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by Anson MacDonald

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Nearly two thousand years ago, an Age of Science almost got under way. There were slot machines and taximeters, steam engines and engineers. But—it failed to catch. Why?

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Illustrations by de Camp, Kelliker, Kramer, Orban and Rogers.

COVER BY ROGERS

All stories in this magazine are fiction. No actual persons are designated either by name or character. Any similarity is coincidental.

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DOCUMENTS FOR TOMORROW

Most major executives are over forty-five years of age; practically all were born before 1900. They've spent their adult lives learning how to make things work in the world as it is, which is a sufficiently tough assignment in any man's language. They've learned daydreams lead to nightmares, not dividends, and that dividends are the only things that lead to steady eating for them, their families and their employees. Consequently, they don't like daydreams.

Further, since it has taken forty years or more to learn to work in the world as it is, they aren't keen on any major changes. It's all anyone can do to keep things rolling; it requires complete attention, without taking time off to analyze possible consequences of possible major changes.

So it has been, and so it will tend to be, world without end. So technological changes arrive, kick in a lot of teeth, cause a lot of misery, and finally are adapted into the structure of civilization and, lo! they work out nicely. If enough forethought had been given to the thing, the adaptations could have been made beforehand, and a lot more gently.

This editorial is directed to amateur movie makers who are interested in science-fiction—and in documents of tomorrow. There have been a lot of documentary films made in recent years, showing that it was extremely bad judgment to attempt cultivation in the plains country that wasn't suitable to the effort, or the like. Mr. O. C. Wilson has suggested that there could be prepared some extremely interesting documentary films preparing people to understand *what is bound to come tomorrow*.

Let's consider atomic power a moment. Most science-fiction readers have thought about it in some detail now for several years. You've got some idea what it is, why it is, and why it will be important. But, beyond anything the Sunday-supplement student of atomic power has accumulated, you've got some idea of its industrial effects, what it will and will not do, what its economic effects may be, and what they won't be.

Within the next decade almost certainly, atomic power will become available. Atomic power inevitably and necessarily means transmutation. What will be the economic, and hence social and political, effects of almost costless fuel, and the power to make any desired element from cheap raw material?

Suppose that on January 1, 1942, it was announced that the whole problem was licked, that transmutation of any element to any other desired element had been achieved, and that commercial transmutation plants and atomic power plants were to be constructed in various parts of the nation under the aegis of the OPM and with RFC money. As things now stand, so far as public education goes, a few newspapers could play up the angle that fuel would now have no value, because sand and water would replace coal and oil, that gold could be made from lead ore in one step, and that copper was being made from an iron-carbon reaction—and they'd start scraping stock-market prices off the floor when the ticker finally caught up. There'd be a paralysis of investment and buying for years while people tried to find out what it was all about.

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by S. J. E.
(NAME AND ADDRESS
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CITY STATE



BY HIS BOOTSTRAPS

By Anson MacDonald

*Concerning the man who not only met himself,
but stood by while hisself fought himself!*

Illustrated by Rogers

BOB WILSON did not see the circle grow.

Nor, for that matter, did he see the stranger who stepped out of the

circle and stood staring at the back of Wilson's neck—stared, and breathed heavily, as if laboring under strong and unusual emotion.

Wilson had no reason to suspect that anyone else was in his room; he had every reason to expect the contrary. He had locked himself in his room for the purpose of completing his thesis in one sustained drive. He *had* to—tomorrow was the last day for submission, yesterday the thesis had been no more than a title: "An Investigation into Certain Mathematical Aspects of a Rigor of Metaphysics."

Fifty-two cigarettes, four pots of coffee, and thirteen hours of continuous work had added seven thousand words to the title. As to the validity of his thesis he was far too groggy to give a damn. Get it done, was his only thought, get it done, turn it in, take three stiff drinks and sleep for a week.

He glanced up and let his eyes rest on his wardrobe door, behind which he had cached a gin bottle, nearly full. No, he admonished himself, one more drink and you'll never finish it, Bob, old son.

The stranger behind him said nothing.

Wilson resumed typing. "—nor is it valid to assume that a conceivable proposition is necessarily a possible proposition, even when it is possible to formulate mathematics which describes the proposition with exactness. A case in point is the concept 'Time Travel.' Time travel may be imagined and its necessities may be formulated under any and all theories of time, formulae which resolve the paradoxes of each theory. Nevertheless, we know certain things about the empirical nature of time which preclude the possibility of the conceivable proposition. Duration is an attribute of consciousness and not of the plenum. It has no *ding an sich*. Therefore—"

A key of the typewriter stuck, three more jammed up on top of it.

Wilson swore dully and reached forward to straighten out the cantankerous machinery. "Don't hother with it," he heard a voice say. "It's a lot of utter hogwash anyhow."

Wilson sat up with a jerk, then turned his head slowly around. He fervently hoped that there was someone behind him. Otherwise—

He perceived the stranger with relief. "Thank God," he said to himself. "For a moment I thought I had come unstuck." His relief turned to extreme annoyance. "What the devil are you doing in my room?" he demanded. He shoved back his chair, got up and strode over to the one door. It was still locked, and bolted on the inside.

The windows were no help; they were adjacent to his desk and three stories above a busy street. "How did you get in?" he added.

"Through that," answered the stranger, hooking a thumb toward the circle. Wilson noticed it for the first time, blinked his eyes and looked again. There it hung between them and the wall, a great disk of nothing, of the color one sees when the eyes are shut tight.

Wilson shook his head vigorously. The circle remained. "Gosh," he thought, "I was right the first time. I wonder when I slipped my trolley?" He advanced toward the disk, put out a hand to touch it.

"Don't!" snapped the stranger.

"Why not?" said Wilson edgily. Nevertheless he paused.

"I'll explain. But let's have a drink first." He walked directly to the wardrobe, opened it, reached in and took out the bottle of gin without looking.

"Hey!" yelled Wilson. "What are you doing there? That's my liquor."

"Your liquor—" The stranger

paused for a moment. "Sorry. You don't mind if I have a drink, do you?"

"I suppose not," Bob Wilson conceded in a surly tone. "Pour me one while you're about it."

"O. K.," agreed the stranger, "then I'll explain."

"It had better be good," Wilson said ominously. Nevertheless he drank his drink and looked the stranger over.

He saw a chap about the same size as himself and much the same age—perhaps a little older, though a three-day growth of beard may have accounted for that impression. The stranger had a black eye and a freshly cut and badly swollen upper lip. Wilson decided he did not like the chap's face. Still, there was something familiar about the face; he felt that he should have recognized it, that he had seen it many times before under different circumstances.

"Who are you?" he asked suddenly.

"Me?" said his guest. "Don't you recognize me?"

"I'm not sure," admitted Wilson. "Have I ever seen you before?"

"Well—not exactly," the other temporized. "Skip it—you wouldn't know about it."

"What's your name?"

"My name? Uh . . . just call me Joe."

Wilson set down his glass. "O. K., Joe Whatever-your-name-is, trot out that explanation and make it snappy."

"I'll do that," agreed Joe. "That dingus I came through"—he pointed to the circle—"that's a Time Gate."

"A what?"

"A Time Gate. Time flows along side by side on each side of the Gate, but some thousands of years apart—just how many thousands I don't know. But for the next couple of

hours that Gate is open. You can walk into the future just by stepping through that circle." The stranger paused.

Bob drummed on the desk. "Go ahead. I'm listening. It's a nice story."

"You don't believe me, do you? I'll show you." Joe got up, went again to the wardrobe and obtained Bob's hat, his prized and only hat, which he had mistreated into its present battered grandeur through six years of undergraduate and graduate life. Joe chucked it toward the impalpable disk.

It struck the surface, went on through with no apparent resistance, disappeared from sight.

Wilson got up, walked carefully around the circle and examined the bare floor. "A neat trick," he conceded. "Now I'll thank you to return to me my hat."

The stranger shook his head. "You can get it for yourself when you pass through."

"Huh?"

"That's right. Listen—" Briefly the stranger repeated his explanation about the Time Gate. Wilson, he insisted, had an opportunity that comes once in a millennium—if he would only hurry up and climb through that circle. Furthermore, though Joe could not explain in detail at the moment, it was very important that Wilson go through.

Bob WILSON helped himself to a second drink, and then a third. He was beginning to feel both good and argumentative. "Why?" he said flatly.

Joe looked exasperated. "Dammit, if you'd just step through once, explanations wouldn't be necessary. However—" According to Joe, there was an old guy on the other side who needed Wilson's help. With Wil-

son's help the three of them would run the country. The exact nature of the help Joe could not or would not specify. Instead he bore down on the unique possibilities for high adventure. "You don't want to slave your life away teaching numskulls in some fresh-water college," he insisted. "This is your chance. Grab it!"

Bob Wilson admitted to himself that a Ph.D. and an appointment as an instructor was not his ideal of existence. Still, it beat working for a living. His eye fell on the gin bottle, its level now deplorably lowered. That explained it. He got up unsteadily.

"No, my dear fellow," he stated, "I'm not going to climb on your merry-go-round. You know why?"

"Why?"

"Because I'm drunk, that's why. You're not there at all. *That ain't there.*" He gestured widely at the circle. "There ain't anybody here but me, and I'm drunk. Been working too hard," he added apologetically. "I'm goin' to bed."

"You're not drunk."

"I am drunk. Peter Piper pepped a pick of pippered peckles." He moved toward his bed.

Joe grabbed his arm. "You can't do that," he said.

"Let him alone!"

They both swung around. Facing them, standing directly in front of the circle was a third man. Bob looked at the newcomer, looked back at Joe, blinked his eyes and tried to focus them. The two looked a good bit alike, he thought, enough alike to be brothers. Or maybe he was seeing double. Bad stuff, gin. Should 'ave switched to rum a long time ago. Good stuff, rum. You could drink it, or take a bath in it. No, that was gin—he meant Joe.

How silly! Joe was the one with

the black eye. He wondered why he had ever been confused.

Then who was this other lug? Couldn't a couple of friends have a quiet drink together without people butting in?

"Who are you?" he said with quiet dignity.

The newcomer turned his head, then looked at Joe. "He knows me," he said meaningly.

Joe looked him over slowly. "Yes," he said, "yes, I suppose I do. But what the deuce are you here for? And why are you trying to bust up the plan?"

"No time for long-winded explanations. I know more about it than you do—you'll concede that—and my judgment is bound to be better than yours. He doesn't go through the Gate."

"I don't concede anything of the sort—"

The telephone rang.

"Answer it!" snapped the newcomer.

Bob was about to protest the peremptory tone, but decided he wouldn't. He lacked the phlegmatic temperament necessary to ignore a ringing telephone. "Hello?"

"Hello," he was answered. "Is that Bob Wilson?"

"Yes. Who is this?"

"Never mind. I just wanted to be sure you were there. I *thought* you would be. You're right in the groove, kid, right in the groove."

Wilson heard a chuckle, then the click of disconnection. "Hello," he said. "Hello!" He jiggled the bar a couple of times, then hung up.

"What was it?" asked Joe.

"Nothing. Some nut with a misplaced sense of humor." The telephone bell rang again. Wilson added, "There he is again," and picked up the receiver. "Listen, you

butterfly-brained ape! I'm a busy man, and this is *not* a public telephone."

"Why, Bob?" came a burst feminine voice.

"Huh? Oh, it's you, Genevieve. Look—I'm sorry. I apologize—"

"Well, I should think you would!"

"You don't understand, boney. A guy has been pestering me over the phone and I thought it was him. You know I wouldn't talk that way to you, Babe."

"Well, I should think not. Particularly after all you said to me this afternoon, and all we *meant* to each other."

"Huh? This afternoon? Did you say this afternoon?"

"Of course. But what I called up about was this: You left your hat in my apartment. I noticed it a few minutes after you had gone and just thought I'd call and tell you where it is. Anybow," she added coyly, "it gave me an excuse to hear your voice again."

"Sure. Fine," he said mechanically. "Look, Babe, I'm a little mixed up about this. Trouble I've had all day long, and more trouble now. I'll look you up tonight and straighten it out. But I *know* I didn't leave your bat in my apartment—"

"Your hat, silly!"

"Huh? Oh, sure! Anybow, I'll see you tonight. 'By.' He rang off burriedly. Gosh, he thought, that woman is getting to be a problem. Hallucinations. He turned to his two companions.

"Very well, Joe. I'm ready to go if you are." He was not sure just when or why he had decided to go through the time gadget, but he had. Who did this other mug think he was, anybow, trying to interfere with a man's freedom of choice?

"Fine!" said Joe, in a relieved

voice. "Just step through. That's all there is to it."

"No, you don't!" It was the ubiquitous stranger. He stepped between Wilson and the Gate.

Bob Wilson faced him. "Listen, you! You come butting in here like you think I was a bum. If you don't like it, go jump in the lake—and I'm just the kind of guy who can do it! You and who else?"

The stranger reached out and tried to collar him. Wilson let go a swing, but not a good one. It went by nothing faster than parcel post. The stranger walked under it and let him have a mouthful of knuckles—large, hard ones. Joe closed in rapidly, coming to Bob's aid. They traded punches in a free-for-all, with Bob joining in enthusiastically but inefficiently. The only punch he landed was on Joe, theoretically his ally. However, he had intended it for the third man.

It was this *fauz pas* which gave the stranger an opportunity to land a clean left jab on Wilson's face. It was inches higher than the button, but in Bob's bemused condition it was sufficient to cause him to cease taking part in the activities.

Bob WILSON came slowly to awareness of his surroundings. He was seated on a floor which seemed a little unsteady. Someone was hending over him. "Are you all right?" the figure inquired.

"I guess so," he answered thickly. His mouth pained him; he put his hand to it, got it sticky with blood. "My head hurts."

"I should think it would. You came through head over heels. I think you hit your head when you landed."

Wilson's thoughts were coming back into confused focus. Came through? He looked more closely at

his succorer. He saw a middle-aged man with gray-shot bushy hair and a short, neatly trimmed beard. He was dressed in what Wilson took to be purple lounging pajamas.

But the room in which he found himself bothered him even more. It was circular and the ceiling was arched so subtly that it was difficult to say how high it was. A steady glareless light filled the room from no apparent source. There was no furniture save for a high dais or pulpit-shaped object near the wall facing him. "Came through? Came through what?"

"The Gate, of course." There was something odd about the man's accent. Wilson could not place it, save for a feeling that English was not a tongue he was accustomed to speaking.

Wilson looked over his shoulder in the direction of the other's gaze, and saw the circle.

That made his head ache even more. "Oh Lord," he thought, "now I really am nuts. Why don't I wake up?" He shook his head to clear it.

That was a mistake. The top of his head did not quite come off—not quite. And the circle stayed where it was, a simple locus hanging in the air, its flat depth filled with the amorphous colors and shapes of no-vision. "Did I come through that?"

"Yes."

"Where am I?"

"In the Hall of the Gate in the High Palace of Norkaal. But what is more important is *when* you are. You have gone forward a little more than thirty thousand years."

"Now I know I'm crazy," thought Wilson. He got up unsteadily and moved toward the Gate.

The older man put a hand on his shoulder. "Where are you going?"

"Back!"

"Not so fast. You will go back all right—I give you my word on that. But let me dress your wounds first. And you should rest. I have some explanations to make to you, and there is an errand you can do for me when you get back—to our mutual advantage. There is a great future in store for you and me, my boy—a great future!"

Wilson paused uncertainly. The elder man's insistence was vaguely disquieting. "I don't like this."

The other eyed him narrowly. "Wouldn't you like a drink before you go?"

Wilson most assuredly would. Right at the moment a stiff drink seemed the most desirable thing on earth—or in time. "O. K."

"Come with me." The older man led him back of the structure near the wall and through a door which led into a passageway. He walked briskly; Wilson hurried to keep up.

"By the way," he asked, as they continued down the long passage, "what is your name?"

"My name? You may call me Diktor—everyone else does."

"O. K., Diktor. Do you want my name?"

"Your name?" Diktor chuckled. "I know your name. It's Bob Wilson."

"Huh? Oh—I suppose Joe told you."

"Joe? I know no one by that name."

"You don't? He seemed to know you. Say—maybe you aren't the guy I was supposed to see."

"But I am. I have been expecting you—in a way, Joe . . . Joe—Oh!" Diktor chuckled. "It had slipped my mind for a moment. He told you to call him Joe, didn't he?"

"Isn't it his name?"

"It's as good a name as any other. Here we are." He ushered Wilson

into a small, but cheerful, room. It contained no furniture of any sort, but the floor was soft and warm as live flesh. "Sit down. I'll be back in a moment."

Boh looked around for something to sit on, then turned to ask Diktor for a chair. But Diktor was gone, furthermore the door through which they had entered was gone. Bob sat down on the comfortable floor and tried not to worry.

Diktor returned promptly. Wilson saw the door dilate to let him in, but did not catch on to how it was done. Diktor was carrying a carafe, which gurgled pleasantly, and a cup. "Mud in your eye," he said heartily and poured a good four fingers. "Drink up."

Bob accepted the cup. "Aren't you drinking?"

"Presently. I want to attend to your wounds first."

"O. K." Wilson tossed off the first drink in almost indecent haste—it was good stuff, a little like Scotch, he decided, but smoother and not as dry—while Diktor worked deftly with salves that smarted at first, then soothed. "Mind if I have another?"

"Help yourself."

Boh drank more slowly the second cup. He did not finish it; it slipped from relaxed fingers, spilling a ruddy, brown stain across the floor. He snored.

BOB WILSON woke up feeling fine and completely rested. He was cheerful without knowing why. He lay relaxed, eyes still closed, for a few moments and let his soul snuggle back into his body. This was going to be a good day, he felt. Oh, yes—he had finished that double-damned thesis. No, he hadn't either! He sat up with a start.

The sight of the strange walls

around him brought him back into continuity. But before he had time to worry—at once, in fact—the door relaxed and Diktor stepped in. "Feeling better?"

"Why, yes, I do. Say, what is this?"

"We'll get to that. How about some breakfast?"

In Wilson's scale of evaluations breakfast rated just after life itself and ahead of the chance of immortality. Diktor conducted him to another room—the first that he had seen possessing windows. As a matter of fact half the room was open, a balcony hanging high over a green countryside. A soft, warm, summer breeze wafted through the place. They broke their fast in luxury, Rouman style, while Diktor explained.

Boh Wilson did not follow the explanations as closely as he might have done, because his attention was diverted by the maidservants who served the meal. The first came in bearing a great tray of fruit on her head. The fruit was gorgeous. So was the girl. Search as he would he could discern no fault in her.

Her costume lent itself to the search.

She came first to Diktor, and with a single, graceful movement dropped to one knee, removed the tray from her head, and offered it to him. He helped himself to a small, red fruit and waved her away. She then offered it to Boh in the same delightful manner.

"As I was saying," continued Diktor, "it is not certain where the High Ones came from or where they went when they left Earth. I am inclined to think they went away into Time. In any case they ruled more than twenty thousand years and completely obliterated human culture as you knew it. What is more impor-



*He took a wild swing, hisself ducked,
and himself collected the haymaker—*

tant to you and to me is the effect they had on the human psyche. One twentieth-century style go-getter can accomplish just about anything he

wants to accomplish around here—Aren't you listening?"

"Huh? Oh, yes, sure. Say, that's one mighty pretty girl." His eyes

still rested on the exit through which she had disappeared.

"Who? Oh, yes, I suppose so. She's not exceptionally beautiful as women go around here."

"That's hard to believe. I could learn to get along with a girl like that."

"You like her? Very well, she is yours."

"Huh?"

"She's a slave. Don't get indignant. They are slaves by nature. If you like her, I'll make you a present of her. It will make her happy." The girl had just returned. Diktor called to her in a language strange to Bob. "Her name is Arma," he said in an aside, then spoke to her briefly.

Arma giggled. She composed her face quickly, and, moving over to where Wilson reclined, dropped on both knees to the floor and lowered her head, with both hands cupped before her. "Touch her forehead," Diktor instructed.

Bob did so. The girl arose and stood waiting placidly by his side. Diktor spoke to her. She looked puzzled, but moved out of the room. "I told her that, notwithstanding her new status, you wished her to continue serving breakfast."

DIKTOR RESUMED his explanations while the service of the meal continued. The next course was brought in by Arma and another girl. When Bob saw the second girl he let out a low whistle. He realized he had been a little hasty in letting Diktor give him Arma. Either the standard of pulchritude had gone up incredibly, he decided, or Diktor went to a lot of trouble in selecting his servants.

"—for that reason," Diktor was saying, "it is necessary that you go back through the Time Gate at once. Your first job is to bring this

other chap back. Then there is one other task for you to do, and we'll be sitting pretty. After that it is share and share alike for you and me. And there is plenty to share, I— You aren't listening!"

"Sure I was, chief. I heard every word you said." He fingered his chin. "Say, have you got a razor I could borrow? I'd like to shave."

Diktor swore softly in two languages. "Keep your eyes off those wenches and listen to me! There's work to be done."

"Sure, sure. I understand that—and I'm your man. When do we start?" Wilson had made up his mind some time ago—just shortly after Arma had entered with the tray of fruit, in fact. He felt as if he had walked into some extremely pleasant dream. If co-operation with Diktor would cause that dream to continue, so be it. To hell with an academic career!

Anyhow, all Diktor wanted was for him to go back where he started and persuade another guy to go through the Gate. The worst that could happen was for him to find himself back in the twentieth century. What could he lose?

Diktor stood up. "Let's get on with it," he said shortly, "before you get your attention diverted again. Follow me." He set off at a brisk pace with Wilson behind him.

Diktor took him to the Hall of the Gate and stopped. "All you have to do," he said, "is to step through the Gate. You will find yourself back in your own room, in your own time. Persuade the man you find there to go through the Gate. We have need of him. Then come back yourself."

Bob held up a hand and pinched thumb and forefinger together. "It's in the bag, boss. Consider it done." He started to step through the Gate.

"Wait!" commanded Diktor. "You are not used to time travel. I warn you that you are going to get one hell of a shock when you step through. This other chap—you'll recognize him."

"Who is he?"

"I won't tell you because you wouldn't understand. But you will when you see him. Just remember this— There are some very strange paradoxes connected with time travel. Don't let anything you see throw you. You do what I tell you to and you'll be all right."

"Paradoxes don't worry me," Bob said confidently. "Is that all? I'm ready."

"One minute." Diktor stepped behind the raised dais. His head appeared above the side a moment later. "I've set the controls. O. K. Go!"

Bob Wilson stepped through the locus known as the Time Gate.

THERE WAS no particular sensation connected with the transition. It was like stepping through a curtained doorway into a darker room. He paused for a moment on the other side and let his eyes adjust to the dimmer light. He was, he saw, indeed in his own room.

There was a man in it, seated at his own desk. Diktor had been right about that. This, then, was the chap he was to send back through the Gate. Diktor had said he would recognize him. Well, let's see who it is.

He felt a passing resentment at finding someone at his desk in his room, then thought better of it. After all, it was just a rented room; when he disappeared, no doubt it had been rented again. He had no way of telling how long he had been gone—shucks, it might be the middle of next week!

The chap did look vaguely familiar, although all he could see was his back. Who was it? Should he speak to him, cause him to turn around? He felt vaguely reluctant to do so until he knew who it was. He rationalized the feeling by telling himself that it was desirable to know with whom he was dealing before he attempted anything as outlandish as persuading this man to go through the Gate.

The man at the desk continued typing, paused to snuff out a cigarette by laying it in an ash tray, then stamping it with a paper weight.

Bob Wilson knew that gesture.

Chills trickled down his back. "If he lights his next one," he whispered to himself, "the way I think he is going to—"

The man at the desk took out another cigarette, tamped it on one end, turned it and tamped the other, straightened and crimped the paper on one end carefully against his left thumbnail and placed that end in his mouth.

Wilson felt the blood beating in his neck. *Sitting there with his back to him was himself, Bob Wilson!*

He felt that he was going to faint. He closed his eyes and steadied himself on a chair back. "I knew it," he thought, "the whole thing is absurd. I'm crazy. I know I'm crazy. Some sort of split personality. I shouldn't have worked so hard."

The sound of typing continued.

He pulled himself together, and reconsidered the matter. Diktor had warned him that he was due for a shock, a shock that could not be explained ahead of time, because it could not be believed. "All right—suppose I'm not crazy. If time travel can happen at all, there is no reason why I can't come back and see myself doing something I did in

the past. If I'm sane, that is what I'm doing.

"And if I am crazy, it doesn't make a damn bit of difference what I do!

"And furthermore," he added to himself, "if I'm crazy, maybe I can stay crazy and go back through the Gate! No, that does not make sense. Neither does anything else—the hell with it!"

He crept forward softly and peered over the shoulder of his double. "Duration is an attribute of the consciousness," he read, "and not of the plenum."

"That tears it," he thought, "right back where I started, and watching myself write my thesis."

The typing continued. "It has no *ding an sich*. Therefore—" A key stuck, and others piled up on top of it. His double at the desk swore and reached out a hand to straighten the keys.

"Don't bother with it," Wilson said on sudden impulse. "It's a lot of utter hogwash anyhow."

The other Bob Wilson sat up with a jerk, then looked slowly around. An expression of surprise gave way to annoyance. "What the devil are you doing in my room?" he demanded. Without waiting for an answer he got up, went quickly to the door and examined the lock. "How did you get in?"

"This," thought Wilson, "is going to be difficult."

"Through that," Wilson answered, pointing to the Time Gate. His double looked where he had pointed, did a double take, then advanced cautiously and started to touch it.

"Don't!" yelled Wilson.

The other checked himself. "Why not?" he demanded.

Just why he must not permit his other self to touch the Gate was not clear to Wilson, but he had had an

unmistakable feeling of impending disaster when he saw it about to happen. He temporized by saying, "I'll explain. But let's have a drink." A drink was a good idea in any case. There had never been a time when he needed one more than he did right now. Quite automatically he went to his usual cache of liquor in the wardrobe and took out the bottle he expected to find there.

