly for Andy: "That character just put one shot into the side of the waist here and out the back. That 22 wasn't made to kill a man in the first place. Dom should be all right." He turned toward Andy a bleak face, and Andy knew he was a long way from confident.

"Son, don't feel bad. Living is hard recently. Next time Dom will be wiser too. Do what you can now. Make sure that character is really gone, then come back, and we'll see about some bandages, also some lunch."

Do what you can now. . . .

Andy would stick with Pop. They would save Dom. It would be hard; but Andy would be able to stand it, because he was already used to living on so many improbable hopes and so much guilt.

THE GOLD-MAKERS

J. B. S. Haldane

J. B. S. HALDANE

One of England's truly brilliant modern scientists, John Burdon Sanderson Haldane, born in November, 1892, sent in his permission for the use of this story from his summer vacation address, which was "Biological Station, Roscoff, Finistère, France"—on the westernmost coast of France due south across the English Channel from Plymouth, England. By the time negotiations with Professor Haldane were completed, he was back at his home base as editor of the Journal of Genetics, P.O. Belghoria (West Bengal), India. Before hearing from the great biologist in Finistère, his secretary in Belghoria, A. K. Bhattacharyya, had written to report that film rights to the story (which was originally published in 1932) had been sold to a London company.

This going-on-seventy biologist (still sixty-nine as this is written, August 1962) is no longer a Britisher, but rather "a citizen of the Republic of India and proud of it," as he writes. Described as a "burly, tweedy, shaggy man," Haldane has received numerous academic distinctions—and much intemperate censure for his opposition to British appeasement of Hitler during the 1930s.

Today, Haldane is one of the Grand Old Men of genetics; but as a fiction writer he is less known. Considering the skillful melodramatic plotting of the following story, it seems too bad that Professor Haldane has not pursued this line of work more than he has done in his long and eventful life!

The Gold-Makers

I AM more shameless than my colleagues about some things. I don't believe I know French better than most of them. But I don't mind talking it at a great rate without too meticulous a regard for genders. So every now and then I take a perfectly good holiday by giving a course of lectures in alleged French in Paris. Everyone is pleased by this arrangement. My university feels it is doing something for international co-operation, I manage to tell my French colleagues some things they don't know, and I learn any number of things I don't know myself. It's no good going to Germany, because the Germans read everything that is printed anywhere, and publish all they have done, and a bit more, at immense length. The French remain beautifully oblivious to a lot of work done outside France until everyone says French science is going to the dogs. Then it turns out that some perfectly obscure French man or woman has just discovered something really original and unlikely, such as radioactivity, or wave mechanics, which makes Einstein seem as simple as Rule of Three, and incidentally landed Eugène Galois in Devil's Island, and me (I sincerely hope) in the local gaol at Ambert.

I shouldn't have put in all this preface if I was publishing this narrative in the *Chemical Gazette* or the *British Journal of Physics*, as I originally thought of doing. But readers of this magazine might wonder what I was doing in the Rue Cujas at 11 P.M. on June 28, 1930, and why the man with no front teeth should have known who I am, and that I actually understand something about the application of wave mechanics to chemistry. The streets round the Sorbonne are placarded with lecture announcements, and my portrait had appeared in *L'Illustration* with a highly misleading biography. On the date in question I had just delivered my sixth and last lecture, and subsequently consumed a considerable quantity of very light beer with some French colleagues at the Café Soufflet, which is at the corner of the Boulevard St. Michel and the Rue des Écoles. I had sat there with my eminently respectable col-

league Henriot and his wife, whilst one of his most brilliant pupils played backgammon at a neighboring table with a little lady whose calling was not in doubt. I had reflected on the improbability of such a scene at Oxford or Cambridge, yet remembered a not utterly dissimilar occasion at the Cosmopolitan Club off Leith Walk in Edinburgh. But the Professor's wife had not been there.

The man with no front teeth was remarkably shabbily dressed, and looked hungry, which is unusual in Paris, where there is work for almost everybody today. He sidled up to me, and in a voice which was not rendered more intelligible by the absence of his teeth, said, "For the love of Science read this, and if you want more, follow me." He slunk on ahead of me and waited in the shadow of a doorway while I stood under a lamp and looked at the paper he had given me. It was the first part of the wave equation for carbon, or, rather, of the set of forty-two simultaneous differential equations which would enable one to predict the behavior of that element if one could solve them. But it was expressed in a notation new to me, and certainly unpublished. Now a beggar or a tout for some unsavory concern might conceivably have copied out some of Kultchagin's equations to act as ground bait for me, but he could not possibly have transposed them like that. Imagine a man handing you a copy of *A Shropshire Lad* translated faultlessly into Icelandic, and then written out in Egyptian hieroglyphics, and you can get an idea of the intellectual effort involved and the special knowledge needed. This was something really queer, and I am a student of the really queer in physical chemistry, but do not despise it when I meet it elsewhere. I followed him. "Bar du Progrès, Porte de la Villette, minuit," he whispered. He was obviously in very considerable terror, and motioned me to go on.

I had an hour before midnight. I felt that I might be in for something odd, and after making sure that I was not followed, I went into the Café d'Harcourt and over a coffee wrote a note to my friend Bertaux, giving him the facts and asking him to ring me up at my hotel at noon next day, and to inform the police if I were missing. Then I boarded the Metro for the Porte de la Villette, an exit from Paris which so far was only known to me by its proximity on the map to the municipal

slaughterhouse. I was not as calm as I could have wished, for as I entered the train I found that I had just lit a three-penny cigar in oblivion of the fact that there are no smoking compartments on the Metro, a fact which I have always resented most keenly.

The Bar du Progrès is dim, but not really sinister. It is extremely like some thousands of other bars. There is the same fat lady behind the same zinc counter, the same surprising variety of bottles behind her, the same rather consumptive-looking waiter. At the back there is a table in a recess, with two chairs. One occupant of the table can be seen from the door. The other is screened. I went in just before midnight, ordered a café cognac, and sat down facing the door. The only other customer was an inoffensive-looking lorry driver who was describing in considerable detail a collision in which he had, of course, been the innocent party, but which had detained him beyond his usual bedtime. On the stroke of midnight my friend of the Rue Cujas came in and without a word sat down in the seat opposite me. I ordered him another café cognac, and repeated the latter at suitable intervals during the next hour. I observed that the missing teeth were only one effect of what must have been a thoroughly nasty wound in the face. But the scars were old; it looked like a war wound. He spoke in a low voice for the best part of an hour in rapid and not easily intelligible French. Occasionally, at critical places in the story, he put in certain key words in English. Once or twice he made a scientific point in German. He was obviously suffering from extreme terror, but it was not the terror of the raw recruit during his first heavy shelling. It was the much grimmer emotion of the old soldier who realizes that there is a definite limit to human endurance, the terror of 1918. This is roughly what he told me. I don't think my recollection contains any serious errors on matters of fact.

"You have heard what happened to Eugène Galois?"

"I know he was found guilty of murder and sent to Devil's Island. But I can't believe he murdered a colleague for money. He's as big a mathematician as his namesake was a century ago. He might have committed a *crime passionnel*. Anyone with guts might do that. But you can't murder for gain unless

your mind is obsessed by money, and his mind was too full of loxodromic groups to leave room for that sort of obsession. I hear they're trying to get his case retried. If I can do anything in reason to help, I will."

"I'm glad you feel like that about Galois," said my neighbor, "but it's too late. He died last month of parrot disease. The convicts were allowed to keep pets, and there was an epidemic. He was a martyr. I am only talking to you because he is dead. He was on to the biggest thing since the invention of the steam engine. He was murdered because he knew too much. If you listen to me, you may make world history. You may quite possibly become the richest man on the planet. But you are also likely to be murdered. Indeed, if you have been seen with me you probably will be. But if you're afraid, you'd better clear out at once."

I don't mind admitting that I was afraid. But since November 11, 1918, my adventures had been intellectual and emotional only. Moreover, I am ambitious. I felt a victim to my really lamentable propensity for quotation, and reminded myself,

He either fears his fate too much, or his deserts are small,
Who dares not put it to the touch, to gain or lose it all.

"Go on," I said. I also repeated under my breath a line from a less reputable poem, which I had found consolatory on unpleasant occasions during the war, to the effect that, whatever happened, I should be "damnable mouldy a hundred years hence." He went on.

"Galois was a man of genius. You know that. But you don't perhaps realize how broad his interests were. He felt very deeply that the evils of the present day were due to the application of science by unscientific men. 'We have given humanity a large degree of control over matter, and they have given us modern war and modern industry,' he used to say. So he determined to apply his science according to his own ideas, not those of financiers. He had a special down on financiers. He realised that wave mechanics meant a new era in chemistry. When he heard that Eucken and Bonhöfer had proved hydrogen to be a mixture, he said it was only the beginning.

He had some private means, and after his last published paper he went off to the country, and worked out the wave equations for the gold atom. You will realize the stupendous nature of that. A man with the mathematical ability to do it could have determined the orbit of the new planet Pluto in one evening in a café with the band playing. He bought a cottage in the country and had the walls papered white. He went round the different rooms with a stepladder, covering the paper with calculations. Of course he filled masses of notebooks too. But he said he needed the walls for the main results, and by writing them up in that way he knew how to find what he wanted. He worked eight hours a day for a year and a half, and at the end of that time he had his principal results in a single notebook. I have seen it, but you will soon hear why I haven't got it. In another half-year he had worked out that gold must have an enormous and quite unsuspected affinity for a certain group of organic compounds. Then he got hold of Riquier, an organic chemist who had been with him at the École Normale, and Riquier made one of the compounds in question. They showed that their scheme would work on a laboratory scale. Then they approached me.

"My name is Martin. That is irrelevant. I do not think that I shall live long. I was a works chemist at Nanterre and a friend of Riquier's. We went down together to Ste. Leocadie, a little village on the sea coast, in Bouches du Rhône, near Aigues Mortes, where there is a large lagoon. We started a salt pan. I don't know that the salt was particularly good, but we managed to sell it, anyway. That, however, wasn't what we were after. You know there is gold in sea water. Not very much, about one part in twenty million. When you evaporate the water in a salt pan, most of the salt crystallizes out, and you are left with a sticky solution full of Epsom salts and what not. Almost all the gold is in there, so it is easy to concentrate it a hundred times in the sunlight of southern France. You can crystallize out most of the rest of the salts without losing much gold. The brine left behind has about one part in 200,000 of gold. That's a lot. Gravel with only one part in a million has been worked profitably, and even on the Rand the quartz only averages twelve parts in a million of gold. You take your residual solution and add about eight parts in a

million of Riquier's compound, which we call auron. I don't know what it is, but it is bright blue, and it is made from a saponine, and I believe has two pyrrole rings in its molecule. You leave the mixture for an hour, and then bubble air through it. The blue stuff has combined with the gold to make a red compound. This is a surface active substance, and it all comes into the froth which you blow off the top. You dry the froth, add a little acid, and out comes the gold. You can use the blue stuff again, but we used to lose about 5 per cent. at each operation.

"My job was to run the bubbling tanks. Riquier made the stuff, and Galois saw to sales and purchases. There were some local men, chosen for their stupidity, who looked after the salt pans, and I acted as foreman there. We started in January 1929, but it wasn't till May that we got the process working perfectly, and from May to September we got out about four million francs' worth of gold, £30,000, or a little more. Most of that went in paying off our debts, but we had a million or so of clear profit. Of course before the show started we had decided what to do with the money. We were all somewhat idealistic. You have to be idealistic to go in for science in France today, when a professor gets £300 a year or so as the reward of a distinguished career. Our immediate idea was to go straight ahead until we had a thousand million francs, and then to start endowing science as it ought to be endowed, so that a good scientific worker was paid as well as a good engineer or surgeon, and a reasonable amount was available for apparatus. Naturally, we thought most of France, Belgium, and Italy, where scientific workers are worst paid. But we hadn't forgotten Germany, and we had a few schemes even for England and America. Well, that's all over! If you succeed where we failed, don't forget French science."

"I'm not likely to," I said.

"We reckoned to make some hundred millions of francs without exciting much notice, but obviously the thing couldn't go on indefinitely. But here Galois had his plans. He believed that the world was not producing gold quickly enough. If humanity increases its stock of gold more slowly than its other material wealth, prices will fall and you will get unemployment. That is what is happening now. If we made gold too

quickly, say thirty thousand million francs a year, prices would rise, and all the world would be like France and Germany after the war. Galois's idea was to produce gold just fast enough to keep prices steady on an average. 'The thing will be too big for any one man,' said Galois, 'and if I gave it to the French Government the country would be flooded with gold, and our agriculture and manufactures would die like those of Spain did after the conquest of Mexico and Peru. No, we'll give France enough to pay her foreign debts, but the secret, and the control of the thing, must go to the League of Nations, and the day they get it America and the Soviet will join up.'

"Well, everything went swimmingly till the end of last August. Then I got a typewritten document from Paris. There was no address, but it was headed Association Internationale pour la Défense des Interêts Rentiers. It ran roughly like this:

DEAR SIR— As it is possible that in future the operations on which you are engaged will incommode us, I have the honor to offer you an income of two hundred thousand francs per year should you abandon them. Your colleagues have also been approached. In the event of your resigning your occupation, you will receive your first quarter's salary within one week, the notes being despatched to your mother's house. In earnest of our good intentions we enclose 10,000 francs.

Should the offer not be accepted within one week from today, we shall be compelled to take steps to eliminate the concern in which you are a partner.

A.I.D.I.R.

"I was impressed by the ten thousand francs, but still more by the fact that when I looked at the letter three days later the paper had crumbled to powder. As a chemist I can imagine how this might be done, but it would take some working out. For that showed that our enemies had skill and knowledge behind them, as well as money. The fact that they had destroyed this evidence meant that there was probably something in their threats.

"I talked it over with my colleagues. They had had similar

letters. Unfortunately they were against warning the police, as they didn't want to give away what we were doing. Galois thought the A.I.D.I.R. might be what it purported to be, a representative of a financial group interested in fixed-interest-bearing securities, which would of course fall in value if we flooded the world with gold, while ordinary shares and equities would rise. Riquier and I, rightly as it turned out, believed that they really stood for a gold-mining group.

"I never found out how they discovered our secret. Galois and I used to take our gold by car to a bank at Cette. Someone connected with that may have got suspicious and tracked us. Possibly Riquier may have talked too much to a lady who I think was his mistress. But I doubt it.

"Next week I was rung up on the telephone. The voice said, 'A.I.D.I.R. speaking. Our offer is and remains open. We are even prepared to raise it if you state your terms in the advertisement column of the *Petit Nîmois*. If you do not accept, you will all be killed. This is our last communication.'

"I found later that the call had been made at a public call office in Nîmes. We agreed to take no notice, but started a scheme of defences. We all had automatic pistols, and Riquier made us a supply of lachrymatory gas bombs. The factory was easily defensible, and we had burglar alarms, and a couple of fairly excitable dogs. The other two were enthusiasts, and I am not much afraid of death. As you see, my face got fairly smashed up in the war."

He lifted his rather long and dirty hair, and I noticed that, besides the damage to his mouth, he had no left ear.

"At that time I had some false teeth, which I have just pawned in order to live. But I have been in constant pain since 1916, so I do not find life immensely attractive, even when I am not being hunted.

"Towards the end of September I developed a boil on my neck, and had to go into a clinic for two days to have it lanced. While I was away, the blow fell. Riquier was found shot outside the factory door. Two Swiss tourists swore that they had seen Galois shoot him after a quarrel. The bullets fitted a pistol which a Marseilles gunsmith swore Galois had bought from him, and which was found near the body. Several other witnesses turned up later, and swore to the most

incredible lies, which hung together to make a pretty damning story. Almost simultaneously an alleged Chilian millionaire called Fernandez sued Galois for six million francs which he claimed to have lent him for a scheme for extracting gold from sea water. Apparently he had a large outfit of forged documents. As you know, the jury found that Galois was a swindler and a murderer. I got hold of his lawyer, and offered to give evidence, but he thought it would be useless, and I lay low. But the A.I.D.I.R. people found me. As I was coming home one night I was attacked by three men. I didn't want to shoot and get jailed, as I probably would have been. I managed to burst a lachrymatory bomb among them, and left them weeping. But I have been on the run ever since. Meanwhile Fernandez was able to seize the factory for debt, and presumably got our documents and about a kilogram of auron.

"Even after his condemnation Galois's lawyer believed in him. He found out some odd facts. He established that both Fernandez and one of the supposed Swiss were connected with the same gold-mining group."

That was the end of our conversation, because at this point I noticed a bomb coming towards me through the air. Up till that moment I had refused to decide between two alternatives—that M. Martin's story was true, or that he was a very good liar. I had a strong suspicion that he would shortly ask me to lend him a hundred francs. I felt that I had had my money's worth, and proposed to lend him a hundred and fifty, for good lying is a rare gift which should be encouraged.

The bomb, however, convinced me that he had been speaking the truth. But its immediate effect was to jerk me back for thirteen years into the past. It was very unfortunate indeed for the throwers of this bomb that hand grenades had been my special line during the Great War. I am one of the few people who ran a bombing school for nine months without casualties. Among the things which we occasionally did as demonstrations was to catch lighted bombs and throw them back, or more accurately, sideways, out of the trench. I had a one-eyed and rarely quite sober corporal who used to do this, but I sometimes did it myself. I admit that we used to lengthen the time fuse beforehand. Provided you are a good

judge of time, it is no more dangerous than crossing the road among motor traffic, but it is more impressive to onlookers. Some idiot asked questions about it in Parliament, and got an army order issued forbidding the practice.

This bomb was a 'stick bomb' with a long wooden handle. I think it was a German type with a five-seconds time fuse. Looking past the bomb through the door of the café, I saw two men in a car, one at the wheel, and one who had clearly just thrown it. The car was moving slowly. I reckoned that the charge would explode in another three seconds. As the bomb, which was thrown with a very good aim, landed in my coffee cup, I caught it by the handle, and ran towards the door, swinging it as I did so. The man standing in the car was expecting me to run out, so he fired at me. But he was not expecting me to return the bomb, so he fired very erratically. One bullet went through my raincoat. Another, as I afterwards learnt, hit the lady behind the counter, but not fatally. As I reached the door, I pitched the bomb neatly into the car, which was now accelerating, and threw myself flat on my face with more speed than elegance, as I had been accustomed to do when a machine gun opened fire on me.

The bomb burst as I reached the ground. The man with the revolver was jumping from the car as it did so. A piece wounded him, and he fell on the pavement. The driver could not escape, and the explosion lifted him into the air. His body, oddly twisted, fell back into the car as it struck a lamp post and burst into flames. I got up and ran past the blazing car. As I passed the man on the pavement, I kicked his head as hard as I could. Some bone in it broke with a crack. I ran my fastest down a side street, dodged round several corners, and was violently sick. The burning car lit up the sky behind me as I walked with deliberate slowness on to the Rue de Flandres. I saw no sign of Martin, and nobody followed me. I was fortunate enough to catch, within a very few minutes, an omnibus going to the Châtelet, one of those which run at hourly intervals throughout the night. I got off just before the terminus, and walked to my hotel by a round-about route.

I am fairly sure that I was not followed, for on several occasions I turned corners when no one was in sight. I reflected for a short time on my adventures, and on the fact

that I had not paid for the coffee. I regretted this, for I am rather scrupulous in small matters. I also hoped that I had killed the man on the pavement, or at least given him severe enough concussion to blot out his memory of recent events. In that case there would probably be no one who had seen me with Martin, and I stood a chance of becoming the modern equivalent of Midas. Meanwhile, however, there was nothing to be done, and rather unexpectedly I fell asleep within half an hour of getting to bed.

I did not wake up next morning until about ten. I came to the conclusion that I had better clear out for England at once. As soon as I had dressed I telephoned to Bertaux that I was all right, but had to leave Paris. I told him to keep his mouth shut, and to lunch with me at one o'clock. I then took a bus to my bank in the Place de la Concorde, and drew out two thousand francs for my hotel bill and railway ticket. There had been no account of last night's affair in the morning paper, but when I left the bank I bought a *Paris-Midi*, which devoted a column to the outrage of the Bar du Progrès. The man in the car was dead, although a baker had burned his hands badly in an attempt to rescue him. Another man, presumably the one with the revolver, was in the hospital with a wound in the shoulder and a fractured jaw. So was the proprietress. The waiter had seen me throwing a bomb, but apparently no one had seen the bomb coming in! Fortunately he gave a very vague description of me, and had overheard Martin and me talking in German, but not in English. He also said that I spoke French with a German accent, in which he was not so far out. Being a Scotsman, I do not talk it with an English accent. If I go into a café full of young ladies eager to make my acquaintance, it is often simplest to keep off the rest by standing one of them a drink. In such a case I always ask her to guess my nationality. She then suggests Dutch, Danish, Polish, and Czechoslovak. I assume that I am really taken for a German, but that the young lady, being too polite to make such a suggestion, names the various neighbouring states.

I went to the Gare du Nord for a ticket, and for a reservation on the four o'clock train. As I left the station I noticed a man with a black moustache in a bowler hat looking at me

rather intently. I got into a taxi and ordered the driver to go to the restaurant where Bertaux was expecting me. I gave the directions in a fairly low voice, so I hardly think the watcher could have overheard me. He got into another taxi, and I noticed it following us. I did not wish to involve Bertaux in my little troubles. I also wanted to be perfectly sure that I was being followed, and, if possible, to shake the man off. So instead of going to my restaurant near the Sorbonne, I told the driver to go to the Gare du Luxembourg.

I can just remember the time when the London Metropolitan was worked by steam-engines. Those of my readers who regret those romantic days are advised to travel by the Chemin de Fer de Sceaux et Limours, a suburban railway line which starts from the Gare du Luxembourg and leaves Paris by an extremely long tunnel which is always full of a particularly suffocating smoke. I bought a ticket for Massy-Verrières, an undistinguished station on that undistinguished line. My pursuer followed me. I went down and got into the fullest compartment I could find. He got in close behind me. At the first stop, the Gare de Port Royal, still in Paris, I dashed out through the smoke and up the stairs. My unknown friend followed. But here I had a stroke of luck. Just outside the station there was one—and only one—taxi. I boarded it and told the man to go to the Institut Pasteur. I crouched to offer as small a target as possible if my unknown friend opened fire. Fortunately he did not. As we turned the first corner I looked back and saw him running after me. I do not know when he finally lost sight of me, but, as I went down to the Metro station in the Boulevard Pasteur, to which I had diverted my vehicle, I saw a taxi driving up at a rather dangerous speed. Four different lines, however, leave that station, and if he was still chasing me, he must have taken the wrong train.

After several changes on the Metro, I arrived rather late at my restaurant. Bertaux was waiting, but had nearly finished lunch. I told him I was being followed by would-be murderers, and was going to run for it. As I refused to take his advice and go to the police, I think that he suspected my pursuer of being an irate husband. That is the worst of these romantics. I had no intention of going back to my

hotel, for if my identity was known it might be watched. I asked Bertaux to go for a small suitcase which I had already packed with my more essential clothes and shaving things. He was to say I would call round for my trunk later. I had just finished lunch when he came back. I determined to run in the opposite direction from England, in the hope that my enemies were only watching the west-bound trains, so I went straight to the Gare de l'Est and bought a ticket for Berne, hoping to work round from there to one of the German air ports and fly home.

Even as I bought my ticket I noticed, or seemed to notice, a man who looked at me closely and then went to a telephone booth. I did not see him again after this, and my journey was uneventful as far as Belfort. But in the *Soir*, which I had bought, I found two interesting items. The man with the broken jaw had given his name. It was presumably false, but this meant that he could speak. On the same page was a not uncommon headline, "*Un Inconnu se suicide*"—"Suicide of Unknown Man." The man in question, who had been found hanged from the scaffolding of a suburban cinema under construction, had no left ear, and his front teeth were missing. Nothing was found on his person but a crude scrawl stating that he was fed up. So they had got Martin. Possibly they had forced my name out of him before his murder. In any case, I proposed to do my best to escape his fate.

It was night when I got to Belfort. As the train ran into the station I saw on the platform my friend who had chased me earlier in the day, with two other men. Presumably he at least had flown to Belfort.

I may well have done him an injustice, but the events of the past twenty hours had somewhat prejudiced me against him, and, although I was not certain whether he intended to murder me or merely to hand me over to the police on a charge of bombing his friends, I did not feel called upon to put his intentions to an experimental test. I am sure he had not seen me when I rapidly left the compartment, and before the train had drawn up, bolted myself into a lavatory, where I remained. I had taken my handbag, as there was still a chance that my name was not known to my hunters.

Five minutes after leaving Belfort I had some luck. If I had not, I should not be alive and writing this account. The train drew up, as I had hoped it would, and clearly not in a station, as there were no lights. I dashed out of my retreat, opened a door, and jumped out of the train on the left-hand side. As I did so, the train began to move. Someone fired two or three shots at me. Presumably they missed because the train was moving and I was already fifteen yards away. Then a train going towards Paris, for which we had no doubt been waiting, cut in between me and the gunman. I did not stop running, and soon reached a road, where my luck still held. A lorry was waiting at a level crossing for the trains to pass. I asked for, and got, a lift. It appeared that the lorry was going from Strasbourg to Lons-le-Saunier with the household effects of a subprefect. For a hundred francs the driver was willing to take me to Besançon, where he was stopping for the night. I suspected that I might be chased, so I took him into my confidence, or, more accurately, halfway in. Having received a sound classical education, I remembered Odysseus, and the advantage of economy of truth when in tight corners. I judged the driver to be romantic in the worst sense of the word. Sailors, it is said, have a wife in every port, but ports are confined to sea coasts and large rivers and canals, whereas lorries can visit any town in a civilized country. Lorry drivers of a polygamous disposition are thus peculiarly favoured by their professional duties.

I therefore informed him that I had formed a romantic attachment for the *poule* of a millionaire, and persuaded her to flee to Switzerland. The irate lover had pursued me while I was attempting to join her, and had tried to have me murdered in the train. As it was likely that he, or one of his myrmidons, would chase me in a car, I desired to hide among the furniture of the subprefect. Another fifty francs secured me a place on the top of a bale of carpets under a table, the tarpaulin was drawn over me, and we started off. I had sufficient experience of lorry-jumping in World War I to guess that I had not chosen a bed of roses. And this was a particularly ancient lorry. By bracing my arms against the table-top I managed on the whole to avoid hitting the under side of the table when the lorry kicked its tail into the air,

but the strain was considerable, and I was already aching, and had hit the table once, when, after ten minutes, the lorry stopped with a jarring of the brakes and an explosion of language.

The French tongue is peculiarly ill-adapted for abuse. Theological invective is useless among a nation who are now mostly rationalists, and even in their religious days had a sneaking regard for the Devil. And anatomical and physiological terms which horrify the Anglo-Saxon do not shock the Latin. So the special vocabulary of abuse is largely confined to the monosyllable which Marshal Cambronne used at Waterloo. This word circulated freely while my saviour denied having seen me, much less given me a lift. He even applied it to an offer of fifty francs to look under the tarpaulin. He also mentioned the police. I heard the voices of two other men in discussion, and drew out my only weapon, a large penknife, not so much in the hope of saving my life, as on the principle enunciated by Macbeth, that, "Whiles I see lives, the gashes do better upon them." I am a Scotsman, like Macbeth. I proposed to close with one of my assailants and aim at his jugular vein, for the bullets from a small-bore automatic pistol, though quite efficient killers, have little immediate stopping power. The discussion continued, the details being inaudible. Finally my saviour produced his last verbal card. "*Tristes individus*," he began a sentence, but before he had finished it I heard the noise of a large car accelerating. They had thought better of it. After all, one cannot hold up all the recalcitrant lorry drivers of a Department at the pistol's point.

At this moment I made the bravest decision of my life. I refused an offer to come out from my hiding-place. The next two hours were the most unpleasant I have ever passed, and I have been through three intense bombardments and had one septic wound. When we arrived at Besançon, I was bruised all over, and bleeding in a number of places. As the lorry driver stood me a stiff cognac for which he insisted on paying, he informed me that the men in the car had passed him again on their way back to Belfort, and looked at him closely. So at least I had saved my life.

I was extremely tired as well as sore, but I lost no time

about my next step. With their clearly efficient organization I assumed that the A.I.D.I.R. would discover my identity in a day or so, if they did not know it already. I wrote to a friend in London (for obvious reasons I do not mention his name) to say that I desired the story to appear in the press that I had disappeared suddenly from Paris, leaving my luggage behind. I also wrote a letter dated from Munich to my cousin Polly, better known as Meg o' Mayfair, the lady who meets a duchess a day in the gossip columns of the *Daily Excess*. I told her that I was feeling very run down after my lectures, and had been so absent-minded as to leave most of my luggage in Paris. I was going off for a walking tour in the Böhmer Wald, and hoped to see her when I returned in a month or two. I did not feel that Polly would be able to avoid contributing the gist of this note to the news columns. Another letter from the same address to my Parisian landlady stated that I would return to call for my luggage and pay my bill, although I guessed that the A.I.D.I.R. would probably do both on my behalf. I enclosed these letters to a friend who was working at the Bavarian Academy of Sciences, with an urgent request to post them, burn the covering letter, and keep his mouth shut.

I reckoned that although the A.I.D.I.R. would probably not take this too seriously, they would be bound to divert a little energy to Germany, and if they failed to find me within a fortnight or so, they might begin to transfer their energies across the frontier. Meanwhile I slept, although it was clear from the state of the sheets that the spot on which I laid my head had supported many boots in the past.

In the grey dawn my chauffeur 'woke me. I suppressed a desire to see Goya's "Scenes of Cannibalism" in the local picture gallery, though this would have accorded well with my mood, and continued my journey. I again refused to sit outside, but this time I was packed more scientifically and rattled rather little. By request the lorry halted on a deserted part of the road near Poligny, about thirty miles on. I kept up my romance, and said that I proposed to walk to the Swiss frontier, and cross by the Col de St. Georges, a good day's walk up through the Jura. But my plans were different.

I walked in the opposite direction, making for the centre of France by unfrequented roads.