"Hey!" protested the other. "What are you doing there? That's *my* liquor."

"*Your* liquor—" Hell's bells! It was *his* liquor. No, it wasn't; it was —*their* liquor. Oh, the devil! It was much too mixed up to try to explain. "Sorry. You don't mind if I have a drink, do you?"

"I suppose not," his double said grudgingly. "Pour me one while you're about it."

"O. K.," Wilson assented, "then I'll explain." It was going to be much, much too difficult to explain until he had had a drink, he felt. As it was, he couldn't explain it fully to himself.

"It had better be good," the other warned him, and looked Wilson over carefully while he drank his drink.

WILSON watched his younger self scrutinizing him with confused and almost insupportable emotions. Couldn't the stupid fool recognize his own face when he saw it in front of him? If he could not see what the situation was, how in the world was he ever going to make it clear to him?

It had slipped his mind that his face was barely recognizable in any case, being decidedly battered and unshaven. Even more important, he failed to take into account the fact that a person does not look at his own face, even in mirrors, in the same frame of mind with which he

regards another's face. No sane person ever expects to see his own face hanging on another.

Wilson could see that his companion was puzzled by his appearance, but it was equally clear that no recognition took place. "Who are you?" the other man asked suddenly.

"Me?" replied Wilson. "Don't you recognize me?"

"I'm not sure. Have I ever seen you before?"

"Well—not exactly," Wilson stalled. How did you go about telling another guy that the two of you were a trifle closer than twins? "Skip it—you wouldn't know about it."

"What's your name?"

"My name? Uh—" Oh, oh! This was going to be sticky! The whole situation was utterly ridiculous. He opened his mouth, tried to form the words "Bob Wilson," then gave up with a feeling of utter futility. Like many a man before him, he found himself forced into a lie because the truth simply would not be believed. "Just call me Joe," he finished lamely.

He felt suddenly startled at his own words. It was at this point that he realized that he was *in fact*, "Joe," the Joe whom he had encountered once before. That he had landed back in his own room at the very time at which he had ceased working on his thesis he already realized, but he had not had time to think the matter through. Hearing himself refer to himself as Joe slapped him in the face with the realization that this was not simply a similar scene, but the *same* scene he had lived through once before—save that he was living through it from a different viewpoint.

At least he thought it was the same scene. Did it differ in any respect? He could not be sure as he

could not recall, word for word, what the conversation had been.

For a complete transcript of the scene that lay dormant in his memory he felt willing to pay twenty-five dollars cash, plus sales tax.

Wait a minute now—he was under no compulsion. He was sure of that. Everything he did and said was the result of his own free will. Even if he couldn't remember the script, there were some things he knew "Joe" hadn't said. "Mary had a little lamb," for example. He would recite a nursery rhyme and get off this damned repetitious treadmill. He opened his mouth—

"O. K., Joe Whatever-your-name-is," his alter ego remarked, setting down a glass which had contained, until recently, a quarter pint of gin, "trot out that explanation and make it snappy."

He opened his mouth again to answer the question, then closed it. "Steady, son, steady," he told himself. "You're a free agent. You want to recite a nursery rhyme—go ahead and do it. Don't answer him; go ahead and recite it—and break this vicious circle."

But under the unfriendly, suspicious eye of the man opposite him he found himself totally unable to recall any nursery rhyme. His mental processes stuck on dead center.

He capitulated. "I'll do that. That dingus I came through—that's a Time Gate."

"A what?"

"A Time Gate. Time flows along side by side on each side—" As he talked he felt sweat breaking out on him; he felt reasonably sure that he was explaining in exactly the same words in which explanation had first been offered to him. "—into the future just by stepping through that circle." He stopped and wiped his forehead.

"Go ahead," said the other implacably. "I'm listening. It's a nice story."

BOB SUDDENLY wondered if the other man could be himself. The stupid arrogant dogmatism of the man's manner infuriated him. All right, all right! He'd show him. He strode suddenly over to the wardrobe, took out his hat and threw it through the Gate.

His opposite number watched the hat snuff out of existence with expressionless eyes, then stood up and went around in back of the Gate, walking with the careful steps of a man who is a little bit drunk, but determined not to show it. "A neat trick," he applauded, after satisfying himself that the hat was gone, "now I'll thank you to return to me my hat."

Wilson shook his head. "You can get it for yourself when you pass through," he answered absent-mindedly. He was pondering the problem of how many hats there were on the other side of the Gate.

"Huh?"

"That's right. Listen—" Wilson did his best to explain persuasively what it was he wanted his earlier *persona* to do. Or rather to cajole. Explanations were out of the question, in any honest sense of the word. He would have preferred attempting to explain tensor calculus to an Australian aborigine, even though he did not understand that esoteric mathematics himself.

The other man was not helpful. He seemed more interested in nursing the gin than he did in following Wilson's implausible protestations.

"Why?" he interrupted pugnaciously.

"Dammit," Wilson answered, "if you'd just step through once, explanations wouldn't be necessary.

However—" He continued with a synopsis of Diktor's proposition. He realized with irritation that Diktor had been exceedingly sketchy with his explanations. He was forced to hit only the high spots in the logical parts of his argument, and bear down on the emotional appeal. He was on safe ground there—no one knew better than he did himself how fed up the earlier Bob Wilson had been with the petty drudgery and stuffy atmosphere of an academic career. "You don't want to slave your life away teaching numskulls in some fresh-water college," he concluded. "This is your chance. Grab it!"

Wilson watched his companion narrowly and thought he detected a favorable response. He definitely seemed interested. But the other set his glass down carefully, stared at the gin bottle, and at last replied:

"My dear fellow, I am not going to climb on your merry-go-round. You know why?"

"Why?"

"Because I'm drunk, that's why. You're not there at all. *That ain't there.*" He gestured widely at the Gate, nearly fell, and recovered himself with effort. "There ain't anybody here but me, and I'm drunk. Been working too hard," he mumbled, "'m goin' to bed."

"You're not drunk," Wilson protested unhelpfully. "Damnation," he thought, "a man who can't hold his liquor shouldn't drink."

"I am drunk. Peter Piper pepped a pick of pippered peckles." He lumbered over toward the bed.

Wilson grabbed his arm. "You can't do that."

"Let him alone!"

Wilson swung around, saw a third man standing in front of the Gate—recognized him with a sudden shock. His own recollection of the sequence

of events was none too clear in his memory, since he had been somewhat intoxicated—damned near boiled, he admitted—the first time he had experienced this particular busy afternoon. He realized that he should have anticipated the arrival of a third party. But his memory had not prepared him for who the third party would turn out to be.

He recognized himself—another carbon copy.

He stood silent for a minute, trying to assimilate this new fact and force it into some reasonable integration. He closed his eyes helplessly. This was just a little too much. He felt that he wanted to have a few plain words with Diktor.

"Who the hell are you?" He opened his eyes to find that his other self, the drunk one, was addressing the latest edition. The newcomer turned away from his interrogator and looked sharply at Wilson.

"He knows me."

Wilson took his time about replying. This thing was getting out of hand. "Yes," he admitted, "yes, I suppose I do. But what the deuce are you here for? And why are you trying to bust up the plan?"

His facsimile cut him short. "No time for long-winded explanations. I know more about it than you do—you'll concede that—and my judgment is bound to be better than yours. He doesn't go through the Gate."

The offhand arrogance of the other antagonized Wilson. "I don't concede anything of the sort—" he began.

He was interrupted by the telephone bell. "Answer it!" snapped Number Three.

THE TIPSY Number One looked belligerent but picked up the handset. "Hello. . . . Yes. Who is this?

. . . Hello. . . . Hello!" He tapped the bar of the instrument, then slammed the receiver back into its cradle.

"Who was that?" Wilson asked, somewhat annoyed that he had not had a chance to answer it himself.

"Nothing. Some nut with a misplaced sense of humor." At that instant the telephone rang again. "There he is again!" Wilson tried to answer it, but his alcoholic counterpart beat him to it, hrushed him aside. "Listen, you butterfly-hrained ape! I'm a husy man and this is not a public telephone. . . . Huh? Oh, it's you, Genevieve. Look—I'm sorry. I apologize—. . . You don't understand, honey. A guy has been pestering me over the phone and I thought it was him. You know I wouldn't talk to you that way, Bahe. . . . Huh? This afternoon? Did you say *this* afternoon? . . . Sure. Fine. Look, Bahe, I'm a little mixed up about this. Trouble I've had all day long and more trouble now. I'll look you up tonight and straighten it out. But I know I didn't leave your hat in my apartment—. . . Huh? Oh, sure! Anyhow, I'll see you tonight. 'By."

It almost nauseated Wilson to hear his earlier self catering to the demands of that clinging female. Why didn't he just hang up on her? The contrast with Arma—there was a dish!—was acute; it made him more determined than ever to go ahead with the plan, despite the warning of the latest arrival.

After hanging up the phone his earlier self faced him, pointedly ignoring the presence of the third copy. "Very well, Joe," he announced. "I'm ready to go if you are."

"Fine!" Wilson agreed with relief. "Just step through. That's all there is to it."

"No, you don't!" Number Three barred the way.

Wilson started to argue, but his erratic comrade was ahead of him. "Listen, you! You come hutting in here like you think I was a hum. If you don't like it, go jump in the lake—and I'm just the kind of a guy who can do it! You and who else?"

They started trading punches almost at once. Wilson stepped in warily, looking for an opening that would enable him to put the slug on Number Three with one decisive blow.

He should have watched his drunken ally as well. A wild swing from that quarter glanced off his already damaged features and caused him excruciating pain. His upper lip, cut, puffy, and tender from his other encounter, took the blow and became an area of pure agony. He flinched and jumped back.

A sound cut through his fog of pain, a dull *Smack!* He forced his eyes to track and saw the feet of a man disappear through the Gate. Number Three was still standing by the Gate. "Now you've done it!" he said bitterly to Wilson, and nursed the knuckles of his left hand.

The obviously unfair allegation reached Wilson at just the wrong moment. His face still felt like an experiment in sadism. "Me?" he said angrily. "You knocked him through. I never laid a finger on him."

"Yes, hut it's your fault. If you hadn't interfered, I wouldn't have had to do it."

"Me interfere? Why, you bald-faced hypocrite—you huttin in and tried to queer the pitch. Which reminds me—you owe me some explanations and I damn well mean to have 'em. What's the idea of—"

But his opposite number cut in on him. "Stow it," he said gloomily.

"It's too late now. He's gone through."

"Too late for what?" Wilson wanted to know.

"Too late to put a stop to this chain of events."

"Why should we?"

"Because," Number Three said bitterly, "Diktor has played me—I mean has played *you . . . us*—for a dope, for a couple of dopes. Look, he told you that he was going to set you up as a big shot over *there*"—he indicated the Gate—"didn't he?"

"Yes," Wilson admitted.

"Well, that's a lot of malarkey. All he means to do is to get us so incredibly tangled up in this Time Gate thing that we'll never get straightened out again."

Wilson felt a sudden doubt nibbling at his mind. It could be true. Certainly there had not been much sense to what had happened so far. After all, why should Diktor want his help, want it bad enough to offer to split with him, even-Stephen, what was obviously a cushy spot? "How do you know?" he demanded.

"Why go into it?" the other answered wearily. "Why don't you just take my word for it?"

"Why should I?"

His companion turned a look of complete exasperation on him. "If you can't take my word, whose word can you take?"

The inescapable logic of the question simply annoyed Wilson. He resented this interloping duplicate of himself anyhow; to be asked to follow his lead blindly irked him. "I'm from Missouri," he said. "I'll see for myself." He moved toward the Gate.

"Where are you going?"

"Through! I'm going to look up Diktor and have it out with him."

"Don't!" the other said. "Maybe we can break the chain even now."

Wilson felt and looked stubborn. The other sighed. "Go ahead," he surrendered. "It's your funeral. I wash my hands of you."

Wilson paused as he was about to step through the Gate. "It is, eh? Hm-m-m—how can it be *my* funeral unless it's *your* funeral, too?"

The other man looked blank, then an expression of apprehension raced over his face. That was the last Wilson saw of him as he stepped through.

THE Hall of the Gate was empty of other occupants when Bob Wilson came through on the other side. He looked for his hat, but did not find it, then stepped around back of the raised platform, seeking the exit he remembered. He nearly bumped into Diktor.

"Ah, there you are!" the older man greeted him. "Fine! Fine! Now there is just one more little thing to take care of, then we will be all squared away. I must say I am pleased with you, Bob, very pleased indeed."

"Oh, you are, are you?" Bob faced him truculently. "Well, it's too bad I can't say the same about you! I'm not a damn bit pleased. What was the idea of shoving me into that . . . that daisy chain without warning me? What's the meaning of all this nonsense? Why didn't you warn me?"

"Easy, easy," said the older man, "don't get excited. Tell the truth now—if I had told you that you were going back to meet yourself face to face, would you have believed me? Come now, fess up."

Wilson admitted that he would not have believed it.

"Well, then," Diktor continued with a shrug, "there was no point in me telling you, was there? If I had told you, you would not have

believed me, which is another way of saying that you would have believed false data. Is it not better to be in ignorance than to believe falsely?"

"I suppose so, but—"

"Wait! I did not intentionally deceive you. I did not deceive you at all. But had I told you the full truth, you would have been deceived because you would have rejected the truth. It was better for you to learn the truth with your own eyes. Otherwise—"

"Wait a minute! Wait a minute!" Wilson cut in. "You're getting me all tangled up. I'm willing to let bygones be bygones, if you'll come clean with me. Why did you send me back at all?"

"Let bygones be bygones." Diktor repeated. "Ah, if we only could! But we can't. That's why I sent you back—in order that you might come through the Gate in the first place."

"Huh? Wait a minute—I already had come through the Gate."

Diktor shook his head. "Had you, now? Think a moment. When you got back into your own time and your own place you found your earlier self there, didn't you?"

"Mmmm—yes."

"He—your earlier self—had not yet been through the Gate, had he?"

"No. I—"

"How could you have been through the Gate, unless you persuaded him to go through the Gate?"

Bob Wilson's head was beginning to whirl. He was beginning to wonder who did what to whom and who got paid. "But that's impossible! You are telling me that I did something because I was going to do something."

"Well, didn't you? You were there."

"No, I didn't—no . . . well, maybe

I did, but it didn't feel like it."

"Why should you expect it to? It was something totally new to your experience."

"But . . . hut—" Wilson took a deep breath and got control of himself. Then he reached back into his academic philosophical concepts and produced the notion he had been struggling to express. "It denies all reasonable theories of causation. You would have me believe that causation can be completely circular. I went through because I came back from going through to persuade myself to go through. That's silly."

"Well, didn't you?"

Wilson did not have an answer ready for that one. Diktor continued with, "Don't worry about it. The causation you have been accustomed to is valid enough in its own field but is simply a special case under the general case. *Causation in a plenum need not be and is not limited by a man's perception of duration.*"

Wilson thought about that for a moment. It sounded nice, hut there was something slippery about it. "Just a second," he said. "How about entropy? You can't get around entropy."

"Oh, for Heaven's sake," protested Diktor, "shut up, will you? You remind me of the mathematicians that proved that airplanes couldn't fly." He turned and started out the door. "Come on. There's work to be done."

Wilson hurried after him. "Dammit, you can't do this to me. What happened to the other two?"

"The other two what?"

"The other two of me? Where are they? How am I ever going to get unsnarled?"

"You aren't snarled up. You don't feel like more than one person, do you?"

"No, hut—"

"Then don't worry about it."

"But I've got to worry about it. What happened to the guy that came through just ahead of me?"

"You remember, don't you? However—" Diktor hurried on ahead, led him down a passageway, and dilated a door. "Take a look inside," he directed.

WILSON did so. He found himself looking into a small windowless unfurnished room, a room that he recognized. Sprawled on the floor, snoring steadily, was another edition of himself.

"When you first came through the Gate," explained Diktor at his elbow, "I brought you in here, attended to your hurts, and gave you a drink. The drink contained a soporific which will cause you to sleep about thirty-six hours, sleep that you hardly needed. When you wake up, I will give you breakfast and explain to you what needs to be done."

Wilson's head started to ache again. "Don't do that," he pleaded. "Don't refer to that guy as if he were me. *This is me*, standing here."

"Have it your own way," said Diktor. "That is the man you *were*. You remember the things that are about to happen to him, don't you?"

"Yes, but it makes me dizzy. Close the door, please."

"O. K.," said Diktor, and complied. "We've got to hurry, anyhow. Once a sequence like this is established there is no time to waste. Come on." He led the way back to the Hall of the Gate.

"I want you to return to the twentieth century and obtain certain things for us, things that can't be obtained on this side but which will be very useful to us in, ah, developing—yes, that is the word—developing this country."

"What sort of things?"

"Quite a number of items. I've prepared a list for you—certain reference books, certain items of commerce. Excuse me, please. I must adjust the controls of the Gate." He mounted the raised platform from the rear. Wilson followed him and found that the structure was boxlike, open at the top, and had a raised floor. The Gate could be seen by looking over the high sides.

The controls were unique.

Four colored spheres the size of marbles hung on crystal rods arranged with respect to each other as the four major axes of a tetrahedron. The three spheres which bounded the base of the tetrahedron were red, yellow, and blue; the fourth at the apex was white. "Three spatial controls, one time control," explained Diktor. "It's very simple. Using here-and-now as zero reference, displacing any control away from the center moves the other end of the Gate farther from here-and-now. Forward or back, right or left, up or down, past or future—they are all controlled by moving the proper sphere in or out on its rod."

Wilson studied the system. "Yes," he said, "but how do you tell where the other end of the Gate is? Or when? I don't see any graduations."

"You don't need them. You can see where you are. Look." He touched a point under the control framework on the side toward the Gate. A panel rolled back and Wilson saw there was a small image of the Gate itself. Diktor made another adjustment and Wilson found that he could see through the image.

He was gazing into his own room, as if through the wrong end of a telescope. He could make out two figures, but the scale was too small for him to see clearly what they were doing, nor could he tell which editions of himself were there pres-

ent—if they were in truth himself! He found it quite upsetting. "Shut it off," he said.

DIKTOR DID SO and said, "I must not forget to give you your list." He fumbled in his sleeve and produced a slip of paper which he handed to Wilson. "Here—take it."

Wilson accepted it mechanically and stuffed it into his pocket. "See here," he began, "everywhere I go I keep running into myself. I don't like it at all. It's disconcerting. I feel like a whole batch of guinea pigs. I don't half understand what this is all about and now you want to rush me through the Gate again with a bunch of half-baked excuses. Come clean. Tell me what it's all about."

Diktor showed temper in his face for the first time. "You are a stupid and ignorant young fool. I've told you all that you are able to understand. This is a period in history entirely beyond your comprehension. It would take weeks before you would even begin to understand it. I am offering you half a world in return for a few hours' co-operation and you stand there arguing about it. Stow it, I tell you. Now—where shall we set you down?" He reached for the controls.

"Get away from those controls!" Wilson rapped out. He was getting the glimmering of an idea. "Who are you, anyhow?"

"Me? I'm Diktor."

"That's not what I mean and you know it. How did you learn English?"

Diktor did not answer. His face became expressionless.

"Go on," Wilson persisted. "You didn't learn it here; that's a cinch. You're from the twentieth century, aren't you?"

Diktor smiled sourly. "I wondered

how long it would take you to figure that out."

Wilson nodded. "Maybe I'm not bright, but I'm not as stupid as you think I am. Come on. Give me the rest of the story."

Diktor shook his head. "It's immaterial. Besides, we're wasting time."

Wilson laughed. "You've tried to hurry me with that excuse once too often. How can we waste time when we have *that*?" He pointed to the controls and to the Gate beyond it. "Unless you lied to me, we can use any slice of time we want to, any time. No, I think I know why you tried to rush me. Either you want to get me out of the picture here, or there is something devilishly dangerous about the job you want me to do. And I know how to settle it—you're going with me!"

"You don't know what you're saying," Diktor answered slowly. "That's impossible. I've got to stay here and manage the controls."

"That's just what you aren't going to do. You could send me through and lose me. I prefer to keep you in sight."

"Out of the question," answered Diktor. "You'll have to trust me." He bent over the controls again.

"Get away from there!" shouted Wilson. "Back out of there before I bop you one." Under Wilson's menacing fist Diktor withdrew from the control pulpit entirely. "There. That's better," he added when both of them were once more on the floor of the hall.

The idea which had been forming in his mind took full shape. The controls, he knew, were still set on his room in the boardinghouse where he lived—or had lived—back in the twentieth century. From what he had seen through the speculum of the controls, the time control was set

to take him right back to the day in 1942 from which he had started. "Stand there," he commanded Diktor, "I want to see something."

He walked over to the Gate as if to inspect it. Instead of stopping when he reached it, he stepped on through.

He was better prepared for what he found on the other side than he had been on the two earlier occasions of time translation—"earlier" in the sense of sequence in his memory track. Nevertheless it is never too easy on the nerves to catch up with one's self.

For he had done it again. He was back in his own room, but there were two of himself there before him. They were very much preoccupied with each other; he had a few seconds in which to get them straightened out in his mind. One of them had a beautiful black eye and a badly battered mouth. Beside that he was very much in need of a shave. That tagged him. He had been through the Gate at least once. The other, though somewhat in need of shaving himself, showed no marks of a fist fight.

He had them sorted out now, and knew where and when he was. It was all still most damnably confusing, but after former—no, not *former*, he amended—other experiences with time translation he knew better what to expect. He was back at the beginning again; this time he would put a stop to the crazy nonsense once and for all.

The other two were arguing. One of them swayed drunkenly toward the bed. The other grabbed him by the arm. "You can't do that," he said.

"Let him alone!" snapped Wilson.

The other two swung around and looked him over. Wilson watched

the more sober of the pair size him up, saw his expression of amazement change to startled recognition. The other, the earliest Wilson, seemed to have trouble in focusing on him at all. "This is going to be a job," thought Wilson. "The man is positively stinking." He wondered why anyone would be foolish enough to drink on an empty stomach. It was not only stupid, it was a waste of good liquor.

He wondered if they had left a drink for him.

"Who are you?" demanded his drunken double.

Wilson turned to "Joe." "He knows me," he said significantly.

"Joe," studied him. "Yes," he conceded, "yes, I suppose I do. But what the deuce are you here for? And why are you trying to bust up the plan?"

Wilson interrupted him. "No time for long-winded explanations. I know more about it than you do—you'll concede that—and my judgment is bound to be better than yours. He doesn't go through the Gate."

"I don't concede anything of the sort—"

The ringing of the telephone checked the argument. Wilson greeted the interruption with relief, for he realized that he had started out on the wrong tack. Was it possible that he was really as dense himself as this lug appeared to be? Did he look that way to other people? But the time was too short for self-doubts and soul-searching. "Answer it!" he commanded Bob (Boiled) Wilson.

The drunk looked belligerent, but acceded when he saw that Bob (Joe) Wilson was about to beat him to it.

"Hello.... Yes. Who is this?... Hello.... Hello!"

"Who was that?" asked "Joe."

"Nothing. Some nut with a mis-

placed sense of humor." The telephone rang again. "There he is again." The drunk grabbed the phone before the others could reach it. "Listen, you butterfly-brained ape! I'm a busy man and this is not a public telephone.... Huh? Oh, it's you, Genevieve—" Wilson paid little attention to the telephone conversation—he had heard it too many times before, and he had too much on his mind. His earliest *persona* was much too drunk to be reasonable, he realized; he must concentrate on some argument that would appeal to "Joe"—otherwise he was outnumbered. "—Huh? Oh, sure!" the call concluded. Anyhow, I'll see you tonight. "By."

Now was the time, thought Wilson, before this dumb yap can open his mouth. What would he say? What would sound convincing?

But the boiled edition spoke first. "Very well, Joe," he stated, "I'm ready to go if you are."

"Fine!" said "Joe." "Just step through. That's all there is to it."

This was getting out of hand, not the way he had planned it at all. "No, you don't!" he barked and jumped in front of the Gate. He would have to make them realize, and quickly.

But he got no chance to do so. The drunk cussed him out, then swung on him; his temper snapped. He knew with sudden fierce exultation that he had been wanting to take a punch at someone for some time. Who did they think they were to be taking chances with his future?

The drunk was clumsy; Wilson stepped under his guard and hit him hard in the face. It was a solid enough punch to have convinced a sober man, but his opponent shook his head and came back for more. "Joe" closed in. Wilson decided that he would have to put his origi-

nal opponent away in a hurry, and give his attention to "Joe"—by far the more dangerous of the two.

A slight mix-up between the two allies gave him his chance. He stepped back, aimed carefully, and landed a long jab with his left, one of the hardest blows he had ever struck in his life. It lifted his target right off his feet.

As the blow landed Wilson realized his orientation with respect to the Gate, knew with bitter certainty that he had again played through the scene to its inescapable climax.

He was alone with "Joe"; their companion had disappeared through the Gate.

HIS FIRST IMPULSE was the illogical but quite human and very common feeling of look-what-you-made-me-do. "Now you've done it!" he said angrily.

"Me?" "Joe" protested. "You knocked him through. I never laid a finger on him."

"Yes," Wilson was forced to admit. "But it's your fault," he added, "if you hadn't interfered, I wouldn't have had to do it."

"Me interfere? Why, you bald-faced hypocrite, you huttied in and tried to queer the pitch. Which reminds me—you owe me some explanations and I damn well mean to have them. What's the idea of—"

"Stow it," Wilson headed him off. He hated to be wrong and he hated still more to have to admit that he was wrong. It had been hopeless from the start, he now realized. He felt bowed down by the utter futility of it. "It's too late now. He's gone through."

"Too late for what?"