As I walked I tried to consider my situation as a purely intellectual problem. The A.I.D.I.R. probably believe that Martin knew how to make auron, and has told me the secret. But in any case I know enough to make it worth their while to murder me. If the bomb had been thrown five minutes later I should be in a better position to judge whether they intend to flood the world with gold, or merely to suppress the secret and guard their profits. I suspect the latter, for they would not be likely to keep the secret for long. While they believe that by murdering me they can hush the thing up, they will try to do so. I am therefore taking what I think to be the safest, though not the noblest course. I am publishing all I know on the subject of gold extraction from sea water. Until publication they will try to murder me. But I hope that my account will appear simultaneously in England and the United States in magazines which generally contain fiction. Many of their readers may suppose this story to be fiction. But if I am murdered, or imprisoned on a false charge, like Galois, this will constitute an advertisement to the whole world that I have written the truth.

Even the A.I.D.I.R. cannot comb out the whole of France for me, though they may possibly put the French police on my track. But they are doubtless watching the French frontiers, the British ports, and my university. They may even contrive to open letters to my friends, but they will hardly suspect me of publishing the most practically important discovery of the century in popular magazines. I am writing this manuscript in a little walled town in Auvergne, where I arrived a week after the rather hectic day which I have here chronicled. On the way I have done my best to sink my identity. I have removed all names and marks from my clothes, burnt my passport, and exchanged my suitcase for a knapsack. I have even gone so far as to remove the buttons from my clothes, and substitute French buttons. Sewing is not one of my accomplishments, and not only did I prick my fingers, but several of my buttons are insecure. My beard is growing nicely. In fact I think of wearing one permanently in future. Also, I got ten francs for my razor. In Clermont-

Ferrand I bought a French-Danish dictionary. As soon as the manuscript is accepted for publication, I am asking the firm who will act as my agents to put an advertisement in the *Petit Parisien* on three consecutive days, giving the date when the news will be published. The advertisement will be a request to the creditors of a mythical American lately deceased, to write to a lawyer (also I hope mythical) in Baltimore, before a certain date. I, and I alone, shall know that that date is the date of publication, and until then I must conceal my identity. I shall wander about France as long as my money lasts, and even try to earn a little more. I got five francs yesterday for assisting a motorist, whose engine had broken down, to carry a suitcase to the nearest village. I dare not write to England for money, as this would give my address away if letters to my acquaintances are opened. Also it might be difficult to get a letter without producing evidence of my identity.

I am living as cheaply as I can, but my expenses are much increased by the law of the land. In England anyone may sleep in the open, provided he has a shilling on his person to rebut the charge of being without visible means of support. But in France, to quote Anatole France from memory, "The law with majestic impartiality forbids the rich, no less than the poor, to sleep in ditches or under haystacks." That is the worst of equality. Unless I can get a job, my money will run out in a month at most. Shortly before it is all spent, I propose to seek the shelter of the only available free lodging, namely prison. I may, of course, be run in anywhere for having no identity papers, but my plan is to go to Ambert, get rather drunk, and be arrested. I shall then say that I am a native of Iceland, and have lost my passport. The local Danish vice-consul will presumably appear. I worked for three months in Copenhagen at the Institute of Theoretical Physics, and know enough Danish to be fairly rude, and a smattering of the modern Icelandic dialect. Besides, I am spending two hours a day with my dictionary. So I am going to be Mr. Thorgrim Magnusson, an ardent Icelandic home-ruler, who objects to all Danish officials as representatives of a foreign domination. I hope that I shall be so unpleasant that the Danes will refuse to accept me, and the French will

keep me in jail. I do not particularly relish the idea of hard labour in a French prison, but it is preferable to the fate of Galois, Riquier, and Martin. Also I have a theory, which I devoutly hope is correct, that prisoners are allowed to smoke in France.

The moment my story is published, I appeal to my friends and relations to take all possible steps to get me released. I shall also give my real name. But if no prisoner of the name of Thorgrim Magnusson is to be found in the jails of Auvergne, it may be presumed that I have met the fate of Martin. Only yesterday I saw an individual who appeared to be following me. I went up the nearest hill and outdistanced him. But I cannot believe that the A.I.D.I.R. have agents everywhere, and I suspect he was merely struck by my rather unkempt appearance. I believe that I shall get away with it.

What will happen after this story is published I do not know. I do not propose to emulate Galois and shall not try to make gold. I will not even take holidays at the seaside. Obviously if I knew the formula for auron and intended to work the process, I should not have given away half the secret. I shall certainly be watched, but I credit the A.I.D.I.R. with sufficient intelligence not to assassinate me. They will hope that this story will be taken as the ingenious attempt of a professor to explain his otherwise discreditable arrest for drunkenness. I take it, however, that someone will have the wits to see that it is a perfectly true story, and that Galois' process will be working somewhere within the next ten years. I hope so, because I should like to see the men who organized the murder of Galois and his friends picking crusts out of the gutter. A team of fairly good mathematicians could do the requisite calculations in four years or so. So about six years hence I recommend my readers to sell out shares in gold-mines and fixed-interest-bearing securities, and to buy industrials. But there are some very good mathematical physicists in Russia, and if the Bolsheviki get hold of the process first there will be about £1,000,000,000 per year available for the purposes of the world revolution. In that case the purchase of securities of any kind will be pointless.

THE TISSUE-CULTURE KING

Julian Huxley

JULIAN HUXLEY

Sir Julian Huxley, biologist, writer, and statesman, was born June 22, 1887. He has worked in biology and allied sciences for many years, and written a number of brilliant scientific, social, and philosophical books and essays. He was the first Director General of the United Nations Educational, Scientific and Cultural Organization—UNESCO—from 1946 to 1948, and in 1958 was knighted. His is without doubt one of the most seminal minds of our time.

As pointed out in the Introduction, this 1926 fable of the misuse of various forms of biological and psychological science is, as far as the records show, the only fiction Sir Julian has ever written. It seems to the editor of this collection that the point the author made over thirty-five years ago is more urgent today than it was then, particularly if you extend his lesson from biology and psychology to all the sciences—as he himself does in his final paragraph, if only by implication. This “sting in his tale,” to make an obvious pun, this moral, in no way detracts from the fact that the story is by itself a highly ingenious bit of work, definitely worth including in any good collection of imaginative fiction, whether “science” or not.

The Tissue-Culture King

WE HAD been for three days engaged in crossing a swamp. At last we were out on dry ground, winding up a gentle slope. Near the top the brush grew thicker. The look of a rampart grew as we approached; it had the air of having been deliberately planted by men. We did not wish to have to hack our way through the spiky barricade, so turned to the right along the front of the green wall. After three or four hundred yards we came on a clearing which led into the bush, narrowing down to what seemed a regular passage or trackway. This made us a little suspicious. However, I thought we had better make all the progress we could, and so ordered the caravan to turn into the opening, myself taking second place behind the guide.

Suddenly the tracker stopped with a guttural exclamation. I looked, and there was one of the great African toads, hopping with a certain ponderosity across the path. But it had a second head growing upwards from its shoulders! I had never seen anything like this before, and wanted to secure such a remarkable monstrosity for our collections; but as I moved forward, the creature took a couple of hops into the shelter of the prickly scrub.

We pushed on, and I became convinced that the gap we were following was artificial. After a little, a droning sound came to our ears, which we very soon set down as that of a human voice. The party was halted, and I crept forward with the guide. Peeping through the last screen of brush we looked down into a hollow and were immeasurably startled at what we saw there. The voice proceeded from an enormous Negro man at least eight feet high, the biggest man I had ever seen outside a circus. He was squatting, from time to time prostrating the forepart of his body, and reciting some prayer or incantation. The object of his devotion was before him on the ground; it was a small flat piece of glass held on a little carved ebony stand. By his side was a huge spear, together with a painted basket with a lid.

After a minute or so, the giant bowed down in silence, then took up the ebony-and-glass object and placed it in the basket. Then to my utter amazement he drew out a two-headed toad like the first I had seen, but in a cage of woven grass, placed it on the ground, and proceeded to more genuflection and ritual murmurings. As soon as this was over, the toad was replaced, and the squatting giant tranquilly regarded the landscape.

Beyond the hollow or dell lay an undulating country, with clumps of bush. A sound in the middle distance attracted attention; glimpses of color moved through the scrub; and a party of three or four dozen men were seen approaching, most of them as gigantic as our first acquaintance. All marched in order, armed with great spears, and wearing colored loin straps with a sort of sporran, it seemed, in front. They were preceded by an intelligent-looking Negro of ordinary stature armed with a club, and accompanied by two figures more remarkable than the giants. They were undersized, almost dwarfish, with huge heads, and enormously fat and brawny both in face and body. They wore bright yellow cloaks over their black shoulders.

At sight of them, our giant rose and stood stiffly by the side of his basket. The party approached and halted. Some order was given, a giant stepped out from the ranks towards ours, picked up the basket, handed it stiffly to the newcomer, and fell into place in the little company. We were clearly witnessing some regular routine of relieving guard, and I was racking my brains to think what the whole thing might signify—guards, giants, dwarfs, toads—when to my dismay I heard an exclamation at my shoulder.

It was one of those damned porters, a confounded fellow who always liked to show his independence. Bored with waiting, I suppose, he had self-importantly crept up to see what it was all about, and the sudden sight of the company of giants had been too much for his nerves. I made a signal to lie quiet, but it was too late. The exclamation had been heard; the leader gave a quick command, and the giants rushed up and out in two groups to surround us.

Violence and resistance were clearly out of the question.

With my heart in my mouth, but with as much dignity as I could muster, I jumped up and threw out my empty hands, at the same time telling the tracker not to shoot. A dozen spears seemed towering over me, but none were launched; the leader ran up the slope and gave a command. Two giants came up and put my hands through their arms. The tracker and the porter were herded in front at the spear point. The other porters now discovered there was something amiss, and began to shout and run away, with half the spearmen after them. We three were gently but firmly marched down and across the hollow.

I understood nothing of the language, and called to my tracker to try his hand. It turned out that there was some dialect of which he had a little understanding, and we could learn nothing save the fact that we were being taken to some superior authority.

For two days we were marched through pleasant park-like country, with villages at intervals. Every now and then some new monstrosity in the shape of a dwarf or an incredibly fat woman or a two-headed animal would be visible, until I thought I had stumbled on the original source of supply of circus freaks.

The country at last began to slope gently down to a pleasant river valley; and presently we neared the capital. It turned out to be a really large town for Africa, its mud walls of strangely impressive architectural form, with their heavy, slabby buttresses, and giants standing guard upon them. Seeing us approach, they shouted, and a crowd poured out of the nearest Gate. My God, what a crowd! I was getting used to giants by this time, but here was a regular Barnum and Bailey show; more semidwarfs; others like them but more so—one could not tell whether the creatures were precociously mature children or horribly stunted adults; others portentously fat, with arms like sooty legs of mutton, and rolls and volutes of fat crisping out of their steatopygous posteriors; still others precociously senile and wizened, others hateful and imbecile in looks. Of course, there were plenty of ordinary Negroes too, but enough of the extraordinary to make one feel pretty queer. Soon after we got inside, I suddenly noted something

else which appeared inexplicable—a telephone wire, with perfectly good insulators, running across from tree to tree. A telephone—in an unknown African town. I gave it up.

But another surprise was in store for me. I saw a figure pass across from one large building to another—a figure unmistakably that of a white man. In the first place, it was wearing white ducks and sun helmet; in the second, it had a pale face.

He turned at the sound of our cavalcade and stood looking a moment; then walked towards us.

“Halloa!” I shouted. “Do you speak English?”

“Yes,” he answered, “but keep quiet a moment,” and began talking quickly to our leaders, who treated him with the greatest deference. He dropped back to me and spoke rapidly: “You are to be taken into the council hall to be examined; but I will see to it that no harm comes to you. This is a forbidden land to strangers, and you must be prepared to be held up for a time. You will be sent down to see me in the temple buildings as soon as the formalities are over, and I’ll explain things. They want a bit of explaining,” he added with a dry laugh. “By the way, my name is Hascombe, lately research worker at Middlesex Hospital, now religious adviser to His Majesty King Mgobe.” He laughed again and pushed ahead. He was an interesting figure—perhaps fifty years old, spare body, thin face, with a small beard, and rather sunken, hazel eyes. As for his expression, he looked cynical, but also as if he were interested in life.

By this time we were at the entrance to the hall. Our giants formed up outside, with my men behind them, and only I and the leader passed in. The examination was purely formal, and remarkable chiefly for the ritual and solemnity which characterized all the actions of the couple of dozen fine-looking men in long robes who were our examiners. My men were herded off to some compound. I was escorted down to a little hut, furnished with some attempt at European style, where I found Hascombe.

As soon as we were alone I was after him with my questions. “Now you can tell me. Where are we? What is the meaning of all this circus business and this menagerie of monstrosities? And how do you come here?” He cut me short.

"It's a long story, so let me save time by telling it my own way."

I am not going to tell it as he told it; but will try to give a more connected account, the result of many later talks with him, and of my own observations.

Hascombe had been a medical student of great promise; and after his degree had launched out into research. He had first started on parasitic protozoa, but had given that up in favor of tissue culture; from these he had gone off to cancer research, and from that to a study of developmental physiology. Later a big Commission on sleeping sickness had been organized, and Hascombe, restless and eager for travel, had pulled wires and got himself appointed as one of the scientific staff sent to Africa. He was much impressed with the view that wild game acted as a reservoir for the *Trypanosoma gambiense*. When he learned of the extensive migrations of game, he saw here an important possible means of spreading the disease and asked leave to go up country to investigate the whole problem. When the Commission as a whole had finished its work, he was allowed to stay in Africa with one other white man and a company of porters to see what he could discover. His white companion was a laboratory technician, a taciturn noncommissioned officer of science called Aggers.

There is no object in telling of their experiences here. Suffice it that they lost their way and fell into the hands of this same tribe. That was fifteen years ago; and Aggers was now long dead—as the result of a wound inflicted when he was caught, after a couple of years, trying to escape.

On their capture, they too had been examined in the council chamber, and Hascombe (who had interested himself in a dilettante way in anthropology as in most other subjects of scientific inquiry) was much impressed by what he described as the exceedingly religious atmosphere. Everything was done with an elaboration of ceremony; the chief seemed more priest than king, and performed various rites at intervals, and priests were busy at some sort of altar the whole time. Among other things, he noticed that one of their rites was connected with blood. First the chief and then the

councillors were in turn requisitioned for a drop of vital fluid pricked from their finger tips, and the mixture, held in a little vessel, was slowly evaporated over a flame.

Some of Hascombe's men spoke a dialect not unlike that of their captors, and one was acting as interpreter. Things did not look too favorable. The country was a "holy place," it seemed, and the tribe a "holy race." Other Africans who trespassed there, if not killed, were enslaved, but for the most part they let well alone, and did not trespass. White men they had heard of, but never seen till now, and the debate was what to do—to kill, let go, or enslave? To let them go was contrary to all their principles: the holy place would be defiled if the news of it were spread abroad. To enslave them—yes; but what were they good for? and the Council seemed to feel an instinctive dislike for these other-colored creatures. Hascombe had an idea. He turned to the interpreter. "Say this: 'You revere the Blood. So do we white men; but we do more—we can render visible the blood's hidden nature and reality, and with permission I will show this great magic.'" He beckoned to the bearer who carried his precious microscope, set it up, drew a drop of blood from the tip of his finger with his knife, and mounted it on a slide under a coverslip. The bigwigs were obviously interested. They whispered to each other. At length, "Show us," commanded the chief.

Hascombe demonstrated his preparation with greater interest than he had ever done to first-year medical students in the old days. He explained that the blood was composed of little people of various sorts, each with their own lives, and that to spy upon them thus gave us new powers over them. The elders were more or less impressed. At any rate the sight of these thousands of corpuscles where they could see nothing before made them think, made them realize that the white man had power which might make him a desirable servant.

They would not ask to see their own blood for fear that the sight would put them into the power of those who saw it. But they had blood drawn from a slave. Hascombe asked too for a bird, and was able to create a certain interest by showing how different were the little people of its blood.

"Tell them," he said to the interpreter, "that I have many

other powers and magics which I will show them if they will give me time."

The long and short of it was that he and his party were spared—He said he knew then what one felt when the magistrate said: "Remanded for a week."

He had been attracted by one of the elder statesmen of the tribe—a tall, powerful-looking man of middle-age; and was agreeably surprised when this man came round next day to see him. Hascombe later nicknamed him the Prince-Bishop, for his combination of the qualities of the statesman and the ecclesiastic. His real name was Bugala. He was as anxious to discover more about Hascombe's mysterious powers and resources as Hascombe was to learn what he could of the people into whose hands he had fallen, and they met almost every evening and talked far into the night.

Bugala's inquiries were as little prompted as Hascombe's by a purely academic curiosity. Impressed himself by the microscope, and still more by the effect which it had had on his colleagues, he was anxious to find out whether by utilizing the powers of the white man he could not secure his own advancement. At length, they struck a bargain. Bugala would see to it that no harm befell Hascombe. But Hascombe must put his resources and powers at the disposal of the Council; and Bugala would take good care to arrange matters so that he himself benefited. So far as Hascombe could make out, Bugala imagined a radical change in the national religion, a sort of reformation based on Hascombe's conjuring tricks; and that he would emerge as the Hight Priest of this changed system.

Hascombe had a sense of humor, and it was tickled. It seemed pretty clear that they could not escape, at least for the present. That being so, why not take the opportunity of doing a little research work at state expense—an opportunity which he and his like were always clamoring for at home? His thoughts began to run away with him. He would find out all he could of the rites and superstitions of the tribe. He would, by the aid of his knowledge and his scientific skill, exalt the details of these rites, the expression of those superstitions, the whole physical side of their religiosity, on to a new level which should to them appear truly miraculous.

It would not be worth my troubling to tell all the negotiations, the false starts, the misunderstandings. In the end he secured what he wanted—a building which could be used as a laboratory; an unlimited supply of slaves for the lower and priests for the higher duties of laboratory assistants, and the promise that when his scientific stores were exhausted they would do their best to secure others from the coast—a promise which was scrupulously kept, so that he never went short for lack of what money could buy.

He next applied himself diligently to a study of their religion and found that it was built round various main motifs. Of these, the central one was the belief in the divinity and tremendous importance of the Priest-King. The second was a form of ancestor-worship. The third was an animal cult, in particular of the more grotesque species of the African fauna. The fourth was sex, *con variazioni*. Hascombe reflected on these facts. Tissue culture; experimental embryology; endocrine treatment; artificial parthenogenesis. He laughed and said to himself: "Well, at least I can try, and it ought to be amusing."

That was how it all started. Perhaps the best way of giving some idea of how it had developed will be for me to tell my own impressions when Hascombe took me round his laboratories. One whole quarter of the town was devoted entirely to religion—it struck me as excessive, but Hascombe reminded me that Tibet spends one-fifth of its revenues on melted butter to burn before its shrines. Facing the main square was the chief temple, built impressively enough of solid mud. On either side were the apartments where dwelt the servants of the gods and administrators of the sacred rites. Behind were Hascombe's laboratories, some built of mud, others, under his later guidance, of wood. They were guarded night and day by patrols of giants, and were arranged in a series of quadrangles. Within one quadrangle was a pool which served as an aquarium; in another, aviaries and great hen houses; in yet another, cages with various animals; in the fourth a little botanic garden. Behind were stables with dozens of cattle and sheep, and a sort of experimental ward for human beings.

He took me into the nearest of the buildings. "This," he said, "is known to the people as the Factory (it is difficult to give the exact sense of the word, but it literally means producing-place), the Factory of Kingship or Majesty, and the Well-spring of Ancestral Immortality." I looked round, and saw platoons of buxom and shining African women, becomingly but unusually dressed in tight-fitting dresses and caps, and wearing rubber gloves. Microscopes were much in evidence, also various receptacles from which steam was emerging. The back of the room was screened off by a wooden screen in which were a series of glass doors; and these doors opened into partitions, each labelled with a name in that unknown tongue, and each containing a number of objects like the one I had seen taken out of the basket by the giant before we were captured. Pipes surrounded this chamber, and appeared to be distributing heat from a fire in one corner.

"Factory of Majesty!" I exclaimed. "Wellspring of Immortality! What the dickens do you mean?"

"If you prefer a more prosaic name," said Hascombe, "I should call this the Institute of Religious Tissue Culture." My mind went back to a day in 1918 when I had been taken by a biological friend in New York to see the famous Rockefeller Institute; and at the word tissue culture I saw again before me Dr. Alexis Carrel and troops of white-garbed American girls making cultures, sterilizing, microscopizing, incubating, and the rest of it. The Hascombe Institute was, it is true, not so well equipped, but it had an even larger, if differently colored, personnel.

Hascombe began his explanations. "As you probably know, Frazer's 'Golden Bough'* introduced us to the idea of a sacred priest-king, and showed how fundamental it was in primitive societies. The welfare of the tribe is regarded as inextricably bound up with that of the King, and extraordinary precautions are taken to preserve him from harm. In this kingdom, in the old days, the King was hardly allowed to set his foot to the ground in case he should lose divinity; his cut hair and nail-parings were entrusted to one of the most

* A very elaborate treatise on a division of Roman mythology, especially on the cult of Diana.

important officials of state, whose duty it was to bury them secretly, in case some enemy should compass the King's illness or death by using them in black magic rites. If anyone of base blood trod on the King's shadow, he paid the penalty with his life. Each year a slave was made mock-king for a week, allowed to enjoy all the king's privileges, and was decapitated at the close of his brief glory; and by this means it was supposed that the illnesses and misfortunes that might befall the King were vicariously got rid of.

"I first of all rigged up my apparatus, and with the aid of Aggers, succeeded in getting good cultures, first of chick tissues and later, by the aid of embryo-extract, of various and adult mammalian tissues. I then went to Bugala, and told him that I could increase the safety, if not of the King as an individual, at least of the life which was in him, and that I presumed that this would be equally satisfactory from a theological point of view. I pointed out that if he chose to be made guardian of the King's subsidiary lives, he would be in a much more important position than the chamberlain or the burier of the sacred nail-parings, and might make the post the most influential in the realm.

"Eventually I was allowed (under threats of death if anything untoward occurred) to remove small portions of His Majesty's subcutaneous connective tissue under a local anaesthetic. In the presence of the assembled nobility I put fragments of this into culture medium, and showed it to them under the microscope. The cultures were then put away in the incubator, under a guard—relieved every eight hours—of half a dozen warriors. After three days, to my joy they had all taken and showed abundant growth. I could see that the Council was impressed, and reeled off a magnificent speech, pointing out that this growth constituted an actual increase in the quantity of the divine principle inherent in royalty; and what was more, that I could increase it indefinitely. With that I cut each of my cultures into eight, and sub-cultured all the pieces. They were again put under guard, and again examined after three days. Not all of them had taken this time, and there were some murmurings and angry looks, on the ground that I had killed some of the King; but I pointed out that the King was still the King, that his little wound had completely

healed, and that any successful cultures represented so much extra sacredness and protection to the state. I must say that they were very reasonable, and had good theological acumen, for they at once took the hint.

"I pointed out to Bugala, and he persuaded the rest without much difficulty, that they could now disregard some of the older implications of the doctrines of kingship. The most important new idea which I was able to introduce was *mass production*. Our aim was to multiply the King's tissues indefinitely, to ensure that some of their protecting power should reside everywhere in the country. Thus by concentrating upon quantity, we could afford to remove some of the restrictions upon the King's mode of life. This was of course agreeable to the King; and also to Bugala, who saw himself wielding undreamt-of power. One might have supposed that such an innovation would have met with great resistance simply on account of its being an innovation; but I must admit that these people compared very favorably with the average business man in their lack of prejudice.

"Having thus settled the principle, I had many debates with Bugala as to the best methods for enlisting the mass of the population in our scheme. What an opportunity for scientific advertising! But, unfortunately, the population could not read. However, war propaganda worked very well in more or less illiterate countries—why not here?"

Hascombe organized a series of public lectures in the capital, at which he demonstrated his regal tissues to the multitude, who were bidden to the place by royal heralds. An impressive platform group was always supplied from the ranks of the nobles. The lecturer explained how important it was for the community to become possessed of greater and greater stores of the sacred tissues. Unfortunately, the preparation was laborious and expensive, and it behooved them all to lend a hand. It had accordingly been arranged that to everyone subscribing a cow or buffalo, or its equivalent—three goats, pigs, or sheep—a portion of the royal anatomy should be given, handsomely mounted in an ebony holder. Sub-culturing would be done at certain hours and days, and it would be obligatory to send the cultures for renewal. If

through any negligence the tissue died, no renewal would be made. The subscription entitled the receiver to sub-culturing rights for a year, but was of course renewable. By this means not only would the totality of the King be much increased, to the benefit of all, but each cultureholder would possess an actual part of His Majesty, and would have the infinite joy and privilege of aiding by his own efforts the multiplication of divinity.

Then they could also serve their country by dedicating a daughter to the state. These young women would be housed and fed by the state, and taught the technique of the sacred culture. Candidates would be selected according to general fitness, but would of course, in addition, be required to attain distinction in an examination on the principles of religion. They would be appointed for a probationary period of six months. After this they would receive a permanent status, with the title of Sisters of the Sacred Tissue. From this, with age, experience, and merit, they could expect promotion to the rank of mothers, grandmothers, and great-grandmothers, and grand ancestresses of the same. The merit and benefit they would receive from their close contact with the source of all benefits would overflow on to their families.

The scheme worked like wildfire. Pigs, goats, cattle, buffaloes, and Negro maidens poured in. Next year the scheme was extended to the whole country, a peripatetic laboratory making the rounds weekly.

By the close of the third year there was hardly a family in the country which did not possess at least one sacred culture. To be without one would have been like being without one's trousers—or at least without one's hat*—on Fifth Avenue. Thus did Bugala effect a reformation in the national religion, enthrone himself as the most important personage in the country, and entrench applied science and Hascombe firmly in the organization of the state.

Encouraged by his success, Hascombe soon set out to capture the ancestry-worship branch of the religion as well. A public proclamation was made pointing out how much

* This was written before the year 1927.

more satisfactory it would be if worship could be made not merely to the charred bones of one's forbears, but to bits of them still actually living and growing. All who were desirous of profiting by the enterprise of Bugala's Department of State should therefore bring their older relatives to the laboratory at certain specified hours, and fragments would be painlessly extracted for culture.

This, too, proved very attractive to the average citizen. Occasionally, it is true, grandfathers or aged mothers arrived in a state of indignation and protest. However, this did not matter, since, according to the law, once children were twenty-five years of age, they were not only assigned the duty of worshipping their ancestors, alive or dead, but were also given complete control over them, in order that all rites might be duly performed to the greater safety of the commonweal. Further, the ancestors soon found that the operation itself was trifling, and, what was more, that once accomplished, it had the most desirable results. For their descendants preferred to concentrate at once upon the culture which they would continue to worship after the old folks were gone, and so left their parents and grandparents much freer than before from the irksome restrictions which in all ages have beset the officially holy.

Thus, by almost every hearth in the kingdom, instead of the old-fashioned rows of red jars containing the incinerated remains of one or other of the family forbears, the new generation saw growing up a collection of family slides. Each would be taken out and reverently examined at the hour of prayer. "Grandpapa is not growing well this week," you would perhaps hear the young black devotee say; the father of the family would pray over the speck of tissue; and if that failed, it would be taken back to the factory for rejuvenation. On the other hand, what rejoicing when a rhythm of activity stirred in the cultures! A spurt on the part of great-grandmother's tissues would bring her wrinkled old smile to mind again; and sometimes it seemed as if one particular generation were all stirred simultaneously by a pulse of growth, as if combining to bless their devout descendants.

To deal with the possibility of cultures dying out, Has-

combe started a central storehouse, where duplicates of every strain were kept, and it was this repository of the national tissues which had attracted my attention at the back of the laboratory. No such collection had ever existed before, he assured me. Not a necropolis, but a histopolis, if I may coin a word: not a cemetery, but a place of eternal growth.

The second building was devoted to endocrine products—an African Armour's—and was called by the people the "Factory of Ministers to the Shrines."

"Here," he said, "you will not find much new. You know the craze for 'glands' that was going on at home years ago, and its results, in the shape of pluriglandular preparations, a new genre of patent medicines, and a popular literature that threatened to outdo the Freudians, and explain human beings entirely on the basis of glandular make-up, without reference to the mind at all.

"I had only to apply my knowledge in a comparatively simple manner. The first thing was to show Bugala how, by repeated injections of pre-pituitary, I could make an ordinary baby grow up into a giant. This pleased him, and he introduced the idea of a sacred bodyguard, all of really gigantic stature, quite overshadowing Frederick's Grenadiers.

"I did, however, extend knowledge in several directions. I took advantage of the fact that their religion holds in reverence monstrous and imbecile forms of human beings. That is, of course, a common phenomenon in many countries, where half-wits are supposed to be inspired, and dwarfs the object of superstitious awe. So I went to work to create various new types. By employing a particular extract of adrenal cortex, I produced children who would have been a match for the Infant Hercules, and, indeed, looked rather like a cross between him and a brewer's drayman. By injecting the same extract into adolescent girls I was able to provide them with the most copious mustaches, after which they found ready employment as prophetesses.

"Tampering with the post-pituitary gave remarkable cases of obesity. This, together with the passion of the men for fatness in their women, Bugala took advantage of, and I believe made quite a fortune by selling as concubines female slaves treated in this way. Finally, by another pituitary treatment, I

at last mastered the secret of true dwarfism, in which perfect proportions are retained.

"Of these productions, the dwarfs are retained as acolytes in the temple; a band of the obese young ladies form a sort of Society of Vestal Virgins, with special religious duties, which, as the embodiment of the national ideal of beauty, they are supposed to discharge with peculiarly propitious effect; and the giants form our Regular Army.