"Too late to put a stop to this chain of events." He was aware now that it always had been too late, regardless of what time it was, what



year it was, or how many times he came back and tried to stop it. He remembered having gone through the first time, he had seen himself asleep on the other side. Events would have to work out their weary way.

"Why should we?"

It was not worth while to explain, but he felt the need for self-justification. "Because," he said, "Diktor has played me—I mean has played you . . . us—for a dope, for a couple of dopes. Look, he told you that he was going to set you up as a big shot over there, didn't he?"

"Yes—"

"Well, that's a lot of malarkey. All he means to do is to get us so incredihly tangled up in this Gate thing that we'll never get straightened out again."

"Joe" looked at him sharply. "How do you know?"

Since it was largely hunch, he felt pressed for reasonable explanation. "Why go into it?" he evaded. "Why don't you just take my word for it?"

"Why should I?"

Why should you? Why, you lunk, can't you see? I'm yourself, older and more experienced—you have to believe me. Aloud he answered, "If you can't take my word, whose word can you take?"

"Joe" grunted. "I'm from Missouri," he said. "I'll see for myself."

Wilson was suddenly aware that "Joe" was about to step through the Gate. "Where are you going?"

"Through! I'm going to look up Diktor and have it out with him."

"Don't!" Wilson pleaded. "Maybe we can break the chain even now." But the stuhhorn sulky look on the other's face made him realize how futile it was. He was still enmeshed in inevitability; it had to happen. "Go ahead," he shrugged. "It's your funeral. I wash my hands of you."

"Joe" paused at the Gate. "It is, eh? Hm-m-m—how can it be *my* funeral unless it's *your* funeral, too?"

WILSON STARED speechlessly while "Joe" stepped through the Gate. Whose funeral? He had not thought of it in quite that way. He felt a sudden impulse to rush through the Gate, catch up with his alter ego, and watch over him. The stupid fool might do anything. Suppose he got himself killed? Where would that leave Boh Wilson? Dead, of course.

Or would it? Could the death of a man thousands of years in the future kill *him* in the year 1942? He saw the absurdity of the situation suddenly, and felt very much relieved. "Joe's" actions could not endanger him; he remembered everything that "Joe" had done—was going to do. "Joe" would get into an argument with Diktor and, in due course of events, would come back through the Time Gate. No, *had* come back through the Time Gate. He was "Joe." It was hard to remember that.

Yes, he was "Joe." As well as the first guy. They would thread their courses, in and out and roundabout, and end up here, with *him*. Had to.

Wait a minute—in that case the whole crazy business was straightened out. He had gotten away from Diktor, had all of his various personalities sorted out, and was back where he started from, no worse for the wear except for a crop of whiskers and, possibly, a scar on his lip. Well, he knew when to let well enough alone. Shave, and get back to work, kid.

As he shaved he stared at his face and wondered why he had failed to recognize it the first time. He had to admit that he had never looked at

it objectively before. He had always taken it for granted.

He acquired a crick in his neck from trying to look at his own profile through the corner of one eye.

On leaving the bathroom the Gate caught his eye forcibly. For some reason he had assumed that it would be gone. It was not. He inspected it, walked around it, carefully refrained from touching it. Wasn't the damned thing ever going to go away? It had served its purpose; why didn't Diktor shut it off?

He stood in front of it, felt a sudden surge of the compulsion that leads men to jump from high places. What would happen if he went through? What would he find? He thought of Arma. And the other one—what was her name? Perhaps Diktor had not told him. The other maidservant, anyhow, the second one.

But he restrained himself and forced himself to sit back down at the desk. If he was going to stay here—and of course he was, he was resolved on that point—he must finish the thesis. He had to eat; he needed the degree to get a decent job. Now where was he?

TWENTY MINUTES later he had come to the conclusion that the thesis would have to be rewritten from one end to the other. His prime theme, the application of the empirical method to the problems of speculative metaphysics and its expression in rigorous formulae, was still valid, he decided, but he had acquired a mass of new and not yet digested data to incorporate in it. In re-reading his manuscript he was amazed to find how dogmatic he had been. Time after time he had fallen into the pathetic fallacy of Des-Cartes, mistaking clear reasoning for correct reasoning.

He tried to brief a new version of the thesis, but discovered that there were two problems he was forced to deal with which were decidedly not clear in his mind: the problem of the ego and the problem of free will. When there had been three of him in the room, which one was the ego—was *himself*? And how was it that he had been unable to change the course of events?

An absurdly obvious answer to the first question occurred to him at once. The ego was *himself*. Self is self, an unproved and unprovable first statement, directly experienced. What, then, of the other two? Surely they had been equally sure of ego-being—he remembered it. He thought of a way to state it: Ego is the point of consciousness, the latest term in a continuously expanding series along the line of memory duration. That sounded like a general statement, but he was not sure; he would have to try to formulate it mathematically before he could trust it. Verbal language had such queer booby traps in it.

The telephone rang.

He answered it absent-mindedly. "Yes?"

"Is that you, Bob?"

"Yes. Who is this?"

"Why, it's Genevieve, of course, darling. What's come over you today? That's the second time you've failed to recognize my voice."

Annoyance and frustration rose up in him. Here was another problem he had failed to settle—well, he'd settle it now. He ignored her complaint. "Look here, Genevieve, I've told you not to telephone me while I'm working. Good-by!"

"Well, of all the— You can't talk that way to me, Bob Wilson! In the first place, you weren't working today. In the second place, what makes you think you can use honey

and sweet words on me and two hours later snarl at me? I'm not any too sure I want to marry you."

"Marry you? What put that silly idea in your head?"

The phone sputtered for several seconds. When it had abated somewhat he resumed with, "Now just calm down. This isn't the Gay Nineties, you know. You can't assume that a fellow who takes you out a few times intends to marry you."

There was a short silence. "So that's the game, is it?" came an answer at last in a voice so cold and hard and completely shrewish that he almost failed to recognize it. "Well, there's a way to handle men like you. A woman isn't unprotected in this State!"

"You ought to know," he answered savagely. "You've hung around the campus enough years."

The receiver clicked in his ear.

He wiped the sweat from his forehead. That dame, he knew, was quite capable of causing him lots of trouble. He had been warned before he ever started running around with her, but he had been so sure of his own ability to take care of himself. He should have known better—but then he had not expected anything quite as raw as this.

He tried to get back to work on his thesis, but found himself unable to concentrate. The deadline of 10 a.m. the next morning seemed to be racing toward him. He looked at his watch. It had stopped. He set it by the desk clock—four fifteen in the afternoon. Even if he sat up all night he could not possibly finish it properly.

Besides there was Genevieve—

The telephone rang again. He let it ring. It continued; he took the receiver off the cradle. He would *not* talk to her again.

He thought of Arma. There was a proper girl with the right attitude. He walked over to the window and stared down into the dusty, noisy street. Half subconsciously he compared it with the green and placid countryside he had seen from the balcony where he and Diktor had breakfasted. This was a crummy world full of crummy people. He wished poignantly that Diktor had been on the up-and-up with him.

An idea broke surface in his brain and plunged around frantically. The Gate was still open. *The Gate was still open!* Why worry about Diktor? He was his own master. Go back and play it out—everything to gain, nothing to lose.

He stepped up to the Gate, then hesitated. Was he wise to do it? After all, how much did he know about the future?

He heard footsteps climbing the stairs, coming down the hall, no—yes, stopping at his door. He was suddenly convinced that it was Genevieve; that decided him. He stepped through.

THE HALL of the Gate was empty on his arrival. He hurried around the control box to the door and was just in time to hear, "Come on. There's work to be done." Two figures were retreating down the corridor. He recognized both of them and stopped suddenly.

That was a near thing, he told himself; I'll just have to wait until they get clear. He looked around for a place to conceal himself, but found nothing but the control box. That was useless; they were coming back. Still—

He entered the control box with a plan vaguely forming in his mind. If he found that he could dope out the controls, the Gate might give him all the advantage he needed.

First he needed to turn on the speculum gadget. He felt around where he recalled having seen Diktor reach to turn it on, then reached in his pocket for a match.

Instead he pulled out a piece of paper. It was the list that Diktor had given him, the things he was to obtain in the twentieth century. Up to the present moment there had been too much going on for him to look it over.

His eyebrows crawled up his forehead as he read. It was a funny list, he decided. He had subconsciously expected it to call for technical reference books, samples of modern gadgets, weapons. There was nothing of the sort. Still, there was a sort of mad logic to the assortment. After all, Diktor knew these people better than he did. It might be just what was needed.

He revised his plans, subject to being able to work the Gate. He decided to make one more trip back and do the shopping Diktor's list called for—but for his own benefit, not Diktor's. He fumbled in the semidarkness of the control booth, seeking the switch or control for the speculum. His hand encountered a soft mass. He grasped it, and pulled it out.

It was his hat.

He placed it on his head, guessing idly that Diktor had stowed it there, and reached again. This time he brought forth a small notebook. It looked like a find—very possibly Diktor's own notes on the operation of the controls. He opened it eagerly.

It was not what he had hoped. But it did contain page after page of handwritten notes. There were three columns to the page; the first was in English, the second in international phonetic symbols, the third in a completely strange sort of writ-

ing. It took no brilliance for him to identify it as a vocabulary. He slipped it into a pocket with a broad smile; it might have taken Diktor months or even years to work out the relationship between the two languages; he would be able to ride on Diktor's shoulders in the matter.

The third try located the control and the speculum lighted up. He felt again the curious uneasiness he had felt before, for he was gazing again into his own room and again it was inhabited by two figures. He did not want to break into that scene again, he was sure. Cautiously he touched one of the colored beads.

The scene shifted, panned out through the walls of the boarding-house and came to rest in the air, three stories above the campus. He was pleased to have gotten the Gate out of the house, but three stories was too much of a jump. He fiddled with the other two colored beads and established that one of them caused the scene in the speculum to move toward him or away from him while the other moved it up or down.

He wanted a reasonably inconspicuous place to locate the Gate, some place where it would not attract the attention of the curious. This bothered him a hit; there was no ideal place, but he compromised on a blind alley, a little court formed by the campus powerhouse and the rear wall of the library. Cautiously and clumsily he maneuvered his flying eye to the neighborhood he wanted and set it down carefully between the two buildings. He then readjusted his position so that he stared right into a blank wall. Good enough!

Leaving the controls as they were, he hurried out of the booth and stepped unceremoniously back into his own period.

HE BUMPED his nose against the brick wall. "I cut that a little too fine," he mused as he slid cautiously out from between the confining limits of the wall and the Gate. The Gate hung in the air, about fifteen inches from the wall and roughly parallel to it. But there was room enough, he decided—no need to go back and readjust the controls. He ducked out of the areaway and cut across the campus toward the Students' Co-op, wasting no time. He entered and went to the cashier's window.

"Hi, Bob."

"Hello, Soupy. Cash a check for me?"

"How much?"

"Twenty dollars."

"Well—I suppose so. Is it a good check?"

"Not very. It's my own."

"Well, I might invest in it as a curiosity." He counted out a ten, a five, and five ones.

"Do that," advised Wilson. "My autographs are going to be rare collectors' items." He passed over the check, took the money, and proceeded to the bookstore in the same building. Most of the books on the list were for sale there. Ten minutes later he had acquired title to:

"The Prince," by Niccolo Machiavelli.

"Behind the Ballots," by James Farley.

"Mein Kampf" (unexpurgated), by Adolf Schicklgruber.

"How to Make Friends and Influence People," by Dale Carnegie.

The other titles he wanted were not available in the bookstore; he went from there to the university library where he drew out "Real Estate Broker's Manual," "History of Musical Instruments," and a quarto titled "Evolution of Dress Styles." The latter was a hand-

some volume with beautiful colored plates and was classified as reference. He had to argue a little to get a twenty-four hour permission for it.

He was fairly well loaded down by then; he left the campus, went to a pawnshop and purchased two used, but sturdy, suitcases into one of which he packed the books. From there he went to the largest music store in the town and spent forty-five minutes in selecting and rejecting phonograph records, with emphasis on swing and boogie-woogie—highly emotional stuff, all of it. He did not neglect classical and semi-classical, but he applied the same rule to those categories—a piece of music had to be sensuous and compelling, rather than cerebral. In consequence his collection included such strangely assorted items as the "Marseillaise," Ravel's "Bolero," four Cole Porter's, and "L'Apresmidi d'un Faun."

He insisted on buying the best mechanical reproducer on the market in the face of the clerk's insistence that what he needed was an electrical one. But he finally got his own way, wrote a check for the order, packed it all in his suitcases, and had the clerk get a taxi for him.

He had a bad moment over the check. It was pure rubber, as the one he had cashed at the Students' Co-op had cleaned out his balance. He had urged them to phone the bank, since that was what he wished them not to do. It had worked. He had established, he reflected, the all-time record for kiting checks—thirty thousand years.

When the taxi drew up opposite the court where he had located the Gate, he jumped out and hurried in.

The Gate was gone.

He stood there for several minutes, whistling softly, and assessing

—unfavorably—his own abilities, mental processes, et cetera. The consequences of writing bad checks no longer seemed quite so hypothetical.

He felt a touch at his sleeve. "See here, Bud, do you want my hack, or don't you? The meter's still clicking."

"Huh? Oh, sure." He followed the driver, climbed back in.

"Where to?"

That was a problem. He glanced at his watch, then realized that the usually reliable instrument had been through a process which rendered its reading irrelevant. "What time is it?"

"Two fifteen." He reset his watch.

Two fifteen. There would be a jamboree going on in his room at that time of a particularly confusing sort. He did not want to go *there*—not yet. Not until his blood brothers got through playing happy fun games with the Gate.

The Gate!

It would be in his room until sometime after four fifteen. If he timed it right—"Drive to the corner of Fourth and McKinley," he directed, naming the intersection closest to his boardinghouse.

He paid off the taxi driver there, and lugged his bags into the filling station at that corner, where he obtained permission from the attendant to leave them and assurance that they would be safe. He had nearly two hours to kill. He was reluctant to go very far from the house for fear some hitch would upset his timing.

It occurred to him that there was one piece of unfinished business in the immediate neighborhood—and time enough to take care of it. He walked briskly to a point two streets away, whistling cheerfully, and turned in at an apartment house.

In response to his knock the door of Apartment 211 was opened a crack, then wider. "Bob darling! I thought you were working today."

"Hi, Genevieve. Not at all—I've got time to burn."

She glanced back over her shoulder. "I don't know whether I should let you come in—I wasn't expecting you. I haven't washed the dishes, or made the bed. I was just putting on my make-up."

"Don't be coy." He pushed the door open wide, and went on in.

WHEN he came out he glanced at his watch. Three thirty—plenty of time. He went down the street wearing the expression of the canary that ate the cat.

He thanked the service station salesman and gave him a quarter for his trouble, which left him with a lone nickel. He looked at this coin, grinned to himself, and inserted it in the pay phone in the office of the station. He dialed his own number.

"Hello," he heard.

"Hello," he replied. "Is that Bob Wilson?"

"Yes. Who is this?"

"Never mind," he chuckled. "I just wanted to be sure you were there. I *thought* you would be. You're right in the groove, kid, right in the groove." He replaced the receiver with a grin.

At four ten he was too nervous to wait any longer. Struggling under the load of the heavy suitcases he made his way to the boardinghouse. He let himself in and heard a telephone ringing upstairs. He glanced at his watch—four fifteen. He waited in the hall for three interminable minutes, then labored up the stairs and down the upper hallway to his own door. He unlocked the door and let himself in.

The room was empty, the Gate still there.

Without stopping for anything, filled with apprehension lest the Gate should flicker and disappear while he crossed the floor, he hurried to it, took a firm grip on his bags, and strode through it.

THE HALL of the Gate was empty, to his great relief. What a break, he told himself thankfully. Just five minutes, that's all I ask. Five uninterrupted minutes. He set the suitcases down near the Gate to be ready for a quick departure. As he did so he noticed that a large chunk was missing from a corner of one case. Half a hook showed through the opening, sheared as neatly as with a printer's trimmer. He identified it as "Mein Kampf."

He did not mind the loss of the book but the implications made him slightly sick at his stomach. Suppose he had not described a clear arc when he had first been knocked through the Gate, had hit the edge, half in and half out? Man Sawed in Half—and no illusion!

He wiped his face and went to the control booth. Following Diktor's simple instructions he brought all four spheres together at the center of the tetrahedron. He glanced over the side of the booth and saw that the Gate had disappeared entirely. "Check!" he thought. "Everything on zero—no Gate." He moved the white sphere slightly. The Gate reappeared. Turning on the speculum he was able to see that the miniature scene showed the inside of the Hall of the Gate itself. So far so good—but he would not be able to tell what time the Gate was set for by looking into the Hall. He displaced a space control slightly; the scene flickered past the walls of the palace and hung in the open air. Return-

ing the white time control to zero he then displaced it very, very slightly. In the miniature scene the sun became a streak of brightness across the sky; the days flickered past like light from a low frequency source of illumination. He increased the displacement a little, saw the ground become sear and brown, then snow covered, and finally green again.

Working cautiously, steadying his right hand with his left, he made the seasons march past. He had counted ten winters when he became aware of voices somewhere in the distance. He stopped and listened, then very hastily returned the space controls to zero, leaving the time control as it was—set for ten years in the past—and rushed out of the booth.

He hardly had time to grasp his hags, lift them, and swing them through the Gate, himself with them. This time he was exceedingly careful not to touch the edge of the circle.

HE FOUND himself, as he had planned to, still in the Hall of the Gate, but, if he had interpreted the controls correctly, ten years away from the events he had recently participated in. He had intended to give Diktor a wider berth than that, but there had been no time for it. However, he reflected, since Diktor was, by his own statement and the evidence of the little notebook Wilson had lifted from him, a native of the twentieth century, it was quite possible that ten years was enough. Diktor might not be in this era. If he was, there was always the Time Gate for a getaway. But it was reasonable to scout out the situation first before making any more jumps.

It suddenly occurred to him that Diktor might be looking at him through the speculum of the Time

Gate. Without stopping to consider that speed was no protection—since the speculum could be used to view *any* time sector—he hurriedly dragged his two suitcases into the cover of the control booth. Once inside the protecting walls of the booth he calmed down a bit. Spying could work both ways. He found the controls set at zero; making use of the same process he had used once before, he ran the scene in the speculum forward through ten years, then cautiously hunted with the space controls on zero. It was a very difficult task; the time scale necessary to hunt through several months in a few minutes caused any figure which might appear in the speculum to flash past at an apparent speed too fast for his eye to follow. Several times he thought he detected flitting shadows which might be human beings but he was never able to find them when he stopped moving the time control.

He wondered in great exasperation why whoever had built the double-damned gadget had failed to provide it with graduations and some sort of delicate control mechanism—a vernier, or the like. It was not until much later that it occurred to him that the creator of the Time Gate might have no need of such gross aids to his senses. He would have given up, was about to give up, when, purely by accident, one more fruitless scanning happened to terminate with a figure in the field.

It was himself, carrying two suitcases. He saw himself walking directly into the field of view, grow large, disappear. He looked over the rail, half expecting to see himself step out of the Gate.

But nothing came out of the Gate. It puzzled him, until he recalled that it was the setting at *that* end, ten years in the future, which controlled

the time of egress. But he had what he wanted; he sat back and watched. Almost immediately Diktor and another edition of himself appeared in the scene. He recalled the situation when he saw it portrayed in the speculum. It was Bob Wilson number three, about to quarrel with Diktor and make his escape back to the twentieth century.

That was that—Diktor had not seen him, did not know that he had made unauthorized use of the Gate, did not know that he was hiding ten years in the "past," would not look for him there. He returned the controls to zero, and dismissed the matter.

BUT OTHER MATTERS needed his attention—food, especially. It seemed obvious, in retrospect, that he should have brought along food to last him for a day or two at least. And maybe a .45. He had to admit that he had not been very foresighted. But he easily forgave himself—it was hard to be foresighted when the future kept slipping up behind one. "All right, Bob, old boy," he told himself aloud, "let's see if the natives are friendly—as advertised."

A cautious reconnoiter of the small part of the Palace with which he was acquainted turned up no human beings, nor life of any sort, not even insect life. The place was dead, sterile, as static and unlivid-in as a window display. He shouted once, just to hear a voice. The echoes caused him to shiver; he did not do it again.

The architecture of the place confused him. Not only was it strange to his experience—he had expected that—but the place, with minor exceptions, seemed totally unadapted to the uses of human beings. Great halls large enough to hold ten thou-

sand people at once—had there been floors for them to stand on. For there frequently were no floors in the accepted meaning of a level or reasonably level platform. In following a passageway he came suddenly to one of the great mysterious openings in the structure and almost fell in before he realized that his path had terminated. He crawled gingerly forward and looked over the edge. The mouth of the passage dehouched high up on a wall of the place; below him the wall was cut back so that there was not even a vertical surface for the eye to follow. Far below him, the wall curved back and met its mate of the opposite side—not decently, in a horizontal plane, but at an acute angle.

There were other openings scattered around the walls, openings as unserviceable to human beings as the one in which he crouched. "The High Ones," he whispered to himself. All his cockiness was gone out of him. He retraced his steps through the fine dust and reached the almost friendly familiarity of the Hall of the Gate.

On his second try he attempted only those passages and compartments which seemed obviously adapted to men. He had already decided what such parts of the Palace must be—servants' quarters, or, more probably, slaves' quarters. He regained his courage by sticking to such area. Though deserted completely, by contrast with the rest of the great structure a room or a passage which seemed to have been built for men was friendly and cheerful. The sourceless ever-present illumination and the unbroken silence still bothered him, but not to the degree to which he had been upset by the Gargantuan and mysteriously convoluted chambers of the "High Ones."

He had almost despaired of finding his way out of the Palace and was thinking of retracing his steps when the corridor he was following turned and he found himself in bright sunlight.

HE WAS STANDING at the top of a broad steep ramp which spread fan-like down to the base of the building. Ahead of him and below him, distant at least five hundred yards, the pavement of the ramp met the green of sod and bush and tree. It was the same placid, lush, and familiar scene he had looked out over when he breakfasted with Diktor—a few hours ago and ten years in the future.

He stood quietly for a short time, drinking in the sunshine, soaking up the heart-lifting beauty of the warm, spring day. "This is going to be all right," he exulted. "It's a grand place."

He moved slowly down the ramp, his eyes searching for human beings. He was halfway down when he saw a small figure emerge from the trees into a clearing near the foot of the ramp. He called out to it in joyous excitement. The child—it was a child he saw—looked up, stared at him for a moment, then fled back into the shelter of the trees.

"Impetuous, Robert—that's what you are," he chided himself. "Don't scare 'em. Take it easy." But he was not made downhearted by the incident. Where there were children there would be parents, society, opportunities for a bright, young fellow who took a broad view of things. He moved on down at a leisurely pace.

A man showed up at the point where the child had disappeared. Wilson stood still. The man looked him over and advanced hesitantly a step or two. "Come here!" Wilson

invited in a friendly voice. "I won't hurt you."

The man could hardly have understood his words, but he advanced slowly. At the edge of the pavement he stopped, eyed it and would not proceed farther.

Something about the behavior pattern clicked in Wilson's brain, fitted in with what he had seen in the Palace, and with the little that Diktor had told him. "Unless," he told himself, "the time I spent in 'Anthropology I' was totally wasted, this Palace is tabu, the ramp I'm standing on is tabu, and, by contagion, I'm tabu. Play your cards, son, play your cards!"

He advanced to the edge of the pavement, being careful not to step off it. The man dropped to his knees and cupped his hands in front of him, head bowed. Without hesitation Wilson touched him on the forehead. The man got back to his feet, his face radiant.

"This isn't even sporting," Wilson said. "I ought to shoot him on the rise."

His Man Friday cocked his head, looked puzzled, and answered in a deep, melodious voice. The words were liquid and strange and sounded like a phrase from a song. "You ought to commercialize that voice," Wilson said admiringly. "Some stars get by on less. However—Get along now, and fetch something to eat. Food." He pointed to his mouth.

The man looked hesitant, spoke again. Bob Wilson reached into his pocket and took out the stolen notebook. He looked up "eat," then looked up "food." It was the same word. "Blellan," he said carefully. "Blellaaaan?"

"Blellaaaaaaan," agreed Wilson. "You'll have to excuse my accent. Hurry up." He tried to find "hurry"

in the vocabulary, but it was not there. Either the language did not contain the idea or Diktor had not thought it worth while to record it. But we'll soon fix that, Wilson thought—if there isn't such a word, I'll give 'em one.

The man departed.

WILSON SAT HIMSELF down Turk-fashion and passed the time by studying the notebook. The speed of his rise in these parts, he decided, was limited only by the time it took him to get into full communication. But he had only time enough to look up a few common substantives when his first acquaintance returned, in company.

The procession was headed by an extremely elderly man, white-haired but beardless. All of the men were beardless. He walked under a canopy carried by four male striplings. Only he of all the crowd wore enough clothes to get by anywhere but on a beach. He was looking uncomfortable in a sort of toga effect which appeared to have started life as a Roman-striped awning. That he was the head man was evident.

Wilson hurriedly looked up the word for "chief."

The word for chief was "Diktor."

It should not have surprised him, but it did. It was, of course, a logical probability that the word "Diktor" was a title rather than a proper name. It simply had not occurred to him.

Diktor—the Diktor—had added a note under the word. "One of the few words," Wilson read, "which shows some probability of having been derived from the dead languages. This word, a few dozen others, and the grammatical structure of the language itself, appear to be the only link between the lan-



guage of the 'Forsaken Ones' and the English language."

The chief stopped in front of Wilson, just short of the pavement. "O. K., Diktor," Wilson ordered, "kneel down. You're not exempt." He pointed to the ground. The chief knelt down. Wilson touched his forehead.