"The Obese Virgins have set me a problem which I confess I have not yet solved. Like all races who set great store by sexual enjoyment, these people have a correspondingly exaggerated reverence for virginity. It therefore occurred to me that if I could apply Jacques Loeb's great discovery of artificial parthenogenesis to man, or, to be precise, to these young ladies, I should be able to grow a race of vestals, self-reproducing yet ever virgin, to whom in concentrated form should attach that reverence of which I have just spoken. You see, I must always remember that it is no good proposing any line of work that will not benefit the national religion. I suppose state-aided research would have much the same kinds of difficulties in a really democratic state. Well this, as I say, has so far beaten me. I have taken the matter a step further than Bataillon with his fatherless frogs, and I have induced parthenogenesis in the eggs of reptiles and birds; but so far I have failed with mammals. However, I've not given up yet!"

Then we passed to the next laboratory, which was full of the most incredible animal monstrosities. "This laboratory is the most amusing," said Hascombe. "Its official title is 'Home of the Living Fetishes.' Here again I have simply taken a prevalent trait of the populace, and used it as a peg on which to hang research. I told you that they always had a fancy for the grotesque in animals, and used the most bizarre forms, in the shape of little clay or ivory statuettes, for fetishes.

"I thought I would see whether art could not improve upon nature, and set myself to recall my experimental embryology. I use only the simplest methods. I utilize the plasticity of the earliest stages to give double-headed and cyclopean monsters. That was, of course, done years ago in newts by Spemann and fish by Stockard; and I have merely applied the mass-production methods of Mr. Ford to their results. But

my specialties are three-headed snakes, and toads with an extra heaven-pointing head. The former are a little difficult, but there is a great demand for them, and they fetch a good price. The frogs are easier: I simply apply Harrison's methods to embryo tadpoles."

He then showed me into the last building. Unlike the others, this contained no signs of research in progress, but was empty. It was draped with black hangings, and lit only from the top. In the center were rows of ebony benches, and in front of them a glittering golden ball on a stand.

"Here I am beginning my work on reinforced telepathy," he told me. "Some day you must come and see what it's all about, for it really is interesting."

You may imagine that I was pretty well flabbergasted by this catalogue of miracles. Every day I got a talk with Hascombe, and gradually the talks became recognized events of our daily routine. One day I asked if he had given up hope of escaping. He showed a queer hesitation in replying. Eventually he said, "To tell you the truth, my dear Jones, I have really hardly thought of it these last few years. It seemed so impossible at first that I deliberately put it out of my head and turned with more and more energy, I might almost say fury, to my work. And now, upon my soul, I am not quite sure whether I want to escape or not."

"Not *want* to!" I exclaimed, "surely you can't mean that!"

"I am not so sure," he rejoiced. "What I most want is to get ahead with this work of mine. Why, man, you don't realize what a chance I've got! And it is all growing so fast—I can see every kind of possibility ahead"; and he broke off into silence.

However, although I was interested enough in his past achievements, I did not feel willing to sacrifice my future to his perverted intellectual ambitions. But he would not leave his work.

The experiments which most excited his imagination were those he was conducting into mass telepathy. He had received his medical training at a time when abnormal psychology was still very unfashionable in England, but had luckily been thrown in contact with a young doctor who was a keen stu-

dent of hypnotism, through whom he had been introduced to some of the great pioneers, like Bramwell and Wingfield. As a result, he had become a passable hypnotist himself, with a fair knowledge of the literature.

In the early days of his captivity he became interested in the sacred dances which took place every night of full moon, and were regarded as propitiations of the celestial powers. The dancers all belong to a special sect. After a series of exciting figures, symbolizing various activities of the chase, war, and love, the leader conducts his band to a ceremonial bench. He then begins to make passes at them; and what impressed Hascombe was this, that a few seconds sufficed for them to fall back in deep hypnosis against the ebony rail. It recalled, he said, the most startling cases of collective hypnosis recorded by the French scientists. The leader next passed from one end of the bench to the other, whispering a brief sentence into each ear. He then, according to immemorial rite, approached the Priest-King, and, after having exclaimed aloud, "Lord of Majesty, command what thou wilt for thy dancers to perform," the King would thereupon command some action which had previously been kept secret. The command was often to fetch some object and deposit it at the moon-shrine; or to fight the enemies of the state; or (and this was what the company most liked) to be some animal, or bird. Whatever the command, the hypnotized men would obey it, for the leader's whispered words had been an order to hear and carry out only what the King said; and the strangest scenes would be witnessed as they ran, completely oblivious of all in their path, in search of the gourds or sheep they had been called on to procure, or lunged in a symbolic way at invisible enemies, or threw themselves on all fours and roared as lions, or galloped as zebras, or danced as cranes. The command executed, they stood like stocks or stones, until their leader, running from one to the other, touched each with a finger and shouted, "Wake." They woke, and limp, but conscious of having been the vessels of the unknown spirit, danced back to their special hut or clubhouse.

This susceptibility to hypnotic suggestion struck Hascombe, and he obtained permission to test the performers more closely. He soon established that the people were, as a race,

extremely prone to dissociation, and could be made to lapse into deep hypnosis with great ease, but a hypnosis in which the subconscious, though completely cut off from the waking self, comprised portions of the personality not retained in the hypnotic selves of Europeans. Like most who have fluttered round the psychological candle, he had been interested in the notion of telepathy; and now, with this supply of hypnotic subjects under his hands, began some real investigation of the problem.

By picking his subjects, he was soon able to demonstrate the existence of telepathy, by making suggestions to one hypnotized man who transferred them without physical intermediation to another at a distance. Later—and this was the culmination of his work—he found that when he made a suggestion to several subjects at once, the telepathic effect was much stronger than if he had done it to one at a time—the hypnotized minds were reinforcing each other. “I’m after the superconsciousness,” Hascombe said, “and I’ve already got the rudiments of it.”

I must confess that I got almost as excited as Hascombe over the possibilities thus opened up. It certainly seemed as if he were right in principle. If all the subjects were in practically the same psychological state, extraordinary reinforcing effects were observed. At first the attainment of this similarity of condition was very difficult; gradually, however, we discovered that it was possible to tune hypnotic subjects to the same pitch, if I may use the metaphor, and then the fun really began.

First of all we found that with increasing reinforcement, we could get telepathy conducted to greater and greater distances, until finally we could transmit commands from the capital to the national boundary, nearly a hundred miles. We next found that it was not necessary for the subject to be in hypnosis to receive the telepathic command. Almost everybody, but especially those of equable temperament, could thus be influenced. Most extraordinary of all, however, were what we at first christened “near effects,” since their transmission to a distance was not found possible until later. If, after Hascombe had suggested some simple command to a largish group of hypnotized subjects, he or I went right up among

them, we would experience the most extraordinary sensation, as of some superhuman personality repeating the command in a menacing and overwhelming way and, whereas with one part of ourselves we felt that we must carry out the command, with another we felt, if I may say so, as if we were only a part of the command, or of something much bigger than ourselves which was commanding. And this, Hascombe claimed, was the first real beginning of the superconsciousness.

Bugala, of course, had to be considered. Hascombe, with the old Tibetan prayer wheel at the back of his mind, suggested that eventually he would be able to induce hypnosis in the whole population, and then transmit a prayer. This would ensure that the daily prayer, for instance, was really said by the whole population, and, what is more, simultaneously, which would undoubtedly much enhance its efficacy. And it would make it possible in times of calamity or battle to keep the whole praying force of the nation at work for long spells together.

Bugala was deeply interested. He saw himself, through this mental machinery, planting such ideas as he wished in the brain cases of his people. He saw himself willing an order; and the whole population rousing itself out of trance to execute it. He dreamt dreams before which those of the proprietor of a newspaper syndicate, even those of a director of propaganda in wartime, would be pale and timid. Naturally, he wished to receive personal instruction in the methods himself; and, equally naturally, we could not refuse him, though I must say that I often felt a little uneasy as to what he might choose to do if he ever decided to override Hascombe and to start experimenting on his own. This, combined with my constant longing to get away from the place, led me to cast about again for means of escape. Then it occurred to me that this very method about which I had such gloomy presentiments, might itself be made the key to our prison.

So one day, after getting Hascombe worked up about the loss to humanity it would be to let this great discovery die with him in Africa, I set to in earnest. "My dear Hascombe," I said, "you must get home out of this. What is there to prevent you saying to Bugala that your experiments are nearly

crowned with success, but that for certain tests you must have a much greater number of subjects at your disposal? You can then get a battery of two hundred men, and after you have tuned them, the reinforcement will be so great that you will have at your disposal a mental force big enough to affect the whole population. Then, of course, one fine day we should raise the potential of our mind-battery to the highest possible level, and send out through it a general hypnotic influence. The whole country, men, women, and children, would sink into stupor. Next we should give our experimental squad the suggestion to broadcast 'sleep for a week.' The telepathic message would be relayed to each of the thousands of minds waiting receptively for it, and would take root in them, until the whole nation became a single superconsciousness, conscious only of the one thought 'sleep' which we had thrown into it."

The reader will perhaps ask how we ourselves expected to escape from the clutches of the superconsciousness we had created. Well, we had discovered that metal was relatively impervious to the telepathic effect, and had prepared for ourselves a sort of tin pulpit, behind which we could stand while conducting experiments. This, combined with caps of metal foil, enormously reduced the effects on ourselves. We had not informed Bugala of this property of metal.

Hascombe was silent. At length he spoke. "I like the idea," he said; "I like to think that if I ever do get back to England and to scientific recognition, my discovery will have given me the means of escape."

From that moment we worked assiduously to perfect our method and our plans. After about five months everything seemed propitious. We had provisions packed away, and compasses. I had been allowed to keep my rifle, on promise that I would never discharge it. We had made friends with some of the men who went trading to the coast, and had got from them all the information we could about the route, without arousing their suspicions.

At last, the night arrived. We assembled our men as if for an ordinary practice, and after hypnosis had been induced, started to tune them. At this moment Bugala came in, unannounced. This was what we had been afraid of; but there

had been no means of preventing it. "What shall we do?" I whispered to Hascombe, in English. "Go right ahead and be damned to it," was his answer; "we can put him to sleep with the rest."

So we welcomed him, and gave him a seat as near as possible to the tightly packed ranks of the performers. At length the preparations were finished. Hascombe went into the pulpit and said, "Attention to the words which are to be suggested." There was a slight stiffening of the bodies. "Sleep," said Hascombe. "*Sleep* is the command: command all in this land to sleep unbrokenly." Bugala leapt up with an exclamation; but the induction had already begun.

We with our metal coverings were immune. But Bugala was struck by the full force of the mental current. He sank back on his chair, helpless. For a few minutes his extraordinary will resisted the suggestion. Although he could not move, his angry eyes were open. But at length he succumbed, and he too slept.

We lost no time in starting, and made good progress through the silent country. The people were sitting about like wax figures. Women sat asleep by their milk-pails, the cow by this time far away. Fat-bellied naked children slept at their games. The houses were full of sleepers sleeping upright round their food, recalling Wordsworth's famous "party in a parlor."

So we went on, feeling pretty queer and scarcely believing in this morphic state into which we had plunged a nation. Finally the frontier was reached, where with extreme elation, we passed an immobile and gigantic frontier guard. A few miles further we had a good solid meal, and a doze. Our kit was rather heavy, and we decided to jettison some superfluous weight, in the shape of some food, specimens, and our metal headgear, or mind-protectors, which at this distance, and with the hypnosis wearing a little thin, were, we thought, no longer necessary.

About nightfall on the third day, Hascombe suddenly stopped and turned his head.

"What's the matter?" I said. "Have you seen a lion?" His reply was completely unexpected. "No. I was just wondering whether really I ought not to go back again."

"Go back again," I cried. "What in the name of God Almighty do you want to do that for?"

"It suddenly struck me that I ought to," he said, "about five minutes ago. And really, when one comes to think of it, I don't suppose I shall ever get such a chance at research again. What's more, this is a dangerous journey to the coast, and I don't expect we shall get through alive."

I was thoroughly upset and put out, and told him so. And suddenly, for a few moments, I felt I must go back too. It was like that old friend of our boyhood, the voice of conscience.

"Yes, to be sure, we ought to go back," I thought with fervor. But suddenly checking myself as the thought came under the play of reason—"Why should we go back?" All sorts of reasons were proffered, as it were, by unseen hands reaching up out of the hidden parts of me.

And then I realized what had happened. Bugala had waked up; he had wiped out the suggestion we had given to the superconsciousness, and in its place put in another. I could see him thinking it out, the cunning devil (one must give him credit for brains!), and hear him, after making his passes, whisper to the nation in prescribed form his new suggestion: "Will to return! Return!" For most of the inhabitants the command would have no meaning, for they would have been already at home. Doubtless some young men out on the hills, or truant children, or girls run off in secret to meet their lovers, were even now returning, stiffly and in somnambulistic trance, to their homes. It was only for them that the new command of the superconsciousness had any meaning—and for us.

I am putting it in a long and discursive way; at the moment I simply *saw* what had happened in a flash. I told Hascombe, I showed him it *must* be so, that nothing else would account for the sudden change. I begged and implored him to use his reason, to stick to his decision, and to come on. How I regretted that, in our desire to discard all useless weight, we had left behind our metal telepathy-proof head coverings!

But Hascombe would not, or could not, see my point. I suppose he was much more imbued with all the feelings and spirit of the country, and so more susceptible. However that

may be, he was immovable. He must go back; he knew it; he saw it clearly; it was his sacred duty; and much other similar rubbish. All this time the suggestion was attacking me too; and finally I felt that if I did not put more distance between me and that unisonic battery of will, I should succumb as well as he.

"Hascombe," I said, "I am going on. For God's sake, come with me." And I shouldered my pack, and set off. He was shaken, I saw, and came a few steps after me. But finally he turned, and, in spite of my frequent pauses and shouts to him to follow, made off in the direction we had come. I can assure you that it was with a gloomy soul that I continued my solitary way. I shall not bore you with my adventures. Suffice it to say that at last I got to a white outpost, weak with fatigue and poor food and fever.

I kept very quiet about my adventures, only giving out that our expedition had lost its way and that my men had run away or been killed by the local tribes. At last I reached England. But I was a broken man, and a profound gloom had invaded my mind at the thought of Hascombe and the way he had been caught in his own net. I never found out what happened to him, and I do not suppose that I am likely to find out now. You may ask why I did not try to organize a rescue expedition; or why, at least, I did not bring Hascombe's discoveries before the Royal Society or the Metaphysical Institute. I can only repeat that I was a broken man. I did not expect to be believed; I was not at all sure that I could repeat our results, even on the same human material, much less with men of another race; I dreaded ridicule; and finally I was tormented by doubts as to whether the knowledge of mass telepathy would not be a curse rather than a blessing to mankind.

However, I am an oldish man now and, what is more, old for my years. I want to get the story off my chest. Besides, old men like sermonizing and you must forgive, gentle reader, the sermonical turn which I now feel I must take. The question I want to raise is this: Dr. Hascombe attained to an unsurpassed power in a number of the applications of science—but *to what end did all this power serve?* It is the merest cant and twaddle to go on asserting, as most of our press and

people continue to do, that increase of scientific knowledge and power must in itself be good. I commend to the great public the obvious moral of my story and ask them to think what they propose to do with the power which is gradually being accumulated for them by the labors of those who labor because they like power, or because they want to find the truth about how things work.

A MARTIAN ADVENTURE

Willy Ley

WILLY LEY

*This story (originally published under the pseudonym of "Robert Willey") is the first piece of science fiction by one of this country's foremost science historians ever to be anthologized, as it was the first (of only four) he ever published. Ley's career commenced in the 1920s when, as a very young man (he was born in 1906), he was one of the founders of the German Rocket Society, later dissolved by the Nazis. (Mr. Ley himself emigrated to the United States in 1935.) His knowledge of rocketry and allied sciences is profound; he has written what is without doubt the standard popular survey of space rockets and the problems of interplanetary travel in his *Rockets, Missiles and Space Travel*—first edition, 1944, the latest, almost twice as long, 1960. Simultaneously, pursuing another of his scientific interests, he has done several books on little-known aspects of zoology and botany, beginning with *The Lungfish and the Unicorn* in 1941. At the end of 1961, he was working on what will undoubtedly be the most comprehensive popular history of astronomy yet written.*

Willy Ley classes himself as a "historian of science," though he has also done some practical work in the field of rocketry and allied fields. The one thing he states with assurance that he will not do in the future is to write more science fiction! "A Martian Adventure" was originally called "At the Perihelion," and was one of the author's earliest ventures into science fiction. As an example of the prodigious progress of technology, the fact is that when the story was first published most readers thought it was sheer science fantasy; whereas today (with the possible exception of the "skolopenders") it seems almost as if it were about to happen. . . .

A Martian Adventure

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

The silhouette looked like a ribbon about a foot wide with crawling legs on both sides of it. The legs showed something like balls, about the size of a golf ball, clinging to them. It looked as if they were wrapped in some kind of net made of rather thick threads. The threads gave the impression of a spider web, tough and flexible, hard and sticky at the same time.

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

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

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

Next to the door there was a small aperture, about one inch in diameter. He placed a square metal box near the opening with a queer looking nozzle dangling from a metal hose attached to it. Then he took another little instrument, consisting

of a short piece of narrow copper tubing and a rubber ball. He squeezed the rubber ball in his hand and inserted the copper tubing in a water container, filling the ball with water. After making certain that the dark shadow still rested on the window, he opened the aperture, thrust the end of the copper tubing through it and pressed the ball. Due to the lesser gravity of Mars, a jet of water spouted from the tube and splashed on the sand, almost forty feet away.

Before the sand could swallow the water, it began to freeze. But even before it froze the body of a long and slender animal leaped toward it. It was the shadow from the window, a centipede of gigantic dimensions. Its body, every inch of six feet long, was of bright-blue color; the many legs moved more rapidly than the human eye could follow. It was a full-grown specimen of the blue skolopenders of Mars, the only large animal of Mars thus far discovered. The settlers called it the "Blue Menace"; the Russians, who lived mainly on Thaumasia, where Dan had settled, called it simply "the devil"—*tchort* in their language.

Dan shuddered and smiled grimly at the same time.

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

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

He buttoned up his fur coat; it was cold, though it was

summer for the southern hemisphere of Mars—the Martian summer of the year 1978 A.D. Dan breathed slowly and deeply. He was just able now, after one and a half Martian years, to stand it without an oxygen mask, but only when he was not working, and in a fertile area. In the true desert, or if he had physical labor to do, or on top of the Martian mountains—none of them exceeding three thousand feet—the oxygen mask was essential.

Dan glanced around again; and, seeing nothing out of the ordinary, he went back into the house. It was about supper time, and it was dangerous to be caught by the darkness in the desert. There was practically neither dusk nor dawn on Mars, and the blue *tchorts* could see in the dark. Later, after midnight, they were comparatively harmless, because the extreme cold of the Martian night froze them stiff. But nobody who lost his way in the desert was lucky enough to survive till midnight.

Three things were essential for travel in the Martian deserts, aside from the food and water supply: oxygen apparatus, flame thrower, and so-called “desert automobile.” This was a low-powered, fast car that could be sealed airtight. In outer appearance they looked very much like Terrestrial streamlined limousines with enormously oversized tires. Explorers and adventurers that left the safety of the glass-walled settlements ate and slept in these cars; there was Terrestrial air pressure and Terrestrial warmth inside. In addition to these comforts, they offered protection against the blue skolopenders.

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

The corporation that manufactured and rented these desert tents also claimed that the insulation could withstand the splash of the exhaust of the rocket motors of a landing or

departing space ship. The settlers distrusted this statement somewhat, but they knew that the insulation was bulletproof to a certain extent—an additional feature that was good to know.

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

While preparing his supper, he thought about his immediate plans. He had to go to Space Port, the largest city on Thaumasia, within the next few days. There was some matter with the local government to be attended to and it was necessary to do it in person.

Two weeks ago, when the regular space ship of the Interplanetary Transport Corporation had arrived, he had been in Space Port to call for his mail. Among the interplanetary mail he had found a heavy letter from the local government. More than a year ago, when the Martian districts had been assigned to the principal countries of the Earth, the area called Thaumasia around Lacus Solis had been made Soviet territory, because the majority of the permanent settlers in this district were Russians.

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

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

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

in any event, had to be filed in person to be valid, he had decided to go to Space Port.

2

It was late when he awoke the next morning. He had been sitting up and writing till late into the night. There was a scientific controversy as to the nature of the extinct intelligent inhabitants of Mars in the magazines and journals of Earth, and he had added whatever he could from his personal observations. It was a difficult question. These original inhabitants, extinct now for at least ten thousand years, had built stone houses and cities that were now ruins, heavily infested by the Blue Menace. Nobody knew how they had looked, how they had lived and where they had gone. Popular belief was that they had been men, with a civilization comparable to the European civilization of the year 1700, and that the blue skolopenders had killed them.

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

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

had already coined a few terms covering the various possibilities.

A black line appeared at the horizon—the glass wall of Space Port. All settlements on Mars were surrounded by these walls of tough, black glass. They were a hundred feet high and built of T-shaped sections. No skolopender could climb these walls and the few doors were fortified by batteries of flame throwers.

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

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

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

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

It did not require Dan's fairly comprehensive knowledge of space-travel theory to know what was going on. The rockets

had to break the fall of the ship in such a way that its velocity relative to the Martian surface became zero at the same instant the altitude became zero. This could be an automotive device, but the pilot had to watch for possible side slips and take the necessary measures if one occurred.

Dan saw yellow clouds rise from the ground. The exhaust of the ship, which was not more than five hundred yards high by now, began to strike the ground. Then came the thrilling moment when the landing field was *one* mass of hot exhaust gases splashing over the ground. He could feel the heat through the glass walls. Nothing could be seen but a sea of white flame and whirling yellow dust. Suddenly the spectacle ceased, and through the slowly settling sand and dust the silvery space ship could be seen on the ground, undamaged.

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

The other space ship was to land within a few hours, the ship that had just landed would probably still be out in the open and might be hit by the splash of the second vessel. Therefore the pilot was using up the rest of the fuel in his tanks to avoid a possible explosion. Dan's guess proved to be right.

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

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

It was a large new ship of latest design and able to carry up to twenty passengers with as much comfort as a space liner could offer. Dan deciphered the Russian characters at

the prow: "Lenin—Leningrad." He asked a question of the guard at the door of the ship, but the man shook his head. Apparently he did not understand English.

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

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

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

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

3

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

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

uniformed guard, who ushered Dan into one of the back rooms.

There were five people in the room, aside from the two guards at the door. They were grouped around a table on which there were little stacks of papers and forms. Two of the five looked typically Russian to Dan, dark-eyed and dark-haired. He had seen that type often on Thaumasia. The one that seemed to be the boss of the five was a tall, lean man with a long nose. Though he seemed to be quite young, he had little hair left and it was gray; it had probably been brown originally, Benson thought. His eyes gave Benson the impression of a fanatic, and the carelessness of attire, the decayed teeth, and the fact that he had not shaved for days supported this opinion. It seemed to Dan that he could detect Tartaric blood in him, though the tall, lean figure seemingly contradicted such an assumption.

The next one gave the impression of being a giant, but it was not his height which probably was just about six feet. It was his massive chest supporting an immense head. He was the only one wearing the proverbial Russian beard. But his hairy hands were white and soft and comparatively small, and his blue eyes were kind.

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

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

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

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

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

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

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

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

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

He looked questioningly at Dan.

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

Tchernikoff nodded and was silent for a moment.

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

"No."

"It is all right. If you join our service you will be classified as a foreign expert. You applied to stay on our territory without becoming a citizen of the Union of Soviet Socialist Republics. This wish can be granted, of course. But with my arrival a few changes are to take place on Thaumasia, and we would like you to take part in making these changes. From now on Thaumasia, will bear the name of Novaya Respublika—the New Republic. It will be an independent country within the Union of the Soviet Republics. I am to be its governor and at the same time what you would call Russian Ambassador, though this term cannot be used in its full meaning. Comrades Djilinskiy and Tishtshenko are political

commissars. They will take over the supervision of police and communication tomorrow. Comrade Rakolsky will not be permanently on Mars; he is a scientific advisor on a special mission.

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

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

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

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

It sounded to Benson as an offer of exterminating sharks would sound to a sailor. He accepted without hesitation and signed a document in Russian and English, which had been prepared in advance.

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

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

The professor rose, too, and led the way, Benson following him. Outside, they selected a table and Benson told the professor all he knew about the skolopenders: that the first six pairs of their legs were poisonous and that even a little scratch was fatal to human beings and to all terrestrial animals. Of course it had not been established whether the "poison" was also a poison to indigenous Martian life. Dan went on to tell that the skolopenders might actually be classed as herbivorous; they had been seen chewing Martian vegetation, while people killed by them had merely been sucked dry but not eaten;

that fire was the surest way of killing them, though concentrated bursts of machine gun fire might do it too; that the females carried their eggs around with them like some terrestrial crabs; and that they were, so far, the only known Martian life form which did not flee when a human came near.

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

This was the opportunity Benson had waited for.

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

The professor looked at him kindly and said in a low voice, "I do not know whether you are supposed to know it, but I'll tell you. She belongs to the G.P.U. and is to supervise both of us."

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

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

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

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

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

"Fifty-Seventh near Broadway," she replied. "I lived there for three years. That is long enough for a woman of only a little less than average intelligence to pick up a language."

While she was sipping her drink, the professor related the story in Russian. Benson understood a word here and there, and as far as he could make out, it was actually the plan they had decided upon.

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

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

"Well, I have been told that people fainted on just seeing their heads in a museum," answered Dan. "They certainly look hideous, and it needs strong nerves and some experience to remain calm in their presence."

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

A few loud words from passersby made him turn his head, and without meaning to, he glanced at a large mirror reaching from floor to ceiling. He could see under his own table in this mirror. He saw the girl's foot knocking at the boot of the professor. Immediately afterward, the professor rose and asked to be excused because he felt very tired.

"The first examination by the G.P.U. is duel" thought Dan, and for a fleeting instant he was willing to retire, too.

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

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

"There aren't many things to tell," he said aloud. "It is a cold planet—cold in summer and very cold in winter. The climate is healthy, though, but life is hard, even if we succeed in exterminating the Blue Menace. It will always remain unfriendly to man. Actually this planet is no longer alive, even though we have lists of 'living' Martian plants and 'living' Martian animals. But they are all dry, and mostly brittle. As far as I am concerned, the plants are dead and so are the deserts. The civilization is gone. The only thing alive are the blue skolopenders."

He took a long sip from his glass.

The girl looked at him, with slight mockery. Her hand touched his fleetingly.

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

Dan felt as if this girl could read his thoughts.

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

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

Then she spoke, with lowered voice. "Dan Benson, I can see through you. Tonight you forgot what drove you away from Earth. I do not know whether I should congratulate you; I cannot decide that for weeks. Now you are homesick for Earth. And as soon as the contract you signed tonight expires, you will return to your planet and to your country." Her voice changed, began to sound businesslike. "I do not know whether somebody informed you that I am of the G.P.U. This institution knows everything. It knows that you were broke when you arrived here. It knows that you made

two thousand seven hundred and fifty dollars on literary work and close to eighteen thousand dollars by the sale of your Martian gems. It knows, therefore, that you do not really need today's contract." Her voice changed again and was as before. "The G.P.U. even knows what you do not know; why you signed the contract. But the G.P.U. does not comment, it acts.

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

"I do!" he said without hesitation.

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

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

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

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

Benson and the professor had decided to test the method they had worked out for the extermination of the blue skolo-

penders on a small scale first. If the experiment was successful, the method would be used generally, if not, they had to think of something else.

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

The plane headed for a single ancient ruin in the desert. Dan knew that skolopenders were abundant there. He had always hoped to be able to investigate this ruin and to search it for the ancient gems that were so highly priced on Earth. It had always proved impossible. The blue skolopenders had attacked his car in such numbers that he had feared the top would crush in. Not even during the coldest period of Martian winter was an approach possible. Dan wondered what the skolopenders fed on. Did they find food underground? Were there caves of some kind? If so, the first scheme would not work.

It had been prepared during the night. A desert truck had towed a ditch-digging machine in a large circle around the ruins and short sticks of slow burning rocket fuel had been scattered. Now the desert truck stood by, waiting for the plane. It came in at low altitude, looking very clumsy to people not used to the sight, because the thin Martian atmosphere required enormous wings. It went into a semicircle and then made a slow deliberate bombing run in the direction of the ruins. It was a bombing run; unstreamlined canisters dropped from the plane. As they tumbled, an officer in the desert truck threw the ignition switch for the rocket fuel in the trench. The canisters exploded with a dull sound, releasing a very heavy yellowish gas that flowed like a liquid into the cracks of the ancient walls and found its way into the base-

ment. The gas was the strongest poison known to Terrestrial warfare.

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

But more and more came, and slowly the men gave way. Suddenly there was confusion. Over the flaming pools, across the bodies of unfortunate soldiers, raced the animals. Benson shouted orders to the pilot; the plane instantly turned and followed the skolopenders. High as their running speed was, they could not compete with the airplane. They dropped a rain of thermite bombs on and around the animals.

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

"Attention now," he said. "They will be attracted by the water I spilled. As soon as they are within range, I open fire. Should the flame thrower fail only for a second, or should the fuel supply be exhausted before all are dead, one of you must close my window at once. If only one *tchort* leaps in, we are doomed, all of us. When it is necessary, I'll yell to you, Larry." The pilot nodded. "Then you take off at once. Keep the motor running."

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

The skolopenders came in a straight line toward the plane. The water attracted them. Benson waited as long as his nerves

allowed him to, then he opened fire. The first three of the animals died in the fiery blast; two others were caught when they tried to run away. Dan was just ready to direct the flame against the last survivor—an especially large specimen—when the flame lessened in intensity and stopped. The fuel supply was exhausted.

“Take off! Shut the window!” yelled Dan.

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

The pilot saw this in his small mirror, and sent the plane spiraling upward until it reached its ceiling. The skolopender must be dead by now. Benson donned a pair of heavy leather gloves to be safe if he should touch the legs of the creature and, carefully avoiding looking at the dangling body, he opened the window. He saw the blue body fall; if it was still alive, the impact on the ground would kill it.

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

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

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

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

The aim was to manufacture from Martian resources whatever was possible and to produce quantities sufficient not only for Thaumasia and its population—which was to be increased—but also for the other Martian districts which had capitalist governments. Naturally, Mars-made products, however inefficient the production methods, were much cheaper than any imported products, which suffered under the extremely high cost of transportation.

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

Then one of the Army men spoke.

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

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

The commissioner of the police spoke next. Due to the rigid registration system, everybody on Thaumasia was known to the police. There were all in all three thousand one hundred and eighty-nine male and two hundred and thirty-six female

inhabitants of Thaumasia. Only two hundred men, approximately, were younger or older than specified.

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

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

5

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

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

Dan was more nervous than the others. There were many things he did not understand. Oftentimes this was due to linguistic difficulties; more frequently it was not. He had the feeling of being outside the real activities, though he was invited to every conference of the government—at least to every conference he knew about. Certainly there were others kept secret from him. There were questions he asked that were not answered. And there were questions asked of him he could not make out. He answered to the best of his knowledge, and sometimes it seemed that his answers pleased those that asked the questions. But why it pleased them and why these questions were asked he could not understand.

He did not see the girl at all, except during the official

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

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

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

They hated the Blue Menace. But the joy felt by them during the first weeks of the war, when their flame blasts killed the animals by the thousands; slowly disappeared. Tchernikoff's commands, executed by Koltchakoff, Nadya, and the scientific committee—consisting of Dan and the professor—drove them on relentlessly. The men had practically no rest periods.

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

Many men died from Martian sickness, from accidents

while handling the liquid fire, from the termite bombs and the explosives. Unforeseen attacks of the skolopenders took heavy toll.

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

The plan had to be fulfilled.

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

The plan had to be fulfilled.

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

The plan had to be fulfilled.

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

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

Of the two hundred and fifty men about twenty stepped out. The lieutenant had them brought a few hundred yards away. Then he turned to the others.

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

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

Similar happenings were repeated.

The black line at day and the fiery line at night, that crept over Thaumasia, slackened in speed. It had been a straight line at the outset. Then the line split up into two parallel lines, one going northeast, the other southwest. There were ancient cities that were ruins on the surface but caverns of enormous

size underneath. The caverns protected the animals; they attacked the advancing lines of men from the rear and slew numbers of the invaders from Earth.

Benson ordered a new type of bomb. They were heavy, with a large charge of high explosive. When the ruins were gassed and sprayed with liquid fire, the new bombs were dropped. Since they fell but slowly, due to the lesser gravity of Mars, Benson used what were called penetration bombs by the army experts on Earth. A powerful rocket charge drove them downward; they arrived with a speed several times as high as gravitation alone could produce. The penetration bombs broke through the *débris* piled on top of the ancient basements and exploded inside. The ground shook when they went up—dust, *débris*, and sand mushroomed high into the air.

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

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

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

Thinking of Nadya did not keep him from his work. Nor did it keep him from listening to the growing rebellion. The men were on the verge of open revolt. Sometimes Benson

wondered when they would turn their flame throwers upon his tank.

There was one night when Phobos and Deimos, the two small moons of Mars, shone more brilliantly than usual. They were like diamonds in the sky, maybe because it was so very cold. Benson went around in the camp. The men had dug a fire trench around themselves for protection. They had twenty-four hours to rest. Dan had argued this out with Tchernikoff. He tried to keep the men in good humor; he knew himself that he failed rather badly.

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

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

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

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

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

"Do they hate me too?" asked Dan.

"Certainly. You belong to us. Once they classified you with them. You were a gem digger like they were. Now their licenses are withdrawn, and you are in command. That's why they hate you more." She looked at him fully, and Dan felt uneasy under her clear gaze, that seemed to penetrate his brain and read his thoughts. What she said increased this feeling. "You don't like to belong to us, do you? But you do. Hand me my mask."

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

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

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

She did not finish the sentence because he kissed her. She did not withdraw for awhile, then she struggled free.

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

She had to stop because he kissed her again.

"As I was saying," she continued minutes later, "I want to know one thing." She rose from her seat and faced him fully. "This is serious now. Things are pretty complicated because we met on Mars. First, because you had to forget a love; second, because I had to avoid an undesirable marriage. I must know whether you feel that you can believe in me."

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

He did not know whether he said all this, or whether she read it in his face. He was inclined to think the latter. She knew what he thought, so much was certain. And she smiled and murmured something in Russian he did not understand. In English she said, "The stupidity of otherwise intelligent

men is amazing to behold." She slapped his face—very gently—and said, "Forget that you were alone with me!"

"That's impossible to forget!"

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

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

6

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

Koltchakoff greatly reduced the force, sending most of the planes to Space Port and most of the tanks to Planetogorod. As soon as the last ruin had been cleared out, the remaining tanks were to go to Planetogorod too, escorting the trucks with the draftees. The next project was the building of a monorail from Planetogorod to Space Port. The work detail did its job with considerable enthusiasm. It was the last ruin still infested—and they were ignorant about Tchernikoff's ideas about monorails, and his other plans still to come.

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

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

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

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

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

"Do you like him?" asked Nadya.

"Immensely," answered Dan.

"I am glad," was her reply, but she did not explain why. After awhile she asked one of her inexplicable questions.

"Do you know Beethoven?"

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

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

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

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

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

"Have you been notified about the withdrawal of your license? They probably overlooked you. Dig!"

Selecting a spot that looked promising, Dan began to relate what he knew. "You know," he said, "we know nothing about the original inhabitants of Mars. We only know that once a race of intelligent beings dwelt here. They built houses and cities, as men would. Don't ask me how old the ruins are;

there is a controversy about their age that has lasted since the first landing of a space ship on Mars. If the ruins were on Earth we would say that they are about ten thousand years old. But erosion progresses much more slowly on Mars—where it rains once a year, if at all. They must be much older—one hundred thousand years, two hundred thousand, maybe a million. Maybe even more. We don't know. Anyway, they are so old that there are no traces of the inhabitants left. Nobody ever succeeded in finding a bone or a piece of furniture that would allow some guess as to their looks, size, or habits. If the size of the buildings permits a conclusion, I'd say that they were approximately as tall as one of the smaller human races.

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

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

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

"Look here," he said, pointing to the amethyst. "The design is entirely ornamental. There has never been a find which showed animals or plants or parts of them—like leaves, for

example. I believe that these Martians had a religion which tabooed live things and that this is the reason they always used geometric designs. There are primitive religions on earth that have similar taboos."

Nadya looked at the jewels.

"They are yours, Nadya," he said.

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

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

Nadya looked at her wrist watch. They had to drive back to Space Port now, if they wanted to meet Tchernikoff's deadline. It was wise to be on time.

7

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

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

He bought a copy of the magazine and asked the policeman to read the article on the front page for him. It was signed by Tchernikoff, and it praised, in a somewhat self-laudatory manner, the fulfillment of the first part of the industrialization plan. Then the next move was sketched and the construction of the monorail from Space Port to Planetogorod announced. The important part, however, and apparently the one that caused the excited discussions, was a decree that all gems found during the execution of the industrialization

plan belonged to the government. This also applied to gems discovered since the day when Tchernikoff took over the administration. In doubtful cases, the government would buy the gems at prices decided by the official in charge.

Benson thanked the policeman for the translation and continued his walk. He understood a lot of things now. He understood Nadya's advice to remember that he had found his gems before he signed his contract; he understood how Tchernikoff was going to finance the industrialization plan. He had asked this question many a time and never received an answer.

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

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

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

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

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

She played the "Appassionata!"

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

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

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

Dan was aghast. Nadya's words, "Let your temper ride

you," flashed through his mind. The advice was not necessary; he felt like fuming. But he controlled himself.

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

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

"And today you did not take your good-luck charms with you? Too bad indeed. You should have them today. Consider yourself under arrest, Dr. Benson."

"Arrest? What have I done?"

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

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

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

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

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

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

Dan kept calm. He said, smiling, "Please do so, Commissar Tcherskaya, the 'Appassionata,' preferably."

Tchernikoff cursed his impudence. Nadya shot a Russian sentence at him, and Tchernikoff agreed.

Djilinskiy sat down and said, "The commissar is obliging

you, Dr. Benson. She will play your funeral piece right now. There may be no time to do it properly, when you are executed."

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

She played the first movement of the "Appassionata."

It was after midnight when Dan was dragged from his cell. "The commissar wants to see you."

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

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

"I hope I didn't scare you. . . . I expect you to admire my talents as an actress. . . . Your case is already known to the American consul. . . . There is a nice little revolt going on in Planetogorod. . . . Koltchakoff disarmed his men very poorly. . . . He loves Tchernikoff's post. . . . Probably he'll get it. . . . The diplomatic intervention will drag the trial indefinitely. . . . Sleep well and watch out for classical music. . . . I wish I could kiss you."

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

Nothing happened during the next day. Late in the evening

he was brought before the same official again. This time there was an interpreter present, and the document was read to him in English. It stated that due to the intervention of American diplomats, the governor had ordered the prisoner, Dan Benson, to be transported to the Supreme Court in Moscow, if he agreed to be tried on Earth. Wonderingly, Dan signed the document and was brought back to his cell. This night a different guard brought his supper. While rattling with the keys and watching him eat, as was customary—revolver pointed at him all the time—the guard whistled. First the "International." Then a Russian folk song Dan knew. Finally a melody Dan knew, too. "Watch out for classical music," Nadya had said. Here it was: Beethoven's "Appassionata."

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

Benson struggled to keep awake. It was not very difficult. There was much commotion in the building; people running along the corridors, shouting orders and making noise with weapons. From outside he heard occasional rifle shots. Heavy motors roared in between. He heard tanks passing the short concrete part of the street near the prison.

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

Suddenly the machine guns started up again. One of them, Dan realized, had a peculiar sound. A few men with heavy boots came along the corridor; they stopped in front of his door, opened it and motioned him to come out. They did not speak a word, neither to him nor among themselves, and did not answer Dan's questions. They brought him to the room where he had signed the document.

Nadya was there, waiting for him. She wore a uniformed dress, oxygen mask at the belt and a heavy army revolver in

a holster. Turning to one of the guards, she said, "Prisoner Benson departs today for Moscow. Call an orderly to accompany him to the landing field."

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

"Kervin, you? I can't trust you with such a valuable prisoner. Isn't there anybody even of a very inferior intelligence available? Idiots, everything is messed up as soon as one of you looks at it! If there were a law against stupidity, all of you would be stood up against the wall! Give me that briefcase—damn it no, the other—I'll take him to the ship myself. Then I *will* know that he is inside, and I won't have to take your word for it, you stupid idiots."

She turned to Dan. "Come on, you, committing sabotage here right before our eyes." Then in English, "I hope to Heaven you did not understand all those nice expressions in our language."

Outside, she put on the oxygen mask and took the revolver out of its holster. It was easy for everybody to see that he was under arrest. A car was waiting. The driver brought them as far as he was allowed. They were at the gates of the landing field. Nadya talked to one of the officials; he let them pass unmolested.

At this moment, the ground shook with an explosion. Look-up, they saw two airplanes at low altitude, the symbol of the Soviets plainly visible on wings and fuselage. A black object separated from one of the planes; a flame flashed and dark smoke appeared. With a whining howl, a penetration bomb made its way toward one of the buildings.

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

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

A particularly heavy explosion made them turn again. One of the planes had been brought down by the machine gunners. The other began to go into a glide at the same moment; it was hit, too. Cars and tanks raced across the landing field behind that plane. It landed in the farthest corner, and its two pilots hastily mounted a light machine gun. Fighting started around the airplane. One of the cars that had pursued the plane turned around and stopped in front of Nadya and Dan. He believed that the officer who jumped out of the car could hear his heart beat. But he only asked Nadya whether she had been hurt.

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

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

"Nadya, what is all this fighting about?"

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

They were now only twenty yards from the *Lena*. Nadya suddenly stopped, fumbled with her oxygen mask and uttered a shrill scream. She gasped for her breath and slowly dropped to her knees. It was so evident that she was having a severe

attack of Martian sickness that Dan almost believed it himself. He picked her up.

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

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

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

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

Then it lessened, and Dan heard the professor's voice calling him to the control room. He asked him what to do. Dan realized in this instant why he had been asked several times to what extent he was able to operate a space ship, and why Nadya had him plot that course. He knew that he had to prevent the ship from falling back and that he had to bring it into a circular orbit first.

He looked at the speedometer. The needle stood at 2000 meters per second and crept upward at the rate of about eight meters per second. He increased the acceleration by opening two more fuel lines from tanks to motors and looked

at the instrument again. There were colored marks on it. A red line at 3.510 was the circular velocity of Mars. At this speed the ship would circle Mars, without any expenditure of fuel, for any desired time. A red double line at 4.97 indicated the parabolic velocity of Mars. At that speed the ship would leave the attraction of the red planet. Other colored lines marked the circular and parabolic velocities of the other celestial bodies safe for space ships of this type. There was the yellow line at 1.69 for the Moon, the yellow double line at 2.39. The needle just passed it. There were the white lines for Venus at 6.98 and 9.87, and the lines for Earth at 7.91 and 11.2. They were blue, as the Earth looks blue when seen from the void.

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

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

"Before we make any decisions," the professor began, "we want you to know a secret. Nadya is my daughter."

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

Then Nadya and the professor, interrupting each other, informed him about the events of the last week. Koltchakoff, knowing well that a revolt was bound to come, had organized it, deceiving Tchernikoff and Djilinskiy. It was a good opportunity for him and there was but little doubt that he would succeed. It was an opportune time for a revolt; there was no ship in space that would arrive on Mars before two hundred and forty days from now.

"Maybe we'll learn something," Nadya thought aloud, switching on the radio, shifting from frequency to frequency. "All I can say," she explained to Dan who could not follow the radio noises, blurry with static on top of everything else, "is that Djilinskiy and Koltchakoff are fighting each other with radio speeches and probably with guns and tanks too.

Just for curiosity's sake I'd like to know whether Koltchakoff just wants to succeed Tchernikoff or whether he wants to make himself independent."

"There is a star that did not exist a minute ago," Dan interrupted her. He looked through the small powerful telescopic device built into the wall of the ship. "It's a ship," he stated finally, "must be the *Lenin*. They may be calling us."

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

"They are armed!" interrupted Nadya.

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

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

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

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

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

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

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

"Now," said Dan, "let's see what they want!"

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

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

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

Seconds later, something struck the hull of the *Lena*. He heard a cracking sound and the hiss of escaping air. This was not dangerous; they wore their space suits. But he waited for the explosion of the fuel tanks, expected to see a blinding flash and then nothing.

Instead, it became dark and silent; apparently the window shutters had been closed. Dan started back to the cabin, when Nadya's face appeared in the opening. The electric light bulbs were glowing now. She opened the visor of her space helmet and threw her arms around his neck. Kissing his still-closed visor plate, she shot a stream of Russian words at him, paused,

then said in English, "I know I should not think so. If only for exterminating Tchernikoff, I'd love you, if—"

"If—?" he asked.

"—if I had not loved you already."

"Who observed?" asked Dan.

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

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

"To Mars, you mean," corrected Dan. "I'll try for the area of Trivium Charontis, that's French. Hope the computer and I manage the landing between us."

Nadya shook her head.

"Or the Mare Cimmerium, that's German. Too bad the United States did not grab a part."

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

"But we cannot!" cried Dan. "I had time enough to make a cursory computation of the possible orbits, you know, comparing probable fuel supply with probable weight of the ship, keeping in mind the relative positions of the two planets and their orbital velocities. We have not enough fuel, or, which is the same, the ship is too heavy for one of the so-

called Pirquet routes, the hyperbolic orbits. We might just be able to slip into Pirquet VII B, but then we'd have no fuel left to check our fall toward the Earth. We'd crash to atoms, or less.

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

"Is there no way at all?"

Dan hesitated to answer.

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

They sat silent for a few minutes, considering. Then Nadya rose, looked long into Dan's eyes and decided: "We now have lots of time orbiting Mars. Check whether we could actually make that orbit to Earth. If we can, do it."

8

The ship was falling toward the Sun.

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

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

At the point nearest the Sun—the perihelion—the speed

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

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

As soon as the rocket motors had ceased firing, the ship had changed her appearance. She was a madly spinning double star now. On the one end of a thin but tough steel cable there was the main cabin, the supply room, and the control room—in short, the upper part of the vessel—on the other side, the machinery and the fuel tanks. Held together by half a mile of cable, the two parts spun around each other, thus producing an artificial gravity in the cabin. Last adjustments made, Dan returned to the cabin and announced that their imprisonment had begun. For more than four months they had to live together for every minute of the twenty-four hours of the day. That is a severe test for understanding among people, a severe strain on their nerves. It had happened that the crews of space ships had killed each other on these long trips—for no reason at all. Confinement to one room, if extended sufficiently long, is enough reason to hate those who are in the same room—enough to kill them.

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

The first three weeks passed quickly. There was much to tell, many things to be discussed. Then came weeks when they grew silent. Everything their memories held had been told

over and over again. Dan introduced lessons, to pass the time. Three hours every day he taught them astronomy and chemistry; three hours the professor taught zoölogy and geology.

Nadya did her part, too. She sometimes disappeared for hours in the supply room and reappeared dressed up in rags with pots and pans. She played Cinderella beautifully, and looked poor and sweet. Or she came attired in woven metal—normally used for fuel filters—with tools in her hands, and acted as Queen of Space, commanding her lover to conquer the next galaxy for her and ordering her father to cure the pimples of the moon. Once she disappeared and came with a costume consisting of shoes and a piece of metal cloth—as a modern gold digger. The two men laughed for hours.

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

They passed the orbit of Mercury. The gigantic disk of the Sun seemed to fill the greatest part of the heavens; actually, it was less than a quarter of the sky. The three people in the ship were in their hammocks, stripped of their clothing, sweat standing in large drops all over their bodies. The curve of the flight still drew nearer to the Sun. The velocity was beyond imagination. It is easy to say that their speed had mounted to more than four hundred miles per second. The figure four hundred can only be comprehended as a figure. Four hundred miles per second are inconceivable. It is possible to conceive four hundred in thinking of four hundred people in a lecture hall, or of four hundred soldiers marching. It is even possible to conceive of four hundred miles of distance. But four hundred miles per second is beyond comprehension. It can be calculated—it can even be done, because it is within the realm of natural laws—but it cannot be understood.

Then the velocity increased further.

The heat increased further.

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

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

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

Dan knew what each of them was thinking. Are we going to fall into the Sun? His burning eyes forbade them to ask this question.

Seven days near the perihelion.

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

Thus they had formed their ideas.

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

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

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

"I cannot say where we are," Dan answered the unspoken question. "I cannot make observations with all window

shutters closed and the ship spinning as it is. But I do not dare to stop the rotation. Being toasted on both sides we may survive; being roasted on one we will not."

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

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

She did not answer; she did not even move.

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

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

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

Dan did not answer. His brain was occupied with an even more terrifying thought. The thought had occurred to him three days before, and since then it had grown into fear—a fear that was a greater strain than the heat of these seven days. They still had fuel on board, tons and tons of it. Would the insulation stand up? The emergency valves were wide open; he had seen to that. The fuel could boil and its vapors would escape through these valves that opened into the large exhaust nozzles. But the boiling fuel might explode. The tests on Earth had shown that it occasionally did explode when heated for days to the boiling point. Normally, it did not explode, but occasionally it did.

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

catalyst. And it was a question of luck whether this particular impurity was present.

The professor interrupted his thoughts.

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

"No. Just wait."

"You have no observations to make?"

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

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

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

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

"Foolish of me not to remember sooner. We have a new drug in Russia. It produces sound sleep. No after effects, if the tests on hundreds of volunteers and prisoners have any meaning. My friend, Dr. Jourovskiy, taught me how to use it. All it needs is a sound heart and an empty stomach. My heart is all right; so is Nadya's. How about yours?"

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

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

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

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

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

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

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

9

The first impression that came to Dan when he awoke was that of a warm summer morning.

"Son, do you feel all right?"

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

"How long have you been up?" he asked.

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

"Is Nadya still asleep?"

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

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

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

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

"Of all men on Earth, the Americans are the worst. As soon as I work up a nice little temper you smother it with food. Food! Oh, fie! Why don't you help me to unstrap these

things? First you bind me helpless, and then you let me starve! Do you call this love or devotion? Wait till I feel healthy again! Just wait!"

Dan, laughing, helped her to untie the straps.

"If you ask me, you feel healthy enough, judging from the way you talk. Come on now, dear, be a good girl, brush your little teeth and eat your oats. Afterwards Daddy opens the window and shows you the Sun."

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

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

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

For hours and hours he worked. Inside the cabin spun three metal wheels, each weighing one ten-thousandth of the weight of the ship. Their axes were perpendicular to each other. When these wheels—the device was called "the Oberth" after its first inventor—were turned, the hull of the ship turned also, but in the opposite direction. Ten thousand turns of one wheel made the hull of the ship make one complete turn opposite to the direction but in the same plane as that particular wheel. The Oberth did not influence the orbit. Speed and direction of the ship were not changed by it, only the position of the ship on its orbit. The mechanism was used to

bring the ship into the proper position for rocket blasts that were to correct the orbit.

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

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

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

He knew that there was an astronomical observatory near this spot, but that did not explain the presence of a search-light powerful enough to be seen at this distance. On the contrary, astronomers tried to get away, as far as possible, from artificial sources of light. Watching he suddenly noticed that the light flickered at intervals, three long, three short, three long again. This was no code anyone aboard knew of. "Maybe," thought Dan, "they just want to attract our attention." Then he called himself a *Dummkopf* in German and an idiot in both English and Russian (where the same word

means two different things, the Russian meaning being closer to "excessive innocence").

"They want to talk to us!" he said, and switched on receiver and loudspeaker.

A taped voice said over and over again, "Calling Space Ship *Lena*—calling Space Ship *Lena*, Please answer—answer please—*Raumschiff Lena*—*Raumschiff Lena*—*bitte um Antwort*—*antworten Sie bitte*—*Raumschiff Lena*—*Raumschiff Lena*—*Kosmeetchesskoye korabl Lena*—*Kosmeetchesskoye korabl Lena*—"

"SS *Lena* replying to Lunar Station—SS *Lena* replying to Lunar station—"

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

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

Dan answered the questions that poured in on him, asked many himself. They spoke for hours, and Dan learned what had happened. Koltchakoff had observed the battle in space and informed the American government about the departure of the *Lena*. The lunar observatories had been watching for them the whole time of their flight, hoping against hope.

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

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

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

Outside, thin air screamed past the rapidly moving ship. The scream ceased, started again; the hull grew warm. Then rocket motors roared; air screamed again. They felt weight press them upon their hammocks, and they had to hold themselves down when they suddenly became almost weightless.

Then they heard the peculiar sound made by the drogue chutes; the loudspeaker told them that they would land hard, with coast guard cutters standing by. There was a bad jolt; they heard the splash of water and then water boiling into steam around the exhaust nozzles. All Dan could think of was that the ship was probably ruined.

Nadya came into Dan's room in the hotel.

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

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

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

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

A knock at the door interrupted them.

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

Dan and Nadya looked at each other understandingly and smiled.

LEARNING THEORY

James McConnell

JAMES McCONNELL

Of all the scientists in this collection, it is possible that Dr. McConnell (Ph. D. in psychology) has kept closest to his own field in the following story. His field in psychology actually is "learning theory." For some years he worked on the subject at the University of Michigan, using planaria, tiny worms which are among the simplest of the complex organisms, as experimental animals. Early in 1961 the well-known novelist and critic Arthur Koestler published in The London Observer a lengthy description of the work McConnell and his group were doing, so that this young scientist (he is still in his early thirties) has already gained considerable reputation. In the fall of 1961, McConnell transferred to Palo Alto, California, to undertake a special program of study and research concerned with learning theory on another level, teaching machines, one of the coming devices to speed up the education of the human young. . . .

McConnell's story may raise in your mind, as it has in others, the uncomfortable question: what if our experimental animals, suffering through the learning techniques to which we submit them, also realize what is going on and undergo the same emotional reactions? We doubt, however, if they do so with such complete and chilling awareness as the hero of this unforgettable tale, since animals, from planaria to rats and guinea pigs, are so much below us on the evolutionary scale that they probably do not even have the ability to comprehend, in the sense that we use the term. . . .

Learning Theory

I AM WRITING this because I presume He wants me to. Otherwise He would not have left paper and pencil handy for me to use. And I put the word "He" in capitals because it seems the only thing to do. If I am dead and in hell, then this is only proper. However, if I am merely a captive somewhere, then surely a little flattery won't hurt matters.

As I sit here in this small room and think about it, I am impressed most of all by the suddenness of the whole thing. At one moment I was out walking in the woods near my suburban home. The next thing I knew, here I was in a small, featureless room, naked as a jaybird, with only my powers of rationalization to stand between me and insanity. When the "change" was made (whatever the change was), I was not conscious of so much as a momentary flicker between walking in the woods and being here in this room. Whoever is responsible for all of this is to be complimented—either He has developed an instantaneous anesthetic or He has solved the problem of instantaneous transportation of matter. I would prefer to think it the former, for the latter leads to too much anxiety.

As I recall, I was immersed in the problem of how to teach my class in beginning psychology some of the more abstruse points of Learning Theory when the transition came. How far away life at the University seems at the moment: I must be forgiven if now I am much more concerned about where I am and how to get out of here than about how freshmen can be cajoled into understanding Hull or Tolman.

Problem #1: Where am I? For an answer, I can only describe this room. It is about twenty feet square, some twelve feet high, with no windows, but with what might be a door in the middle of one of the walls. Everything is of a uniform gray color, and the walls and ceiling emit a fairly pleasant achromatic light. The walls themselves are of some hard material which might be metal since it feels slightly cool to the touch. The floor is of a softer, rubbery material that yields a

little when I walk on it. Also, it has a rather "tingly" feel to it, suggesting that it may be in constant vibration. It is somewhat warmer than the walls, which is all to the good since it appears I must sleep on the floor.

The only furniture in the room consists of what might be a table and what passes for a chair. They are not quite that, but they can be made to serve this purpose. On the table I found the paper and the pencil. No, let me correct myself. What I call paper is a good deal rougher and thicker than I am used to, and what I call a pencil is nothing more than a thin round stick of graphite which I have sharpened by rubbing one end of it on the table.

And that is the sum of my surroundings. I wish I knew what He has done with my clothes. The suit was an old one, but I am worried about the walking boots. I was very fond of those boots—they were quite expensive and I would hate to lose them.

The problem still remains to be answered, however, as to just where in the hell I am—if not hell itself!

Problem #2 is a knottier one— Why am I here? Were I subject to paranoid tendencies, I would doubtless come to the conclusion that my enemies had kidnapped me. Or perhaps that the Russians had taken such an interest in my research that they had spirited me away to some Siberian hideout and would soon appear to demand either cooperation or death. Sadly enough, I am too reality oriented. My research was highly interesting to me, and perhaps to a few other psychologists who like to dabble in esoteric problems of animal learning, but it was scarcely startling enough to warrant such attention as kidnapping.

So I am left as baffled as before. Where am I, and why? And who is He?

I have decided to forego all attempts at keeping this diary according to "days" or "hours." Such units of time have no meaning in my present circumstances, for the light remains constant all the time I am awake. The human organism is not possessed of as neat an internal clock as some of the lower species. Far too many studies have shown that a human being who is isolated from all external stimulation soon loses his

sense of time. So I will merely indicate breaks in the narrative and hope that He will understand that if He wasn't bright enough to leave me with my wristwatch, He couldn't expect me to keep an accurate record.

Nothing much has happened. I have slept, been fed and watered, and have emptied my bladder and bowels. The food was waiting on the table when I awoke last time. I must say that He has little of the gourmet in Him. Protein balls are not my idea of a feast royal. However, they will serve to keep body and soul together (presuming, of course, that they *are* together at the moment). But I must object to my source of liquid refreshment. The meal made me very thirsty, and I was in the process of cursing Him and everybody else when I noticed a small nipple which had appeared in the wall while I was asleep. At first I thought that perhaps Freud was right after all, and that my libido had taken over control of my imagery. Experimentation convinced me, however, that the thing was real, and that it is my present source of water. If one sucks on the thing, it delivers a slightly cool and somewhat sweetish flow of liquid. But really, it's a most undignified procedure. It's bad enough to have to sit around all day in my birthday suit. But for a full professor to have to stand on his tip-toes and suck on an artificial nipple in order to obtain water is asking a little too much. I'd complain to the Management if only I knew to whom to complain!

Following eating and drinking, the call to nature became a little too strong to ignore. Now, I was adequately toilet-trained with indoor plumbing, and the absence of same is most annoying. However, there was nothing much to do but choose a corner of the room and make the best of a none too pleasant situation. (As a side-thought, I wonder if the choosing of a corner was in any way instinctive?) However, the upshot of the whole thing was my learning what is probably the purpose of the vibration of the floor. For the excreted material disappeared through the floor not too many minutes later. The process was a gradual one. Now I will be faced with all kinds of uncomfortable thoughts concerning what might possibly happen to me if I slept too long!

Perhaps this is to be expected, but I find myself becoming a little paranoid after all. In attempting to solve my Problem

#2, why I am here, I have begun to wonder if perhaps some of my colleagues at the University are not using me as a subject in some kind of experiment. It would be just like McCleary to dream up some fantastic kind of "human-in-isolation" experiment and use me as a pilot observer. You would think that he'd have asked my permission first. However, perhaps it's important that the subject not know what's happening to him. If so, I have one happy thought to console me. If McCreary is responsible for this, he'll have to take over the teaching of my classes for the time being. And how he hates teaching Learning Theory to freshmen!

You know, this place seems dreadfully quiet to me.

Suddenly I have solved two of my problems. I know both where I am and who He is. And I bless the day that I got interested in the perception of motion.

I should say to begin with that the air in this room seems to have more than the usual concentration of dust particles. This didn't seem particularly noteworthy until I noticed that most of them seemed to pile up along the floor against one wall in particular. For a while I was sure that this was due to the ventilation system—perhaps there was an out-going airduct there where this particular wall was joined to the floor. However, when I went over and put my hand to the floor there, I could feel no breeze whatsoever. Yet even as I held my hand along the dividing line between the wall and the floor, dust motes covered my hand with a thin coating. I tried this same experiment everywhere else in the room to no avail. This was the only spot where the phenomenon occurred, and it occurred along the entire length of this one wall.