The food that had been fetched along was plentiful and very palatable. Wilson ate slowly and with dignity, keeping in mind the importance of face. While he ate he was serenaded by the entire assemblage. The singing was excellent he was bound to admit. Their ideas of harmony he found a little strange and the performance, as a whole, seemed primitive, but their voices were all clear and mellow and they sang as if they enjoyed it.

The concert gave Wilson an idea. After he had satisfied his hunger he made the chief understand, with the aid of the indispensable little notebook, that he and his flock were to wait where they were. He then returned to the Hall of the Gate and brought back from there the phonograph and a dozen assorted records. He treated them to a recorded concert of "modern" music.

The reaction exceeded his hopes. "Begin the Beguine" caused tears to stream down the face of the old chief. The first movement of Tschaikowsky's "Concerto Number One in B Flat Minor" practically stampeded them. They jerked. They held their heads and moaned. They shouted their applause. Wilson refrained from giving them the second movement, tapered them off instead with the compelling monotony of the "Bolero."

"Diktor," he said—he was not thinking of the old chief—"Diktor, old chum, you certainly had these people doped out when you sent me

shopping. By the time you show up—if you ever do—I'll own the place."

THIS is not an account of how Boosterism came to Arcadia. Wilson's rise to power was more in the nature of a triumphal progress than a struggle for supremacy; it contained little that was dramatic. Whatever it was that the High Ones had done to the human race it had left them with only physical resemblance and with temperament largely changed. The docile friendly children with whom Wilson dealt had little in common with the brawling, vulgar, lusty, dynamic swarms who had once called themselves the People of the United States.

The relationship was like that of Jersey cattle to longhorns, or cocker spaniels to wolves. The fight was gone out of them. It was not that they lacked intelligence, nor civilized arts; it was the competitive spirit that was gone, the will-to-power.

Wilson had a monopoly on that.

But even he lost interest in playing a game that he always won. Having established himself as boss man by taking up residence in the Palace and representing himself as the viceroy of the departed High Ones, he, for a time, busied himself in organizing certain projects intended to bring the culture "up-to-date"—the reinvention of musical instruments, establishment of a systematic system of mail service, redevelopment of the idea of styles in dress and a tabu against wearing the same fashion more than one season. There was cunning in the latter project. He figured that arousing a hearty interest in display in the minds of the womenfolk would force the men to hustle to satisfy their wishes. What the culture lacked was drive—it was slipping downhill. He tried to give them the drive they lacked.

His subjects co-operated with his wishes, but in a bemused fashion, like a dog performing a trick, not because he understands it, but because his master and godhead desires it.

He soon tired of it.

But the mystery of the High Ones, and especially the mystery of their Time Gate, still remained to occupy his mind. His was a mixed nature, half hustler, half philosopher. The philosopher had his inning.

It was intellectually necessary to him that he be able to construct in his mind a physio-mathematical model for the phenomena exhibited by the Time Gate. He achieved one, not a good one perhaps, but one which satisfied all of the requirements. Think of a plane surface, a sheet of paper, or, better yet, a silk handkerchief—silk, because it has no rigidity, folds easily, while maintaining all of the relational attributes of a two-dimensional continuum on the surface of the silk itself. Let the threads of the woof be the dimension—or direction—of time; let the threads of the warp represent all three of the space dimensions.

An ink spot on the handkerchief becomes the Time Gate. By folding the handkerchief that spot may be superposed on any other spot on the silk. Press the two spots together between thumb and forefinger; the controls are set, the Time Gate is open, a microscopic inhabitant of this piece of silk may crawl from one fold to the other without traversing any other part of the cloth.

The model is imperfect; the picture is static—but a physical picture is necessarily limited by the sensory experience of the person visualizing it.

He could not make up his mind whether or not the concept of folding the four-dimensional continuum—three of space, one of time—back on itself so that the Gate was "open"

required the concept of higher dimensions through which to fold it. It seemed so, yet it might simply be an intellectual shortcoming of the human mind. Nothing but empty space was required for the "folding," but "empty space" was itself a term totally lacking in meaning—he was enough of a mathematician to know that.

If higher dimensions were required to "hold" a four-dimensional continuum, then the number of dimensions of space and of time were necessarily infinite; each order requires the next higher order to maintain it.

But "infinite" was another meaningless term. "Open series" was a little better, but not much.

ANOTHER consideration forced him to conclude that there was probably at least one more dimension than the four his senses could perceive—the Time Gate itself. He became quite skilled in handling its controls, but he never acquired the foggiest notion of how it worked, or how it had been built. It seemed to him that the creatures who built it must necessarily have been able to stand outside the limits that confined him in order to anchor the Gate to the structure of space time. The concept escaped him.

He suspected that the controls he saw were simply the part that stuck through into the space he knew. The very Palace itself might be no more than a three-dimensional section of a more involved structure. Such a condition would help to explain the otherwise inexplicable nature of its architecture.

He became possessed of an overpowering desire to know more about these strange creatures, the "High Ones," who had come and ruled the human race and built this Palace and this Gate, and gone away again

—and in whose backwash he had been flung out of his setting some thirty millennia. To the human race they were no more than a sacred myth, a contradictory mass of tradition. No picture of them remained, no trace of their writing, nothing of their works save the High Palace of Norkaal and the Gate. And a sense of irreparable loss in the hearts of the race they had ruled, a loss expressed by their own term for themselves—the Forsaken Ones.

With controls and speculum he hunted back through time, seeking the Builders. It was slow work, as he had found before. A passing shadow, a tedious retracing—and failure.

Once he was sure that he had seen such a shadow in the miniature Hall reflected in the speculum. He set the controls back far enough to be sure that he had repassed it, armed himself with food and drink and waited.

He waited three weeks.

The shadow might have passed during the hours he was forced to take out for sleep. But he felt sure that he was in the right period; he kept up the vigil.

He saw it.

It was moving toward the Gate.

When he pulled himself together he was halfway down the passageway leading away from the Hall. He realized that he had been screaming. He still had an attack of the shakes.

Somewhat later he forced himself to return to the Hall, and, with eyes averted, enter the control booth and return the spheres to zero. He hacked out hastily and left the Hall for his apartment. He did not touch the controls nor enter the Hall for more than two years.

It had not been fear of physical menace that had shaken his reason,

nor the appearance of the creature—he could recall nothing of *how* it looked. It had been a feeling of sadness infinitely compounded which had flooded through him at the instant, a sense of tragedy, of grief insupportable and unescapable, of infinite weariness. He had been flicked with emotions many times too strong for his spiritual fiber and which he was no more fitted to experience than an oyster is to play a violin.

He felt that he had learned all about the High Ones a man could learn and still endure. He was no longer curious. The shadow of that vicarious emotion ruined his sleep, brought him sweating out of dreams.

ONE OTHER PROBLEM bothered him—the problem of himself and his meanders through time. It still worried him that he had met himself coming back, so to speak, had talked with himself, fought with himself.

Which one was *himself*?

He was all of them, he knew, for he remembered being each one. How about the times when there had been more than one present?

By sheer necessity he was forced to expand the principle of nonidentity—"Nothing is identical with anything else, not even with itself"—to include the ego. In a four-dimensional continuum each event is an absolute individual, it has its space co-ordinates and its date. The Boh Wilson he was right now was *not* the Boh Wilson he had been ten minutes ago. Each was a discrete section of a four-dimensional process. One resembled the other in many particulars, as one slice of bread resembles the slice next to it. But they were *not* the same Boh Wilson—they differed by a length of time.

When he had doubled back on him-

self, the difference had become apparent, for the separation was now in space rather than in time, and he happened to be so equipped as to be able to see a space length, whereas he could only remember a time difference. Thinking back he could remember a great many different Boh Wilsons, baby, small child, adolescent, young man. They were all different—he knew that. The only thing that bound them together into a feeling of identity was continuity of memory.

And that was the same thing that bound together the three—no, four, Boh Wilsons on a certain crowded afternoon—a memory track that ran through all of them. The only thing about it that remained remarkable was time travel itself.

And a few other little items—the nature of "free will," the problem of entropy, the law of the conservation of energy and mass. The last two, he now realized, needed to be extended or generalized to include the cases in which the Gate, or something like it, permitted a leak of mass, energy, or entropy from one neighborhood in the continuum to another. They were otherwise unchanged and valid. Free will was another matter. It could not be laughed off, because it could be directly experienced—yet his own free will had worked to create the same scene over and over again. Apparently human will must be considered as one of the factors which make up the processes in the continuum—"free" to the ego, mechanistic from the outside.

And yet his last act of evading Diktor had apparently changed the course of events. He was here and running the country, had been for many years, but Diktor had not showed up. Could it be that each act of "true" free will created a new

and different future? Many philosophers had thought so.

This future appeared to have no such person as Diktor—the Diktor—in it, anywhere or anywhen.

As THE END of his first ten years in the future approached, he became more and more nervous, less and less certain of his opinion. Damnation, he thought, if Diktor is going to show up it was high time that he did so. He was anxious to come to grips with him, establish which was to be boss.

He had agents posted throughout the country of the Forsaken Ones with instructions to arrest any man with hair on his face and fetch him forthwith to the Palace. The Hall of the Gate he watched himself.

He tried fishing the future for Diktor, but had no significant luck. He thrice located a shadow and tracked it down; each time it was himself. From tedium and partly from curiosity he attempted to see the other end of the process; he tried to re-locate his original home, thirty thousand years in the past.

It was a long chore. The further the time button was displaced from the center, the poorer the control became. It took patient practice to be able to stop the image within a century or so of the period he wanted. It was in the course of this experimentation that he discovered what he had once looked for, a fractional control—a vernier, in effect. It was as simple as the primary control, but twist the bead instead of moving it directly.

He steadied down on the twentieth century, approximated the year by the models of automobiles, types of architecture, and other gross evidence, and stopped in what he believed to be 1942. Careful displacement of the space controls took him

to the university town where he had started—after several false tries; the image did not enable him to read road signs.

He located his boardinghouse, brought the Gate into his own room. It was vacant, no furniture in it.

He panned away from the room, and tried again, a year earlier. Success—his own room, his own furniture, but empty. He ran rapidly back, looking for shadows.

There! He checked the swing of the image. There were three figures in the room, the image was too small, the light too poor for him to be sure whether or not one of them was himself. He leaned over and studied the scene.

He heard a dull thump outside the booth. He straightened up and looked over the side.

Sprawled on the floor was a limp human figure. Near it lay a crushed and battered hat.

He stood perfectly still for an uncounted time, staring at the two redundant figures, hat and man, while the winds of unreason swept through his mind and shook it. He did not need to examine the unconscious form to identify it. He knew . . . *he knew*—it was his younger self, knocked willy-nilly through the Time Gate.

It was not that fact in itself which shook him. He had not particularly expected it to happen, having come tentatively to the conclusion that he was living in a different, an alternative, future from the one in which he had originally transitted the Time Gate. He had been aware that it might happen nevertheless, that it did happen did not surprise him.

When it did happen, *he himself had been the only spectator!*

He was Diktor. He was the Diktor. He was *the only* Diktor!

He would never find Diktor, nor have it out with him. He need never fear his coming. There never had been, never would be, any other person called Diktor, because Diktor never had been nor ever would be anyone but himself.

In review, it seemed obvious that he must be Diktor; there were so many bits of evidence pointing to it. And yet it had not been obvious. Each point of similarity between himself and the Diktor, he recalled, had arisen from rational causes—usually from his desire to ape the gross characteristics of the "other" and thereby consolidate his own position of power and authority before the "other" Diktor showed up. For that reason he had established himself in the very apartments that "Diktor" had used—so that they would be "his" first.

To be sure his people called him Diktor, but he had thought nothing of that—they called anyone who ruled by that title, even the little subchieftains who were his local administrators.

He had grown a beard, such as Diktor had worn, partly in imitation of the "other" man's precedent, but more to set him apart from the hairless males of the Forsaken Ones. It gave him prestige, increased his tabu. He fingered his bearded chin. Still, it seemed strange that he had not recalled that his own present appearance checked with the appearance of "Diktor." "Diktor" had been an older man. He himself was only thirty-two, ten here, twenty-two *there*.

Diktor he had judged to be about forty-five. Perhaps an unprejudiced witness would believe himself to be that age. His hair and beard were shot with gray—had been, ever since the year he had succeeded too well in spying on the High Ones. His

face was lined. Uneasy lies the head and so forth. Running a country, even a peaceful Arcadia, will worry a man, keep him awake nights.

Not that he was complaining—it had been a good life, a grand life, and it beat anything the ancient past had to offer.

In any case, he had been looking for a man in his middle forties, whose face he remembered dimly after ten years and whose picture he did not have. It had never occurred to him to connect that blurred face with his present one. Naturally not.

But there were other little things. Arma, for example. He had selected a likely-looking lass some three years back and made her one of his household staff, renaming her Arma in sentimental memory of the girl he had once fancied. It was logically necessary that they were the same girl, not two Armas, but one.

But, as he recalled her, the "first" Arma had been much prettier.

Hm-m-m—it must be his own point of view that had changed. He admitted that he had had much more opportunity to become bored with exquisite female beauty than his young friend over there on the floor. He recalled with a chuckle how he had found it necessary to surround himself with an elaborate system of tabus to keep the nubile daughters of his subjects out of his hair—most of the time. He had caused a particular pool in the river adjacent to the Palace to be dedicated to his use in order that he might swim without getting tangled up in mermaids.

The man on the floor groaned, but did not open his eyes.

Wilson, the Diktor, bent over him but made no effort to revive him. That the man was not seriously injured he had reason to be certain. He did not wish him to wake up until

he had had time to get his own thoughts entirely in order.

For he had work to do, work which must be done meticulously, without mistake. Everyone, he thought with a wry smile, makes plans to provide for their future.

He was about to provide for his past.

THERE WAS the matter of the setting of the Time Gate when he got around to sending his early self back. When he had tuned in on the scene in his room a few minutes ago, he had picked up the action just before his early self had been knocked through. In sending him back he must make a slight readjustment in the time setting to an instant around two o'clock of that particular afternoon. That would be simple enough; he need only search a short sector until he found his early self alone and working at his desk.

But the Time Gate had appeared in that room at a later hour; he had just caused it to do so. He felt confused.

Wait a minute, now—if he changed the setting of the time control, the Gate would appear in his room at the earlier time, remain there, and simply blend into its "reappearance" an hour or so later. Yes, that was right. To a person in the room it would simply be as if the Time Gate had been there all along, from about two o'clock.

Which it had been. He would see to that.

Experienced as he was with the phenomena exhibited by the Time Gate, it nevertheless required a strong and subtle intellectual effort to think other than in durational terms, to take an *eternal* viewpoint.

And there was the hat. He picked it up and tried it on. It did not fit very well, no doubt because he was

wearing his hair longer now. The bat must be placed where it would be found— Oh, yes, in the control booth. And the notebook, too.

The notehook, the notebook—Mm-m-m— Something funny, there. When the notebook he had stolen had become dog-eared and tattered almost to illegibility some four years back, he had carefully recopied its contents in a new notehook—to refresh his memory of English rather than from any need for it as a guide. The worn-out notebook he had destroyed; it was the new one he intended to obtain, and leave to be found.

In that case, *there never had been two notebooks*. The one he had now would become, after being taken through the Gate to a point ten years in the past, the notebook from which he had copied it. They were simply different segments of the same physical process, manipulated by means of the Gate to run concurrently, side by side, for a certain length of time.

As he had himself—one afternoon.

He wished that he had not thrown away the worn-out notebook. If he had it at hand, he could compare them and convince himself that they were identical save for the wear and tear of increasing entropy.

But when had he learned the language, in order that he might prepare such a vocabulary? To be sure, when he copied it he then *knew* the language—copying had not actually been necessary.

But he *had* copied it.

The physical process he had all straightened out in his mind, but the intellectual process it represented was completely circular. His older self had taught his younger self a language which the older self knew because the younger self, after being

taught, grew up to be the older self and was, therefore, capable of teaching.

But where had it started?

Which comes first, the hen or the egg?

You feed the rats to the cats, skin the cats, and feed the carcasses of the cats to the rats who are in turn fed to the cats. The perpetual motion fur farm.

If God created the world, who created God?

Who wrote the notebook? Who started the chain?

He felt the intellectual desperation of any honest philosopher. He knew that he had about as much chance of understanding such problems as a collie has of understanding how dog food gets into cans. Applied psychology was more his size—which reminded him that there were certain books which his early self would find very useful in learning how to deal with the political affairs of the country he was to run. He made a mental note to make a list.

The man on the floor stirred again, sat up. Wilson knew that the time had come when he must insure his past. He was not worried; he felt the sure confidence of the gambler who is "hot," who *knows* what the next roll of the dice will show.

HE BENT OVER his alter ego. "Are you all right?" he asked.

"I guess so," the younger man mumbled. He put his hand to his bloody face. "My head hurts."

"I should think it would," Wilson agreed. "You came through head over heels. I think you hit your head when you landed."

His younger self did not appear

fully to comprehend the words at first. He looked around dazedly, as if to get his bearings. Presently he said, "Came through? Came through what?"

"The Gate, of course," Wilson told him. He nodded his head toward the Gate, feeling that the sight of it would orient the still groggy younger Bob.

Young Wilson looked over his shoulder in the direction indicated, sat up with a jerk, shuddered and closed his eyes. He opened them again after what seemed to be a short period of prayer, looked again, and said, "Did I come through that?"

"Yes," Wilson assured him.

"Where am I?"

"In the Hall of the Gate in the High Palace of Norkaal. But what is more important," Wilson added, "is *when* you are. You have gone forward a little more than thirty thousand years."

The knowledge did not seem to reassure him. He got up and stumbled toward the Gate. Wilson put a restraining hand on his shoulder. "Where are you going?"

"Back!"

"Not so fast." He did not dare let him go back yet, not until the Gate had been reset. Besides he was still drunk—his breath was staggering. "You will go back all right—I give you my word on that. But let me dress your wounds first. And you should rest. I have some explanations to make to you, and there is an errand you can do for me when you get back—to our mutual advantage. There is a great future in store for you and me, my boy—a great future!"

A great future!

IN TIMES TO COME

NEXT month's issue will carry the first part of "Second Stage Lensmen," Dr. E. E. Smith's new novel. Matter of fact, so long is the whole story, and I so genuinely want to give it to you as quickly and coherently as possible, "Second Stage Lensmen" will make up almost half the November issue. The whole story will be 118,000 words long. You'll notice that the title is "Second Stage Lensmen." Kinnison gets some help this time, and it isn't quite fair to call them all men, either. One wearer of the lens is entirely human, but certainly shouldn't be called a Lensman; some of the other second-stage wearers of the lens, on the other hand, are far indeed from being human. There was one, for instance, who conquered and wiped out the entire population of the toughest, most highly intelligent planet of Lundermark's Nebula single-handed.

And, of course, there's Worsel, the highly unreluctant dragon—Clarissa MacDougal, made a Lenswoman because she, and she alone of all the forces of Civilization's Galactic Patrol could undertake the very special and highly dangerous job that had to be done on a planet Civilization had never heard of before—

We have an article of an unusual nature coming up, too. Willy Ley discusses "Sergeant Terry Bull's Terrible Weapons"—based on a series of articles written by an ordnance officer for ordnance officers of the U. S. Army, the "Terrible Weapons" are hypothetical weapons that could be made and used. These weapons, while not going into the far future, are not yet existent, but practicable, unusual, and interesting. They were developed, it seems, in the course of the war with the Mungo Empire. Inventors of new and wonderful death-dealing gadgets are invited to read—the men who cooked up these could-be's know the things that make nice ideas unusable—things like manufacturing problems, mud in the works, over-delicate construction, and problems of supply.

THE EDITOR.

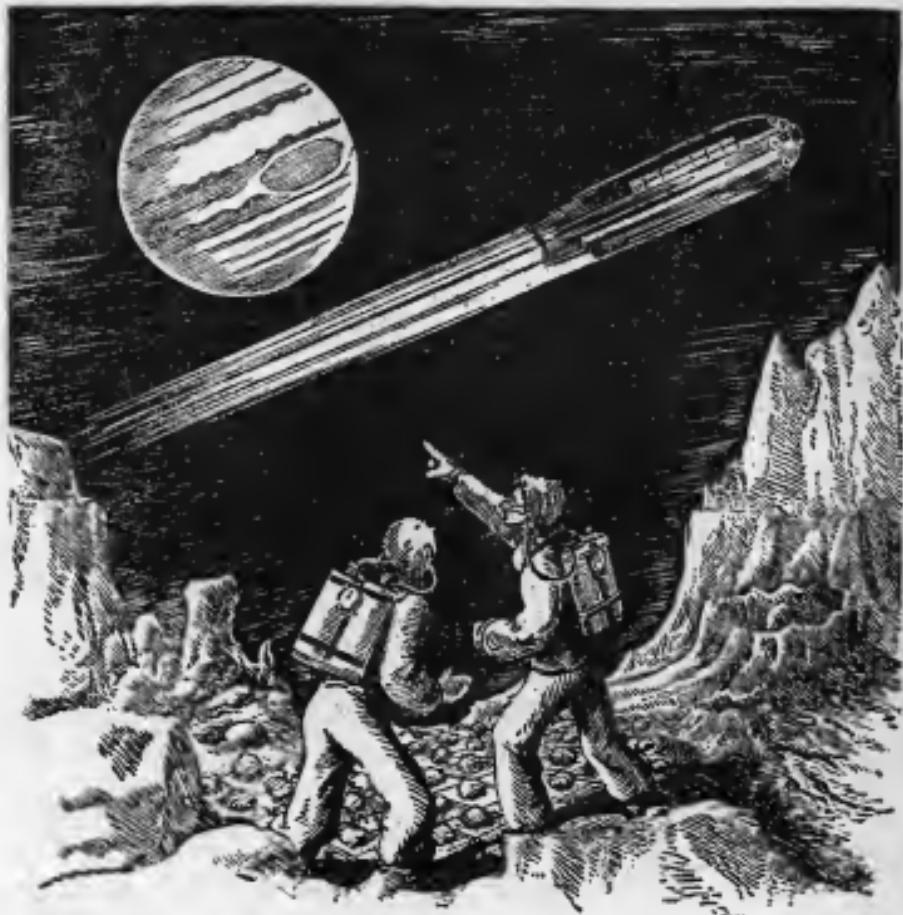
ANALYTICAL LABORATORY

For the first time, a story has succeeded in scoring a clean, complete sweep of first place. "Methuselah's Children," by Robert Heinlein, took first place with a point-score of 1.000 to as many decimal places as you like. It was unanimously voted first place.

And, as usually seems to happen, when there's agreement on one, the argument on the others gets hotter—with high point-scores as a result. The results, therefore, stand:

Place	Story	Author	Points
1.	Methuselah's Children	Robert Heinlein	1.000
2.	Jurisdiction	Nat Schachner	3.00
3.	Biddiver	Theodore Sturgeon	3.40
4.	Backlash	Jack Williamson	4.35
5.	Kylstron Fort	William Corson	4.7

THE EDITOR.



NOT FINAL!

By Isaac Asimov

There was a bomb—an 85,000-mile-diameter bomb—waiting to burst a flood of destruction on the System if only they could find a way to get out—

Illustrated by Kolliker

NICHOLAS ORLOFF inserted a monocle in his left eye with all the incorruptible Briticism of a Russian educated at Oxford and said re-

proachfully, "But, my dear Mr. Secretary! Half a billion dollars!"

Leo Birnam shrugged his shoulders wearily and allowed his lank

body to cramp up still farther in the chair, "The appropriation must go through, commissioner. The Dominion government here at Ganymede is becoming desperate. So far I've been holding them off, but as secretary of scientific affairs, my powers are small."

"I know, but—" and Orloff spread his hands helplessly.

"I suppose so," agreed Birnam. "The Empire government finds it easier to look the other way. They've done it consistently up to now. I've tried for a year now to have them understand the nature of the danger that hangs over the entire System, but it seems that it can't be done. But I'm appealing to you, Mr. Commissioner. You're new in your post and can approach this Jovian affair with an unjaundiced eye."

Orloff coughed and eyed the tips of his boots. In the three months since he had succeeded Gridley as colonial commissioner he had tabled unread everything relating to "those damned Jovian D. T.'s." That had been according to the established cabinet policy which had labeled the Jovian affair as "deadwood" long before he had entered office.

But now that Ganymede was becoming nasty, he found himself sent out to Jovopolis with instructions to hold the "blasted provincials" down. It was a nasty spot.

Birnam was speaking, "The Dominion government has reached the point where it needs the money so badly, in fact, that if they don't get it, they're going to publicize everything."

Orloff's phlegm broke completely, and he snatched at the monocle as it dropped, "My dear fellow!"

"I know what it would mean. I've advised against it, but they're justified. Once the inside of the Jovian affair is out; once the people know

about it; the Empire government won't stay in power a week. And when the Technocrats come in, they'll give us whatever we ask. Public opinion will see to that."

"But you'll also create a panic and hysteria—"

"Surely! That is why we hesitate. But you might call this an ultimatum. We want secrecy, we *need* secrecy; but we need money more."

"I see." Orloff was thinking rapidly, and the conclusions he came to were not pleasant. "In that case, it would be advisable to investigate the case further. If you have the papers concerning the communications with the planet, Jupiter—"

"I have them," replied Birnam, dryly, "and so has the Empire government at Washington. That won't do, commissioner. It's the same cud that's been chewed by Earth officials for the last year, and it's gotten us nowhere. I want you to come to Ether Station with me."

The Ganymedian had risen from his chair, and he glowered down upon Orloff from his six and a half feet of height.

Orloff flushed, "Are you ordering me?"

"In a way, yes. I tell you there is no time. If you intend acting, you must act quickly or not at all." Birnam paused, then added, "You don't mind walking, I hope. Power vehicles aren't allowed to approach Ether Station, ordinarily, and I can use the walk to explain a few of the facts. It's only two miles off."

"I'll walk," was the brusque reply.