But if ventilation was not responsible for the phenomenon, what was? All at once there popped into my mind some calculations I had made when the rocket boys had first proposed a manned satellite station. Engineers are notoriously naive when it comes to the performance of a human being in most situations, and I remembered that the problem of the perception of the satellite's rotation seemingly had been ignored by the slip-stick crowd. They had planned to rotate the doughnut-shaped satellite in order to substitute centrifugal force for the force of gravity. Thus the outer shell of the

doughnut would appear to be "down" to anyone inside the thing. Apparently they had not realized that man is at least as sensitive to angular rotation as he is to variations in the pull of gravity. As I figured the problem then, if a man aboard the doughnut moved his head as much as three or four feet outwards from the center of the doughnut, he would have become fairly dizzy! Rather annoying it would have been, too, to have been hit by a wave of nausea every time one sat down in a chair. Also, as I pondered the problem, it became apparent that dust particles and the like would probably show a tendency to move in a direction opposite to the direction of the rotation, and hence pile up against any wall or such that impeded their flight.

Using the behavior of the dust particles as a clue, I then climbed atop the table and leapt off. Sure enough, my head felt like a mule had kicked it by the time I landed on the floor. My hypothesis was confirmed.

So I am aboard a spaceship!

The thought is incredible, but in a strange way comforting. At least now I can postpone worrying about heaven and hell—and somehow I find the idea of being in a spaceship much more to the liking of a confirmed agnostic. I suppose I owe McCleary an apology—I should have known he would never have put himself in a position where he would have to teach freshmen all about learning!

And, of course, I know who "He" is. Or rather, I know who He *isn't*, which is something else again. Surely, though, I can no longer think of Him as being human. Whether I should be consoled at this or not, I have no way of telling.

I still have no notion of *why* I am here, however, nor why this alien chose to pick me of all people to pay a visit to His spaceship. What possible use could I be? Surely if He were interested in making contact with the human race, He would have spirited away a politician. After all, that's what politicians are for! Since there has been no effort made to communicate with me, however, I must reluctantly give up any cherished hopes that His purpose is that of making contact with *genus homo*.

Or perhaps He's a galactic scientist of some kind, a biologist of sorts, out gathering specimens. Now, that's a particu-

larly nasty thought. What if He turned out to be a physiologist, interested in cutting me open eventually, to see what makes me tick? Will my innards be smeared over a glass slide for scores of youthful Hims to peer at under a microscope? Brrrr! I don't mind giving my life to Science, but I'd rather do it a little at a time.

If you don't mind, I think I'll go do a little repressing for a while.

Good God! I should have known it! Destiny will play her little tricks, and all jokes have their cosmic angles. He is a *psychologist*! Had I given it due consideration, I would have realized that whenever you come across a new species, you worry about behavior first, physiology second. So I have received the ultimate insult—or the ultimate compliment. I don't know which. I have become a specimen for an alien psychologist!

This thought first occurred to me when I awoke after my latest sleep (which was filled, I must admit, with most frightening dreams). It was immediately obvious that something about the room had changed. Almost at once I noticed that one of the walls now had a lever of some kind protruding from it, and to one side of the lever, a small hole in the wall with a container beneath the hole. I wandered over to the lever, inspected it a few moments, then accidentally depressed the thing. At once there came a loud clicking noise, and a protein ball popped out of the hole and fell into the container.

For just a moment a frown crossed my brow. This seemed somehow so strangely familiar. Then, all at once, I burst into wild laughter. The room had been changed into a gigantic Skinner Box! For years I had been studying animal learning by putting white rats in a Skinner Box and following the changes in the rats' behavior. The rats had to learn to press the lever in order to get a pellet of food, which was delivered to them through just such an apparatus as is now affixed to the wall of my cell. And now, after all of these years, and after all of the learning studies I had done, to find myself trapped like a rat in a Skinner Box! Perhaps this was hell after all, I told myself, and the Lord High Executioner's

admonition to "let the punishment fit the crime" was being followed.

Frankly, this sudden turn of events has left me a little shaken.

I seem to be performing according to theory. It didn't take me long to discover that pressing the lever would give me food some of the time, while at other times all I got was the click and no protein ball. It appears that approximately every twelve hours the thing delivers me a random number of protein balls—the number has varied from five to fifteen so far. I never know ahead of time how many pellets—I mean protein balls—the apparatus will deliver, and it spews them out intermittently. Sometimes I have to press the lever a dozen times or so before it will give me anything, while at other times it gives me one ball for each press. Since I don't have a watch on me, I am never quite sure when the twelve hours have passed, so I stomp over to the lever and press it every few minutes when I think it's getting close to time to be fed. Just like my rats always did. And since the pellets are small and I never get enough of them, occasionally I find myself banging away on the lever with all the compulsion of a stupid animal. But I missed the feeding time once and almost starved to death (so it seemed) before the lever delivered food the next time. About the only consolation to my wounded pride is that at this rate of starvation, I'll lose my bay window in short order.

At least He doesn't seem to be fattening me up for the kill. Or maybe he just likes lean meat!

I have been promoted. Apparently He in his infinite alien wisdom has decided that I'm intelligent enough to handle the Skinner-type apparatus, so I've been promoted to solving a maze. Can you picture the irony of the situation? All of the classic Learning Theory methodology is practically being thrown in my face. If only I could communicate with Him! I don't mind being subjected to tests nearly as much as I mind being underestimated. Why, I can solve puzzles hundreds of times more complex than what He's throwing at me. But how can I tell Him?

As it turns out, the maze is much like our standard T-mazes, and is not too difficult to learn. It's a rather long one, true, with some 23 choice points along the way. I spent the better part of half an hour wandering through the thing the first time I found myself in it. Surprisingly enough, I didn't realize the first time out what I was in, so I made no conscious attempt to memorize the correct turns. It wasn't until I reached the final turn and found food waiting for me that I recognized what I was expected to do. The next time through the maze my performance was a good deal better, and I was able to turn in a perfect performance in not too long a time. However, it does not do my ego any good to realize that my own white rats could have learned the maze a little sooner than I did.

My "home cage," so to speak, still has the Skinner apparatus in it, but the lever delivers food only occasionally now. I still give it a whirl now and again, but since I'm getting a fairly good supply of food at the end of the maze each time, I don't pay the lever much attention.

Now that I am very sure of what is happening to me, quite naturally my thoughts have turned to how I can get out of this situation. Mazes I can solve without too much difficulty, but how to escape apparently is beyond my intellectual capacity. But then, come to think of it, there was precious little chance for my own experimental animals to get out of my clutches. And assuming that I am unable to escape, what then? After He has finished putting me through as many paces as He wishes, where do we go from there? Will He treat me as I treated most of my nonhuman subjects—that is, will I get tossed into a jar containing chloroform? "Following the experiment, the animals were sacrificed," as we so euphemistically report in the scientific literature. This doesn't appeal to me much, as you can imagine. Or maybe if I seem particularly bright to Him, He may use me for breeding purposes, to establish a colony of His own. Now, that might have possibilities . . .

Oh, damn Freud anyhow!

And damn Him too! I had just gotten the maze well learned when He upped and changed things on me. I stumbled about

like a bat in the sunlight for quite some time before I finally got to the goal box. I'm afraid my performance was pretty poor. What He did was just to reverse the whole maze so that it was a mirror image of what it used to be. Took me only two trials to discover the solution. Let Him figure that one out if He's so smart!

My performance on the maze reversal must have pleased Him, because now He's added a new complication. And again I suppose I could have predicted the next step if I had been thinking along the right direction. I woke up a few hours ago to find myself in a totally different room. There was nothing whatsoever in the room, but opposite me were two doors in the wall—one door a pure white, the other jet black. Between me and the doors was a deep pit, filled with water. I didn't like the looks of the situation, for it occurred to me right away that He had devised a kind of jumping stand for me. I had to choose which of the doors was open and led to food. The other door would be locked. If I jumped at the wrong door, and found it locked, I'd fall in the water. I needed a bath, that was for sure, but I didn't relish getting it in this fashion.

While I stood there watching, I got the shock of my life. I meant it quite literally. The bastard had thought of everything. When I used to run rats on jumping stands, to overcome their reluctance to jump, I used to shock them. He's following exactly the same pattern. The floor in this room is wired but good. I howled and jumped about and showed all the usual anxiety behavior. It took me less than two seconds to come to my senses and make a flying leap at the white door, however.

You know something? That water is ice cold!

I have now, by my own calculations solved no fewer than 87 different problems on the jumping stand, and I'm getting sick and tired of it. Once I got angry and just pointed at the correct door—and got shocked for not going ahead and jumping. I shouted bloody murder, cursing Him at the top of my voice, telling Him if He didn't like my performance, He

could damn' well lump it. All He did, of course, was to increase the shock.

Frankly, I don't know how much longer I can put up with this. It's not that the work is difficult. If He were giving me half a chance to show my capabilities, I wouldn't mind it. I suppose I've contemplated a thousand different means of escaping, but none of them is worth mentioning. But if I don't get out of here soon, I shall go stark raving mad!

For almost an hour after it happened, I sat in this room and just wept. I realize that it is not the style in our culture for a grown man to weep, but there are times when cultural taboos must be forgotten. Again, had I thought much about the sort of experiments He must have had in mind, I most probably could have predicted the next step. Even so, I most likely would have repressed the knowledge.

One of the standard problems which any learning psychologist is interested in is this one—will an animal learn something if you fail to reward him for his performance? There are many theorists, such as Hull and Spence, who believe that reward (or “reinforcement,” as they call it) is absolutely necessary for learning to occur. This is mere stuff and nonsense, as anyone with a grain of sense knows, but nonetheless the “reinforcement” theory has been dominant in the field for years now. We fought a hard battle with Spence and Hull, and actually had them with their backs to the wall at one point, when suddenly they came up with the concept of “secondary reinforcement.” That is, anything associated with a reward takes on the ability to act as a reward itself. For example, the mere sight of food would become a reward in and of itself—almost as much a reward, in fact, as is the eating of the food. The *sight* of food, indeed! But nonetheless, it saved their theories for the moment.

For the past five years now, I have been trying to design an experiment that would show beyond a shadow of a doubt that the *sight* of a reward was not sufficient for learning to take place. And now look at what has happened to me!

I'm sure that He must lean towards Hull and Spence in His theorizing, for earlier today, when I found myself in the jumping stand room, instead of being rewarded with my

usual protein balls when I made the correct jump, I—I'm sorry, but it is difficult to write about even now. For when I made the correct jump and the door opened and I started towards the food though, I found it had been replaced with a photograph. A calendar photograph. You know the one. Her name, I think, is Monroe.

I sat on the floor and cried. For five whole years I have been attacking the validity of the secondary reinforcement theory, and now I find myself giving Him evidence that the theory is correct! For I cannot help "learning" which of the doors is the correct one to jump through. I refuse to stand on the apparatus and have the life shocked out of me, and I refuse to pick the wrong door all the time and get an icy bath time after time. It isn't fair! For He will doubtless put it all down to the fact that the mere *sight* of the photograph is functioning as a reward, and that I am learning the problems merely to be able to see Miss What's-her-name in her bare skin!

I can just see Him now, sitting somewhere else in this spaceship, gathering in all the data I am giving Him, plotting all kinds of learning curves, chortling to Himself because I am confirming all of His pet theories. I just wish . . .

Almost an hour has gone by since I wrote the above section. It seems longer than that, but surely it's been only an hour. And I have spent the time deep in thought. For I have discovered a way out of this place, I think. The question is, dare I do it?

I was in the midst of writing that paragraph about His sitting and chortling and confirming His theories, when it suddenly struck me that theories are born of the equipment that one uses. This has probably been true throughout the history of all science, but perhaps most true of all in psychology. If Skinner had never invented his blasted box, if the maze and the jumping stand had not been developed, we probably would have entirely different theories of learning today than we now have. For if nothing else, the type of equipment that one uses drastically reduces the type of behavior that one's subjects can show, and one's theories have to account only for the type of behavior that appears in the laboratories.

It follows from this also that any two cultures that devise the same sort of experimental procedures will come up with almost identical theories.

Keeping all this in mind, it's not hard for me to believe that He is an iron-clad reinforcement theorist, for He uses all of the various paraphernalia that they use, and uses it in exactly the same way.

My means of escape is therefore obvious. He expects from me confirmation of all His pet theories. Well, he won't get it any more! I know all of His theories backwards and forwards, and this means I know how to give Him results that will tear His theories right smack in half!

I can almost predict the results. What does any learning theorist do with an animal that won't behave properly, that refuses to give the results that are predicted? One gets rid of the beast, quite naturally. For one wishes to use only healthy, normal animals in one's work, and any animal that gives "unusual" results is removed from the study but quickly. After all, if it doesn't perform as expected, it must be sick, abnormal, or aberrant in one way or another . . .

There is no guarantee, of course, what method He will employ to dispose of my now annoying presence. Will He "sacrifice" me? Or will He just return me to the "permanent colony"? I cannot say. I know only that I will be free from what is now an intolerable situation.

Just wait until He looks at His results from now on!

FROM: Experimenter-in-Chief, Interstellar Labship PSYCH-145

To: Director, Bureau of Science

Thlan, my friend, this will be an informal missive. I will send the official report along later, but I wanted to give you my subjective impressions first.

The work with the newly discovered species is, for the moment, at a standstill. Things went exceedingly well at first. We picked what seemed to be a normal, healthy animal and smattered it into our standard test apparatus. I may have told you that this new species seemed quite identical to our usual laboratory animals, so we included a couple of the "toys" that

our home animals seem so fond of—thin pieces of material made from woodpulp and a tiny stick of graphite. Imagine our surprise, and our pleasure, when this new specimen made exactly the same use of the materials as have all of our home colony specimens. Could it be that there are certain innate behavior patterns to be found throughout the universe in the lower species?

Well, I merely pose the question. The answer is of little importance to a Learning Theorist. Your friend Verpk keeps insisting that the use of these "toys" may have some deeper meaning to it, and that perhaps we should investigate further. At his insistence, then, I include with this informal missive the materials used by our first subject. In my opinion, Verpk is guilty of gross anthropomorphism, and I wish to have nothing further to do with the question. However, this behavior did give us hope that our newly discovered colony would yield subjects whose performances would be exactly in accordance with standard theory.

And, in truth, this is exactly what seemed to be the case. The animal solved the Bfian Box problem in short order, yielding as beautiful data as I have ever seen. We then shifted it to maze, maze-reversal and jumping stand problems, and the results could not have confirmed our theories better had we rigged the data. However, when we switched the animal to secondary reinforcement problems, it seemed to undergo a strange sort of change. No longer was its performance up to par. In fact, at times it seemed to go quite berserk. For part of the experiment, it would perform superbly. But then, just as it seemed to be solving whatever problem we set it to, its behavior would subtly change into patterns that obviously could not come from a normal specimen. It got worse and worse, until its behavior departed radically from that which our theories predicted. Naturally, we knew then that something had happened to the animal, for our theories are based upon thousands of experiments with similar subjects, and hence our theories must be right. But our theories hold only for normal subjects, and for normal species, so it soon became apparent to us that we had stumbled upon some abnormal type of animal.

Upon due consideration, we returned the subject to its

home colony. However, we also voted almost unanimously to request from you permission to take steps to destroy the complete colony. It is obviously of little scientific use to us, and stands as a potential danger that we must take adequate steps against. Since all colonies are under your protection, we therefore request permission to destroy it.

I must report, by the way, that Verpk's vote was the only one which was cast against this procedure. He has some silly notion that one should study behavior as one finds it. Frankly, I cannot understand why you have seen fit to saddle me with him on this expedition, but perhaps you have your own reasons.

Verpk's vote notwithstanding, however, the rest of us are of the considered opinion that this whole new colony must be destroyed, and quickly. For it is obviously diseased or some such—as reference to our theories has proven. And should it by some chance come in contact with our other colonies, and infect our other animals with whatever disease or aberration it has, we would never be able to predict their behavior again. I need not carry the argument further, I think.

May we have your permission to destroy the colony as soon as possible, then, so that we may search out yet other colonies and test our theories against other healthy animals? For it is only in this fashion that science progresses.

Respectfully yours,

Iowyy

THE MOTHER OF NECESSITY

Chad Oliver

CHAD OLIVER

Anthropology is a highly diverse science, ranging as it does from archeology through sociology to psychology. Chad Oliver, Assistant Professor of Anthropology at the University of Texas, has done professional work in some of these areas and has written topnotch science fiction covering almost every aspect of the subject.

In the story below, which has been published only in Professor Oliver's collection of short stories, Another Kind, but never in a magazine, the author has given us an uncomfortably vivid picture of the possibilities of culture manipulation in a "supercivilized" United States a century from now. It is not what one would expect: an over-mechanized, surplus-ridden, unemployment-haunted, war-psychotic world; rather, it is one in which the people have, almost by "write-in ballot," as Oliver himself puts it, voted themselves back into the womblike nostalgia of a simple urban-rural society of complete stasis. It is a cultural anthropological invention to end all inventions of any sort; and I do not think that anyone can possibly doubt that this sort of "social security" is the daydream of millions of tense and neurotic people of the Western world.

As this note is written, Professor Oliver is in Africa as research anthropologist on a large project called "Culture and Ecology in East Africa." His own particular work involves living with and reporting on the ways of the Akamba tribe of Kenya.

The Mother of Necessity

IT ISN'T the easiest stunt in the world (the fairly young man said to the historian over a glass of beer) to be the son of a really famous man.

Now, Dad and I always got along okay; he was good to me and I like the old boy fine. But you can maybe imagine how it was after they kicked George Washington upstairs to Grandfather, and stuck my dad in his exalted shoes.

George Sage, Father of His Country!

People are always tracking me down and asking about George. You'd think he was some kind of a saint or something. Don't get me wrong—I think Dad is swell. But what can I say to all these weirdies who want to know about their hero? If I give them the real scoop, they think I'm insulting my own father just because I make him human, like you or me.

I've pretty well given up trying to tell the truth; nowadays I usually just mumble something about a dedicated life and let it go at that.

But you're interested in history. You want the facts.

Okay. I'm with you.

But remember: my dad was just like a lot of other guys. He didn't go for all this saint stuff, and neither do I. I'll give him to you just the way he was; take him or leave him.

They call it Peace Monday now, that day when it all started. I was just a kid, but I remember like it was yesterday. It was a wet year, 2062 was, and that Monday was typical. It was gray and rainy outside, and you could hear the wind blowing, and you were glad you were in the apartment, where it was warm. . . .

George Sage was stumped.

His ample body—not fat, but with a detectable paunch—was absolutely motionless in the hammock. His graying hair hadn't been combed all day. Distantly, he listened to the wind. His slightly glazed eyes examined nothing.

A slogan on the wall read: IT'S ALWAYS TIME FOR A CHANGE.

Lois, his wife, knew the signs. She was his only wife; she had to be sensitive to nuances. She tiptoed around the apartment as if the floor were liberally sprinkled with eggshells. She was glad that Bobby was staying in his room.

The silence thickened.

"Zero," George muttered cryptically, shifting in the hammock.

"What, dear?"

"There's nothing new under the sun," George amplified.

"Now, George," Lois said, trying to make a neutral noise.

"Don't nag, dammit! I'm plotting."

"I know you are, George."

"Sure," George said.

The silence flowed in again and congealed.

George breathed irritably.

Lois worked on her nails.

"Do you *have* to do that?" George asked finally.

Lois looked up innocently.

"Your nails," George explained. "You're scraping them."

"Oh." She put her equipment down, and tried to sit very still. Outside, the rain was getting heavier; she hoped that it would let up soon so Bobby could go out and play. She was a little worried about George; he wasn't a young man any more, and he hadn't been as successful as Lloyd or Brigham. He was losing his confidence in himself, and of course that made it hard for him to come up with anything really *sharp*.

They had always hoped that Bobby might grow up and live in one of George's systems; that would have been nice. But there was only Westville left now, and even George found Westville a bit on the stale side.

She crossed over to his hammock and gently ruffled his uncombed hair. It was curious, she thought, how his hair had turned; about one strand in three was white as snow, and all the rest as brown as it had been twenty years before when they had met in college.

"Troubles?" she asked gently.

"You might put it that way, as the man said when he walked the plank."

"Try not to worry about it, dear."

George muttered something impolite, and then looked at her frankly. "We've tried everything, Lo," he said, his eyes very tired. "You know that. The people out there have seen it all now, and you can't impress them these days just by tossing in a clan instead of a bilateral descent system. It all seemed kind of new and exciting once, but now—hell, I sometimes think there's nothing as dull as constant, everlasting change."

"Maybe that's the answer," she said, trying to help. "Maybe if you drew up one that was long on tradition—play on the let's-put-our-roots-in-the-soil routine—"

"Please. I may be an old man, but I've still got *some* pride. Anyhow, Lloyd tried a back-to-the-good-old-days gimmick in Miami just last year, and even he couldn't put it through. The devil of it is, there's just plain nothing new under the sun, to coin an inspired phrase."

"There never was, George."

"What?"

"You *always* used to say that, way back even before we were married. You said it was a little like writing—only ten and three-quarters basic plots, or whatever it was, but the trick was to string 'em together differently."

"Well," George admitted, "it's a long damned way from Homer to Joyce, but I guess the old boy's still Ulysses, no matter how you stick him together."

Lois waited patiently.

"Ummmmm," George said, and sat up in his hammock. "Maybe if we just filched an item here and there from different systems—even made a random assortment—and functioned them—"

Lois smiled, and resumed work on her nails.

George walked over to the library line, dialed a stack of books, and proceeded to his desk. He sat down and began making rapid notes on his scratch-pad.

Bobby stuck his blond head into the room, and yawned. "Mom," he asked, "can I play in here?"

"Not now, Bobby," Lois said. "Your father's working."

Bobby eyed the ample figure of George at the desk, shrugged, and went back to his room, monumentally unimpressed.

Three weeks later, it was another Monday and the rain had showed up on schedule. It was a weary drizzle this time, and it exactly suited George Sage's mood.

Will Nolan, his promotions officer, slouched back behind his big desk, extracted the lenses from his eyes, and studied the ceiling without interest.

"It's great, George," he said flatly. "A great, great pattern."

George began to sweat. That was the mildest comment he had ever got from Nolan in fifteen years—ever since his nomadic-reindeer-herder program. It wouldn't have been so bad, but George had his own misgivings, even more so than usual.

"Really swell," Nolan continued. "Of course, there may be some small difficulty with the Patent Office."

"In other words, you don't think it's original enough to get a patent on. And if we can't get a patent, we can't put it on the market. That right?"

"Well, George," Nolan said shifting uncomfortably. There was a pause of singular length. "Well, George," he repeated.

"Will, you've got to push this through. I don't care how you do it, but it's got to be done."

"Nothing to worry about," Nolan said insincerely.

George eyed his promotions officer, more in sympathy than in anger. George had few illusions about himself; he knew that his career as an inventor had been on the mediocre side. Naturally since he wasn't one of the big boys, he couldn't expect the top agencies to handle his promotions. He and Will Nolan were in the same boat, and it was not the sturdiest craft ever built.

"Let's look on the bright side," George said, trying to sell himself as much as Nolan. "It's not subversive, is it? It doesn't violate any of the American Ways of Life, does it?"

"It's clean, George. Real clean."

"Okay. It's got good things in it, right? It's got a small town deal with country stores and neighborliness and a slow

pace; that gives tradition. Security. You know. It's got a cosmopolitan nucleus, right in the center, that only operates on market days and holidays. When the people Go To the City, they know they're supposed to act like an urban population; that takes the tedium out of it, get me? It's a kind of alternating social organization, and it requires enough service personnel in the urban nucleus to handle anyone who doesn't go for rural life no matter how he's brought up. The big city gives 'em direction, expansion. Now look, Will, the sex angle is good, you've got to admit that. The teen clubs give the kids a healthy outlet, and the merit badges give them status while they're adolescents. Not only that, but the chaperons give the older adults something to do with their time—their valuable experience isn't wasted at all. When the kids get ready to settle down and get married, they'll go into it with their eyes open."

"Sex is always good," Nolan admitted.

"That isn't all," George went on, warming to his topic. "Look at the way I've got the small businesses distributed: kids start right in, manufacturing and selling equipment for the high school and the football team. Farm children supply the lunch wagons, city kids handle accounts at the banks."

"Free enterprise is always good," Nolan agreed.

"Sure, and I haven't neglected the spiritual side, either. Look at all the Sunday Schools, and how about that Pilgrim Society? I tell you, Will, this system has got *everything*."

"Has it got a name?"

"Not yet, no."

"Got to have a name, George. You know that. Can't sell a system without a name. We'll need some slogans, too."

"Okay, okay. What are your writers for?"

Will Nolan inserted the lenses in his eyes and made a few notations. "It's great George," he said. "If we can just get it by the boys in Patents."

"They *can't* turn it down. It'd be against the Constitution. What grounds would they have?"

"They wouldn't have a leg to stand on, of course, not with a great, great idea like this one. It's just that there isn't anything in it that's—well—*new*. You know."

George waved his hand with a confidence he was far from

feeling. "Hell, there's nothing new about pyramids, the Roman circus, the Empire State Building, wigwams—not all by their lonesomes. But all in one society, that's different, different in *kind*."

"I'll push it, George," Nolan said. "Try not to worry."

George Sage was getting decidedly tired of having people tell him not to worry, but he realized that this was no time to blow up about it. He took a cue from Lois and made a neutral noise.

"I'll call you," Nolan said.

George left the promotions building and wandered aimlessly down past the Washington Monument. It was still raining: a bored, gray drizzle with all the character of a clam.

He walked on, hands in his pockets, beginning the long wait that always had emptiness at the end of it, emptiness that was neither success nor failure, but only existence.

"Damn the rain," he said. "Damn it anyway."

Election Day.

Perhaps it was of some significance—it had *better* be of some significance, George thought—that the weather could not have been more pleasant. A balmy sun coated the fields outside Natchezville with melted gold, and summer breezes whispered lazily through the sweet gum trees.

"Sit still, Bobby," Lois said. "Your father has to be careful not to fly our copter inside the city limits while voting is going on."

"Aaaaahh," Bobby commented, and continued to twitch around.

Not without some disgust at himself, George noticed that the fingers on his left hand were firmly crossed. Well, the election *was* important to him; if Natchezville didn't give it a tumble, he might as well turn himself out to pasture. Nolan had just barely snaked it through the Patent Office, and Mr. George Sage was not precisely the fair-haired boy around Washington these days.

More like a bald-headed mummy, in fact.

The copter loafed along in the sunshine, and George swerved a few degrees to make certain he did not get too close to an ancient blimp that Nolan had dredged up some-

where. The blimp hovered over Natchezville, trailing a long airsign: LET'S GIVE OUR KIDS A BETTER SOCIAL ORGANIZATION THAN WE HAD—FULL CIRCLE MEANS A FULLER LIFE!

Not bad, George thought. Not bad at all.

Natchezville spread out like a toy town below them and to their left was a pretty little village, with its white houses gleaming in the sun. It was surrounded by large cotton plantations, for Natchezville was currently patterned after the Old South. If you looked closely, you could see belles in crinoline sipping tall drinks on pillared porches, and gray robots dancing in the slave quarters.

The Court House was a hive of activity as the voting picked up in tempo.

George switched on the TV. Yes, it was still there on Channel 7: a white circle flashing on and off, alternating with a bass voice that kept chanting: "*Full Circle—a design for living designed for living—Full Circle—a design for living—*"

George noticed that his hands were sweating, and wiped them on his handkerchief.

"We're lucky," he said for the tenth time, "that the competition isn't too hot this time around. Neither Lloyd nor Brigham has a system in the race—Natchezville would be pretty small potatoes for them. Really, we've got only three challengers going down there. Krause's Urbania routine is all right—but we've got that *plus* the rural appeal. Old Ginger-ton's Greenwich Village deal is strictly from senility, and the Mammoth Cave entry is just a dark horse."

Lois laughed dutifully.

George took the copter down almost to road level, where wagon and horses were plodding along toward Natchezville. He smiled and waved, but he was primarily intent on checking his roadsigns. Yes, there was one now, starting just ahead:

WHEN YOU MAKE YOUR TURN
ON YOUR ROAD AND MINE
DON'T BE SCARED
TO BE PREPARED
TO GO TO THE END OF THE LINE
FULL CIRCLE

"I like that, Dad," Bobby said. "That's good."

There was a conventional billboard not far ahead, but it was too close to the city limits for him to risk a close look at it. Basically, it seemed to show two stupendously healthy and starry-eyed children gazing worshipfully in a future filled with circles.

George waved again, and took the copter up.

"Damn this waiting," he said.

"Try not to worry, dear," Lois advised.

George thought of a cutting retort, but had been married long enough not to make it.

The copter hummed through the air like an insect, as the sunlight faded and night shadows darkened the land below. A cool breeze sprang up in the north, and Bobby was getting emphatic about his hunger.

It was close to midnight when the copter's private-line TV blinked into life.

It was Will Nolan, and George knew the result by the glow on his face.

"We're in!" Nolan said. "Not a landslide, George boy, but a great, great victory. Congratulations!"

George grinned his thanks, put his arm around Lois, and headed the copter for home. Bobby made gentle boy-snores behind them. Stars sprinkled the sky and the moon was close and warm.

"I'm so proud of you, dear," Lois said.

"It wasn't really anything," George said. "But wait until the Concordburg elections next year! I've got an idea cooking that'll set them on their ears."

The copter hummed on through the friendly night.

Of course, as you might suppose (the historian said to young Robert Sage over a second glass of beer), what happened to your father and to Fullcircle is hardly understandable except in terms of the social and historical context of the phenomena. If I may interrupt you for a moment, I think I can show you what I mean.

Looking at the whole thing now, it all takes on a sort of spurious inevitability, as though it couldn't have happened any

other way. That's the crudest sort of teleological thinking, to be sure, and we must be careful of it.

Still, if we consider certain tendencies in American culture during the last seventy-five years of the century just past—say from 1925 until the year 2000—it helps us to explain your father and what happened to him.

Take two key ideas: individualism and progress. You are doubtless familiar enough with the notion of individuation, and the value American culture placed on the individual. You may not have realized that the idea of progress is a relatively recent one in history. A great many peoples failed to see that constant change necessarily meant improvement—how do you know that what you're getting is better than what you had, and what do you mean by *better*? But Americans believed in progress; it was part of their value system. If you weren't 'making progress' you were as good as dead, in an individual as well as a national sense.

It was possible to demonstrate progress in some areas, such as technology. If by progress you mean efficiency, it could be shown that some tools were more efficient than other tools. Progress in terms of other spheres of culture was harder to define, but Americans believed in that kind of progress too. If you should ever go back and read some of the historical documents of that period, Robert, I'm sure you will be struck by the constant references to spiritual growth and social betterment.

Now, cultures are funny things. All of them change, but all of them are inherently conservative; they have to be. You can't have a culture—which is an integrated system—charging off in ten different directions at once. In America, the slogan might well have been this: the same, with a difference. In other words, you must preserve the traditions of your forefathers, but be more up-to-date than they were.

You probably know that our industry was not always robotized and controlled by cybernetic systems, but it is hard to imagine today that it was ever anything else. This was a fundamental change in our way of life. As long ago as the middle of the last century, a man named Riesman was already pointing out that our culture was becoming oriented toward

the *consumers*; he called it 'other-direction,' I believe, and he noticed the increasing dominance of peer groups and the growing discriminations of taste. People were becoming sophisticated in what they consumed, you might say.

Atomic power, as you have read in your elementary history books, meant the end of old-style warfare. War was no longer an efficient instrument of national policy. It became necessary to win men's minds. At the same time, the physical sciences went into a bit of a decline. Most of the work went into the making of bigger and better super weapons, which were never employed in warfare but were simply set off first in isolated areas, and later on the Moon—in order to keep the other side too scared to fight. The social sciences, meanwhile, had got far enough along to know what made sociocultural systems tick.

It was rather neat, really. Americans had always loved gadgets, and as they became more sophisticated they turned to really fundamental gadgets: social systems. It was all phrased in terms of healthy variety and showing the world what we could do with free enterprise and respect for the individual; but what it was, in fact, was social gadgeteering.

Inventors had always been highly regarded in America, but now the focus of their inventions changed. It was all very well for Edison to have thought up an electric light, of course, but how much more rewarding it was to invent a way of life for a whole generation!

What came out of it all was a series of flexible, delimited social groups—about the size of the old counties—with variant social systems competing for prestige. Every village and town had always thought of itself as different from and better than its neighbor down the road—perhaps you have heard of Boston or of some cities in Texas—and now they could really put on the dog. Of course, they weren't *completely* different; that would have been chaos. They were all American, but with the parts put together differently. And there was a national service culture—a government—that was centered in Washington and had colonies in each area.

I hope you'll excuse me for talking so long, Robert, but I think all this has a bearing on what your father did. The defects—if that is the right word—of this way of running

things were not apparent until after the Natchezville elections, where Fullcircle began. That's why I'm particularly anxious to hear about the next decade or so, when you were growing up. I recall that George lost the Concordburg elections the next year, but after that I'm a little hazy.

I have always wondered just how long it was before your father knew what had happened to him. . . .

"Look," George Sage said, with a moderately successful imitation of long-suffering patience, "do you have to shoot marbles right under my hammock?"

"It's raining outside, Pop," Bob answered, laconically chalking another circle on the living-room carpet.

"It's always raining," George muttered, half to himself. "It's been raining for a million years."

"Don't be depressed, dear," Lois said.

"Now *you're* turning on me! How the hell am I supposed to get any work done?"

"Don't swear in front of Bobby, George."

"Aaaahh." George stared grimly at his son. "You know plenty of worse words than that, don't you, Bobby?"

"Sure," the boy said solemnly. "And my name is *Bob*, not Bobby."

"Hell," George said again.

"Come on, Bob," Lois said. "You run get in the copter and go to the store with Mother."

"Can I pilot?"

"Of course," Lois said, hiding a shiver of anticipation.

They hurried up to the roof.

George was alone.

It was ten years since he had won the Natchezville elections with his Full Circle. Not one of his ideas had panned out since. To make matters worse, he was in competition with himself.

And losing.

He swung out of his hammock, made some half-hearted notes on the pad on his desk, and called Will Nolan. The promotions officer faded into the screen like a reluctant spirit.

"Great to see you, George boy," he said with an appalling lack of sincerity. "What's new?"

"That's what *I* want to know. Any new figures on that Frankenstein of ours?"

"It wasn't Frankenstein," Nolan corrected, removing the lenses from his eyes. "It was Frankenstein's monster."

"Monster, shmonster. What's the box-score?"

Nolan sighed, fixing his gaze on the ceiling. "Your little creation—it's written as one word now, 'Fullcircle,' you know—has spread to six more communities in the last two weeks. It's winning every blasted election. A great, great system!"

"Great," George agreed, in utter despair. "Still the same routine?"

"Yeah. Nobody put it on the ballot, since nobody can get any royalties on it after the first time around; but the thing keeps winning as a *write-in* candidate. No advertising, no promotion, no nothing!"

"The best advertisement," George repeated wearily, "is a satisfied customer."

"Great." Nolan paused, at a loss for words. "Great."

"Will, what have I done? I'm just an average kind of guy, just trying to make a living; I'm no revolutionary, dammit!"

"Well, George—"

"That monstrosity—that Full Circle—I mean Fullcircle—is too good, that's what's wrong. It's got *everything*! All the joys of rural living, all the joys of the city—how can you beat it? *I* can't beat it, and I thought it up! Where will the damned thing end, Will? *Where will it end?*"

"I strongly suspect," Will Nolan said in complete seriousness, "that it's going to take over the world."

"Oh my God."

"Too late to invoke the Deity, my friend. We're headed for technological unemployment. A great, great situation."

"Maybe I'll get a pension," George said.

"I'll work on that angle. I should get one too; I sold it in the first place. Don't call me, I'll call you."

"So long, Will."

George cut the screen off and walked unsteadily back to his hammock. He closed his eyes but he could not relax.

"Survival of the fittest," he remarked to the wall.

He was no fool. He saw what was happening, saw it with

hideous clarity. There was a fight for survival among social systems as well as in the animal kingdom; there were no primitive hunters left in London. The set-up in the United States, with its emphasis on local variations, would work fine, until a social organization came along that was markedly superior to all the rest. And then—

And then it spread.

Everybody wanted one.

It was the end of an era.

"I am Achilles' heel," George said.

The empty rooms began to get on his nerves. He slipped into his rainsuit and went down and out the little-used street entrance. The rain was a gray drizzle in the air, and Washington was hushed and colorless.

George walked, aimlessly.

His feet squished wetly on the old cement.

He didn't even feel like smoking.

It was two hours before he saw another human being. At first, the figure was just a dark shadow, coming toward him. Then, as it walked nearer, it took on substance and features.

It was Henry Lloyd. A few short years ago, he had been the most successful social inventor in the country.

Lloyd was looking very old.

"Hank!" George called out. "It's good to see you."

Lloyd stared at him icily.

"Monopolist," he said, and made a small detour to get around him. He said nothing more, and vanished up the wet street.

George Sage put his head down.

He walked slowly through the gray rain-haze, walked until night had come to the city. Then he headed back toward home, because he knew that Lois would be worried.

That wasn't the only reason, he supposed.

There just wasn't anywhere else for him to go.

So you see (Robert Sage said to the historian as they finished their third glass of beer) that it wasn't all milk and honey after Dad invented our way of life. There was a tough transition time, when Fullcircle was just catching on and a lot of people hated Dad's guts.

I'll tell you, getting that pension wasn't the easiest stunt in the world; there was a time when I thought we were all going to starve to death. People get sore when I mention that; they figure I'm just some spoiled brat who likes to tell lies, but it's the truth.

All that Father of His Country stuff came later—much later.

Well, that's the way it was. I could tell you wanted the facts, so I've given 'em to you straight. It's been a pleasure talking to you.

What's that? Sure, if you insist. I'll get 'em next time—that a deal?

Tell you what. Old George doesn't live far from here. Mother's dead, you know, so Dad is all alone. He still won't admit to himself that it's all over; that's the way artists are, I guess. Like as not, he'll be sitting at that old desk of his, making notes and cussing the weather. He'll look busy, Dad will, but don't let that fool you.

He's lonesome, and likes to be able to talk to people.

I'm going over there now. Won't you come along?

JOHN SZE'S FUTURE

John R. Pierce

JOHN R. PIERCE

This story, originally signed with the pseudonym "J. J. Coupling," was written by "J. R. Pierce, Director of Research—Communications Principles" (as it says in the Bell Telephone Laboratories' phone book), and has never been published before. The author sent it out a couple of times and then abandoned it, only to submit it again for this collection. Why any editor of reasonably sound mind would ever turn down so subtle and sharp a story passes comprehension. However, they did, to our benefit!

The tale is a pointed example of how easily a self-deceived person can keep on deceiving himself by a misinterpretation of the fact that things around him are (via time travel) completely different from what he thinks they are. It is also a sharp criticism of the overemphasis on "measurable" science, with its consequent neglect of psychological research. The point is made by showing how it might be in another world or time where physical science is metaphorically in the doghouse as the result of a nuclear war and psychological studies rule the roost. And to tie the two dissimilar themes together, there is a semantic confusion between the two worlds' overspecialized terminology, a thing which happens in reality only too often, both among the sciences and within each science.

John Pierce is one of the world's foremost communications researchers, having worked on everything from the acoustical principles of the human ear to both repeater and active communications satellites in space (see the introduction to Arthur C. Clarke's story in this book). At Bell Laboratories he is supervising some of the "farthest-out" studies in communications applications that are being undertaken anywhere in the world today.

John Sze's Future

SUDDENLY, he was seated in another chair, a chair that was both firm and comfortable, that fitted itself to his body. When he saw the unusual desk before him, he guessed what had happened. When he looked at the man behind the desk, when he met that gaze of piercing intelligence, he *knew* that he was in the future. Then, because the man wore, not a laboratory coat, but a strangely patterned shirt and an abbreviated jacket, because in the small, coolly colored, softly lighted room there was no sign of machine, meter, or gadget, he knew that he was in *his* future, the future that he had believed in, the future that he had prophesied. Here was clear confirmation that the powers of mind, the control of psi phenomena, had finally triumphed over the gross energies of physics.

In those moments, John Sze's attitudes hardened from fervent belief to confirmed conviction. He spoke with the intonation of assurance.

"You're a psi man," he said.

Crawdon looked at John with a growing bewilderment which changed to horrid misgiving. This certainly couldn't be Skinner. The man in the chair facing him didn't resemble at all the surviving photographs. How could he have failed? He had directed the billions of joules of energy required for time travel with a care based on years of study. He had focused his beams on the most probable location of Skinner's office, next to the laboratory whose situation was known. And they had encountered human flesh. Yet, here was this strange individual, making an embarrassing assertion.

"I'm not exactly a psi man," Crawdon replied, "though I know something about psi." What an odd term for psychologist, he reflected. He had encountered *head shrinker* in twentieth century records, but chiefly, psychologists had been called psychologists. This surely illustrated the difference between the spoken and written languages. It showed, he thought with the irritation which inferiors sometimes feel for

superiors, that even historical psychologists could make mistakes concerning language. But, he had work at hand, even if the work was disappointing. He addressed the man from the past.

"I'm afraid I don't know your name," he said. "Mine's Crawdon." He got up and held out his hand in a twentieth century gesture, as the psychologists had instructed him to do.

"I'm John Sze," John said, rising and shaking the extended hand. "This is a little different from what the orthodox scientists of my day predicted. But I like it. It's exactly what I expected. What century is it, Crawdon? The twenty-first?"

Crawdon was taken aback. He had expected bewilderment and difficult, if not impossible, explanations. This was too easy.

"It's the twenty-second century," Crawdon replied. "March 27, 2178, to be exact, and it's 13:30." After a pause, "Are you a psi man?" he asked.

"I'm a nuclear physicist," John answered. "M.I.T. I edit a magazine which carries a good deal about psi, though. Stories and articles. I've done some experimental work myself on Hieronymous machines," he added.

The first words of this statement so shocked Crawdon that he scarcely heard the latter part. The table talk of one age is the obscenity of another. After the atomic blowup of 1987, the words *nuclear physicist* and *nuclear physics* had become taboo.

Of course, people knew that there *were* such things as nuclear physics. They even used them. But, in the world that the experimental psychologists had pulled together from the chaos of nuclear destruction, no one cared to speak the obscenity that physics had become. And to use the expression *nuclear physicist*, why, that was worse than *reactor engineer*. Crawdon called himself a natural philosopher. One might have to do what he did for society, but there was no sense in calling it by a dirty name.

Clearly, the thing to do was to get this vulgar creature back to his own time as quickly as possible. But that couldn't be done for a few hours yet. His assistants would have to check the rooms and rooms full of equipment which surrounded the properly bare office, like plumbing decently hidden behind

a wall. Had the equipment in fact survived the overwhelming bolt of energy which had so senselessly and mistakenly yanked John Sze from a remote past in which he might much better have remained?

Meanwhile, the man was here. He must be taken to the Coordinator. The Coordinator was far away from this industrial slum to which the powerful machinery of natural philosophy was banished. Crawdon suggested to John that they leave, and they rose and walked from the office (which was on the ground floor) to the quiet street. Crawdon looked sadly at the building as they left it. Every trace of its content, its function, was disguised. It would look perfectly respectable to a stranger from another century, and it probably did. But, to himself it shrieked of his caste.

Crawdon had already dialed his location and destination. They waited less than a minute at the curb before the empty car drew up, homing on Crawdon's transmitter. The door opened, and Crawdon indicated that John should get in. As soon as Crawdon had seated himself beside John, the door closed, and the car started for its destination.

John found the car quiet, comfortable, and roomy, with glass all around, and with no signs of engine, instruments, or controls.

"Where does the power come from, Crawdon?" John asked. "What kind of an engine does it have?"

This wasn't outright obscenity, but it was certainly nothing to say to a stranger. Crawdon stared at him blankly, not knowing how to reply.

"It's psi," John said, knowingly, with a glowing smile.

Crawdon felt relieved.

"Well, that's essentially how we think of it," he said. Euphemisms are difficult, but applied psychology does cover a wide field—in design for user preference, for instance. And too, psychologists themselves made use of natural philosophy, but only small, low power, cybernetic aids, so to speak.

John lapsed into a glowing reverie. Surely, in this world of psi, he himself must have been deliberately selected as a true prophet of his own day.

"You sought me out in the past?" John asked.

This was a difficult situation, Crawdon thought. On top of

all the irritation of his failure, he had to explain that this piece of time travel was an unfortunate accident.

"Not exactly," he told John. "I was aiming at a psi man named Skinner. We regard him as the prophet of our civilization. After the atomic blowup (he found it difficult to say the horrid words), the experimental psi men brought the remnants of the human race together. They founded our civilization; they evolved our culture. We all revere Skinner as the chief founder of their art. I don't know," he added as kindly as he could, "how the selector came to be focused on you."

"I was in an office at Harvard, waiting for an orthodox scientist," John said. "As far as I know, there wasn't a psi man within miles. But think of this. Suppose that it's a matter of sympathy, of empathy. Imagine that around me there is a sympathetic, an empathic field, so to speak. The field could have deflected the focus of your machine—"

Crawdon looked at him vaguely. Despite the fact that he was a natural philosopher, he found the words of this *physicist* of another day completely unintelligible. Most books on physics had been burned after the blowup, and the rest were on the reserved shelves because of the obscene passages they contained. Such things should be expressed in euphemisms. Let's see, now, he thought. Empathy, that had something to do with disorder, didn't it? Or was that entropy? And what in the world could sympathy be? He gave it up as a bad job.

"I really don't know," Crawdon replied. "We'll investigate, of course. And, we'll look into your suggestions carefully."

Crawdon was enough of a psychologist to say that.

John's mind had wandered on to other things, however.

"This psi man you were trying to reach—" he said.

"Skinner," Crawdon prompted.

"What did Skinner do?" John asked.

Crawdon looked up wearily.

"He worked with pigeons," he replied shortly.*

* Just so that you won't think Dr. Pierce is making up this reference to pigeon research by psychologists, you might want to take a careful look at an article by B. F. Skinner, Professor of Psychology at Harvard, in the November, 1961, issue of *Scientific American*. The article is called "Teaching Machines," and it discusses something called the "operant conditioning" of the ordinary pigeon!—G. C.

A glaze went over John's eyes. New vistas opened before him. Most of the psi investigators of his own time must have been on the wrong track. They had worked with complicated, human subjects. But science always started with the simple, and went on to the complicated. A glorious vision rose in his mind, of telepathy with pigeons—and if with pigeons, why not with amoebas as well? And, with success, clairvoyance, telekinesis, teleportation—the whole world here about him. But, these visions were interrupted when the car stopped before a series of blank doors.

"We get out here," Crawdon said. "Teleportation to the Coordinator's office."

Not being a psychologist, Crawdon did not understand fully the extent of euphemism in his world. To him, Teleportation was merely the trade name of the largest corporation in his country. Teleportation operated the network of automatically switched transportation tubes, with rockets for long distances, which knit his world together. The user gave its mechanisms no more thought than he gave the sewers under the street. To him it was entering a darkened compartment, seating oneself, having the form fitting foam press one against the padded chair, and feeling the violent shocks of acceleration and deceleration. That the name might have had another meaning as a word in a language of an earlier day had simply not occurred to Crawdon.

To John, Teleportation was perhaps the most exciting experience of his visit. He felt the shock of acceleration mentally rather than physically. When he stepped out into the coordinator's reception room (Coordinators have personal Teleportation terminals) he was in an exalted state. For the moment, he was even wordless.

Entering the office before John, Crawdon had whispered to the Coordinator that John was a *nuclear physicist* who used *unspeakable language*. The Coordinator was a broadminded man of great tact, a psychologist of course. He handled John admirably, managing to respond to what seemed to him partly obscene ravings with sympathetic smiles. He uttered noncommittal acceptable words in reply. His mind was elsewhere, wondering what to do with such a queer creature. When John

suggested that he would like to go to Mars by teleportation, the Coordinator was sure that he was mad.

"Teleportation doesn't serve Mars," he managed to reply. Then he took Crawdon aside and spoke to him in a low voice.

"Either this man was mad to start with, or he's been completely disoriented by his experience," he said. "Take him to the clinical psychologist in Classification. I'll call ahead to see that someone stays," he added, glancing at the clock. "Then send him back to his own time."

I don't even care if he gets there, he thought bitterly to himself.

Teleportation took an even more exalted John to Classification, where a pretty attendant (a nurse, really) fitted a cap strung with wires over his head and asked him to grip the metal arms of the chair.

"Now relax just a few minutes," she said, and went out of the room to adjust the radiation scanners.

Within five minutes the nurse was back. She ushered John into a starkly simple office. There was a chair before a desk, and a man seated behind the desk. The psychologist had stayed after hours to see John.

"Uh, Mr. John," the nurse said. "this is, ah—psi man Miller. He'll help you," she added kindly.

Psychologist Miller motioned for John to sit opposite him. He was tired, and sat elbows on the desk, supporting his forehead with his hands, as he examined John's records through the transparent hole in the desk top. How could he put what he read into words, he wondered.

"You have periods of excitement," he said. "You are very sure of yourself. You talk loquaciously. Your opinions (he shuddered) frequently run counter to those of your culture."

But this was merely talking around the point. He gave it up.

"I'd see a medic, if I were you," he said. "There's, ah, some indication of glandular imbalance. Have one of these." He held out a plastic roll containing sugary disks.

John was awed. This man, merely resting his hands on his head and concentrating, had seen so much. John's eyes were moist at this revelation of psi powers. He took one of the

candies and chewed it thoughtlessly. A feeling of profound peace came over him.

"Have one yourself," he suggested to Miller.

"Why not?" Miller said, and downed the stiff dose of euphorin. This had been too much after a hard day.

The rest of John's visit, accompanied by Crawdon, was like a peaceful dream. Teleportation, car, Crawdon's office, and then he was back in the very room in his own world from which he had been plucked. He rushed forth, to the plane, to the train, anxious for the feel of a keyboard under his fingers, anxious for the editorial which would take form word by word. He wrote:

"We live in a world in which orthodox scientists refuse to see, or seeing, refuse to believe, that which is before their very eyes.

"Yet, during the past hundred years, men among scientists themselves have attested the psi powers of many different gifted persons. They have seen levitation and telepathy irrefutably demonstrated.

"Now, through my own experience, I know that at this very hour there is among us a man who has attained telepathic contact with pigeons.

"We are at the end of a barren era in the history of man, but the seeds of the future are germinating beneath the ground. It is a future that the openminded, the perceptive among us have already foreseen. The dead hand of scientific orthodoxy cannot long delay—"

KID ANDERSON

Robert S. Richardson

ROBERT S. RICHARDSON

This rough little nightmare about a professional boxer (which was originally published under Richardson's science fiction pseudonym, "Philip Latham") is probably as far away from the field of activity in which its author spends most of his time as any item in this collection. Richardson is a professional astronomer who has been on the staff of Mount Palomar and Mount Wilson Observatories for over twenty-five years. He received his Ph.D. in astronomy from the University of California at Berkeley in 1931.

Richardson's writing activities have been almost exclusively concerned with astronomy, including many excellent articles and also a juvenile on the possibility of life on other planets, published in 1954 by The McGraw-Hill Book Company. In addition, he has written several science fiction stories under the pseudonym mentioned above—including a solemn spoof which Astounding Science Fiction published in 1949, "The Aphrodite Project." It appeared as an "article," and purported to tell how a rocket had been sent to Venus to become its satellite, thus making astronomical observations of the planet's mass easier to obtain. It was all fanciful, of course, but even the Associated Press called in to find out why they hadn't been told about this sensational event before! (The Soviet rocket to Venus has, in a sense at least, made "The Aphrodite Project" a bit more "true!")

Richardson's other infrequent fiction has also had an astronomical slant to it, which makes the present little chiller all the more extraordinary: a real mutation! No matter, "Kid Anderson" is unforgettable by any standard, and no apologies are needed for it or its author.

Kid Anderson

"YOU WON'T beat Angelloti that way."

"I know it."

The same thought had been in Brad's own mind so long that he had answered automatically without realizing the words had come from someone else. Then he saw the dark figure framed in the doorway of the barn. He scowled. He hadn't heard the door open. And he didn't like strangers watching while he worked.

"Punching the heavy bag's no good," the man told him, sauntering inside. "What you want is something that moves around."

Brad had a notion to tell him to keep his advice to himself. Instead he sat down on a bale of hay and pulled off his gloves. The battered alarm clock on the wall told him his time was almost up anyhow.

"Sparring partners cost money," Brad said, wiping himself off with a damp towel. "I'm doing the best I can."

The man stood with his legs apart regarding him out of the corner of his eye. Now that he was closer Brad was surprised to see that he was only about thirty, not much older than himself. He looked familiar. Probably somebody he had met a long time ago. He met a lot of people.

The stranger rested one foot on the bale of hay.

"You licked Angelloti once. What was the matter last time?"

"He was tougher, I guess," Brad shrugged.

"He'll be tougher this time."

"You a reporter or fight fan or what?" Brad demanded sharply.

The stranger selected a long clean straw from the stack beside him and began winding it around his thumb. "I own you," he announced casually.

"You're crazy. Lindy Joyce—"

"Not anymore." The stranger exhibited a legal-looking

document. "I bought your contract. From now on you're working for me. For Ben White."

For an instant Brad burned with fierce resentment. Then he sank dejectedly back on the bale of hay. The hell with Joyce. After all, what had that S.O.B. ever done for him? And this guy didn't look so bad.

"I guess you must like to play longshots," he muttered.

"Nope. I like to play sure things." White unwound the straw and tossed it away. "I got a brand new angle on this training business. An angle nobody ever heard of before. Come out here and help me with this box."

Brad followed him obediently outside the barn to where a station wagon was parked under the pepper tree. White opened the rear door and hopped inside. The interior was filled with boxes, some of which were open at the top revealing what appeared to be electronic devices of some sort. One box in the middle was much larger than the others. Large enough to hold a man.

"Grab hold on that end there," White directed. "It's kind of heavy so get a good grip. We can lug the control stuff in later."

They carried the box in the barn and set it beside the crude ring Brad had built. The lid of the box was secured by a heavy padlock. White took a key from his pocket and inserted it in the lock.

"Meet Kid Anderson," he said, raising the lid. "Andy for short. You and Andy are going to get real well acquainted."

A dummy lay in the box dressed in trunks and sweatshirt. He had the build of a boxer with long arms and broad shoulders tapering down to a narrow waist. His face was nondescript, without expression. It might have been anybody's face.

White glanced around the barn.

"Guess the best place for him is over against the wall on that bale of hay. I expect you can carry him better alone."

Brad gathered the dummy in his arms and set it on the bale of hay with its back resting against the wall. He judged it weighed about 150 pounds, the same as himself. A welter-weight.

"Know why I named him Andy?" White said.

Brad shook his head.

"Short for android. An android is an automatic machine that resembles a human being. I'm mighty proud of Andy."

Andy's head drooped slightly. In the dim illumination he might have been a man who had fallen asleep for the moment. Even in repose there was a sinister quality.

White jerked his thumb at the heavy bag. "You can take that down right now. You're going to be working with Andy now."

"What kind of a gag is this?" Brad growled.

"Sleep pretty good, do you?" White inquired. He had a way of answering a question by countering with another one.

"Pretty good," Brad said.

"That's what I thought . . . pretty good. I know what you've been doing. You've been fighting Angelloti in your mind. Lying awake for hours thinking about all the things he might do to you. Right?"

"You can't seem to shut your mind off."

"Suppose . . . just suppose now . . . you had all the money you wanted for training. What'd you do?"

Brad considered.

"Well . . . I'd try to get somebody that got the same sort of style as Angelloti. Somebody like Tony Lopez or Cecil George, for instance."

"How'd you like Angelloti?"

"Angelloti!"

"Maybe not Angelloti in person. But a guy who's exactly like Angelloti without being Angelloti himself."

"It'd be like having your fight in advance," Brad replied slowly.

White rubbed his hands together briskly. "That's just what we're going to do. We're going to go through that fight in advance. It'll be just like you're working with Angelloti. Only Angelloti's going to be Andy."

"Sounds good," Brad said.

"Put it this way," White continued. "You're matched with a fellow. It's an important bout in your life. If you lick this fellow you're made. Naturally you want to know all about

him. So what do you do? You get films of as many of his fights as you can. You watch 'em for hours. It helps but it doesn't help enough."

He waved his hand in the direction of the car.

"I've got films out there of all Angelloti's fights since he turned pro. Only with my outfit I don't just *watch* Angelloti. I've *got* Angelloti. I've got him bottled up so I can do anything I want with him. I can run him hard or easy or fast or slow or backward or forward." He lowered his voice as if he were afraid the figure against the wall might overhear. "I can even feed him into Andy."

He walked over to Andy and grasped him by the chin.

"Like to see the man you're going to fight? Watch this." He dug his fingers into the dummy's face molding and shaping it with quick sure touches. When he withdrew his hands the result was startling. Andy's blank expression was gone. In its place there appeared the scrambled features of Joe Angelloti.

Suddenly Brad felt very tired. His leg muscles were beginning to ache, and he wanted a shower and the peace and solitude of his room.

White clapped him on the shoulder. "Think you can take him?"

Brad reached for his bathrobe.

"I'll murder the bum," he grunted.

Brad had never had a manager like White before. Never before had his manager taken such a deep interest in his personal life. White seemed to know all about him without having to be told. His first move was to change Brad's haphazard method of training and of living in general. He pointed out with unassailable logic that you succeed by doing the right things instead of the wrong things. You advance yourself by not making mistakes. You decide on your goal and then head directly toward it.

The changeover started next morning at breakfast. Brad boarded with his widowed aunt who owned a strip of land and a farmhouse bordering on Highway 101. She had converted the front of the house into a curio shop where she made an uncertain living selling local mineral specimens and Indian relics to credulous tourists from the East. She had let

Brad stay with her because he was an orphan and because it gave her a comfortable feeling to have a man around the house.

White frowned when he surveyed the breakfast that she set.

"This won't do," he declared firmly. "This won't do at all. Brad here has got to have plenty of eggs and bacon and potatoes and thick steaks."

"That costs money," his aunt retorted.

White took out his wallet and tossed a couple of twenties across the table. "I'll give you a list of groceries I want later. When that's gone let me know."

His aunt began to take a liking to Mr. White after that. The distinguishing trait of the other characters Brad had brought home occasionally was a lack of cash money. She had become very discouraged about her nephew. A man of his age had no business loafing around the house all day. He should have a nice office where he worked industriously and successfully from nine in the morning till five in the evening. In the course of time he should raise a family and make enough money to buy a nice house and car. Brad failed utterly to conform to this ideal. When not training he lay in his room poring over old papers and magazines or gazing at the colors emitted by a chunk of crystal. She had only a dim notion of Brad's professional activities in the ring. If he had misbehaved she would not have hesitated to take a swing at him herself.

After breakfast Brad helped White set up his equipment in the barn. It looked enormously impressive and complicated. Mechanical and electrical gadgets had fascinated him since he was a child. He had meant to become an engineer when his education was terminated abruptly in the sixth grade. White handled his instruments with careless ease. The most amazing part was that he could always make them work. Brad felt you could rely on White. He felt that White could make him function as readily as one of his instruments.

Late that afternoon White pronounced the equipment in working order and told Brad to get into his gym clothes. When Brad returned, his manager was rummaging in a suitcase filled with rows of bottles like a doctor's medicine kit. White took a bottle, unscrewed the top, and shook out a small

object wrapped in yellow cellophane like a piece of candy. He removed the cellophane, exposing a glittering metallic sphere no bigger than the seed of a cherry. He held the sphere up to the light so that it emitted rainbow colors like a piece of mother-of-pearl or a bird's wing.

"This sphere is Angelloti," White said solemnly. "Its surface looks smooth but it isn't. If you could see it under a high-power microscope you'd find it was all covered with grooves like a newly plowed field. When I put it in the machine these grooves will emit waves that act on Andy." He inserted the sphere in a slot on the instrument panel. "The grooves are on the surface of a sphere because waves mustn't follow any fixed pattern."