The trip upward to subground level was made in silence, which was broken by Orloff when they stepped into the dimly lit anteroom.

"It's chilly here."

"I know. It's difficult to keep the temperature up to norm this near

the surface. But it will be colder outside. Here!"

Birnam had kicked open a closet door and was indicating the garments suspended from the ceiling. "Put them on. You'll need them."

Orloff fingered them doubtfully, "Are they heavy enough?"

Birnam was pouring into his own costume as he spoke. "They're electrically heated. You'll find them plenty warm. That's it! Tuck the trouser legs inside the hoots and lace them tight."

He turned then and, with a grunt, brought out a double compressed-gas cylinder from its rack in one corner of the closet. He glanced at the dial reading; and then turned the stop-cock. There was a thin wheeze of escaping gas, at which Birnam sniffed with satisfaction.

"Do you know how to work one of these?" he asked, as he screwed onto the jet a flexible tube of metal mesh, at the other end of which was a curiously curved object of thick, clear glass.

"What is it?"

"Oxygen nosepiece! What there is of Ganymede's atmosphere is argon and nitrogen, just about half and half. It isn't particularly breathable." He heaved the double cylinder into position, and tightened it in its harness on Orloff's back.

Orloff staggered, "It's heavy. I can't walk two miles with this."

"It won't be heavy out there," Birnam nodded carelessly upward and lowered the glass nosepiece over Orloff's head. "Just remember to breathe in through the nose and out through the mouth, and you won't have any trouble. By the way, did you eat recently?"

"I lunched before I came to your place."

Birnam sniffed dubiously, "Well, that's a little awkward." He drew

a small metal container from one of his pockets and tossed it to the commissioner. "Put one of those pills in your mouth and keep sucking on it."

Orloff worked clumsily with gloved fingers and finally managed to get a brown spheroid out of the tin and into his mouth. He followed Birnam up a gently sloped ramp. The blind alley ending of the corridor slid aside smoothly when they reached it and there was a faint sooughing as air slipped out into the thinner atmosphere of Ganymede.

Birnam caught the other's elbow, and fairly dragged him out.

"I've turned your air tank on full," he shouted. "Breathe deeply and keep sucking at that pill."

Gravity had flicked to Ganymedian normality as they crossed the threshold and Orloff after one horrible moment of apparent levitation, felt his stomach turn a somersault and explode.

He gagged, and fumbled the pill with his tongue in a desperate attempt at self-control. The oxygen-rich mixture from the air cylinders burned his throat, and gradually Ganymede steadied. His stomach shuddered back into place. He tried walking.

"Take it easy, now," came Birnam's soothing voice. "It gets you that way the first few times you change gravity fields quickly. Walk slowly and get the rhythm, or you'll take a tumble. That's right, you're getting it."

The ground seemed resilient. Orloff could feel the pressure of the other's arm holding him down at each step to keep him from springing too high. Steps were longer now—and flatter, as he got the rhythm. Birnam continued speaking, a voice a little muffled from behind the

leather flap drawn loosely across mouth and chin.

"Each to his own world," he grinned. "I visited Earth a few years back, with my wife, and had a hell of a time. I couldn't get myself to learn to walk on a planet's surface without a nosepiece. I kept choking—I really did. The sunlight was too bright and the sky was too blue and the grass was too green. And the buildings were right out on the surface. I'll never forget the time they tried to get me to sleep in a room twenty stories up in the air, with the window wide open and the moon shining in."

"I went back on the first spaceship going my way and don't ever intend returning. How are you feeling now?"

"Fine! Splendid!" Now that the first discomfort had gone, Orloff found the low gravity exhilarating. He looked about him. The broken, hilly ground, bathed in a drenching yellow light, was covered with ground-hugging broad-leaved shrubs that showed the orderly arrangement of careful cultivation.

Birnam answered the unspoken question, "There's enough carbon dioxide in the air to keep the plants alive, and they all have the power to fix atmospheric nitrogen. That's what makes agriculture Ganymede's greatest industry. Those plants are worth their weight in gold as fertilizers back on Earth and worth double or triple that as sources for half a hundred alkaloids that can't be gotten anywhere else in the System. And, of course, everyone knows that Ganymedian green-leaf has Terrestrial tobacco beat hollow."

There was the drone of a strato-rocket overhead, shrill in the thin atmosphere, and Orloff looked up.

He stopped—stopped dead—and forgot to breathe!

It was his first glimpse of Jupiter in the sky.

It is one thing to see Jupiter, coldly harsh, against the ebon backdrop of space. At six hundred thousand miles, it is majestic enough. But on Ganymede, barely topping the hills, its outlines softened and ever so faintly hazed by the thin atmosphere; shining mellowly from a purple sky in which only a few fugitive stars dare compete with the Jovian giant—it can be described by no conceivable combination of words.

At first, Orloff absorbed the gibbous disk in silence. It was gigantic, thirty-two times the apparent diameter of the Sun as seen from Earth. Its stripes stood out in faint washes of color against the yellowness beneath and the Great Red Spot was an oval splotch of orange near the western rim.

And finally Orloff murmured weakly, "It's beautiful!"

Leo Birnam stared, too, but there was no awe in his eyes. There was the mechanical weariness of viewing a sight often seen, and besides that an expression of sick revulsion. The chin flap hid his twitching smile, but his grasp upon Orloff's arm left bruises through the tough fabric of the surface suit.

He said slowly, "It's the most horrible sight in the System."

Orloff turned reluctant attention to his companion, "Eh?" Then, disagreeably, "Oh, yes, those mysterious Jovians."

At that, the Ganymedian turned away angrily and broke into swinging, fifteen-foot strides. Orloff followed clumsily after, keeping his balance with difficulty.

"Here now," he gasped.

But Birnam wasn't listening. He was speaking coldly, bitterly, "You

on Earth can afford to ignore Jupiter. You know nothing of it. It's a little pin prick in your sky, a little flyspeck. You don't live here on Ganymede, watching that damned colossus gloating over you. Up and over fifteen hours—hiding God knows what on its surface. Hiding something that's waiting and waiting and *trying to get out*. Like a giant bomb just waiting to explode!"

"Nonsense!" Orloff managed to jerk out. "Will you slow down. I can't keep up."

Birnam cut his strides in half and said tensely, "Everyone knows that Jupiter is inhabited, but practically no one ever stops to realize what that means. I tell you that those Jovians, whatever they are, are born to the purple. *They are the natural rulers of the Solar System.*"

"Pure hysteria," muttered Orloff. "The Empire government has been hearing nothing else from your Dominion for a year."

"And you've shrugged it off. Well, listen! Jupiter, discounting the thickness of its colossal atmosphere, is eighty thousand miles in diameter. That means it possesses a surface one hundred times that of Earth, and more than fifty times that of the entire Terrestrial Empire. Its population, its resources, its war potential are in proportion."

"Mere numbers—"

"I know what you mean," Birnam drove on, passionately. "Wars are not fought with numbers, but with science and with organization. The Jovians have both. In the quarter of a century during which we have communicated with them, we've learned a bit. They have atomic power and they have radio. And in a world of ammonia under great pressure—a world in other words in which almost none of the metals can exist as metals for any length of

time because of the tendency to form soluble ammonia complexes—they have managed to build up a complicated civilization. That means they have had to work through plastics, glasses, silicates and synthetic building materials of one sort or another. *That* means a chemistry developed just as far as ours is, and I'd put odds on its having developed further."

Orloff waited long before answering. And then, "But how certain are you people about the Jovians' last message. We on Earth are inclined to doubt that the Jovians can possibly be as unreasonably helligerent as they have been described."

The Ganymedian laughed shortly, "They broke off all communication after that last message, didn't they? That doesn't sound friendly on their part, does it? I assure you that we've all but stood on our ears trying to contact them.

"Here now, don't talk. Let me explain something to you. For twenty-five years here on Ganymede a little group of men have worked their hearts out trying to make sense out of a static-riden, gravity-distorted set of variable clicks in our radio apparatus, for those clicks were our only connection with living intelligence upon Jupiter. It was a job for a world of scientists, but we never had more than two dozen at the Station at any one time. I was one of them from the very beginning and, as a philologist, did my part in helping construct and interpret the code that developed between ourselves and the Jovians, so that you can see I am speaking from the real inside.

"It was a devil of a heartreaking job. It was five years before we got past the elementary clicks of arithmetic: three and four are seven; the square root of twenty-five is

five; factorial six is seven hundred and twenty. After that, months sometimes passed before we could work out and check by further communication a single new fragment of thought.

"But—and this is the point—by the time the Jovians broke off relations, we understood them *thoroughly*. There was no more chance of a mistake in comprehension, than there was of Ganymede suddenly cutting loose from Jupiter. And their last message was a threat, and a promise of destruction. Oh, there's no doubt—there's no doubt!"

THEY were walking through a shallow pass in which the yellow Jupiter light gave way to a clammy darkness.

Orloff was disturbed. He had never had the case presented to him in this fashion before. He said, "But the reason, man. What reason did we give them—?"

"No reason! It was simply this: the Jovians had finally discovered from our messages—just where and how I don't know—that *we* were not Jovians."

"Well, of course."

"It wasn't 'of course' to them. In their experiences they had never come across intelligences that were not Jovian. Why should they make an exception in favor of those from outer space?"

"You say they were scientists." Orloff's voice had assumed a wary frigidity. "Wouldn't they realize that alien environments would breed alien life. We knew it. We never thought the Jovians were Earthmen though we had never met intelligences other than those of Earth."

They were back in the drenching wash of Jupiter light again, and a spreading region of ice glimmered amberly in a depression to the right.

Birnam answered, "I said they were chemists and physicists—but I never said they were astronomers. Jupiter, my dear commissioner, has an atmosphere three thousand miles or more thick, and those miles of gas block off everything but the Sun and the four largest of Jupiter's moons. The Jovians know nothing of alien environments."

Orloff considered. "And so they decided we were aliens. What next?"

"If we weren't Jovians then, in their eyes, we weren't people. It turned out that a non-Jovian was 'vermin' by definition."

Orloff's automatic protest was cut off sharply by Birnam, "In their eyes, I said, vermin we were; and vermin we are. Moreover, we were vermin with the peculiar audacity of having dared to attempt to treat with Jovians—with *human beings*. Their last message was this, word for word—'Jovians are the masters. There is no room for vermin. We will destroy you immediately.' I doubt if there was any animosity in that message—simply a cold statement of fact. But they meant it."

"But why?"

"Why did man exterminate the housefly?"

"Come, sir. You're not seriously presenting an analogy of that nature."

"Why not, since it is certain that the Jovian considers us a sort of housefly—an insufferable type of housefly that dares aspire to intelligence?"

Orloff made a last attempt, "But truly, Mr. Secretary, it seems impossible for intelligent life to adopt such an attitude."

"Do you possess much of an acquaintance with any other type of intelligent life than our own?" came

with immediate sarcasm. "Do you feel competent to pass on Jovian psychology? Do you know just *how* alien Jovians must be physically? Just think of their world with its gravity at two and one half Earth normal; with its ammonia oceans—oceans that you might throw all Earth into without raising a respectable splash; with its three-thousand-mile atmosphere, dragged down by the colossal gravity into densities and pressures in its surface layers that make the sea bottoms of Earth resemble a medium-thick vacuum. I tell you we've tried to figure out what sort of life could exist under those conditions and we've given up. It's thoroughly incomprehensible. Do you expect their mentality, then, to be any more understandable. Never! Accept it as it is. They intend destroying us. That's all we know and all we need to know."

He lifted a gloved hand as he finished and one finger pointed, "There's Ether Station just ahead."

Orloff's head swiveled, "Underground?"

"Certainly! All except the Observatory. That's that steel and quartz dome to the right—the small one."

They had stopped before two large boulders that flanked an earthy embankment, and from behind either one a nosepieced, suited soldier in Ganymedian orange, with blasters ready, advanced upon the two.

Birnam lifted his face into Jupiter's light and the soldiers saluted and stepped aside. A short word was harked into the wrist mike of one of them and the camouflaged opening between the boulders fell into two and Orloff followed the secretary into the yawning air lock.

The Earthman caught one last glimpse of sprawling Jupiter before

the closing door cut off the surface altogether.

It was no longer beautiful!

ORLOFF did not quite feel normal again until he had seated himself in the overstuffed chair in Dr. Edward Prosser's private office. With a sigh of utter relaxation, he propped his monocle under his eyebrow.

"Would Dr. Prosser mind if I smoked in here, while we're waiting?" he asked.

"Go ahead," replied Birnam, carelessly. "My own idea would be to drag Prosser away from whatever he's fooling with just now, but he's a queer chap. We'll get more out of him if we wait until he's ready for us." He withdrew a gnarled stick of greenish tobacco from its case, and bit off the edge viciously.

Orloff smiled through the smoke of his own cigarette, "I don't mind waiting. I still have something to say. You see, for the moment, Mr. Secretary, you gave me the jitters, but, after all, granted that the Jovians intend mischief once they get at us, it remains a fact," and here he spaced his words emphatically, "that they can't get at us."

"A bomb without a fuse, hey?"

"Exactly! It's simplicity itself, and not really worth discussing. You will admit, I suppose, that under no circumstances can the Jovians get away from Jupiter."

"Under no circumstances?" There was a quizzical tinge in Birnam's slow reply. "Shall we analyze that?"

He stared hard at the purple flame of his cigar. "It's an old trite saying that the Jovians can't leave Jupiter. The fact has been highly publicized by the sensation mongers of Earth and Ganymede and a great deal of sentiment has been driveled about the unfortunate intelligences who are irrevocably surface-bound,

and must forever stare into the Universe without, watching, watching, wondering, and never attaining.

"But, after all, what holds the Jovians to their planet. Two factors! That's all! The first is the immense gravity field of the planet. Two and a half Earth normal."

Orloff nodded. "Pretty bad!" he agreed.

"And Jupiter's gravitational potential is even worse, for because of its greater diameter the intensity of its gravitational field decreases with distance only one tenth as rapidly as Earth's field does. It's a terrible problem—but it's been solved."

"Hey?" Orloff straightened.

"They've got atomic power. Gravity—even Jupiter's—means nothing once you've put unstable atomic nuclei to work for you."

Orloff crushed his cigarette to extinction with a nervous gesture. "But their atmosphere—"

"Yes, that's what's stopping them. They're living at the bottom of a three-thousand-mile-deep ocean of it, where the hydrogen of which it is composed is collapsed by sheer pressure to something approaching the density of solid hydrogen. It stays a gas because the temperature of Jupiter is above the critical point of hydrogen, but you just try to figure out the pressure that can make hydrogen gas half as heavy as water. You'll be surprised at the number of zeros you'll have to put down.

"No spaceship of metal or of any kind of matter can stand that pressure. No Terrestrial spaceship can land on Jupiter without smashing like an eggshell, and no Jovian spaceship can leave Jupiter without exploding like a soap bubble. That problem has not yet been solved, but it will be some day. Maybe tomorrow, maybe not for a hundred years, or a thousand. We don't

know, but when it is solved, the Jovians will be on top of us. And it can be solved in a specific way."

"I don't see how—"

"Force fields! We've got them now, you know."

"Force fields!" Orloff seemed genuinely astonished, and he chewed the word over and over to himself for a few moments. "They're used as meteor shields for ships in the asteroid zone—but I don't see the application to the Jovian problem."

"THE ORDINARY force field," explained Birnam, "is a feeble rarefied zone of energy extending over a hundred miles or more outside the ship. It'll stop meteors but it's just so much empty ether to an object like a gas molecule. But what if you took that same zone of energy and compressed it to a thickness of a tenth of an inch. Molecules would bounce off it like this—*ping-g-g-g!* And if you used stronger generators, and compressed the field to a hundredth of an inch, molecules would bounce off even when driven by the unthinkable pressure of Jupiter's atmosphere—and then if you build a ship inside—" He left the sentence dangling.

Orloff was pale. "You're not saying it can be done?"

"I'll bet you anything you like that the Jovians are *trying* to do it. And we're trying to do it right here at Ether Station."

The colonial commissioner jerked his chair closer to Birnam and grabbed the Ganymedian's wrist. "Why can't we bombard Jupiter with atomic bombs. Give it a thorough going-over, I mean! With her gravity, and her surface area, we can't miss."

Birnam smiled faintly, "We've thought of that. But atomite bombs would merely tear holes in the at-

mosphere. And even if you could penetrate, just divide the surface of Jupiter by the area of damage of a single bomb and find how many years we must bombard Juipter at the rate of a bomb a minute before we begin to do significant damage. Jupiter's *big!* Don't ever forget that!"

His cigar had gone out, but he did not pause to relight. He continued in a low, tense voice. "No, we can't attack the Jovians as long as they're on Jupiter. We must wait for them to come out—and once they do, they're going to have the edge on us in numbers. A terrific, heart-breaking edge—so we'll just have to have the edge on them in science."

"But," Orloff broke in, and there was a note of fascinated horror in his voice, "how can we tell in advance what they'll have?"

"We can't. We've got to scrape up everything we can lay our hands on and hope for the best. But there's one thing we *do* know they'll have, and that's force fields. They can't get out without them. And if they have them, we must, too, and that's the problem we're trying to solve here. They will not insure us victory, but without them, we will suffer certain defeat. And now you know why we need money—and more than that. We want Earth itself to get to work. It's got to start a drive for scientific armaments and subordinate everything to that. You see?"

Orloff was on his feet. "Birnam, I'm with you—a hundred percent with you. You can count on me back in Washington."

There was no mistaking his sincerity. Birnam gripped the hand outstretched toward him and wrung it—and at the moment, the door flew open and a little pixie of a man hurtled in.

THE NEWCOMER spoke in rapid jerks, and exclusively to Birnam. "Where'd you come from? Been trying to get in touch with you. Secretary said you weren't in. Then five minutes later you show up on your own. Can't understand it." He busied himself furiously at his desk.

Birnam grinned. "If you'll take time out, doc, you might say hello to Colonial Commissioner Orloff."

Dr. Edward Prosser turned on his toe like a ballet dancer and looked the Earthman up and down twice. "The new un, hey? We getting any money? We ought to. Been working on a shoestring ever since. At that, we might not be needing any. It depends." He was back at the desk.

Orloff seemed a trifle disconcerted, but Birnam winked impressively, and he contented himself with a glassy stare through the monocle.

Prosser pounced upon a black leather booklet in the recesses of a pigeonhole, threw himself into his swivel chair and wheeled about.

"Glad you came, Birnam," he said, leafing through the booklet. "Got something to show you. Commissioner Orloff, too."

"What were you keeping us waiting for?" demanded Birnam. "Where were you?"

"Busy! Busy as a pig! No sleep for three nights." He looked up and his small puckered face fairly flushed with delight. "Everything fell into place of a sudden. Like a jig-saw puzzle. Never saw anything like it. Kept us hopping, I tell you."

"You've gotten the dense force fields you're after," asked Orloff in sudden excitement.

Prosser seemed annoyed. "No, not that. Something else. Come on." He glared at his watch and

jumped out of his seat. "We've got half an hour. Let's go."

An electric-motored flivver waited outside and Prosser spoke excitedly as he sped the purring vehicle down the ramps into the depths of the Station.

"Theory!" he said. "Theory! Damned important, that. You set a technician on a problem. He'll fool around. Waste lifetimes. Get nowhere. Just putter about at random. A true scientist works with theory. Lets math solve his problems." He overflowed with self-satisfaction.

The flivver stopped on a dime before a huge double-door and Prosser tumbled out followed by the other two at a more leisurely pace.

"Through here! Through here!" he said. He shoved the door open and led them down the corridor and up a narrow flight of stairs onto a wall-hugging passageway that circled a huge three-level room. Orloff recognized the gleaming quartz-and-steel pipe-sprouting ellipsoid two levels below as an atomic generator.

He adjusted his monocle and watched the scurrying activity below. An earphoned man on a high stool before a control board studded with dials looked up and waved. Prosser waved back and grinned.

Orloff said, "You create your force fields here?"

"That's right! Ever see one?"

"No." The commissioner smiled, ruefully. "I don't even know what one is, except that it can be used as a meteor shield."

Prosser said, "It's very simple. Elementary matter. All matter is composed of atoms. Atoms are held together by interatomic forces. Take away atoms. Leave interatomic forces behind. *That's* a force field."

Orloff looked blank, and Birnam

chuckled deep in his throat and scratched the back of his ear.

"That explanation reminds me of our Ganymedian method of suspending an egg a mile high in the air. It goes like this. You find a mountain just a mile high and put the egg on top. Then, keeping the egg where it is, you take the mountain away. That's all."

The colonial commissioner threw his head back to laugh and the irascible Dr. Prosser puckered his lips into a pursed symbol of disapproval.

"Come, come. No joke, you know. Force fields most important. Got to be ready for the Jovians when they come."

A SUDDEN rasping bur from below sent Prosser back from the railing.

"Get behind screen here," he babbled. "The twenty-millimeter field is going up. Bad radiation."

The bur muted almost into silence and the three walked out onto the passageway again. There was no apparent change, but Prosser shoved his hand out over the railing and said, "Feel!"

Orloff extended a cautious finger, gasped, and slapped out with the palm of his hand. It was like pushing against very soft sponge rubber or superresilient steel springs.

Birnam tried, too. "That's better than anything we've done yet, isn't it?" He explained to Orloff, "A twenty-millimeter screen is one that can hold an atmosphere of a pressure of twenty millimeters of mercury against a vacuum without appreciable leakage."

The commissioner nodded, "I see! You'd need a seven-hundred-sixty-millimeter screen to hold Earth's atmosphere then."

"Yes! That would be a unit at-

mosphere screen. Well, Prosser, is this what got you excited?"

"This twenty-millimeter screen. Of course not. I can go up to two hundred fifty millimeters using the activated vanadium pentasulphide in the praseodymium breakdown. But it's not necessary. Technician would do it and blow up the place. Scientist checks on theory and goes slow." He winked. "We're hardening the field now. Watch!"

"Shall we get behind the screen?"

"Not necessary, now. Radiation bad only at beginning."

The hurring waxed again, but not as loudly as before. Prosser shouted to the man at the control board and a spreading wave of the hand was the only reply.

Then the control man waved a clenched fist and Prosser cried, "We've passed fifty millimeters! Feel the field!"

Orloff extended his hand and poked it curiously. The sponge rubber had hardened! He tried to pinch it between finger and thumb so perfect was the illusion, but here the "rubber" faded to unresisting air.

Prosser *tch-tched* impatiently. "No resistance at right angles to force. Elementary mechanics, that is."

The control man was gesturing again. "Past seventy," explained Prosser. "We're slowing down now. Critical point is 83.42."

He hung over the railing and kicked out with his feet at the other two. "Stay away! Dangerous!"

And then he yelled, "Careful! The generator's bucking!"

The hur had risen to a hoarse maximum and the control man worked frantically at his switches. From within the quartz heart of the central atomic generator, the sullen

red glow of the bursting atoms had brightened dangerously.

There was a break in the hur, a reverherant roar, and a blast of air that threw Orloff hard against the wall.

Prosser dashed up. There was a cut over his eye. "Hurt? No? Good, good! I was expecting something of the sort. Should have warned you. Let's go down. Where's Birnam?"

The tall Ganymedan picked himself up off the floor and brushed at his clothes. "Here I am. What blew up?"

"Nothing blew up. Something buckled. Come on, down we go." He dabbed at his forehead with a handkerchief and led the way downward.

The control man removed his earphones as he approached and got off his stool. He looked tired and his dirt-smeared face was greasy with perspiration.

"The damn thing started going at 82.8, boss. It almost caught me."

"It did, did it?" growled Prosser. "Within limits of error, isn't it? How's the generator? Hey, Stoddard!"

The technician addressed replied from his station at the generator, "Tube 5 died. It'll take two days to replace."

Prosser turned in satisfaction and said, "It worked. Went exactly as presumed. Problem solved, gentlemen. Trouble over. Let's get back to my office. I want to eat. And then I want to sleep."

He did NOT refer to the subject again until once more behind the desk in his office, and then he spoke between huge bites of a liver-and-onion sandwich.

He addressed Birnam, "Remember the work on space strain last June. It flopped, but we kept at it. Finch got a lead last week and I developed it. Everything fell into place. Slick as goose grease. Never saw anything like it."

"Go ahead," said Birnam, calmly. He knew Prosser sufficiently well to avoid showing impatience.

"You saw what happened. When a field tops 83.42 millimeters, it becomes unstable. Space won't stand the strain. It buckles and the field blows. *Boom!*"

Birnam's mouth dropped open and the arms of Orloff's chair creaked under sudden pressure. Silence for a while, and then Birnam said unsteadily, "You mean force fields stronger than that are impossible."

"They're possible. You can create them. But the denser they are, the more unstable they are. If I had turned on the two-hundred-and-fifty-millimeter field, it would have lasted one tenth of a second. Then, bloopie! Would have blown up the Station! And myself! Technician would have done it. Scientist is warned by theory. Works carefully, the way I did. No harm done."

Orloff tucked his monocle into his vest pocket and said tremulously, "But if a force field is the same thing as interatomic forces, why is it that steel has such a strong interatomic binding force without bucking space. There's a flaw there."

Prosser eyed him in annoyance. "No flaw. Critical strength depends on number of generators. In steel, each atom is a force-field generator. That means about three hundred billion trillion generators for every ounce of matter. If we could use that many— As it is, one hundred generators would be the practical limit. That only raises the critical

point to ninety-seven or thereabout."

He got to his feet and continued with sudden fervor, "No. Problem's over, I tell you. Absolutely impossible to create a force field capable of holding Earth's atmosphere for more than a hundredth of a second. Jovian atmosphere entirely out of question. Cold figures say that; hacked by experiment. Space won't stand it!"

"Let the Jovians do their damnedest. They can't get out! That's final! That's final! *That's final!*"

Orloff said, "Mr. Secretary, can I send a spacegram anywhere in the Station. I want to tell Earth that I'm returning by the next ship and that the Jovian problem is liquidated—entirely and for good."