He showed Brad some other bottles in the trunk. Each bottle bore a label upon which was written a name and number.

"I got all the top-notchers here," he chuckled. "Now here's Jack De Soto, the third ranking heavy. And here's Ike McCann, the English middle-weight champ. This is Milt Kapek who scored a TKO over Willie Leon last month. I've even got you in here."

He took a bottle from the corner of the suitcase. Although the bottle bore a label it was blank.

Brad regarded it suspiciously. "How d'you know that's me?"

"You're my latest addition. I haven't got you tagged yet."

He restored the bottles to the suitcase and glanced at his watch. "We ought to get going. You want to warm up first?"

"Any time," Brad said, shadow boxing around the ring.

White followed his movements with interest. "It looks queer to see a fellow that boxes with his right hand stuck out. You a natural born southpaw?"

"Guess so," Brad said. He jabbed a couple of times with his right, bent low, and hooked with his left.

"Fighting a southpaw sure mixes some fellows up," White commented.

"Can't see it's ever been much help to me."

White turned back to the instrument panel and touched a switch which caused red and green lights to glow. Simultaneously a dozen indicators sprang to quivering life.

"Watch Andy," he murmured, slowly turning a dial.

For what must have been nearly a minute Andy remained as inert as a sack of laundry. Then gradually he began to stir and shift about like a wrinkled balloon being filled with air. At length he rose to a sitting position and turned his head deliberately from side to side. Suddenly he slid off the bale of hay and walked over to the center of the ring.

"Now I'm only going to run Andy at half speed, so take it easy," White called out. "Okay—time!"

Before Brad knew what was happening a glove was pounding him in the face . . . once . . . twice . . . three times. He dived into a clinch and held on hard trying to get his bearings. But Andy shook him off and landed quick rights and lefts to his head and body. The blows were too light to hurt but there was a feeling of suppressed power behind them.

Brad pulled back, keeping his right extended to hold Andy off. This was the man he had to lick in another couple of weeks. He *had* to lick him. Brad began to loosen up. Soon he was blocking . . . ducking . . . countering instinctively without having to think. Several times he connected solidly with blows that would have been damaging had he put his full weight into them. At the end of the round he felt he had a slight edge.

"Well, what do you think of him?" White asked, at the end of the third round.

"He had me scared stiff at first," Brad admitted. "Gosh! He's more like Angelloti than Angelloti himself."

White grinned triumphantly.

"What did I tell you! Now you can take your time. Get him all figured out in advance. When you step in the ring you'll know all the answers."

Brad took a light poke at the figure hanging face downward over the ropes. "You say you got him running 50 per cent of capacity?"

"I'll turn him up a little every day till we get to 75 per cent."

"But then I'll never know how tough he is," Brad objected.

"You'll know close enough. If you go too hard now you'll leave all your fight in the barn."

What had been a novelty soon settled down into routine.

Each day White moved the dial a notch higher. Each day Andy grew a little harder to handle. But Brad was improving too. He felt stronger and more alert. He had never boxed so well. Six fast rounds with Andy scarcely got his wind up. He should have been feeling fine.

Instead he was possessed by an unaccountable restlessness. White had taken over his training program until every detail was planned and foreseen in advance. Life flowed by in a smooth velvety soft stream. Its very smoothness was irritating. Brad's mind became filled with queer fancies which frightened him but which also gave him a curious perverse sort of pleasure. Gradually he had come to hate White with a wholly unexplainable unreasoning hatred. Yet he was afraid to oppose White. White so obviously had his best interests at heart. White looked after him so carefully. He owed White so much. White was so *good* for him.

The one bright spot was Andy. Andy in the form of Joe Angelloti no longer bothered him. He knew all his tricks. He could anticipate his every move. He could cut him to pieces any time he cared to exert himself. Often he felt genuinely sorry for Andy until he remembered that he was running at only 75 per cent of his capacity. Could he still beat him if he were wide open? Brad wasn't sure. That was what he had to find out.

"I want Andy at 100 per cent today," he told White when they met in the barn. "I got to know how good I am."

White looked at him reproachfully. "I've brought you along as fast as I could. You're going into the ring right at your peak."

"Just one round."

White did not reply immediately. He replaced some bottles in the suitcase. He had received a new batch lately which he had been busy marking and recording. Brad itched to get at those bottles. From watching White he was sure he could operate the machine. With those bottles in his possession he could test himself at 100 per cent against every top-notch in his division. What a chance! To study a man at leisure until he knew him thoroughly. From a third-rater he might become welter-weight champion. Might even aspire to the middle-weight crown.

White regretfully shook his head.

"Sorry, kid, can't do it. Seventy-five is the limit. We don't dare risk an injury this close to the fight."

Brad turned without a word and tore into Andy. He was blind mad. He was careless. He didn't do as well as he should. Andy caught him on the side of the jaw when he was a trifle off balance. It wasn't really a hard punch but it did something to him. The impact seemed to go on up through his head and explode in the back of his brain. All afternoon he tried to shake it off but it stubbornly refused to go.

The first Brad knew that something was definitely wrong was when he went in for his shower. The handles marked HOT and COLD on the water pipes were blank. Of course he knew the words must be there. By concentrating hard he made them come back but the letters were blurred and kept fading in and out. He ate a light dinner and then went at once to his room and threw himself on the bed without undressing. For a long time he lay still gazing up at a water spot on the ceiling watching it divide and coalesce and divide again. He never knew when he fell asleep.

He awoke in darkness. The house was still. He counted to 110 before a car whizzed past on the highway. That meant it was probably early in the morning. He was aware of the same sense of unnatural calm that he felt before entering the ring. Previously he had never tried to plan his fights but had simply done whatever seemed best as circumstances arose. This time he knew exactly what he had to do.

Without hesitation he slipped downstairs and out the back door. There was no moon. The wind blowing from the desert felt hot against his face. It set the dry bark of the eucalyptus trees to crackling and filled his eyes with dust. He was glad when he was in the barn at last and could see what he was doing. Andy lay where they had left him sprawled on the bale of hay staring fixedly at the ceiling. Brad stripped and got into his ring togs hurrying as if they were already waiting for him. The sound of the rising wind in his ears was like the distant roar of the crowd.

Brad made a quick inspection of the instrument panel. The dials were set where White had left them that afternoon. Brad left them untouched except for one which he turned to 100.

Next he threw open the suitcase and ran his eye along the rows of bottles. His eyes were smarting from the dust. He was carrying his gloves under his arm and without thinking he used them to dab at his face. That was bad, for the gloves were an old pair that had been used in the ring and might have resin on them. Finally he found the bottle he wanted. He examined the label carefully. When he was satisfied he inserted the sphere in the machine and turned on the switch.

Andy was struggling into life. Brad awaited him eagerly dancing on his toes, his arms working effortlessly. His cares and worries had vanished. Never had he felt so light and free. It was the moment he had been waiting for so long.

Andy was gliding toward him in a half crouch, his chin tucked behind his shoulder, his right arm extended. . . .

When White entered the barn at dawn he found Brad stretched out face down on the floor with Andy bending over him with his arms dangling limply, a stupid expression on his face. He shoved Andy away and turned Brad over. Gently, almost caressingly, he ran his fingers over his head and neck. Already the body was growing rigid. Evidently he had been dead for several hours.

White went to the suitcase and reached for a bottle. As he had expected the bottle was empty. It was the only bottle with a label that was blank.

PILOT LIGHTS OF THE APOCALYPSE

Dr. Louis N. Ridenour

LOUIS N. RIDENOUR

Louis Nicot Ridenour, who was born in Montclair, New Jersey, in 1911 and who died in 1959 at the age of forty-eight, was one of America's most brilliant scientists. His basic field was nuclear physics, and he worked extensively on atomic energy during World War II. He was also editor-in-chief of the Radiation Laboratory Series, published during 1945-1946 to release to the scientific community the declassified work performed during the war; he designed radar systems; he worked on the absorption of slow neutrons; he collaborated on the design of information processing machines; and he had part in many other activities in the fields of physics and electronics. From 1952 until his death, he was with the University of California at Los Angeles.

"Pilot Lights of the Apocalypse" is one of the earliest literary attempts to warn mankind of the dangers of "push-button nuclear warfare," as we have since come to know of it. The little play had a sophisticated audience when it first appeared in Fortune during 1946, but as far as I can find out it has never had the broad circulation among the general population that it should have had.

In addition it is definitely actable: In a reprint of the play issued by Time, Inc., it was stated that "non-professional groups may produce the playlet without payment of royalties." How many such groups ever did so, the record does not show. But the state of the world at the time this note is written (October, 1961) would indicate that—as with so many other early warnings of coming dangers from atomic energy—the play's message was ignored by practically everyone.

Pilot Lights of the Apocalypse

A PLAYLET IN ONE ACT

The curtain rises to disclose the operations room of the Western Defense Command, somewhere in the San Francisco area and a hundred feet underground. Two sergeants, RIGHT, are tending a row of teletype machines that connect the room with the world's principal cities. Two others, REAR, sit before a sort of telephone switchboard with key switches, lights, and labels representing the world's major cities. Behind them stands a captain. At a large desk, CENTER, sit a brigadier general and two colonels, all reading teletype messages. The wall, LEFT, has a sturdy barred door, a world map, and a framed motto: "Remember Pearl Harbor."

TIME: Some years after all the industrialized nations have mastered the production and use of atomic power.

BRIGADIER (*laying down the message he has been reading*):
Nothing much tonight, I'd say. We'd better get tidied up a little. Captain Briggs!

CAPTAIN (*facing about and standing at attention*): Yes, sir.

BRIGADIER: Ready for company?

CAPTAIN: Yes, sir. I think so, sir.

BRIGADIER: See that the men look busy—on their toes and busy.

CAPTAIN: Yes, sir. (*A bell rings.*) Schwartz, you get the door. (*One of the sergeants crosses to the door and opens it. All stand rigidly at attention. A little confused, the sergeant goes through the formality of examining passes. He then admits a group of four: a four-star general, a major, and two civilians.*)

GENERAL: Carry on. (*The men relax. The General leads the two civilians over to the Brigadier and the Colonels. The Major takes up his station by the door. Nobody pays any attention to him.*) Mr. President, this is General Anderson, Watch Officer in charge of the Operations Room.

THE PRESIDENT: How do you do?

BRIGADIER: How do you do, sir? (*They shake hands.*)

GENERAL: Colonel Sparks and Colonel Peabody, Deputy Watch Officers on duty.

THE PRESIDENT: Glad to meet you both. (*They shake hands.*)

GENERAL: Dr. Thompson—General Anderson, Colonel Sparks, and Colonel Peabody. (*All nod and smile.*) Now, Mr. President, this is the nerve center of our counterattack organization for the western area. The teletype machines you see over there (*pointing*) are on radio circuits that connect us with our people in all the principal cities of the world, and with the other continental defense commands. The stations, and their statuses, are marked on the map. (*He gestures toward the map.*) We've just come from the defense center, where the radar plots are kept and the guns and fighters controlled. That's defense. But this is counterattack. Along that wall (*waving toward the rear*) is our control board. If you'll step over here, sir, I'll show you how it works.

THE PRESIDENT (*moving with the General toward the telephone switchboard against the back wall*): Defense and counterattack, eh? Why keep them separate?

GENERAL: Well, the defense has to move quickly, or it's no good at all. They don't have time to think. But counterattack—well, counterattack has to move quickly, too. But we want them to have time to decide what they need to do. You can't tell just from the direction of an attack who launched it. An attack might be staged entirely by mines planted inside our borders, so there wouldn't be any direction connected with it. And then again, we have pretty good information that some other countries besides us have got bombs up above the stratosphere, eight hundred miles above the earth, going round us in orbits like little moons. We put up two thousand and we can see about five thousand four hundred on our radar. Any time, somebody can call down that odd three thousand four hundred by radio and send them wherever they want. There's no telling from trajectory which nation controls those bombs. What this all means is that the data these fellows here have to go on is mainly political. Radar doesn't do them any good. What they need is intelligence; and that's what comes in all the time, as complete and up-to-date as we can get it, on

the teletypes. In the defense center, you saw scientists and technicians. The officers here are political scientists.

THE PRESIDENT: That's very interesting. Maybe you'll give me a job here if I ever need one. I'm a political scientist.

GENERAL (*laughing just enough*): Yes, sir!

THE PRESIDENT: General, you haven't told me what all these gadgets are for. (*He waves toward the switchboard.*)

GENERAL: No, sir, I haven't. This is our counterattack control board. You see that every station is marked with the name of a city. And every station has three pilot lights: red, yellow, and green.

THE PRESIDENT: All the green ones are on.

GENERAL: That's right, sir. We have unattended radio transmitters, each with three spares, in stations in every city covered on this board. If one of the transmitters goes on the blink, a spare is automatically switched on. But if all four transmitters in any station are destroyed, well, we lose the signal from that station. When that happens the green light goes out and the yellow light comes on.

THE PRESIDENT: How about the red light?

GENERAL: That comes on instead of the yellow when all our stations in the whole city go off the air. Yellow means partial destruction—red means substantially complete destruction.

THE PRESIDENT: And green means peace.

GENERAL: Yes, sir. But this isn't just a monitoring board. You see this key here.

THE PRESIDENT: Yes.

GENERAL: That sets off our mines. We have them planted in a great many cities, and the radio control circuit can be unlocked from here.

THE PRESIDENT: Is the whole world mined now?

GENERAL: Well, no. We haven't bothered much with Asia. And some countries are so hard to get into that coverage is spotty. Our schedule calls for completion of mine installations in two more years. But we have another card to play. You remember I told you about the satellite bombs—the ones that are circling around, eight hundred miles up?

THE PRESIDENT: Yes.

GENERAL: Well, this other key here will bring down on the city shown on the marker—we are looking at Calcutta—one of those satellite bombs every time it is pressed.

THE PRESIDENT: Is one of those bombs earmarked for each particular city?

GENERAL: No, sir. The bomb that happens to be in the most favorable location at the time this key is pressed is the one brought down. It might be any one of the whole two thousand.

THE PRESIDENT: This is damned clever.

GENERAL: We have Dr. Thompson to thank for most of it. His people worked out all the technical stuff. All the Army has to do is man the installations and watch the intelligence as it comes along.

DR. THOMPSON: Good of you to say that, General. But seriously, Mr. President, as people pointed out soon after the first atomic bomb was dropped, there isn't any other nation with the industrial know-how to do a job like this.

THE PRESIDENT: It is very impressive, I must say. Are the other Defense Commands equipped the same way?

GENERAL: Yes, sir. As a matter of fact, to guard against accidents, each Defense Command has two complete operations rooms like this, either one of which can take full control if the other is destroyed.

THE PRESIDENT: We've kept ahead in the armaments race. Who'd dare attack us when we're set up like this?

DR. THOMPSON: Surely nobody would. I don't think you need expect any trouble.

THE PRESIDENT: Well, this has all been very interesting. (*To the Brigadier*) General, have you had any exciting times here you can tell me about?

BRIGADIER: Yes, sir. Every time a meteorite comes down—a shooting star, you know—our radar boys track it, shoot it down, and send us in an alert. We have a few bad moments until we get the spectrographic report. If it's iron and nickel—and it always has been so far—we know God sent it, and relax. Someday it'll be uranium, and then we'll have to push a button. Or plutonium.

THE PRESIDENT: How many shooting stars have you shot?

COLONEL SPARKS: (*laughing politely*): We get an average of

twelve a month. In August it's the worst, of course. The Perseids, you know.

THE PRESIDENT (*puzzled*): Iran . . . ?

BRIGADIER (*hastily*): No, sir. The Perseid meteors. Named after Perseus. Astronomers are a classical bunch.

THE PRESIDENT (*recovering*): Oh, sure. (*Turning to the Colonels*) Gentlemen, how do you like this job?

COLONEL SPARKS: We have a feeling of grave responsibility.

THE PRESIDENT: The fate of nations is in your hands. But always remember that our nation is the most precious.

BOTH COLONELS (*awed*): Yes, sir.

GENERAL: Well, Mr. President, we've fallen a little behind our schedule. They'll be waiting for us at the mess.

THE PRESIDENT: All right, General, let's get along. General Anderson, Colonel Sparks, Colonel Peabody, I've enjoyed very much seeing your installation. Keep on your toes. We're all depending on you.

GENERAL AND COLONELS (*together*): Yes, sir.

(Schwartz goes over, opens the door, and stands stiffly at attention as the visitors file out amid a general chorus of "Goodby" and "Goodby, sir." Schwartz closes the door. The Brigadier and Colonels sit at their desks.)

BRIGADIER: Well, that's that. The Old Man gave him a good story; I couldn't have done better myself.

COLONEL SPARKS (*still in the clouds*): He is depending on us.

BRIGADIER: Don't take it too hard. All we're supposed to do is make the other guy sorry. We can't save any lives or rebuild any cities. Never forget what those buttons do.

COLONEL SPARKS: Just the same, sir, I'm glad I was born an American. We've got the know-how. I'm glad I'm on the side that's ahead in the race.

COLONEL PEABODY (*disgusted*): Sparks, you talk like a damn high-school kid. For this job, you're supposed to have some good sense and detachment.

(Just then, there is a dull rumble. The floor and the walls of the room shake, and a couple of sizable chunks of concrete fall out of the ceiling. The lights go out, except for the green ones on the control board. Emergency lights, dimmer than the regular ones, come on at once. All the men are on their feet.)

BRIGADIER: Good God! What was that? (*Recollecting himself*) Peabody, get on the phone to headquarters. Sparks, get out the red-line messages for the last twenty-four hours. Captain, anything from the defense center?

CAPTAIN: My line to them seems to be out, sir.

BRIGADIER: What have you got for status? Anybody showing yellow or red?

CAPTAIN: San Francisco is red, sir.

COLONEL SPARKS (*riffling wildly through teletype messages*): Oh, Jesus. This must be it. San Francisco! (*Screaming*) San Francisco gone!

BRIGADIER: Shut up, Sparks. Take it easy. (*To Peabody*) Can't you get headquarters?

COLONEL PEABODY: The line is dead. I can't get reserve operations, either. Maybe this *is* the real thing.

COLONEL SPARKS (*still half-hysterical*): We better do something. Remember what it says in the book: counterattack must take action before the enemy's destruction of our centers is complete.

BRIGADIER: First we need an enemy. Who's got the highest negative rating in the latest State Department digest?

COLONEL PEABODY (*who has quietly taken the messages from in front of Sparks*): Denmark, sir. But it's well below the danger point. All we've got is this. (*reading*) COPENHAGEN 1635 HOURS 22 JANUARY. WIDESPREAD DISAPPROVAL OF WILLIAMS FOUNTAIN, STATUARY GROUP PRESENTED THE KING DENMARK BY U.S., BEING SHOWN BY PEOPLE COPENHAGEN. FOUNTAIN BEEN PELTED VEGETABLES BY HOODLUM GROUPS THREE OCCASIONS. FORMAL PROTEST STATING STATUE INSULTS KING RECEIVED FROM ROYAL ACADEMY ART IN FOLLOWING TERMS QUOTE . . . and so on. Nothing there, I'd say.

COLONEL SPARKS: Nothing there! San Francisco's in ruins, you damn fool, and we're sitting here like three warts on a pickle. All that over a lousy set of statues. I say let 'em have it.

BRIGADIER (*to Peabody*): Is that the hottest you've got?

COLONEL PEABODY: Yes, sir. I don't think it could have been Denmark. Though the sculptor, Williams, does live in San Francisco.

BRIGADIER: We better wait and be sure. Captain, how are your lines now?

COLONEL SPARKS (*with rising hysteria*): What have we got this stuff for if we don't use it? My God, didn't you hear what the President said? He's depending on us; they're all depending on us. If you haven't got the guts, I have. (*Before he can be stopped, he rushes to the control board and shoves a sergeant to the floor. Peabody is after Sparks in a flash. He pulls him around and knocks him to the floor. Sparks's head hits hard, and he lies still.*)

COLONEL PEABODY: General, he did it! Copenhagen shows red!

SERGEANT (*at a teletype*): Sir, here's a message from the defense center. They've got their line working again. (*He tears it off and brings it to the Brigadier.*)

CAPTAIN: Stockholm's gone red, sir.

COLONEL PEABODY: Sure. The Danes thought it was the Swedes. That export-duties row.

BRIGADIER: And the Swedes have got two hot arguments on their hands. They'll take the British, too, just to be sure. The British soak the Russians, and then we're next. (*He reads the message he has been holding, and drops into a chair.*) My God! Peabody, that was an earthquake. Epicenter right smack in San Francisco.

CAPTAIN: London's gone red, sir. And Edinburgh, and Manchester, and Nottingham, and—

COLONEL PEABODY: Dark Ages, here I come. It's a pity the Security Council didn't have time to consider all this.

BRIGADIER: Peabody, you're beginning to sound a little like Sparks. Come to think of it, there was nothing wrong with him but too much patriotism and too little sense. Captain, we probably can't pull this out of the fire but we've got to try. Send a message on all circuits. (*The Captain sits down at a teletype keyboard.*)

CAPTAIN: Ready, sir.

BRIGADIER: To all stations: URGE IMMEDIATE WORLDWIDE BROADCAST THIS MESSAGE: DESTRUCTION COPENHAGEN 1910 HOURS THIS DATE INITIATED BY THIS STATION THROUGH GRIEVOUS ERROR. ATTACKS MADE SINCE BASED ON IDEA DESTRUCTION COPENHAGEN WAS ACT OF WAR, WHICH IT WAS NOT REPEAT NOT. URGE ATTACKS BE STOPPED UNTIL SITUA-

TION CAN BE CLARIFIED. THERE IS NO REPEAT NO WAR. END.

COLONEL PEABODY (*who has been watching board*): The hell there isn't. New York's gone red, and Chicago, and . . .
(*The room rocks, the lights go out. With a dull, powerful rumble, the roof caves in.*)

CURTAIN

GRAND CENTRAL TERMINAL

Leo Szilard

LEO SZILARD

Certainly one of the most distinguished scientists of our day is the Hungarian-born scientist whose name appears as the author of the following wry fable of a distant future that human beings will never know, since by then they will be nonexistent. Leo Szilard, Professor of Biophysics at the University of Chicago, was born in Budapest in 1898. By the 1930s, he was already one of the leading atomic physicists, at first in Europe and later (after 1937) in this country. Indeed, Szilard and the late Enrico Fermi took out the first patent on atomic energy ever issued in the United States.

Szilard is also famous for having joined with Fermi, in 1939, to persuade Albert Einstein to write his famous secret memorandum to President Franklin D. Roosevelt urging the start of a crash program looking toward the development of the atomic bomb—before the Nazis got it first.

*After the war, Szilard stayed on at the University of Chicago, and it was in that University's alumni magazine that the story below first appeared. In 1961 it was included in his collection of tales called *The Voice of the Dolphin*, a book highly recommended to all readers of this collection. (Simon & Schuster, paperbound edition, one dollar.) In 1959 Szilard shared with Eugene P. Wigner the famous Atoms for Peace award.*

Grand Central Terminal

YOU CAN IMAGINE how shocked we were when we landed in this city and found it deserted. For ten years we were traveling through space, getting more and more impatient and irritable by our enforced idleness; and then, when we finally land on the earth, it turns out—as you have undoubtedly heard—that all life is *extinct* on this planet.

The first thing for us to do was, of course, to find out how this came to pass and to learn whether the agent which destroyed life—whatever it may have been—was still active and perhaps endangering our own lives. Not that there was very much that we could do to protect ourselves, but we had to decide whether we should ask for further expeditions to be sent here or should advise against them.

At first we thought we were confronted with an insoluble enigma. How could any virus or bacterium kill *all* plants and *all* animals? Then, before a week had passed, one of our physicists noticed—quite by accident—a slight trace of radioactivity in the air. Since it was very weak, it would not in itself have been of much significance, but, when it was analyzed, it was found to be due to a peculiar mixture of quite a large number of *different* radioactive elements.

At this point, Xram recalled that, about five years ago, mysterious flashes had been observed on the earth (all of them within a period of one week). It occurred to him that perhaps these flashes had been uranium explosions and that the present radioactivity had perhaps originated in those explosions five years ago and had been initially strong enough to destroy life on the planet.

This sounded pretty unlikely indeed, since uranium is not in itself explosive, and it takes quite elaborate processing to prepare it in a form in which it can be detonated. Since the earth-dwellers who built all these cities must have been rational beings, it is difficult to believe that they should have gone to all this trouble of processing uranium just in order to destroy themselves.

But subsequent analysis has in fact shown that the radioactive elements found in the air here are precisely the same as are produced in uranium explosions and also that they are mixed in the ratio which you would expect had they originated five years ago as fission products of uranium. This can hardly be a chance coincidence, and so Xram's theory is now generally accepted up to this point.

When he goes further, however, and attempts to explain why and how such uranium explosions came about, I am unable to follow him any longer. Xram thinks that there had been a war fought between the inhabitants of two continents, in which both sides were victorious. The records show, in fact, that the first twenty flashes occurred on the Eurasic continent and were followed by five (much larger) flashes on the American continent, and therefore, at first, I was willing seriously to consider the war theory on its merits.

I thought that perhaps these two continents had been inhabited by *two different* species of earth-dwellers who were either unable or unwilling to control the birth rate and that this might have led to conditions of overcrowding, food shortage, and to a life-and-death struggle between the two species. But this theory had to be abandoned in the face of two facts: (1) the skeletons of earth-dwellers found on the Eurasic continent and on the American continent belong to the *same* species and (2) skeleton statistics show that no conditions of overcrowding existed on either continent.

In spite of this, Xram seems to stick to his war theory. The worst of it is that he is now basing all his arguments on a single, rather puzzling but probably quite irrelevant observation recently made in our study of "Grand Central Terminal."

When we landed here, we did not know where to begin our investigations, and so we picked one of the largest buildings of the city as the first object of our study. What its name "Grand Central Terminal" had meant we do not know, but there is little doubt as to the general purpose which this building had served. It was part of a primitive transportation system based on clumsy engines which ran on rails and dragged cars mounted on wheels behind them.

For over ten days now we have been engaged in the study

of this building and have uncovered quite a number of interesting and puzzling details.

Let me start with an observation which I believe we have cleared up, at least to my own satisfaction. The cars stopped in this station were labeled—we discovered—either “Smokers” or “Nonsmokers,” clearly indicating some sort of segregation of passengers. It occurred to me right away that there may have lived in this city two strains of earth-dwellers, a more pigmented variety having a dark or “smoky” complexion, and a less pigmented variety (though not necessarily albino) having a fair or “nonsmoky” complexion.

All remains of earth-dwellers were found as skeletons, and no information as to pigmentation can be derived from them. So at first it seemed that it would be difficult to obtain confirmation of this theory. In the meantime, however, a few rather spacious buildings were discovered in the city which must have served some unknown and rather mysterious purposes. These buildings had painted canvases in frames, fastened to the walls of their interior—both landscapes and images of earth-dwellers. And we see now that the earth-dwellers fall, indeed, into *two* classes—those whose complexion shows strong pigmentation (giving them a smoky look) and those whose complexion shows only weak pigmentation (the nonsmoky variety). This is exactly as expected.

I should perhaps mention at this point that a certain percentage of the images disclose the existence of a third strain of earth-dwellers. This strain has in addition to a pair of hands and legs also a pair of wings, and apparently *all of them* belonged to the less pigmented variety. None of the numerous skeletons so far examined seems to have belonged to this winged strain, and I concluded therefore that we have to deal here with images of an extinct variety. That this view is indeed correct can no longer be doubted, since we have determined that the winged forms are *much more frequently found among the older paintings than among the more recent paintings*.

I cannot of course describe to you here *all* the puzzling discoveries which we made within the confines of the “Grand Central Terminal,” but I want to tell you at least about the most puzzling one, particularly since Xram is basing his war theory on it.

This discovery arose out of the investigation of an insignificant detail. In the vast expanse of the "Grand Central Terminal" we came upon two smaller halls located in a rather hidden position. Each of these two halls (labeled "men" or "women") contains a number of small cubicles which served as temporary shelter for earth-dwellers while they were depositing their excrements. The first question was how did the earth-dwellers locate these hidden depositories within the confines of "Grand Central Terminal."

An earth-dweller moving about at random within this large building would have taken about one hour (on the average) to stumble upon one of them. It is, however, possible that the earth-dwellers located the depositories with aid of olfactory guidance, and we have determined that if their sense of smell had been about thirty to forty times more sensitive than the rudimentary sense of smell of our own species, the average time required would be reduced from one hour to about five or ten minutes. This shows there is no real difficulty connected with this problem.

Another point, however, was much harder to understand. This problem arose because we found that the door of each and every cubicle in the depository was locked by a rather complicated gadget. Upon investigation of these gadgets it was found that they contained a number of round metal disks. By now we know that these ingenious gadgets barred entrance to the cubicle until an additional disk was introduced into them through a slot; at that very moment the door became unlocked, permitting access to the cubicle.

These "disks" bear different images and also different inscriptions which, however, all have in common the word "Liberty." What is the significance of these gadgets, the disks in the gadgets and the word "Liberty," on the disks?

Though a number of hypotheses have been put forward in explanation, consensus seems to veer toward the view that we have to deal here with a ceremonial act accompanying the act of deposition, similar perhaps to some of the curious ceremonial acts reported from the planets Sigma 25 and Sigma 43. According to this view, the word "Liberty" must designate some virtue which was held in high esteem by the earth-dwellers or else their ancestors. In this manner we

arrive at a quite satisfactory explanation for the sacrificing of disks immediately preceding the act of deposition.

But why was it necessary to make sure (or, as Xram says, to enforce) by means of a special gadget, that such a disk was in fact sacrificed in each and every case? This too can be explained if we assume that the earth-dwellers who approached the cubicles were perhaps driven by a certain sense of urgency, that in the absence of the gadgets they might have occasionally forgotten to make the disk sacrifice and would have consequently suffered pangs of remorse afterward. Such pangs of remorse are not unknown as a consequence of omissions of prescribed ceremonial performances among the inhabitants of the planets Sigma 25 and Sigma 43.