Birnam said nothing, but the relief on his face as he shook hands with the colonial commissioner, transfigured the gaunt homeliness of it unbelievably.

And Dr. Prosser repeated, with a birdlike jerk of his head, "That's final!"

HAL TUTTLE looked up as Captain Everett of the spaceship *Transparent*, newest ship of the Comet Space Lines, entered his private observation room in the nose of the ship.

The captain said, "A spacegram has just reached me from the home offices at Tucson. We're to pick up Colonial Commissioner Orloff at Jopolis, Ganymede, and take him back to Earth."

"Good. We haven't sighted any ships?"

"No, no! We're way off the regular space lanes. The first the System will know of us will be the landing of the *Transparent* on Ganymede. It will be the greatest thing in space travel since the first trip to the Moon." His voice softened sud-

denly, "What's wrong, Hal. This is your triumph, after all."

Hal Tuttle looked up and out into the blackness of space. "I suppose it is. Ten years of work, Sam. I lost an arm and an eye in that first explosion, but I don't regret them. It's the reaction that's got me. The problem is solved; my lifework is finished."

"So is every steel-hulled ship in the System."

Tuttle smiled. "Yes. It's hard to realize, isn't it?" He gestured outward. "You see the stars? Part of the time there's nothing between them and us. It gives me a queazy feeling." His voice brooded, "Nine years I worked for nothing. I wasn't a theoretician, and never really knew where I was headed—just tried everything. I tried a little too hard and space wouldn't stand it. I paid an arm and an eye and started fresh."

Captain Everett balled his fist and pounded the hull—the hull through which the stars shone unobstructed. There was the muffled thud of flesh striking an unyielding surface—but no response whatever from the invisible wall.

Tuttle nodded, "It's solid enough,

now—though it flicks on and off eight hundred thousand times a second. I got the idea from the stroboscopic lamp. You know them—they flash on and off so rapidly that it gives all the impression of steady illumination.

"And so it is with the hull. It's not on long enough to buckle space. It's not off long enough to allow appreciable leakage of the atmosphere. And the net effect is a strength better than steel."

He paused and added slowly, "And there's no telling how far we can go. Speed up the intermission effect. Have the field flick off and on millions of times per second—billions of times. You can get fields strong enough to hold an atomic explosion. My lifework!"

Captain Everett pounded the other's shoulder. "Snap out of it, man. Think of the landing on Ganymede. The devil! It will be great publicity. Think of Orloff's face, for instance, when he finds he is to be the first passenger in history ever to travel in a spaceship with a force-field hull. How do you suppose he'll feel?"

Hal Tuttle shrugged. "I imagine he'll be rather pleased."

THE END.



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THE SEA KING'S ARMORED DIVISION

By L. Sprague de Camp

A fact article on the scientific era that almost—but didn't quite—start two thousand years ago. An era that produced taximeters and alarm clocks—and failed. Why?

Illustrated by De Camp

We closed our last installment with the tragic end of Hypatia, about whom Charles Kingsley wrote a moralistic novel. This event was also the end of Alexandrine mathematics and astronomy, which by that time was a pretty gone goose, anyway.

We shall now consider Hellenistic physics. As far as pure physics—statics, kinetics, kinematics, light, heat, sound, electricity and radioactivity—is concerned, the story is ridiculously short. Aristotle's contribution to physics consisted of a generous helping of confusion. Archimedes put statics on a firm basis, as we have seen; he was the physicist of the classical world. And Claude Ptolemy experimented with refraction. Period.

Both Aristotle and Archimedes experimented, though both of them, with true Hellenic deference to the beauties of pure intellect, were rather apologetic about their experiments. Archimedes was by far the more prolific inventor; he invented the Archimedean screw for raising water in addition to the accomplishments mentioned heretofore. But he refused to write up his mechanical work; the only description of it that he left was a book of instructions for making a planetarium.

The story of applied physics is a little meatier. In the last two cen-

turies B. C., in the twilight of the Hellenistic age, Alexandria produced a couple of practical engineers with no inhibitions about dirtying their gentlemanly hands with cog-wheels and levers. If the Machine Age failed to arrive, it was not the fault of Ktesibios and his pupil and associate, Heron.

Ktesibios is best known for his elaborate, self-refilling, compensating clepsydra or water clock. Ktesibios' clock had a piston raised by water. On the piston was a statuette with a pointer reaching over to a table of hours. When the cylinder in which the piston floated became full, a siphon drew off the water and returned the piston to the bottom. The table of hours was necessary because Hellenistic hours were not of uniform length. An hour was defined as one-twelfth of the daylight or the night period. Hence in summer the day hours were longer than the night hours, and in winter the relation was reversed.

Ktesibios invented a crossbow-type catapult with a laminated steel bow like an automobile spring. It did not work because the steel of the time was not good enough. He also invented a compressed-air catapult, which was a crossbow with compressed-air pistons on the ends of the bow. This did not work, either, but the idea had all sorts of

possibilities. The small one-man crossbow was known in his time, but not used.

HERON has left a book, "Pneumatics," which is a mine of information on ancient mechanics. To judge by the titles of his other books that have perished it contains but a fraction of his total mechanical knowledge. Heron opens the hook with some theorizing about the nature of air, which he says is composed of minute and invisible particles. So far so good, but he goes on to say such things as: "Water also, when consumed by the action of fire, is transformed into air—" "Water, again, is transformed into an earthy substance—indeed, slime and mud are transformations of water into earth."

If his physics was off the track, Heron was a most ingenious mechanician. The rest of the book is occupied by drawings and descriptions of seventy-eight devices. The descriptions are excellent; they would do for amateur patent specifications. Most of the inventions involve siphons. The inventions include a self-trimming lamp—with a pinion and two racks—a force pump for fire extinguishing, and the famous steam turbine. Like many of Heron's contraptions, the steam engine was designed to amuse and astonish rather than to perform useful work. It went round and round and got nowhere.

Many of the inventions had to do with stage effects in temples, whereby doors mysteriously opened and trumpets mysteriously tooted. One was a combination of vessels and siphons for apparently turning water into wine. Another was a combination slot machine and holy water dispenser, somewhat hardly

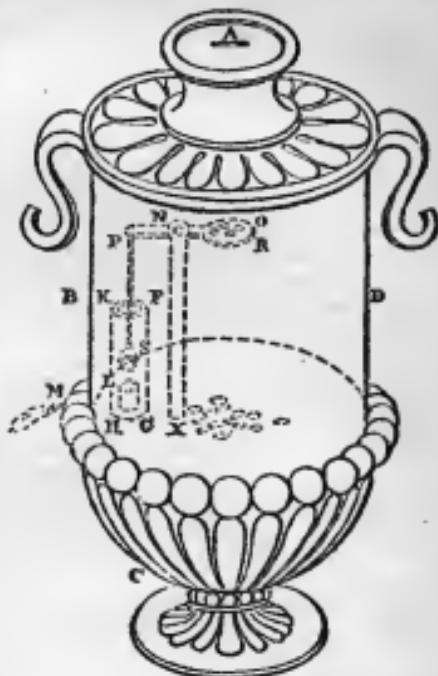


Fig. 1. Heron's slot-machine for dispensing holy water. A coin dropped through A falls on plate O, raising plug S and letting the water flow at M. A copy of a copy of Heron's original.

labeled "Sacrificial vessel which flows only when money is introduced."

Anybody who could be as useful as Heron to the priesthoods of the wonderful syncretic cults of Hellenistic Alexandria ought to have done pretty well by himself. Syncretic religions are merger religions, which start out on the assumption that there is some truth in all faiths, or that the various gods are all really the same god under different names. Thus the Alexandrines would pray to the great Zeus-Jupiter-Ammon-Mazda-Jehovah, no doubt to the anguish of the fiercely monotheistic Jews.

Hellenistic biology consisted mainly of the observations of Aristot-

tle, noted last month, and of his pupil and successor as head of the Lyceum, Theophrastos. These two made some effort at a rational classification of life forms, and were not too far from discovering evolution. Among the later Alexandrines were a couple of good botanists. But otherwise nobody did anything more worth noting in zoology and botany; Aristotle was supposed to have said it all. Centuries later we find supposedly educated men repeating the old fables about why elephants sleep standing up: they have no joints in their legs, an idea which a little close observation would have disproved. Perhaps the fact that the Hellenistic savants were mostly city dwellers accounts for their lack of biological enterprise. Theophrastos wrote a book, "On Rocks," that was the nearest they came to starting geology.

IN MEDICINE some notable advances were made. Some of these were of the Italian type: the lightning advance to the rear. Diagnosis had been developed by the Hellenic—that is, pre-Hellenistic—physicians, notably Hippocrates of Cos. The Egyptians had learned some things about drugs, and the Babylonians about anatomy, as a result of their practice of fortune telling from the appearance of the plumbing of sacrificed animals.

Around 300 B. C. there flourished at Alexandria a couple of the great physicians of the era, Herophilos of Chalcedon, who founded the science of anatomy, and his younger colleague, Eristratos of Chios, who began scientific physiology. These men are said to have engaged in the highly informative practice of vivisecting condemned criminals. Our otherwise not-very-humane modern world would be shocked by such a

performance today. But at least Herophilos' and Eristratos' subjects were enabled to end their lives in more useful fashion than most criminals before or since ever attained.

These two physicians also dissected corpses, with fruitful results. But here they ran into hostile public opinion. The Egyptian populace did not particularly care what happened to live men, but such treatment of stiffs outraged their deepest religious instincts. According to their beliefs, to keep the soul alive you had to preserve the body from now on—except for the brain and viscera, which were removed during mummification. What fun there would be in a future life with neither guts nor gray matter has not been explained. At any rate the unrest among the natives led the reigning Ptolemy to forbid dissection. Before we censure that king or his benighted subjects too severely, it would be well to remember that we have today plenty of well-meaning and well-educated people who go around repeating the preposterous untruth that no medical information of value has been obtained from the vivisection of animals.

As the astronomers became stuck for want of telescopes, so the Alexandrine physicians became stuck for want of microscopes. They did not know it, but pathology could not even get started without microscopes, and all their efforts to find the cause and derive a rational cure for diseases were hopeless. We should not be too hard on the Alexandrians for not realizing the need for an instrument they had never heard of. In our own culture, it was over three centuries after the invention of the microscope before Pasteur and Koch connected microscopic life with disease.

Having no chemistry, and no no-

tion of what scientific pathology really entailed, and being limited in physiology and anatomy to what they could see with their naked eyes, the Hellenistic physicians resorted to the standby of the classical thinker: words. A certain Empedocles had set forth that there were four elements—earth, air, fire and water. Plato had a wonderful time with this classification; he symbolized the four elements by geometrical figures and developed a whole new branch of mysticism.

Eristratus developed from Empedocles' theory a theory of his own called *pneumatism*. Air was inhaled and carried to the heart. So far, not bad. But in the heart the air was changed to a subtle vapor called a *pneuma*, which was carried about the body by the arteries. Some of it went to the brain, where it was changed into another kind of *pneuma* which was carried by the nerves, and was the primary source of movement. The veins, and they alone, carried blood.

Eristratos believed in letting nature take its course as far as possible, which was probably lucky for his patients if not for the progress of medical science. A physician of the Roman period, Galen, developed another theory of "spirits" manufactured and distributed by the various organs. This theory, like that of Eristratos, was ingenious, fitted the facts fairly well, and was quite wrong. The Romans had a version of a "modern" joke about physicians: the sun reveals their successes and the earth hides their failures.

THE anthropological sciences consisted, besides notes on the habits of the "barbarians"—non-Greek speakers—of enormously prolix po-

litical theory. A lot of very acute Hellenic and, later, Hellenistic brains were focused on the problems of why men as social animals act the way they do. The observations were largely confined to the township governments of Greece, and to the forms of government observed there: monarchy, aristocracy and democracy, and their undesirable variants of tyranny, oligarchy and anarchy. Cyclical theories of history were developed. Utopias were imagined, including Plato's very grim technocratic aristocratic communistic "Republic." Class war, of which the Greeks had had plenty, was studied; Stoic communism was developed in an effort to do away with it.

The lasting value of all this writing is problematical, but the same might be said of the theories of modern political science. One very glaring lack was that of any idea of the role of economics. Some people think that many modern theorists have gone to the other and equally unrealistic extreme in assuming that, practically, political science is economics and very little else.

The Hellenic historian Thucydides had a great successor in the Hellenistic Polybios of Magalopolis. Polybios traveled all over the Mediterranean, examining the sites of the battles and interviewing the oldest inhabitants to get his facts straight. He showed discrimination in his use of sources; in fact he was perhaps the greatest historian that Europe was to see for nearly two thousand years. He died at the age of eighty as a result of falling off his horse.

Most of Polybios' work is lost—though represented in Livy—so are all the works of several worthy Hellenistic historians. The reason is that in the days of hand-written books and small editions, books had

to be recopied fairly often or they simply disappeared by fire, loss and general wear and tear. During the Roman period literary men became concerned with form and style to the exclusion of subject matter. The Greek of the Hellenic period was regarded as pure and noble, whereas the plain, matter-of-fact Greek of the Hellenistic period was considered too dull and unpolished to be worth copying.

Speaking of the Greek language, neither the Hellenic nor the Hellenistic thinkers got very far with the science of linguistics. One reason was that they considered no barbarian language worth studying.

Though the Hellenistic world did not know it, the basis of scientific linguistics had been well laid in India around 400 B. C. by a school of Sanskrit philologists. Of these the greatest was Panini, who wrote what has been called the most complete grammar ever composed for any language, living or dead. Phonetics,

accidence, syntax and etymology are all there. Scientific linguistics started in Europe in the Eighteenth Century when Panini was discovered and translated from Sanskrit.

THE peaceful arts are greatly stimulated by improvements in the engines of war, which in turn depend on advances in the peaceful arts. Whether the technological advances that have resulted from warfare have been worth the damage caused by war is a philosophical question for moralists to argue. The interrelationship undeniably exists.

Hellenistic military science showed the highest *mechanical* development in the world before the coming of gunpowder. The siege of Rhodes, which Professor Glomp described to the intrepid Richard Farnsworth last month, illustrates this statement.

Demetrios' armored division, besides the tank, included a pair of 120-foot battering-rams in mobile

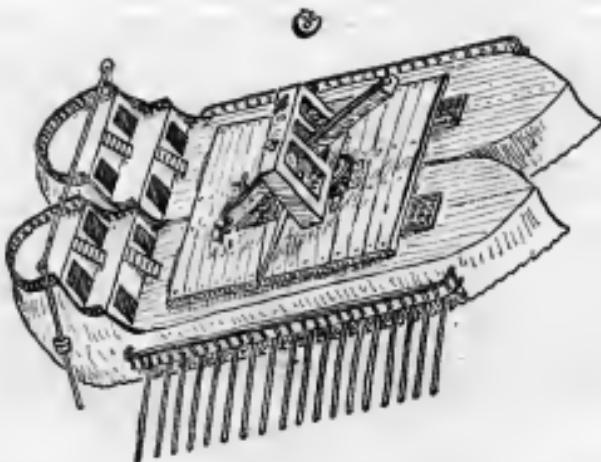


Fig. 2. Monitors: Hellenistic and modern. Above is, not a pair of shoes, but a reconstruction of one of the floating siege-units used by Demetrios Poliorcetes at the Siege of Rhodes, comprising a pair of ships fastened together to make a catamaran and a large catapult mounted over both ships.

sheds. Demetrios used iron armor not only on his tank—which he called a *Helepolis* or city taker—but on a couple of his floating siege units. These consisted of pairs of ships fastened together, like the monitors, but instead of a large catapult each of these units mounted an ironclad tower filled with light catapults and missile troops—archers and slingers; the latter were as important as the former.

It would be interesting to know where Demetrios got his armor plate, and how it was made. It would not be easy stuff to transport. Demetrios could have gotten his timber on the island of Rhodes, which had thick forests in those days before the Turks wastefully lumbered it. But I don't think Rhodes ever had any iron ore.

And it cannot have been easy, either, to pound out plates of appropriate size on anvils. The iron of the time seems to have been of low carbon content and hence high melting point, and the plates could probably not have been cast at all. Remember that European iron-working technique did not advance to where personal iron plate armor was practi-

cal until about the Fourteenth Century. The cast-iron furnace only dates from the Thirteenth; before that all iron was—literally—wrought iron.

In Demetrios' time the heavy-armed soldier wore a solid cuirass, but this was normally of bronze or brass. It was replaced by the skimpy Roman iron-strip cuirass, which in the later Roman Empire gave way to the flexible mail shirt: a leather jacket to which iron scales or rings were attached. True iron plate armor came in about the same time as the guns that were eventually to drive all armor off the battlefield.

But here we have Demetrios armor-plating his siege engines over twenty-one and a half centuries before the British admiralty laid down the armored iron single-screw full-rigged line-of-battle-ship *Warrior*, and the Confederates put a roof of railroad rails on the salvaged Union steam frigate *Merrimac!* Perhaps Demetrios' men made a lot of little plates and riveted them together. But if anybody wants to write a story of the Siege of Rhodes wherein Demetrios Poliorcketes has the as-

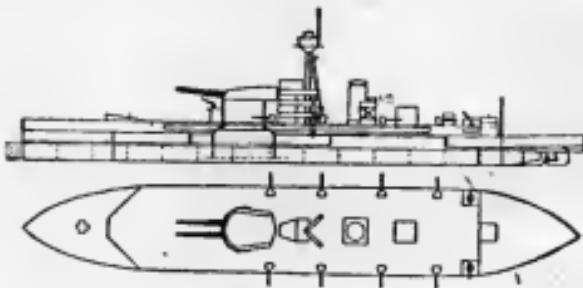


Fig. 3. A modern monitor—H. M. S. Terror. Like Demetrios' monitors, a wide-beam, shallow-draft vessel mounting heavy artillery—in this case two 15-inch naval rifles, and designed for coastal bombardment. The Terror displaced 7,200 tons, was active in World War I against the Belgian coast, was recently sunk after prolonged and successful operations on the African coast.

sistance of a mysterious stranger from the future who calls himself Rhichardos Pharnsouorthes, and who shows Demetrios how to construct a rolling mill, he has my leave.

Mechanized warfare had really gotten started some time before, when Dionysios, the tyrant of Syracuse, invented the ordinance department about 397 B. C. Dionysios—who set an example for later dictators by wearing a steel vest—was preparing to attack the Carthaginian colonies in Sicily. He rounded up all the philosophers and skilled artisans he could catch, hired more from Greece at high wages, entertained them all royally, and told them to invent something to beat the Carthaginians, *or else*. According to the story the savants and mechanics thereupon invented the catapult. It was simply a large crossbow on a fixed mounting, shooting six-foot arrows. One of these arrows was brought from Sicily to Sparta as a curio. A certain Archidamos, seeing it, exclaimed: "O Herakles! The valor of man is at an end!"

Later it was found expedient to replace the bow by a pair of arms whose outer ends pulled the strings and whose inner ends were thrust through sets of torsion skeins. Most of these shot the feathered javelins that so distressed Archidamos. They became considerably more accurate than the smoothbore flintlock musket used in the British army a century and a half ago. The small one-man crossbow was probably a Hellenistic invention, but it never came into common use until the Middle Ages. The *petrobolos* or stone thrower was a later development; it was a machine with a spoon-shaped arm that flew up against a stop. At

Rhodes, Demetrios' stone throwers tossed fifty-pound stones against the walls.

FOR ALL their power and accuracy, catapults never became as decisive a weapon as early cannon. This was probably due to the fact that they were such ponderous machines in proportion to their volume of fire. They had to be cocked by a squad of husky engineers straining at a windlass, which was a slow process. One Dionysios of Alexandria invented a repeating catapult, but it does not seem to have been successful. Large catapults were seldom carried with an army. The engineers brought along the skeins and slings, and when a siege developed they felled trees and hauled their engines on the spot.

The Spartan general Machanidas, the predecessor of the communist king Nahis, experimented with field artillery. He had a corps of mobile catapults at the battle of Mantinea (207 B. C.). But the Spartans lost and Machanidas was killed before the catapults had a chance to come into action. The Roman legions were later accompanied by mobile spear throwers.

The wars of the Diadochi and Epigoni showed several other modern developments. Such strategies as stirring up your enemy's neighbors against him, and sending revolutionary agitators into his country, appeared for the first time. Generals began to direct their armies from behind instead of leading them from in front.

The Diadochi inherited from Alexander the Macedonian phalanx, and the use of cavalry as a decisive arm. Alexander was the only ancient commander whose cavalry could charge home effectively

against good unbroken infantry. The others never had much luck using it in this fashion. The reason was that saddles were mere pads without stirrups. Stirrups were invented by some Hunnish cowboy about this time, but they did not reach Europe until the end of the Roman period. As a consequence, Hannibal's first battle in Italy, that of the Ticinus, started out as a cavalry fight and ended as an infantry battle because so many of the soldiers fell off their horses.

The Diadochi assembled bigger and better phalanxes, and lengthened the *sarissa* or Macedonian pike to more than twenty feet. They secured many elephants, whose use they had learned in India. Elephants were very useful when used as a screen against cavalry. Against good infantry they worked the first time only. After that the infantry learned to open lanes to let them through. When injured or frightened, the elephants were likely to stampede back through their own army. This was not good for their own army.

Indian elephants fought African elephants once, in one of the most spectacular battles of history: Raphia, 217 B. C. The fourth Ptolemy, surnamed Philopator, had seventy-three African elephants from Ethiopia; his opponent, the Seleucid king Antiochos III, had one hundred and two Indian elephants.

The battle started with a clash of elephants, which must have been a sight: the elephants butted and lunged with their tusks, while the men on their backs poked at each other with *sarissae*. The African elephants fled, but that proves nothing about their fighting qualities because they were heavily outnum-

bered. Then the wings of the armies, composed of cavalry and light infantry, attacked. Each right wing drove off the hostile left wing opposite it. That left the phalanxes in the center to push it out with their pikes. Ptolemy twenty-thousand-man Egyptian phalanx beat Antiochos' ten-thousand-man Syrian phalanx, and decided the battle.

RAPHIA was of no importance politically. Ptolemy married his sister and went back to Alexandria to resume his debauches, and Antiochos recovered all the Syrian territory he had lost.

Meanwhile the Romans and Carthaginians, on the fringes of the Hellenistic world, developed a form of heavy infantry manned with shields and swords and organized in small, flexible units. With these troops the Romans beat Hellenistic armies built around phalanxes four times running. The great age of Roman expansion produced a number of very competent Roman generals, but hardly any real tactical geniuses except Scipio Africanus the Elder. The Roman victories resulted largely from a weakness in the phalanx, and from the fearsomely arduous Roman drill system. The legionaries drilled with extra-heavy weapons. They learned to slash with the sword, jab with the spike on the shield, stab at the enemy's guts, and when he looked down to see what you were doing, catch him under the chin with the meat cleaver top edge of the shield, and all as fast as humanly possible. A legionary in action was a veritable human meat grinder. The Hellenistic soldiers were good, but not that good.

The weakness in the phalanx was inherent in the crudity of Hellenistic close-order drill. The phalanx could

not change or reverse its direction. The general aimed it, gave the word to go, and hoped it would hit where it would do the most good. If attacked in the flank or rear, it was always beaten. In the Middle Ages both the phalanx of pikemen and the legion of swordsmen were revived, by the Swiss and the Spaniards respectively. Both formations—with improved drill—were very successful until gunpowder made them obsolete.

One more big innovation occurred, though nobody appreciated it: the ammunition caisson. This was invented at the very end of the Hellenistic age, by a general whose family name was Suren and who worked for the Parthian king Orodes. The Parthians used both armored lancers mounted on specially big horses, and mounted archers. Neither was a howling success. The knights, lacking stirrups, fell off, and the horse archers ran out of arrows before the battle was well started.

Suren had the brilliant idea of raising a small, highly trained army of horse archers. Each ten-man squad had a fast camel loaded with hundreds of pounds of extra arrows. Suren's system was so successful that with his little army of ten thousand he wiped out a Roman force under Crassus¹ three times his size, at the famous battle of Carrhae. But the next year King Orodes had Suren executed for conspiracy. Suren's corps was disbanded, and horse arch-

ers did not become a decisive arm again until the Turks overran the Middle East in the Eleventh Century.

THE HELLENISTIC navies included the biggest warships that the world had seen or was to see again until the end of the Middle Ages. The heavy battleships are sometimes spoken of as twenty-bankers and thirty-bankers, but a little calculation will show that a ship with thirty banks of oars would be almost as high as it was long, and utterly inoperable.

What happened was this: at the time of the Battle of Salamis (480 B. C.) the standard battleship was a *triere*, or three-er. It had three banks of oars. Each oar was pulled by a single rower. The arrangement of these rowers is doubtful. Each trio may have sat on a single bench, set at an angle so the oars did not interfere; or the rowers may have been staggered vertically. But more motive power was wanted.

During the Peloponnesian Wars the Greeks experimented with ships of four and five banks. They learned two things: that a ship with more than three banks would not work because of interference of the oars, and that two men on one large oar were more easily controlled than two men on separate small oars. A few modifications in a five-banker would convert it into a ship with two banks, a lower one of two-man oars and an upper one of three-man oars; or a ship with a single bank of five-man oars. In either case the ship was more efficient. It was still called a *pentere* or *fiver*—Latin *quinquireme*—though the number now referred to the number of men in one rowing space on one side, regardless of the actual number of

¹Crassus was a financier who got his start running a private fire department. He hired the biggest and toughest fire fighters in Rome. When he showed up at a fire, his brave fire laddies would chase off the men of the other private fire departments, while Crassus persuaded the unfortunate property owner to sign over his building at fire-sale prices. When the sale was closed the fire fighting would begin, if there was anything left worth saving.

banks. Authorities differ as to when these changes in construction and terminology took place.