I think that this is on the whole as good an explanation as can be given at the present, and it is likely that further research will confirm this view. Xram, as I mentioned before, has a theory of his own which he thinks can explain everything, the disks in the gadgets as well as the uranium explosions which extinguished life.

He believes that these disks were given out to earth-dwellers as rewards for services. He says that the earth-dwellers were *not* rational beings and that they would not have collaborated in co-operative enterprises without some special incentive.

He says that, by barring earth-dwellers from depositing their excrements unless they sacrificed a disk on each occasion, they were made eager to acquire such disks and that the desire to acquire such disks made it possible for them to collaborate in co-operative efforts which were necessary for the functioning of their society.

He thinks that the disks found in the depositories represent only a special case of a more general principle, and that the earth-dwellers probably had to deliver such disks not only prior to being given access to the depository but also prior to being given access to food, etc.

He came to talk to me about all this a couple of days ago; I am not sure that I understood all that he said, for he talked very fast, as he often does when he gets excited about one of his theories. I got the general gist of it though, and what he says makes very little sense to me.

Apparently, he has made some elaborate calculations which

show that a system of production and distribution of goods based on a system of exchanging disks cannot be stable but is necessarily subject to great fluctuations vaguely reminiscent of the manic-depressive cycles of the insane. He goes as far as to say that in such a depressive phase war becomes psychologically possible even within the same species.

No one is more ready than I to admit that Xram is brilliant. His theories have invariably been proved to be wrong, but so far all of them has contained at least a grain of truth. In the case of his present theory the grain must be a very small grain indeed, and moreover, this once I can *prove* that he is wrong.

In the last few days we made a spot check of ten different lodging houses of the city, selected at random. We found a number of depositories but not a single one that was equipped with a gadget, containing disks—not in any of the houses which we checked so far. In view of this evidence, Xram's theory collapses.

It seems now certain that the disks found in the depositories at "Grand Central Terminal" had been placed there as a ceremonial act. Apparently such ceremonial acts were connected with the act of deposition *in public places* and in public places only.

I am glad that we were able to clear this up in time, for I should have been sorry to see Xram make a fool of himself by including his theory in the report. He is a gifted young man, and in spite of all the nonsensical ideas he can put forward at the drop of a hat, I am quite fond of him.

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THE BRAIN

Norbert Wiener

NORBERT WIENER

Most of the time writers use pseudonyms to hide their real identities completely—not so in the case of the eminent information theory expert, mathematician, and philosopher of science whose name is now signed to this story. In 1952, when it first appeared in the April issue of Tech Engineering News of Massachusetts Institute of Technology (where Dr. Wiener is still a member of the mathematics department), it bore the obviously revealing nom de plume, “W. Norbert.” Then, when it first appeared in a book in 1953, the same pseudonym was used, but in the introductory note the editor was permitted to reveal who “W. Norbert” was (as if everyone didn’t already know!). Now, in this collection of science fiction by scientists, the situation is reversed, and the author’s real name appears with only peripheral mention of the pseudonym in this note.

As pointed out in the Introduction, this is one of only two pieces of short fiction written (or at least published) by its famous author, who is best known to the general public as the creator of the science of cybernetics, and the author of the remarkable best-selling autobiography, Ex-Prodigy, in which he told of his development as a young scientist under the relentless training of his father.

The present story deals with a technique of brain surgery not long ago rather commonly used with certain types of mental patients. Its quite frequent results, as exemplified in the final paragraphs of this melodramatic and vividly realistic story, are one of the main reasons why the operation, though still occasionally used, has fallen into disfavor in many professional quarters.

The Brain

THE BRAIN is a funny organ. It controls all the sensations of the body and yet it can be touched and cut with no local sensation at all. One man will die of a slight concussion and another can have a crowbar shot through his head with nothing but a ruined disposition to show for it. Recently it has become fashionable to do all sorts of weird things to the brain with needles and hot wires in order to cure or relieve some of the many forms of depressive insanity. It's an ugly business—I don't like it. Sometimes it cuts out a man's conscience, and pretty nearly every time it does eerie things to his judgment and personal balance.

There was a fellow in Chicago, for instance, a big-shot salesman with an insurance company. The only trouble with him was that he had the blues so bad that they never knew whether he would leave for home via the elevator or the tenth-story window. His company begged him to have a little piece of his prefrontal lobe out, and he consented. After that, Mr. Big-shot became Mr. Bigger-shot. As a matter of fact, he outsold every salesman in the history of the company. As a token of their regard, they made him vice-president. They forgot one thing, however, that a man with a prefrontal lobotomy isn't very good at following the pea under the walnut shell. When he got out of the selling game into higher finance, he went flat and so did the company. No, I shouldn't like to have anyone tamper with my inner wiring diagrams.

This brings me to a case which came to my attention the other day. I belong to a small group of scientists which meets once a month in the private room of a little restaurant. We have a scientific paper to give an excuse for our meeting, but the real reason for it is a miscellaneous interest and an unbridled loquacity on the part of the whole gang. It's no place for the striped pants boys. We rib one another unmercifully; and if you can't take it, the door is always open. I myself am something in between a mathematician and an engineer, but perhaps the bulk of us are medical men. Heaven help the

waitresses when the medical boys get talking freely! I won't go so far as to assert that the electric lights go blue, and that the atmosphere smells of sulphur at times, but that is the general idea.

Waterman is in our good graces. He runs a state madhouse some fifty miles away, and looks like the amiable and prosperous proprietor of a delicatessen shop. He is short, fat, walrus-moustached and completely without vanity. He usually has a lame duck in tow. This time he came in with a rather tall, sallow man, whose name I didn't get. I did get the impression that he was a doctor, but he had some of the curious hesitation in company that I have seen in prospectors or engineers who have been too long away from normal civilization, confined in the mountains of Korea or the backwoods of Borneo. It is a mixture of lost familiarity with civilization and overdeveloped self-consciousness and self-criticism. Some of those boys had had to do things that no civilized man can do with impunity to himself, and they carry around the marks ever after.

I do not know how the conversation got around to frontal lobotomy. I think one of the engineering guests asked about it as a possibility for a distant relative who was a mental patient. Everybody present had an opinion about it. A few of them spoke for it, but most of them—even the brain surgeons—did not want any part of it.

Then we got talking about what a modern automobile accident can do to a child's brain. The discussion was not exactly dainty, even as doctors' discussions go. The talk was going hot and heavy; and I do not think anyone noticed anyone but the fellow he was talking to. Suddenly there was a little crash. We looked around to see Waterman's friend cold out on the floor. His forehead was covered with beads of sweat. Waterman knelt down beside him and felt his pulse.

"I don't think it's anything serious," he said. "He is a patient of mine, but very intelligent, and I thought it might cheer him up a bit to come along. He is suffering from amnesia, and we don't know his real name. I shouldn't have taken the chance of bringing him here. Come on, let's carry him out. It won't be necessary to break up the meeting."

Waterman telephoned to his hospital for an ambulance,

while two or three of our medical contingent got in touch with the proprietor of the restaurant. He was flustered, but told us to carry the unconscious man to a couch in a back room. Our patient was beginning to come to a bit. He was in an obvious state of emotional excitement and confusion. He kept talking incoherently. Among the words that came out were "gangster," "little Paul," "Martha," and "the crash." The words formed sentences, but they were spoken too low for us to understand them.

Waterman fetched his bag up from the cloakroom. He administered some sedative; a barbiturate, I think. For a while, it quieted our man; but you never can tell about these sedatives. After a while the patient opened his eyes. His mutterings became louder and more intelligible. The words were fairly coherent.

Waterman is a good enough doctor to use opportunities when he finds them.

"This is my chance," he said. "He's on a talking jag. Some six weeks ago a cop picked him up in a doorway. The police turned him over to us. He doesn't even remember his name. We know that he has been a doctor, and it isn't hard to see that he has been through some pretty times. Up to now he's been getting back strength, and we haven't wanted to disturb his recovery by questioning him too much. However, since we seem to have got him into a talkative mood, here goes!"

The return of the banished memory was fascinating to watch. Waterman is a smooth worker, and it was a delight to hear him ask questions. The new personality emerged like the face of a drowned man when they bring him to the surface with grappling irons. I haven't kept any record of what I saw; but Waterman was writing steadily in a little black notebook. The following conversation is a transcription of his record.

Q. "What is your name?"

A. "My name is Arthur Cole."

Q. "You are a doctor, aren't you?"

A. "I am."

Q. "What medical school did you go to?"

A. "Central Western Medical, in Chicago. Class of 1926."

Q. "Where did you pass your internship?"

A. "I was surgical intern at the Physicians and Surgeons Charity Hospital in Chicago. You know where the hospital is—down at the South End."

I dimly remembered the Physicians and Surgeons Charity Hospital in Chicago. It was a dingy pile of greasy red brick in that festering hell of dead streets where the South End meets the West End.

Q. "Surgical intern. That's interesting—did you go in for any special branch of surgery?"

A. "Yes, of course, for two years I took pretty much what they gave me, but I always wanted to be a brain surgeon. What was I saying? I'm afraid I am very confused. I had forgotten altogether that I had been a brain surgeon."

Q. "Oh, so you were a brain surgeon. What did you do after your internship?"

A. "I remember a long line of locked corridors and barbed windows. What was it called? It must have been a hospital for the insane. Oh yes, now I recollect. The Mere—Mere—Meredith County Hospital for the insane. That's in Illinois isn't it?"

Q. I think it is. Do you remember what they called the town?"

A. "Buckminster. No, it wasn't Buckminster. Now, I have it, it was Leominster."

Q. "Yes, that's right, it is at Leominster. How old were you when you went there?"

A. "About thirty."

Q. "Do you remember the year?"

A. "It was in 1931."

Q. "Did you go there alone?"

A. "I went there with my wife. I am married, aren't I? What happened to my wife? She's here, isn't she? Oh, my God! Martha—Martha."

His voice rose to an incoherent scream. Waterman said, "I'm afraid we shall have to try some more sedative. I'm going to make the dose as light as I can. I don't want to lose this opportunity to find out more about him."

The excitement of the patient gradually subsided as the drug took hold. For a few minutes he seemed too dazed to

say anything. Then the confusion began to wear off and Waterman recommenced his inquiries.

Q. "You must help us if we are to help you," he said. "Pull yourself together. How long had you been married when you went to Leominster?"

A. "Not two years. Martha was a nurse at the Chicago Charity Hospital. Martha Sorenson was her name. She came from Minnesota, I remember. Her father owned a wheat farm somewhere near the North Dakota line. We went back there to be married."

Q. "Any children?"

A. "Yes, a boy—Paul. Now it all comes back to me."

He sunk his head in his arms and began to weep. He burst into incoherent cries. "Where is Paul? Where is Paul?" It seemed indecent to be the witness of such pain.

Waterman stood by the head of the couch where Cole lay. I had always thought of him as the life of the party—gay, witty and salty. I had never seen Waterman, the doctor. He was quiet and dignified, and his voice was more soothing than any anodyne. He was Aesculapius himself, the God of Healing.

Q. "Calm yourself, Dr. Cole," he said. "We want to help you, but you are the only man who can teach us how to. Tell us something about the County Hospital. Did you live in?"

A. "For a few months. Then we took an old farmhouse about a mile away. Martha thought we could fix it up, but I didn't see how we could ever dig through that mess of trash and dirt. Martha could make even a pigsty livable. Let's see: I remember there was a U. S. highway passing in front of the house."

He sank onto his face, his head between his arms—his shoulders heaved. "The brakes," he said. "I can hear them scream. The crash! The car turned over. Blood on the road—blood on the road! I could see it and I couldn't do a thing."

Waterman motioned to us to be quiet. I felt the shame of witnessing another man's naked suffering. Gradually the sobs subsided. Again Waterman took up the inquisition.

"Now, don't bother yourself to put it all together," he said. "Just let me ask you questions. It will all come out easier that way. Let's see. What sort of a place was this Goodair?"

A. "Oh, just one of those farming towns, set down on the prairie by pure chance. It was a farming town; that is, except for the factory."

Q. "The factory—what was that? What did it make?"

A. "I never could tell. The people in the town—well, you couldn't believe a word they said. You know the gossip in a small place like that."

Q. "What sort of gossip?"

A. "Some people said it was a bootleg headquarters, and others that it was a headquarters for making drugs. Anyhow, I never liked the place."

Q. "Why not?"

A. "It was a low building of crumbling concrete left over from World War I. I took a walk over there one day. I always felt that somebody was watching me, and I didn't dare to go very near. It was surrounded by a tangle of giant pigweed, and ditches half-filled with a scummy green water. There were a lot of dismantled wrecks of old cars there, and some neglected farm machinery. Nobody ever seemed to go there for weeks at a time, but every now and then we saw a big car drive up just about dusk."

Q. "What sort of a car?"

A. "It looked like a fancy limousine, but it drove like a truck—and the man in it—"

Q. "When did you see the man?"

A. "That was when the car was coming down our road at about eighty miles just before—Oh God! I saw my car open up like a wet paper boat and spring across the road. They were in it. My Paul—my Martha—my poor little Paul."

Cole became inarticulate again; he twitched all over. I have only seen the like in an experimental animal on the operating table. Waterman gave him another dose, I don't know whether of sedative or stimulant, and Cole gradually quieted down.

Q. "Tell me about the man in the car."

A. "Tall and fat and well-dressed. A red scar went from the corner of his eye to his mouth."

Q. "Do you remember what they called him?"

A. "Macaluso, I think. But they never spoke of him by his name. The country people didn't talk of him much, but when they did they called him *The Brain*."

Q. "Was he the man who made the drugs?"

A. "I think so, but a friend of mine told me that he was a big-shot bank robber, too. A slick article, they said. The police had been looking for him a long time, but they hadn't been able to get anything on him which would stick."

Q. "What happened after the accident?"

The patient made as if to answer, but the words would not come through his mouth. The doctor waited silently until Cole seemed to take hold of himself. He spoke bitterly, forcing his words between his teeth.

A. "It broke my wife's back," he said. "From then to the day she died, she never walked one step. My boy had the left side of his skull crushed in against the seat in front. When I saw it, it was flat and utterly without shape. My partner at the hospital was a good man and saved his life. That is, saved him as a blind, deaf, paralyzed, healthy lump of flesh. With the care that he will get in an institution he will probably outlive most well children. You know what that means. Care that you can't get at a state institution and money—money—money. Or else that I would have to live all my life with this horror right in front of me. My God! It can't be real. It isn't real."

Q. "Didn't they ever try to compensate you for the damage? Of course, I don't mean that they could really compensate you, but you must have needed a lot of money to take care of your wife and child."

A. "They tried to compensate me, all right. A few days after the accident, I was approached over the phone by a local lawyer named Peterson. Peterson was regarded as a pretty slick article in the village. He wanted to know some lawyer representing me whom he could get in touch with. I had a friend named Epstein who did some of the hospital's legal business, so I gave Peterson his name. Epstein told me to keep off the telephone, and to stall Peterson until after he had a chance to talk with me."

Q. "What happened then?"

A. "Epstein came over, and I asked him why he was so cagey. He told me that Peterson was hand in glove with Macaluso and did his legal business for him. He also told me something about the Brain's connections and his tie-up with

the county authorities. It did not seem possible to do anything against him. While Epstein was talking Peterson came in. He had a dapperly-waxed little moustache, a frock coat, and an eyeglass hung on a black ribbon. I didn't like the sight of him, but I must say that he was polite."

Q. "He made you an offer though, didn't he?"

A. "He didn't let us know who his principal was, and he disclaimed all responsibility. He tendered me a check for \$30,000 for full release. His patter was pretty glib, but I couldn't turn down his money. I would have taken it, if Epstein hadn't told him that we couldn't sign the paper for less than \$50,000, as the hospital expenses were going to be so severe and long-lasting. Peterson made a show of protest and I had the good sense to keep quiet. Finally Peterson came across with an offer of \$50,000, and Epstein advised me to accept it."

Q. "Well, that compensation must have left you in a financially possible position. What happened then?"

A. "There wasn't anything we could do about Paul. He could eat and he was healthy enough in a vegetative way, but he wasn't my child any more. He had to stay in bed, and he was blind, deaf, and paralyzed. There wasn't a trace of intelligence to be seen. We managed to get him taken at one of the few institutions for cases of that sort, but he was scarcely enough of a human being for us to see him except at long intervals."

Q. "What happened to your wife?"

A. "They took care of her at the State General Hospital about twenty miles away. At first she did pretty well, and then I even thought of building a special house for her with ramps and special kitchen equipment. However her kidneys had not been too good for years and that is always the weak point for paraplegics. She went downhill rapidly. In about three months she sank into a uremic coma, and never opened her eyes again. She died in the late fall, but mercifully my colleagues in the hospital were good to me, so we could be together as much as possible in the last days. The funeral was at her home in Minnesota. Her father was a grim old Swedish farmer and did not say much, but I could see he was a broken man."

Q. "I don't see that there was anything left to keep you at Leominster. Did you go back?"

A. "Yes, I did. The train from the West came into the station at about ten in the evening. I noticed two rather strange-looking fellows loitering about and they seemed to be waiting for me. One was a big six-foot bruiser with a broken nose. The other was a lean, wizened, sallow man of ordinary height. He wore a tight overcoat, kept his hat well over his eyes and his hands in his pockets. The prize fighter sidled over to me and said in a hoarse, wheezy voice, 'We've got a job for you. The Boss is hurt.' 'The Boss,' said I, 'do I know him?' 'Sure you do,' wheezed the prize fighter. 'Everybody knows him. You know him. They call him the Brain. We was driving down the turnpike at a pretty fair clip (it wasn't more than eighty), when a cow steps into the road. Well, the cow's beef, and the car's junk. It turned over three times. The Brain was thrown up against the windshield and we don't like his looks. We keeps ourselves to ourselves, and we was on private business so we can't take the Brain to a hospital. It's a job down your line. We know you and they tell us you're a guy who can turn out a classy piece of work. We think you're a right guy. If you aren't, it don't matter anyhow. Come along.'

"I said I would have to go back to the hospital to collect my bag. 'Big boy,' said Tight Overcoat, 'be good and do what you're told. Come along.' Then he said to the other fellow, 'Beefy, you talk too much.'

"There wasn't anybody around that I could call and the shops were closed up. I didn't like the looks of the situation, but there was nothing to do but come along. They drove out about a mile and a half to the concrete factory surrounded by lank growths of pigweed and beggar's lice. Somebody yelled out, 'Hey, give us the high sign.'

"Beefy muttered something which seemed to be satisfactory. Then they took me by both arms and hustled me into an office. It was comfortable and even elegant, quite different from what I had expected from the bare boards and broken windows of the rest of the factory. They pushed me into the room and I tripped over the threshold and fell on my face. I got up again and found there were a couple of other men in the room. One of them was Peterson. He helped me to get up.

The other fellow was a brisk business executive type in a brown tweed suit. I never did learn his name, but I think he was the Brain's tie-up with big business. Peterson said to me, 'I am sorry that we have got to be somewhat unceremonious with you, but we are not in a position in which we can choose our methods or our manners. We do not wish you any harm, but you must understand that you have got to be discreet. Mr. Macaluso has just had an accident, and it would not be discreet to take him to a hospital. We are depending on you for help, and I promise you that you will be paid well for it.'

" 'Supposing I say no?' " I looked slowly at their faces and turned cold.

" 'In that case, Doctor Cole, we shall have to take measures to protect ourselves. You are an intelligent man, and I am sure you will appreciate the nature of those measures.'

"I hesitated a moment and then made up my mind. 'All right, I'll do it. Where is the patient?' They opened up the door of an inner office, furnished even more luxuriously than the main one. The Brain was sitting on an overstuffed leather chair with his head lolling back over the cushion. His face was covered with an unhealthy deep flush, and the scar stood out even more clearly than I had remembered. His mouth was open. His breath came out stentoriously, and there was a line of dried blood coming from his left nostril, as if a stream had been stenchd not more than a minute or two ago. His head was wrapped in a clean towel. 'Mr. Macaluso was engaged in a business trip of a very private nature,' said Brown-tweed. 'His car hit a cow. He was thrown into the windshield. It would be highly undesirable for us, and I may say for you, if any news of his condition should leak out.'

"I unwrapped the bandage. Macaluso's eyes were staring forward into emptiness. The pupils were unequal. I started to palpate the forehead. It was out-of-shape like a watermelon kicked by a horse. As I touched the skull, Peterson leaned forward; Brown-tweed looked at his fingernails, and stood up suddenly as the bone grated when I pressed on it. It was a clear case of depressed fracture of the left frontal bone. I took my fingers away and told Brown-tweed that I would have to operate at once, and that I would have to send back for my tools.

"Don't worry about that," he said. "We have already taken steps to secure anything that may be needed."

"He passed me a doctor's bag with J. McC. in gold letters just under the handle.

"Isn't that Dr. McCall's bag?" I said.

"It might be," said the other fellow, "but that is no concern of yours. How carelessly they do make these car locks."

"I felt better when I knew I had McCall's bag to work with. His techniques are somewhat different from mine, but anyway I would have a good kit. They were all there—trephine, elevators, electric saw, sodium amytal, novocaine, and alcohol.

"Can you make it?" said my new friend.

"I can," said I, hoping I could. I felt very calm and very powerful.

"I looked around for a pan to boil water in and some towels and a good flat table to work on. The business man followed my eyes.

"You can use the desk," he said. "The Brain won't worry about a few spots on it. The water is already hot in the lavatory, and we have plenty of towels in the linen room. Cupid there used to work as an attendant in the State Hospital until he cooked a patient. That's all right, Cupid," he remarked. "It's quite all right to talk before the Doctor."

"Evidently somebody had known how to prepare for an operation. There were a couple of pair of clean coveralls to take the place of surgical gowns. I put one on, and Cupid put on the other. We laid him out—comfortably flat on his back.

"I got busy. The atmosphere was easier and I first shaved the whole head and bathed it in alcohol. Then I injected the novocaine. When this had taken hold, I injected a deeper local anaesthetic into the tissues around the crushed frontal sinus. I didn't want to use a general anaesthetic because it was too important to watch the return of the patient to consciousness as the pressure was relieved. Then I cut the flap of scalp and heard the grating of the trephine as it bit itself into the bone.

"I must admit that Cupid was a good surgical nurse. He knew just when to pass me a hemostatic forceps on a gauze pad, and he seemed to appreciate what I was doing. Even

under these weird circumstances, I must admit that I felt complimented.

"Perhaps the most unpleasant moment of the operation is when the sawed circle breaks off from the rest of the skull. Then there is the problem of stenching the flow of blood from under the dura, the brain's cellophane wrapping. I could see Macaluso beginning to come to life again and I could hear his softer and more regular breathing. He opened his eyes. They had lost their glassy unequal stare and his lips began to mouth words.

"Where am I?" he said. "What has happened?"

"Take it easy, Brain," said the businesslike man. "You've had an accident. You are in good hands. Dr. Cole is taking care of you."

"Cole," he said. "I had a little business with him a while ago. He's a right guy. Can I speak with him?"

"Here I am," I said as calmly as I could. "What have you to tell me?"

"I am sorry about that other accident. You took it like a brick. Bygones is bygones. You'll do a good job on me, won't you?"

"I suppose that if he had not flicked me on the raw like this, reminding me of my loss, the whole thing might have come out differently. As it was, I made my mind up. I tried to keep all appearance of emotion suppressed; but I felt white and when I started to reassure the Brain, and tell him that I was giving his case my closest personal consideration and the advantage of my best judgment, Cupid turned around and looked at me in a way that I didn't like.

"We are not through yet," I said. "Now be very quiet, and I will finish the operation and clean up."

"I knew what I was going to do, and I don't think I have ever been more deft. At any rate, I was going to settle my relations with Mr. Macaluso once and for all.

"Suddenly Cupid called out, 'Say, Doc, what's you doing? That doesn't look Kosher to me.'

"I said to him quietly, 'This is my judgment and I am taking the responsibility.' I felt I had the upper hand.

"The other fellow from the car, the one who pushed a

revolver at me through his pocket, turned to Macaluso and said, 'Brain, Cupid is opening his trap again.' The patient was bandaged except for a small area of operation, but he was perfectly conscious. I like to have them that way in brain operations. It's safer, and besides the brain's surface has no feeling.

" 'That's all right,' he said. 'Cole is a friend of mine. Don't let Cupid hold up the operation. He talks too much.'

"I had completed the debridement, and still had one particular job to do before replacing the bit of skull removed by the trephine.

" 'Look out,' said Cupid. 'He is . . .'

"The man who had had his hands in his pocket hit Cupid over the head with the butt of his revolver. 'Shut your damn trap,' he said. Cupid lay dead to the world on the floor, and a stream of blood began to creep from one ear. I suppose he had a fracture of the base of the skull, but they wouldn't let me attend to him. I don't even know whether he died or not. I had to walk over Cupid's body to get to the washroom to clean up. When I came back Brown-tweed was waiting. 'Here are \$50,000,' he said. 'You understand that you are through at Leominster. If we ever find you in this part of the country again, you know just how long you will last. We will furnish you transportation to the coast, and you can set yourself up in business again under another name. Now remember, or else.'

"I didn't say anything. The money didn't mean a damn thing to me. Nothing did. The Brain started mumbling through his bandages, 'Give him \$100,000, boys. I feel fine.'

"I told them what to do for him and took the money offered—ninety-nine shiny new thousand dollar bills and one thousand in fifties and hundreds. They gave me a ticket to San Francisco. Beefy drove me through the night to the Chicago airport. He did not leave until I was safe aboard the through plane to San Francisco. Once I was on the plane, I took all the money but a few dollars for my immediate needs and folded it up in the big envelope that I found in the pouch behind the seat in front of me. I addressed it to the County Hospital and gave it to the stewardess to mail. Now I had no debts, no money and no friends in this world. It did not seem

real. I could go anywhere, and I had nowhere to go. At last I was in a cold sweat, and felt as if the half of me was dead and in the grave. That's about all I remember. I have dim recollections of tramp jungles, freight yards, and riding the rods. How I ever got into Dr. Waterman's care I don't remember. They told me a policeman picked me up for a drunk in a doorway."

Cole had spoken more and more slowly as his drugs took hold, and the rest that he desperately needed began. He closed his eyes and passed into a quiet sleep.

I asked Waterman, "Do you believe this yarn?"

"I hate to say," said Waterman. "The man has certainly been through hell, but there is nothing in what he says that a good imagination couldn't invent. I don't quite get his remarks about what he did to the Brain before closing up the wound. There is nothing particularly impressive about reducing a depressed fracture. Have you any ideas?"

"I don't know," I said. "He could have killed Macaluso on the spot, but he didn't. I don't quite see what he was getting at."

We heard a distant siren growing louder and in a few minutes the ambulance from the State Hospital drove up. Two agile young attendants came in under the direction of a white-clad intern. They picked Cole up, transferred him to a stretcher, and carried him away.

Waterman was tired and sat with us for a few minutes before driving out to the hospital in his own car. We smoked in silence.

"I think he dropped something," said Waterman. "Isn't that a wallet?" It contained a coin or two and a few mementos belonging to his present hospital period.

"What a minute," said Waterman. "I think I know something about these wallets. They have a secret compartment inside. Give it to me." He took it and after a little manipulation, he turned it inside out.

"Yes, I think there is a secret compartment. Let's see what's in it."

It contained nothing but a Chicago newspaper clipping two years old. It said:

BRAIN GANG WIPED OUT
PLUTORIA BANK BREAK FLOPS
ONE HUNDRED GRAND LOOT RECOVERED

It went on to tell of a bank robbery attempt made by Macaluso and his henchmen. The attempt had failed grossly. The bank officials were more than ready for the robbers and gave a good account of themselves in the exchange of shots. Those of the robbers who survived to make a getaway were caught between their pursuers and a fast freight where they had to cross the tracks. Not one lived to tell the tale. The paper commented on the incident, remarking that the Brain was known as a careful operator who always planned his jobs well, and that this was the first time he had omitted the most ordinary and elementary precautions.

Waterman took a long puff on his pipe and let the smoke escape upward. I was completely puzzled.

"I don't understand," I said. "It just doesn't make sense. What do you suppose really happened?"

"I don't know," he answered, "but I can guess. In the course of the operation Cole had exposed Macaluso's frontal lobe. It would have been a matter of only a few seconds to undercut it and perform what would be the equivalent of a thoroughgoing frontal lobotomy. It would not have driven Macaluso out of his mind, but would have made him thoroughly unfit to carry out any plans requiring judgment and caution."

I puffed my cigar. "It's not a nice story," I said, "but at any rate, it was a thoroughly successful operation."

"The Obese Virgins have set me a problem which I confess I have not yet solved . . . It occurred to me that if I could apply Jacques Loeb's great discovery of artificial parthenogenesis to man, or to be precise, to these young ladies, I should be able to grow a race of vestals, self-reproducing yet ever virgin."

There's no telling what kind of problem a scientist will set for himself when he takes up science fiction, as Sir Julian Huxley, the distinguished biologist, writer, and statesman, amply demonstrates in the above-quoted story, "The Tissue Culture King." But if this collection of imaginative tales by scientists is typical, the results will invariably be first-rate, hold-on-to-your-hat science fiction. Eminent mathematician and founder of the science of cybernetics, Norbert Wiener contributes a galvanizing tale of a frontal lobotomy gone wrong in "The Brain"; the great biologist and geneticist J. B. S. Haldane, in "The Gold-Makers," tells a strange story of modern alchemy; and science historian Willy Ley's "A Martian Adventure" is a dizzying piece of space fantasy. These and a dozen other tales by famous scientists Isaac Asimov, Eric Temple Bell, Miles J. Breuer, Arthur C. Clarke, Ralph S. Cooper, Chan Davis, James McConnell, Chad Oliver, John R. Pierce, Robert S. Richardson, Louis N. Ridenour, and Leo Szilard prove that the scientific mind can occasionally make a most diverting detour into fantasy with happily mind-boggling results for the lover of science fiction.

GROFF CONKLIN has edited many successful anthologies of science fiction and the supernatural. Among them are **The Supernatural Reader** and **Great Science Fiction About Doctors** (both Collier Books).



COLLIER BOOKS

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