The Diadochi and Epigoni increased the number of men per oar to as many as ten. Nearly all their big battleships were of one or two banks, though they were called eighteeners, twentiers, et cetera. Demetrios Poliorcetes had a sixteenner that is estimated to have had the following characteristics: length, 180 feet; beam, 30 feet; draft, 7½ feet; displacement, 640 tons; complement: 100 officers and seamen, 440 marines, and 800 rowers. It may have had on each side a lower bank of 25 six-man oars and an upper bank of 25 ten-man oars, plus four steering oars. It may have carried a few small catapults, and its top speed was probably about seven knots.

These ships were shallow-draft vessels with parallel sides, blunt ends, and low freeboards. The Hellenistic shipwrights greatly increased both the size and the seaworthiness of ships. But their products were still, by modern standards, impossibly cranky, unseaworthy, flimsy affairs. A good wind frequently sent an entire fleet to the bottom. A ship squarely rammed might literally disintegrate into a floating tangle of timbers, oars and men. To put to sea in such contraptions took the sort of courage that the early aviators had to have.

And the rescuing of gallant enemies hadn't been thought of.

Hellenistic improvements in shipbuilding slowed down and stopped just when they were getting somewhere, and big battleships dwindled in numbers. It was not that these big ships were not efficient—they were extremely effective—but that they were so expensive to build and man that nobody but the Ptolemies

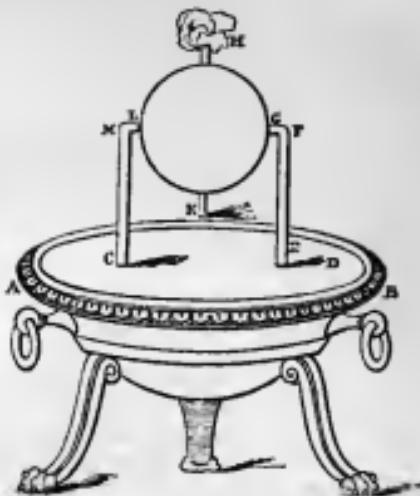


Fig. 4. The famous steam turbine invented by Heron. Based on the rocket-reaction principle it was more showy than workable in the sizes actually constructed.

could afford them.² After the Romans annexed Egypt there was nobody in the Mediterranean for them to fight except pirates, with whom light cruisers were adequate to deal. For the time being the battleship disappeared.

Shipbuilding stagnated for many centuries thereafter. The Venetian galleasses that broke up the Turkish attack at Lepanto (1571) were practically improved Hellenistic tenners, with cannon mounted in deckhouses. This battle showed (a) that cannon were to be the decisive arm at sea, and (b) that cannon so weighted a ship that the rowers could hardly move it. Thereafter warships were built to carry more sail, more guns, and no oars at all.

²Similarly in 1914 twelve nations had modern battleships built or building, whereas in 1939 only half as many countries were constructing them—even counting the U. S. S. R.'s *Treaty International*, which is probably still on paper. But the ships building in 1939 were much more formidable.

It is an impressive record, isn't it? Yet we know that such a burst of scientific and technological activity *can* lead to a Machine Age, and the Hellenistic science did not.

Before we can draw any conclusions, we shall have to see what trends we can detect in the history of Hellenistic science.

As far as we can tell at this late date, the story of its trends is very simple.

It arose around 300 B. C.; flourished brilliantly for about a century; declined somewhat in vigor but continued to produce for another century; and then—petered out.

Is that all? Yes, I'm afraid it is. Shucks.

The baffling part of it is that the decline cannot be correlated with any obvious social, political, economic, racial, climatic or other movement in the eastern Mediterranean at that time. There were wars, yes. But the wars of the Diadochi and Epigoni were not as bloody as many comparable wars before or since. They were mostly fought by professional soldiers, and a general was less interested in killing off the hostile mercenaries than in capturing them and enlisting them on his side.

There were no great barbarian invasions. The Gauls invaded the Balkans and Anatolia, but in a few decades they had either been expelled or had settled down in their own little state of Galatia.

The Romans with their unscientific "practical" outlook—which in the long run proved highly impractical—did not get control of the eastern Mediterranean until the decline in scientific activity had pretty well run its course. The well-marked intellectual trends of the Roman Empire—pedantic, rhetorical artificiality on one hand and antiscientific mysticism on the other

—occurred still later. (Some whitherers think a similar development in our civilization will come to pass.)

According to the precedent of our own civilization, the discoveries of the Hellenistic savants should each have encouraged more research and produced more discoveries, until the whole corpus of science grew to where it was a self-supporting institution—that is, until research was to the material advantage of so many people that it did not have to depend on the patronage of rulers and the casual interest of gentlemen with nothing else to do. Hellenistic science obviously never got to that stage. Why not?

The usually assigned causes are the following: Hellenistic science was largely a class occupation; a recreation for gentlemen, who left all physical work to slaves. Hence the scientists were indifferent to experiment, or regarded it as actually demeaning.

They had a tendency toward verbalism: toward thinking they had explained a phenomenon when they had given it a fancy name, and toward confusing abstractions such as numbers, and subjective concepts such as "perfection," with objective reality.

With this went a tendency toward wild extrapolation: taking a few facts, incomplete and often wrong, and from there constructing the laws governing the entire universe.

They had political and religious opposition to contend with. The Ptolemaic Empire was an absolute monarchy, and the Ptolemies did not encourage political discussion.

ALL THESE are true to a greater or less extent. But they are not true in all cases. There were able experimenters among the Alexandrines, even if like Aristotle and Archimedes

they were somewhat ashamed of their experiments.

The scientists of the Reformation period, who started our own scientific age, had just as much inherited verbalism and extrapolation to contend with, in the form of scholastic philosophy. And they faced as much political and far more religious opposition. True, the ancient Libyans worshiped baboons, and any man who killed a baboon they executed as a notorious atheist. But no Alexandrine scientist was compelled to kill Libyan baboons. A Ptolemy might forbid dissection, but he did not burn the dissectors for heresy, as Giordano Bruno and Miguel Serveto were burned. (The Catholics burned the first and the Protestants the second, so boners are even.)

I do not personally think that these handicaps are adequate to explain why Hellenistic science fizzled, though they all no doubt contributed. Some further suggested causes are: First, technological unbalance of the basic culture. By this is meant simply that a lot of collateral arts and crafts had not developed to the point where the scientists could make use of them. The most glaring handicaps are the difficulty of spreading and preserving the written word, and the crude state of glass manufacture.

The typical book of the Hellenistic period was a long strip of papyrus rolled on a pair of spindles. Papyrus was a sort of mat made of strips of an Egyptian reed. It is fairly flexible, rather brittle, and has a slick surface. The wear on a book that had to be rolled from spindle to spindle like a pianola record can be imagined, as well as the inconvenience.

In the Second Century B. C. King Eumenes II of Pergamon, peeved at

the scarcity of papyrus, invented or bired someone to invent a process of dressing sheep and calf skins to make them suitable for writing material. The name of Eumenes' kingdom is preserved in the modern name for this substance: parchment. Parchment proved admirably durable, but was rather stiff for rolling on a spindle. Some unknown genius had the idea of making a book of separate pages piled in a single stack and fastened together on one side of the stack. This—the modern—type of book was called a codex, and came into use during the First Century A. D.

But it was too late to help preserve much of the records of Hellenistic science. During Julius Caesar's brief Egyptian War the Library of Alexandria had been set afire, and most of the books went up in smoke. Caesar replaced as much of the loss as he could, largely with inferior stuff. Thus it remained for some centuries. At the time of the fire not very much scientific work was being done, and not very much was done thereafter. Around 400 A. D. the sainted Bishop Cyril, whom we have already met, sent his monks to prowl through the Library looking for works by the diabolical pagans to destroy.

Thus when the Arabian General 'Amr took Alexandria from the Byzantine Empire in 640, there was not much Hellenistic science left in the Library. Doubt has been thrown on the famous story that the Caliph Omar wrote General 'Amr, saying that these books of the Greeks either agreed with the Koran, in which case they were superfluous, or disagreed with it, in which case they were pernicious, wherefore it were better to destroy them. Many of the works turned up in Arabic translations during the brief, but quite

productive, Scientific Age of Islam of the following centuries.

Not even the best writing material could have overcome the Hellenistic handicap of minute editions. But nobody invented printing; no reason is known; they just didn't. They had seals, and coin dies, which are first cousins of the printing press; they had the Babylonian cylinder seal, which is practically an embryo rotary press. They had an easy calligraphy. Perhaps the difficulty of the Gothic letters and the complexity of the Chinese ideograms drove the Medieval Europeans and the Chinese later in desperation to invent printing.

WE HAVE SEEN how the physicians and the astronomers got stuck because they had to depend on their naked eyes. The Alexandrines had glass, and moreover glass was often cast in lens-shaped pieces for ornaments. They, or at least people who came shortly after, knew the power of a fish bowl to concentrate the sun's rays and perhaps set a fire.

But the glass of the Hellenistic age was usually colored, full of bubbles, and more or less opaque. It was used for drinking vessels and ornaments. Good clear glass suitable for windowpanes came in under the Roman Empire. Again it was too late to help the Alexandrines. When people were looking at planets and tissues, the material for telescopes and microscopes was not available; when the material was at hand people were no longer much interested in astronomy and medicine.

Thus science was forced to go to sleep, as it were, until the utilitarian arts on which it depended had caught up with its requirements. That brings up another factor: Could not one of the geniuses have set himself to inventing optical glass,

and then the telescope and microscope? Perhaps he could have; more likely the job would have taken several men's lifetimes.

But how were the Alexandrines to know that this was the course to take? The answer is that they weren't. Neither could they be expected to know that they had to invent a good clock before they could get much further in physics. Just so in our own future it may transpire that space travel will wait many years, until some mechanic who is not the least interested in space travel invents a blowtorch that supplies the needed clue. If we knew now that such would be the case, we could set a horde of engineers to inventing blowtorches. But we don't know, and shall be wise only after the event.

A patent law might have helped the Alexandrines by encouraging common men to make all those little improvements in the utilitarian arts on which the progress of science depends. Nobody thought of that.

Another factor was the lack of large-scale industrial organization. There was no capitalism in the modern sense. The typical factory was a family affair with a couple of slaves to do the dirtiest of the dirty work. Governments often engaged in large enterprises such as building fleets or operating mines. But even here the deliberate trying out of new ideas, as was done by Demetrios Poliorketes, and by the rascally Dionysios of Syracuse long before, was regarded as the mere eccentricity of a great man, something to be endured rather than copied. Large-scale manufacturing appears to be a modern idea; actually, the modern capitalistic and socialistic ideas on the subject are much closer to each other than either is to the premachine concepts.

In a large factory, opportunities for technological improvement are fairly easy to see, and when they are seen, the concern may have sufficient financial stability to risk trying them out. Things were different in the little Classical workshops.

Hellenistic science may have suffered, in a roundabout way, from the cutting off of the overland route to India. This was destined to happen when the first Seleucid, Seleukos Nikator, was defeated by the Indian emperor Chandragupta, and ceded a lot of what is now Afghanistan to him. Seleukos in return got money and elephants to fight Antigonos One-eye. It seemed like a good bargain: the elephants turned the trick at Ipsos, when they prevented Demetrios Poliorketes from coming to his father's help.

But then Seleukos' governor in Bactria, Diodotos, revolted, and neither Seleukos nor Chandragupta was able to suppress him. Then a fugitive Scythian chief named Arsak seized the rule of Seleukos' province of Parthia—about 250 B. C. His successors enlarged their realm, which they called—on questionable grounds—the Parthian Empire, until it included all Iran.³ Arsak's dy-

nasty, the Arsacids, never forgot that they were supposed to be rough, though nomads, and Europe said good-by to the overland route to India.

INDIA has made only two really important contributions to science. But these two were important. The first was a system of numerals using place value and a symbol for zero. Zero *may* have been in use as early as the Hellenistic age, though this is not certain. It might have enabled the Hellenistic mathematicians to go on to modern arithmetic, which ought to have stimulated thought in all the other branches of mathematics. Hellenistic mathematicians, Plato or no Plato, discovered and studied many curves other than circular arcs, and they did the conic sections up brown. These combined with the cartographers' new invention of a gridiron of co-ordinates on maps could easily have led to analytic geometry, which was actually developed by Descartes long afterward. Analytic geometry plus the study of limits, which had arisen in connection with the calculation of *pi*, could have guided them to calculus.

The other contribution is scientific linguistics, already noted. If the Alexandrines had become familiar with Panini's grammar, they *might* have married it to Aristotle's logic and evolved a science of semantics. At any rate a comparative study of languages might have put a check on one of their worst failings, their verbalizing tendency. It is true that the possession of scientific grammar did not prevent the Indians from becoming even worse verbalizers and foggier mystics than the Neoplatonists.

So, if Richard Farnsworth decided to give Hellenistic science the extra

³During the period of the Assyrian Empire, the Iranian plateau had been overrun by nomads from what is now Turkestan. These people spoke Indo-Iranian and were probably of Alpine racial type. They called themselves *Aryas*, meaning "the noble ones," and the tribes they settled Aryana, whence the name Iran and their much-abused word "Aryan." Of their several tribes, the Persas or Persians settled in the southwest, calling their new home Persis—modern Fars. The Mada or Medes settled in the northwest. The Parthava or Parthians settled east of the Medes, calling their country Parthia—modern Khurasan. The first ruler of all the Aryas was the Median king Uvakhshar—Greek, Cyaxares—and his realm was called the Median Empire. His son was overthrown by the Persian king Kursub—Greek, Cyrus—who founded the Achaemenid dynasty. The realm was then renamed the Persian Empire. The Aryas' fellow nomads who stayed in Turkestan and the Ukraine and retained their nomadic ways were called Scythians, Sarmatians, Haecae or Dahae, these terms sometimes referring to particular tribes and sometimes to all the stay-at-home Aryas. Arsak was one of these and not a Parthian at all.

push that would enable it to give birth to a Machine Age and to hell with the consequences, what would he have to do?

He could, of course, write books and give lectures setting forth such modern ideas as the law of gravity, the periodic table of elements, and the law of organic evolution. All these might do some good. But it is questionable whether they would be enough to start a Machine Age. He would have the greatest difficulty in collecting enough evidence in his lifetime to establish any of these permanently. Without modern means of transportation, for instance, he would have difficulty in traveling about fast enough to discover and collect enough fossils to set up the science of paleontology. He could say that Aristarchos and Kidiunu were right about the Solar System, but without a telescope he would be just one more theorizer unable to prove his ideas conclusively. Perhaps the best theoretical contribution he could make would be a system of inductive logic, to provide a methodology for scientific research.

Should he plan to associate himself with some Alexandrine glass manufacturer, and spend a decade or two in developing good optical glass? Or should he devote himself to the development of a printing press? Or should he try to make a steam engine that would drive a ship? It would be a heavy decision to make. Whatever line he attacked, he would have to depend on the crude materials, the feeble tools, and the inaccurate measurements of the time. (Quantitative statements by Hellenistic writers are hard to translate into modern measurements because we can never be sure which of the many different cubits, stadia, or

talents they are expressed in.)

If he decides on the steam engine, or if one of the Alexandrines had taken Heron's ineffective little turbine and Ktesibios' compressed-air cylinders and developed a workable reciprocating engine, what would have been the result? Where could such an early engine be applied with greatest immediate effect?

The most obvious application of the steam engine would have been in shipbuilding. The steam engines of around 1800 made their way against the competition of efficient sailing rigs. A large Hellenistic ship had one or two masts, each with one huge bellying square-sail that could not be used for beating into the wind at all. If the steam engine had been introduced at that time, sails might have disappeared without ever developing into the vector-sail rigs that work with such beautiful efficiency on a modern schooner. Nobody would have much regretted the disappearance of the rowers, who consumed such enormous amounts of food and water, tired so quickly in a five-knot sprint, and could be smelled a mile to leeward.

Contact with India might have been kept up much better than it was under the Romans; regular voyages to China would have become feasible. At that time China had paper to offer. It probably did not have printing or gunpowder.

The earliest known printed book contains the statement: "Printed on May 11, 868 A. D., by Wang Chieh, for free general distribution, in order to perpetuate the memory of his parents." Gunpowder appeared in China about that time or a little later. The Chinese made some military use of it: they threw huge firecrackers at the enemy to frighten their horses. Guns

seem to be a European invention. Although Europeans have claimed the independent invention of gunpowder and printing, there is more than a suspicion that these inventions came from China. For instance, Friar Roger Bacon, who wrote the first European treatise on gunpowder, is known to have been acquainted with his fellow-Franciscan, William of Rubrouck, after the latter's return from the Mongol capital at Karakorum, where gunpowder was known. The invention of the compass is also commonly ascribed to the east, but Willy Ley has written an article arguing forcefully that it was invented in Europe in the Dark Ages and thence percolated to Asia. The Chinese scholars, it seems, liked to amend old records.

Let us suppose that Rhichardos Pharnsouorthes succeeds in getting his steam engine and printing press under way, and prints a book on inductive logic. This is supposing quite a lot. There is no reason to think that any real intrepid explorer of time and space would be not only an intrepid explorer but a walking encyclopedia and an inspired mechanician and craftsman as well. He might then tackle the job of making decent optical instruments. He might or might not succeed; he would probably be a pretty old man by that time. At any rate, if he did succeed, the effect on civilization of the telescope and microscope would not become immediately apparent. What would the world then look like, say about the beginning of the Christian Era?

ALEXANDRIA would be even bigger than it actually became, because of the growth of factories. The handsome monuments of the Ptolemies would be covered with soot from the

factory chimneys. The concentration of power implied by the steam engine would not only have created large factories; it would have forced the early growth of a very grim form of corporate capitalism to manage these units. But factories would be already spreading to other parts of the Mediterranean. The progressive kingdom of Pergamon has a lot of them. The trouble with the Ptolemies is that as soon as a business becomes prosperous, they crush it with taxes or confiscate it outright to get money for bigger and better debauches.

To the west, Rome and Carthage are still minor states. Carthage still has its Spanish empire. The Romans, supremely uninterested in machinery, are about a century behind the eastern Mediterranean in the development of steamships. The Carthaginians were a little more progressive, and retained control of the sea in the Punic Wars. They would have crushed the Romans, but the Hellenistic monarchies stepped in and made them unhand their victims, to provide a future counterpoise to Carthaginian power.

The Carthaginians, lacking the mechanical aptitude for making steam engines, build their hulls in Carthage and tow them to Alexandria or Antioch to have the engines installed. They have no clear idea of how the things work. To make sure that they do work, they have set up a huge temple to the Carthaginian steam engine god, Baál-Tshûg. Nowadays when one of their steamships blows up, instead of roasting their children in an idol of Moloch, they scald them to death in the statue of Baál-Tshûg. This mighty god also has a cult at Alexandria, where he is worshiped under the name of Pneumos, without the

horrid human sacrifices of the Carthaginians.

Ships are less fragile, because their sides need not be perforated for oarlocks. Ships of the Carthaginian navy still carry a full set of oars because the admiralty regulations say they must, though they have no oarlocks to hold the oars and no rowers to pull them.

The Alexandria-Memphis-Thebes and Alexandria-Antioch railroads have been in use for some time. The stretch near Gaza is heavily guarded against Arab bandits, who otherwise would pile rocks on the tracks and, when the next train had stopped, ride round and round it whooping and throwing javelins into the cars. A small self-propelled armored railroad car, with a cupola mounting a spear thrower, precedes each train.

The railroad from Antioch to Pergamon would have been finished—it is, in a sense—but the kings of Armenia and Cappadocia, through whose territory it passed, built railroads of nonstandard gauges. So every passenger and parcel has to be transferred to another train at the border. When there is a war and the borders shift, the winner pries up the rails and spikes them down again at his national gauge.

Free-wheel steam vehicles have been built. But without rubber tires they so jar their passengers, and they are so hard to steer, that they are used only by a few rich Alexandrines who will put up with the discomfort in order to make an ostentatious display of their wealth. It will be another few decades before iron metallurgy is capable of producing a spring-steel capable of cushioning them, and iron wheels won't stand up as rubber tires would.

The larger Hellenistic armies have a few armored steam cars which are used in very flat country, as in

Babylonia. They each carry one small spear thrower and have loopholes for firing crossbows through. It has been found that the crossbow or *gastraphetes* is not merely an interesting toy, but an ideal missile weapon to fire from armored cars. As a result it has come into common use a thousand years sooner than it would have otherwise. Against barbarian troops these cars are very effective, mainly by intimidation. Against civilized infantry they are not so good, being easily ditched or set afire unless heavily guarded. And under a hot sun they become practically uninhabitable.

Attempts have been made to build steam-driven flying machines on the ornithopter or flapping-wing principle. To date none of these machines has gotten off the ground, and there is a general conviction that they never will.

ALTHOUGH the government of Egypt is corrupt and ineffective, the country's great wealth has been so increased by its factories that the kingdom is not at present beatable by a combination of outside powers. It is even extending its boundaries and setting up colonies on the coasts of Africa, which is now easily circumnavigated because navigators do not have to try to take sailing ships through the doldrums of the Equator and into the teeth of the trade winds.

But there are ominous signs at home. The good-natured Egyptian *fellaheen* have been herded into factories, where they can easily compare grievances. With the coming of printing, the propaganda of Stoic communism is being spread. There is great demand for books on the three Spartan communist kings, Agis IV, Kleomenes III, and Nabis.

Conservative philosophers and politicians point out, correctly, that Agis, far from being a progressive leveler, though he was restoring the Fascistic Lykurgan system; that Kleomenes forgot his program of social reform when he had won a few military victories, and began to think of himself as a second Alexander; that Nabis, while he did free a few of the helots, imposed a hard-boiled proletarian dictatorship that was as difficult to bear as any tyranny, and benefited few people in the end. But the movement goes on. One of these days Egypt will see a real upset, under the slogan "Out with the Macedonian Oppressors!"

The revolution will be a terrible setback for Alexandrine science; many of the scientists will be killed because their hands lack calluses, or because they speak Greek. The revolution will end in a Napoleonic reaction; the proletarian-nationalist dictator will make himself king and

start a new dynasty. It will seem as though all the social gains of the revolution had been lost. They will not have been—quite. Man will continue on his way. Where to? Come back and ask me five hundred years from now and I'll continue my extrapolation.

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THE END.

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MANIC PERVERSE

By Winston K. Marks

Men had attained immortality—only direct violence could bring death. Even suicide was stopped by a field of paralyzing thought-waves. And that very inability to die drove some mad—

Illustrated by Kramer

ROBERT MASON concluded his thesis on economics with a fact which his research had proved indisputable. Behind a thousand financial titles, through a maze of subsidiaries and holding companies, he traced a single integrating force which at once avoided and escaped the antitrust laws and yet controlled everything. In short: "Universal Insurance Institute owned the world."

Professor Collins looked up from the last page of the paper to see its author enter the blue study. His chin was set with stubborn determination. "You sent for me?"

"Good evening, Robert. Yes, I sent for you. This is splendid. Splendid. Your insight is exceptional."

"Then you agree with my conclusion?" Mason's hands unclenched disappointedly.

"Of course. Any student of government and finance will agree with you. U. I. has been running this planet since before you were born. It is not generally known, however. What led you to this study?"

"The conviction that all that is altruistic is not morally justified." Mason rubbed the soft stubble of beard on his chin with embarrassment. "Who else but an insurance company would enforce the laws of

mortality to such a ridiculous extent? Why, a man's life isn't his own."

"You misinterpret, Robert. A man's life is his own. His right to destroy it is not. But come, is your life so unhappy?"

Mason brushed aside the question. "They've made the world almost deathless. I'll admit the instinct is to live, and their accident prevention campaigns and their medical centers have wiped out a great deal of misery. But, professor! A single death makes news. A highway wreck makes headlines over the world, and a successful suicide attempt—"

"Come out of your histories, Robert. Your attitude is unreasonable. The world has gratefully adjusted itself to a deathless existence. Perhaps you admire your ancestors too much. Their valor in living under certain penalty of death is most noteworthy. Perhaps you cherish that lost martyrdom a little more than most of us. Be that as it may. You are well protected against any foolish impulses." Collins raised his hand, and the student held his retort.

The professor slipped a long finger into his bookshelf and tilted out a bound pamphlet. "A first and only edition of a prophecy written over three centuries ago. Glance over it."



MASON SETTLED himself and flipped through the pages. It was a long-termed prediction based on insurance trends of that time. The accumulation from premiums was vast even then. Real estate was rapidly becoming the monopoly of insurance investors. Soon, it was stated, this vast reserve of wealth would encompass industry and transportation, and an inevitable

amalgamation of these interests would weld a financial structure which would dominate every government on the globe.

In self-protection, as always, this insurance trust would continue scientific progress in the control of hazards to life and property until, at length, destruction of either became a rarity instead of an eventuality.

The author hesitated to predict immortality, but his faith in this altruistic juggernaut suggested a time when, "a claim for indemnity shall be considered a black defeat to the purpose of this supersurety company."

Was this good? The author thought so. The value of insurance lay in its doctrine of stability. When

it came to pass that every major transaction was motivated by this unselfish philosophy, the millennium should have arrived.

The student slapped the book shut.
"He didn't describe the millennium."

"You have it about you. By ancient standards you are a young god. He could not predict that. You see, even to the widest imagination the road of the future has humps. Only the roughest profile looms on the horizon. Who, in the past hundred years, for example, could have guessed the void in the heart of our sun? Or the impermeability of the heaviside layer to organic matter? Or the true source of the aurora?"

Mason shook his head impatiently. "Why is death denied us? With absolute birth control there can be no serious fluctuations in population."

"You have said it yourself. The instinct is to live. The impulse to suicide or murder is always a short-lived initiative. When the mood is past, the victim is invariably thankful the act was prevented. Your attitude desecrates the miraculous discovery that allows us to protect ourselves against these murderous impulses."

The old gentleman tilted back in his pneumatic rocker. "Robert, you have tried to kill yourself . . . no, don't deny it. You speak with conviction on a device which a majority of people scarcely realize exists. It was over a girl? And another boy, a close friend, perhaps?" He smiled. "We have long needed protection against some of love's manifestations."

"There was no girl," Mason said simply.

The professor's melancholy smile evaporated. Fine lines drew in at his eyes. "This is enough, Mason. I accept your thesis for your doctorate provided you relinquish the

right to publication. Your attitude is negative. I cannot allow you to use this paper as a stepping-stone to authority on morals. Good evening!"

Before the door had closed Collins had drawn out a clean sheet of paper, written across the top: Robert Mason; and under it he began making brief notes from memory. At length he opened a file and slipped the report into a bulging folder labeled, "Manic Perverse." He frowned grimly.

TWO MILES away Robert Mason's two-person vehicle reached its ceiling. Deliberately he had neglected to set his destination, so each time a collision impended within ten miles ahead the compensators dragged at the motors or spurted the craft forward. Mason didn't mind the jerky motion. The authorities advised against uncharted travel as conducive to bumps and bruises. It was the nearest "unsafe" experience a man could enjoy in this age.

The curious compulsion was strong upon him again. Certainly a man could die if he wanted to.

Involuntarily his mind sought ways to thwart this eternal conspiracy. For a moment he considered the *apandemic field* itself. No, that was useless. One could not escape the microwaves that permeated every cubic foot of space and matter from the Earth's core to the boundary of the Earth's atmosphere. Constantly, insidiously tuned to the sensitive vibrations of the electrostatic brain field of man, their precise wave length interfered with that nervous emanation peculiar to the mental depression of suicide. Another broader band covered the several murder impulse emanations. Coincidence of brain and apandemic waves overloaded synaptic gaps.

The individual slipped into momentary unconsciousness. Uncontrolled, the brain reverted to normal vibration, and the interference disappeared.

Mason shook his blond head desperately. This past hectic year the mood had been growing on him until what had once been mere curiosity now gripped his whole soul. The condition was unreal inasmuch as it denied self-debate on the desirability of living or dying. An atavistic fear of death sought justification, and there was only one mad way to justify this fear—to die.

His mind roved over his present potentialities. Altitude eight thousand feet. Speed six hundred miles per hour. Trapdoor in the luggage compartment behind him. With an easy motion he touched the panel. A red light on the dash and a whistling suction told him that the metal floor plate had slid aside. His ears popped as the air pressure dropped sharply in the cabin.

Now! He needn't step through the hole. All he need do was sit beside it and relax. Splendid! The pitching craft would ultimately toss his loose body through the wide aperture. He need not make the overt move.

Gently he leaned forward, pressed his hands down behind him, raised himself three inches from the leather seat. It should work. It was subtle.

Not good enough.

Robert Mason settled back stiff and erect, his body swaying now and then. The tenseness left his mouth.

He became aware. A deep muscular relaxation brought a heavy sigh. "Damn!"

It had been the same thirty-one times before. Each time he thought he had achieved finesse. The difficulty lay in the mind. He knew there were foolproof ways to kill

himself. But at the instant of their conception—blackness! No use trying to remember, for obviously they had been too direct. The rope, for instance.

A low bench under a tree with a suitable limb. A length of rope. But no, he couldn't climb the tree, for it occurred to him that once out on the limb to tie the rope, all he need do was relax or willfully consider suicide. The fall might have been fatal.

He had found himself prone at the trunk with bits of bark slivered into his cheek.

Some of his aborted efforts had been messy, some embarrassing. As at the infirmary last week.

Swallowing a heavy but nonfatal dose of narcotic, he had staggered into the campus hospital shrieking, "Migraine!" The preliminary treatment for this deep-seated mysterious malady was a hypodermically given sedative. The combination of drugs should have gained him his end. He counted on the uncertainty of persuading the intern to inject him to keep him from the paralytic state of mind. But when the man in white rustled up with the syringe, a drop of the cold solution exuded from his nervous needle and splashed to Mason's bare skin. Instantly he stiffened in unconsciousness. The doctor recognized both the condition and the ruse, slapped Mason to his senses and promised to commit him to indefinite psychiatric confinement when he saw him again.

Thank heavens they couldn't prove anything. Thank God you can't see a headache.

A terrible loneliness filled Mason as the lights of Chicago thrust their halo over the black horizon. Why couldn't he throw off this deadly compulsion that distorted his waking thoughts into morbid nightmares

of fruitless struggle? Why was he unique in his inability to adapt himself?

He tilted the nose of his craft down and drove it in a power dive at the distant beacon. The landing beam picked up his controls. The vicious dive ended in a silent glide.

THE CONFIDENTIAL psychiatric committee of the Senate met in a small conference room on the seventieth level of the Universal Insurance Institute Building. The chairman addressed himself to the last witness.

"This committee owes you an apology, Professor Collins. Your earlier reports have been substantiated from a dozen sources. There is no longer any doubt that the condition you have described and named *manic perverse* exists and is spreading. We agree that steps must be taken to remedy this before we have a general obsession on our hands."

"One peculiar tendency of the victims explains the lack of knowledge on our part. Each considers himself alone in his predicament. However, it is unlikely this condition will remain secret, and when the story breaks—"

He glanced around the chamber. Every man present was a potential betrayer.

"The most contagious epidemics have been psychological. This one could prove as vicious as the old mass war hysterias. Therefore, I have proposed a discontinuation of the apandemic field."

Bald and gray heads bobbed back in dismay.

"It's barbaric! We can't save by destroying."

"Mass hysteria will pass. Mass suicide is final."

"Mr. Chairman, I demand your resignation!"

Another senator was on his feet to second the motion, when the chairman stretched out both hands for silence. His words were calm and delivered with a slow smile.

"You shall have my resignation if you wish, but first—"

PALE, red-eyed Robert Mason shivered on a lonely beach of icy Lake Michigan. His feet were numb from the slush, and a cold wind hit through his light clothing. But all desire for comfort was gone. His obsession had obscured his last grain of reason.

The world before him was gray water and gray skies. Low over his horizon a black sun beckoned him, and in his madness he stepped forward. Foot-high waves slopped at his knees. The water felt strangely warm. Another step, a soft splash to his right—he whirled.

A hundred feet down the rocky, snow-spotted beach a young girl in a bathing suit was entering the light surf. Mason wanted to hide from her, but it was too late. She had seen him and stopped also. They stared dumbly at each other.

"You little fool, this beach is forbidden. It's unpatrolled this time of year," he shouted hoarsely.

Defiantly she yelled back, "What are you doing, surf fishing?"

"I didn't come here to bathe."

"Neither did I."

The figures moved together, slowly stumbling through the waves. Their hands touched and clasped, and they didn't speak again. The explanation was so simple neither could miss it. They had a common purpose.

Even under the sodden clouds Mason saw that her wind-tossed hair was beautiful. She had no right to die. But then neither did he. For a moment he felt sorry for them both, and he saw the same emotion in her,

pale expression. In both the long-hred compulsion hattled with another emotion, a belated desire to live and love. But the compulsion was the stronger. They turned side to side, hands still clasped, and started off the sharp drop-off.

Half exultant, half panicky, they struck out through the bitterness of water in which ice floes still lived.

Mason fought off the numhness which he thought to be the tardy apandemic paralysis. And then he fought harder, spurred suddenly hy an overwhelming force inside him.

"Go hack!" he screamed at the girl. A wave dropped away, and down the trough he glimpsed the girl's face, white, incredulous. Her lips moved. Then a cramp douhled him beneath the surface. Someone had jerked a steel drawstring in his stomach. His head thumped hard against his suhmerged knees.

And then she was standing beside him, peering through the window of his oxygen tent. She was truly heauiful, even in the starched white of a hospital dressing gown. His head throhbed and hurt worse than the terrihle congestion in his lungs. But neither pneumonia nor sulfanamide could quench his fierce thirst to live now.

"We can die," he whispered. "We can die, so—now we can live."

She couldn't hear, hut she nodded. She understood; between them was a bond welded hy the presence of death, a rare and precious phenom-enon in this age.

—let me confess. At Professor Collins' and my insistence, the president exercised his authority granted in the Emergency Clause in the Apandemic Control Act. Pending

ratification hy the Senate and the World Congress, the apandemic field has been discontinued. For three days, seventy-two hours, now, the restraint has been nonexistent."

He selected a report from his brief case and read from it. When he finished there was silence. "So you see, gentlemen, these hourly statistics indicate a mortality increase so slight as to be negligible. The effect is better than we dared hope. A properly prepared publicity on the whole matter is next in consideration. His excellency, the president, has suggested a continuation of this brief moratorium of immortality during which the remainder of the victims of manic perverse delusions shall be free to dispose of their lives or their obsessions."

"And then," demanded a pessimistic senator, "when we have buried these uncounted multitudes—what then?"

"Regenerate the field, hut keep in hetter contact with our department of psychiatry henceforth."

The chairman closed his case and stood up. "This is merely a proposal, of course, pending your ratification."

"And if we refuse to ratify?"
"Come, senator, we must face the facts."

And the Senate suhcommittee faced the fact—that their chairman was also Congressional Representative of Universal Insurance Institute. They could demand his resignation and possibly impeach the president, but to what end? Universal Insurance Institute was unimpeachahle, omnipotent and, after all, *altruistic*.

To a man they shrugged their shoulders and voted to recommend ratification.



TWO PERCENT INSPIRATION

By Theodore Sturgeon

They had a bit of information the Martians most insistently wanted. The Martians had murder in mind as they chased them; the humans had a small trick in mind—

Illustrated by Rogers

DR. BJORNSEN was a very thorough man. He thought that way and acted that way and expected

others to exceed him in thoroughness. Since this was an impossibility, he expressed an almost vicious

disappointment in incompetents, and took fiendish delight in pointing out the erring one's shortcomings. He was in an ideal position for this sort of thing, being principal of the Nudnick Institute.

Endowed by Professor Thaddeus MacLhainy Nudnick, the institute was conducted for the purpose of supplying brilliant young assistants to Professor Nudnick. It enrolled two thousand students every year, and the top three of the graduating class were given subsistence and a considerable salary for the privilege of entering Nudnick's eight-year secondary course, where they underwent some real study before they began as assistants in the Nudnick laboratories.

Bjornsen never congratulated an honor student, because they had behaved as he expected them. He found many an opportunity of delivering a kick or two in the slats to those who had fallen by the wayside; and of these opportunities, the ones that pleased him the most, were the ones involving expulsion. He considered himself an expert disciplinarian, and he was more than proud of his forte for invective.

It was with pleasurable anticipation that he summoned one Hughie McCauley to his office one afternoon. Hughie was a second-year student, and made ideal bait for Bjornsen's particular line of attack. The kid was intelligent to a degree, and fairly well read, so that he could understand Bjornsen's more subtle insults. He was highly sensitive, so that he could be hurt by what Bjornsen said, and he showed it. He lacked sense, so that he continually retorted to Bjornsen's comments, giving the principal blurred statements to pick meticulously apart while the victim writhed. Hughie was such perfect material for perse-

cution that Bjornsen rather hated to expel him; but he comforted himself by recalling the fact that there were hundreds of others who could be made to squirm. He'd take his time with Hughie, however; stretch it out, savor the boy's suffering before he kicked him out of the school.

"Send him in," Bjornsen told the built-in communicator on his luxurious desk. He leaned back in his chair, put the tips of his fingers together, lowered his head so that only the whites of his eyes were visible as he stared through his shaggy brows at the door, and waited.

Hughie came in, his hair plastered unwillingly down, his fear and resentment sticking out all over him. The kid's knees knocked together so that he stumbled against the doorknob. There was a gloss of cold sweat on his forehead. From previous experience, he had no difficulty in taking up the front-and-center position before the principal's desk.

"Y-yes, sir?"

Bjornsen made a kissing noise with his wrinkled lips before he spoke, threw back his head and glared. "You might," he said quietly, "have washed your ears before you came in here." He knew that there is no more painfully undignified attack for an adolescent, particularly if it is not true. Hughie flushed and stuck out his lower lip.

Bjornsen said, "You are an insult to this institution. You were in a position, certainly, to know yourself before you applied for admission; therefore, the very act of applying was dishonest and insincere. You must have known that you were unfit even to enter these buildings, to say nothing of daring to perpetuate the mistake of the board of examiners in staying here. I am thoroughly disgusted with you." Bjornsen smiled his disgust, and it was a

smile that perfectly matched his words. He bent to flip the switch on the communicator, cutting off its mellow buzz.

"Yes?"

"Dr. Bjornsen! Professor Nudnick is—"

The annunciator's hollow voice was drowned out in the crashing of a hard, old foot against the door. Nudnick kicked it open because he knew it could not be slammed, and he liked startling Bjornsen. "What sort of nonsense is this?" he demanded, in a voice that sounded like flatulence through ten feet of lead pipe. "Since when has that vinegar-visaged female out there been instructed to announce me? Damn it, you'll see me whether you're husy or not!"

BJORNSEN had hounced out of his chair to indulge in every sort of sycophantism short of curtseying. "Professor Nudnick! I am delighted to see you!" This was perfect. The only thing that could possibly increase Hughie McCauley's agony was to have an audience to his dismissal; and what better audience could he have than the great endower of the school himself? Bjornsen rubbed his hands, which yielded an unpleasant dry sound, and really got to work.

"Professor Nudnick," he said, catching Hugie's trembling shoulder and using it to thrust the attached boy between him and Nudnick, "you could not have picked a better time to arrive. This shivering example of negation is typical of the trash that has been getting by the examiners recently. Now I may prove to you that my recent letter on the subject was justified."

Nudnick looked calmly at Hughie. "I don't read your letters," he said

mildly. "They hore me. What's he done?"

Bjornsen, a little taken aback, put this new resentment into his words. "Done? What he hasn't done is more important. He has neglected to tidy up his thinking habits. He indulges in reading imaginative fiction during his hours of relaxation instead of reading books pertaining in some way to his studies. He whistles in corridors. He asks impertinent questions of his instructors. He was actually discovcred writing a letter to a . . . a girl!"

"Tsk, tsk," clucked the professor. "This goes on during classes?"

"Certainly not! Even he would not go that far, though I expect it hourly."

"Hm-m-m. Is he intelligent?"

"Not very."

"What kind of questions does he ask?"

"Oh—stupid ones. About the nature of a space-warp, whatever that may be, and about whether or-not time travel is possible. A dreamer—that's what he is, and a scientific institution is no place for dreamers."

"What are you going to do with him?"

"Expel him, of course."

Nudnick reached over and pulled the boy out of Bjornsen's claw. "Then why not post him as expelled and spare him this agony? It so happens, Bjornsen, that this is just the kind of hoy I came here to get. I'm going to take him with me on a trip to the Asteroid Belt. Salary at two thousand a month, if he's willing. Are you, what's-your-name?"

Hughie nodded swimmingly.

"Eh." Beckoning the hoy, Nudnick started for the door. Bjornsen was absolutely thunderstruck. "My advice to you, Bjornsen," grated the scientist, "is as follows. Keep your nose out of the students' lives on

their off hours. If you must continue in these little habits of yours, take it out in pulling the wings off flies. And get married. Take this advice or hand in your resignation effective this date next month."

Hughie paused at the door, looking back. Nudnick gave him a quick look, shoved him toward Bjornsen. "Go ahead, kid. I'd like it, too."

Hughie grinned, walked up to Bjornsen, and with a quick one-two knocked the principal colder than a cake of ice.

THEY WERE eight days out now, and these were the eight:

The day when the unpredictable Professor Nudnick had whisked Hughie up to his mountain laboratory, and had put him to work loading the last of an astonishingly complete list of stores into the good ship *Stoutfella*. Hughie began to regard the professor as a little less than the god he had imagined, and a little more as a human being. The old man was perpetually cheerful, pointing out Hughie's stupidities and his little triumphs without differentiating between them. He treated Hughie with a happy tolerance, and seemed to be more delighted with the lad's ignorance than by his comparatively meager knowledge. When Hughie had haltingly asked if he might take a suitcase full of fiction with him, Nudnick had chuckled dryly and sent him off to the nearest town with a pocketful of money. Hughie arrived back at the laboratory laden and blissful. They took off.

And the day when they heard the last broadcast news report before they whisked through the Heaviside layer. Among other items was one to the effect that Dr. Emil Bjornsen, principal of the Nudnick Insti-

tute, had resigned to accept a government job. Hughie had laughed gleefully at this, but Nudnick shook his shaggy old head. "Not funny, Hughie," he said. "Bjornsen's a shrewd man. I've an idea why he did that, and it has nothing to do with my . . . our . . . ultimatum."

Struck by the scientist's sober face, Hughie calmed down to ask, "What did he do it for?"

Nudnick clapped a perforated course card into the automatic pilot, reeled its lower edge into the integrator, and checked his controls before switching them over to the "Iron Mike."

"It has to do with this trip," he said, waving the kid into the opposite seat, "and it's about time you knew what this is all about. What we're after is a mineral deposit of incalculable value. How it is, I don't know, but somewhere in that mess of nonsense out there"—he indicated the Asteroid Belt—"is a freak. It's a lump like the rest of the asteroids, but it differs from the rest of them. It must've been a wanderer, drifting heaven alone knows how far in space until it got caught in the Belt. It's almost pure, through and through—an oxide of prosydium. That mean anything to you?"

Hughie pushed a couple of freckles together over his nose. "Yeah. Rare Earth element. Used for . . . lessee . . . something to do with Nudnick Metal, isn't it?"

"That's right. Do you know what Nudnick Metal is?"

"No. Far as I know, it's a trade secret, known only to the workers in the Isopolis Laboratories." The Isopolis Laboratories were half heaven and half prison. By government grant, the great Nudnick plant there turned out the expensive metal. It was manned by workers

who would never again set foot outside the walls—men who did not have to, for everything they could possibly want was supplied them. There was no secret about the way they lived, nor about anything in the fifty-square-mile inclosure except the process itself. "Nudnick Metal is a synthetic element, thousands of times denser than anything else known. That's about all I remember," Hughie finished rather lamely.

Nudnick chuckled. "I'll let you in on it. The metal is the ideal substance for coating spaceships, because it's as near being impenetrable as anything in the Universe. This ship, for instance, is coated with a layer of the stuff less than one one-hundred-fifty-thousandths of an inch thick, and yet is protected against practically anything. We could run full tilt into an object the size of Earth, and though the impact would drill a molten hole thirty miles deep and most likely kill us a little bit, the hull wouldn't even be scratched. Heh. Want to know what Nudnick Metal is? I'll tell you. Copper. Just plain, ordinary, everyday Cu!"

Hughie said, "Copper? But what makes it— How is it—"

"EASY enough. You know, Hughie, it's the simple things that are really effective. Try to remember that. Nudnick Metal is collapsed copper; collapsed in the way that the elements of the companions of Sirius and Procyon are collapsed. You know the analogy—pile wine-glasses into a barrel, and there'll be a definite, small number of glasses that can be packed in. But crush them to fine powder, and then start packing. The barrel will hold thousands upon thousands more. The molecules of Nudnick Metal are crushed that way. You could build four hundred ships this size, from

stem to stern of solid copper, and you'd use less copper than that which was used to coat this hull.

"The process is only guessed at because copper is synthesized from the Uranium we ship into Isopolis ostensibly for power. As you just said, it is known that we import prosodium. That's the only clue anyone but I and the Isopolites have as to the nature of the process. But prosodium isn't an ingredient. It's more like a catalyst. Of all the elements, only prosodium can, by its atomic disintegration, absorb the unbelievable heat liberated by the collapse of the copper molecules. I won't go into the details of it, but the energy thus absorbed and transmuted can be turned back to hasten the collapsing process. The tough thing about prosodium is that it's as rare as a hairy egg, and so far no one's been able to synthesize it in usable quantities. All of which makes Nudnick Metal a trifle on the expensive side. This lump of prosodium in the Belt will cut the manufacturing cost way down, and the man or concern or planet that gets hold of it can write his—its—own ticket. See?"

"I will," said Hughie slowly, "if you'll say all of that over again a few thousand times a day for the next couple of years." The boy was enormously flattered by the scientist's confiding in him. Though he himself was not qualified to use it, he knew that the information he had just received was worth countless millions in the right quarters. It frightened him a little. He wanted to keep the old man talking, and so reached for a question. "Why do we have to sneak out in a little ship like this? Why not take a flotilla of destroyers from Earth and take possession?"

"Can't do things that way, son.

The Joint Patrol puts the kibosh on that. You can blame the jolly old idealism of the Interplanetary Peace Congress for that, and the Equal Armament Amendment. You see, Mars and Earth are forced by mutual agreement to maintain absolutely equal armament, to share all new developments and to police space with a Joint Patrol. A flotilla of Earth ships taking off without the knowledge or consent of the Patrol constitutes an act of war. War is a nasty business for a lot of people who weren't in on starting it. We can't do it that way. But if I turn over the location of my find to the Patrol, it becomes the property of the Joint Patrol, neatly tied up in red tape, and it doesn't do anybody any good—particularly the Nudnick Laboratories. However—here's where we come in.

"If an independent expedition lands on, or takes in tow, any body in space that is not the satellite of a planet, said body becomes the sole property of that expedition. Therefore, I've got to keep this expedition as secret from Earth as from Mars, so that Earth—and Nudnick—can get the ultimate benefit. In two months my little treasure will be in apposition with Earth. If I have taken it in tow by then, I can announce my discovery by ultraradio. The signal reaches Earth before it reaches Mars; by the time the little red men can send out a pirate to erase me, I am surrounded by a Patrol Fleet, and quite safe. But if Mars gets wind of what I am up to, son, we are going to be intercepted, followed, and rubbed out for the glory and profit of the red planet. Get it?"

"I get it. But what's all this got to do with Bjornsen?"

The old scientist scratched his nose. "I don't know. Bjornsen's

a peculiar egg, Hughie. He worked most of his life to get to be principal of the institute, and it seems to me he didn't do it just for the salary and prestige attached. More than once that egocentric martinet tried to pump me for information about what I was doing, about the Nudnick Metal process, about a hundred things of the sort. I'm sure he hasn't got any real information, but he might possibly have a hunch. A good hunch is plenty to put a Martian ship on our tail and a lot of money in Bjornsen's pocket. We'll see."

AND THEN there was the third day, when Hughie had made bold enough to ask Nudnick why he had picked him for the trip, when he had his choice of thousands upon thousands of other assistants. Nudnick unwrapped his white teeth in one of those indescribable grins of his.

"Lots of reasons, son, among which are the fact that I delight in displeasing the contents of Bjornsen's stuffed shirt, and the fact that I dislike being bored, and since I must needs make this trip myself, I might as well be amused while I am cooped up. Also, I have found that baby geniuses are inclined to be a little cocky about what they know, and the fact that they knew it at such a tender age. A trained assistant, on the other hand, is almost certain to be a specialist of sorts, and specialists have inflexible and dogmatic minds. Bjornsen said that one of your cardinal crimes was that you relaxed in fantasy. I, with all of my scientific savvy, can find it in me to admire a mind which can conceive of the possibility of a space-warp, or time-travel. Don't look at me that way—I'm not kidding you. I can't possibly imagine such a thing—my mind is far too cluttered up

with facts. I don't know whether or not a Martian ship will pick up our trail on this trip. If one does, it will take fantastic thinking to duck him. I'm incapable of thinking that way; so it's up to you."

Hughie, hearing the old man's voice, watching his eyes as he spoke, recognized the sincerity there, and began to realize that he carried an unimaginable responsibility on his shoulders.

On the fourth and fifth days out, there was little to do, and Hughie amused both of them by reading aloud, at Nudnick's insistence, from some of his store of books and magazines. At first Hughie was diffident; he could not believe that Nudnick, who had so outdone any fictional scientist, could be genuinely interested; but Nudnick put it on the basis of an order, and Hughie began to read, with many a glance at the old man to see if he could find the first glimmerings of derision. He found difficulty in controlling his voice and his saliva until Nudnick slowed him down. Soon he was lost in the yarn. It was a good one.

It concerned one Satan Strong, Scientist, Scourge of the Spaceways and Supporter of the Serialized Short-story. Satan was a bad egg whose criminality was surpassed only by his forte for Science on the Spot. Pursued particularly by the Earth sections of the Space Patrol, Satan Strong was always succeeding in the most dastardly deeds, which always turned out to be the preliminaries to greater evils which were always thwarted by the quick thinking of Captain Jaundess of the Patrol, following which, by "turning to his micro-ultra-philtmeter, he rapidly tore out a dozen connections, spot-welded twenty-seven busbars, and converted the machine into an improved von Krockmeier

hyperspace lever, which bent space like the blade of a rapier and hurtled him in a flash from hilt to point" and effected his escape until the next issue. Nudnick was entranced.

"It's pseudoscience," he chuckled. "I might even say that it's pseudological pseudoscience. But it's lovely!" He regarded his withered frame quizzically. "Pity I don't have muscles and a widow's peak," he said. "I've got the science but I rather fear I lack glamour. Have you the next issue?"

Hughie had.

Then, on the sixth day, Hughie's reading was interrupted by a shrill whine from the forward instrument panel. A light flashed under a screen; Nudnick walked over to it and flipped a switch. The screen glowed, showing the blackness of space and its crystal points of light. He turned a knob; the points of light swung slowly across the screen until the tiny black ring of the juncture of the crosshairs encircled a slightly luminous spot.

"What is it?" Hughie asked, regretfully laying down his book.

"Company," said Nudnick tersely. "No telling who it is at this distance, unless they want to tell us about themselves by ultraradio. They're on our course, and overtaking."

Hughie stared into the screen. "You had this stern detector running all the time, didn't you? Gee— You don't think it's a pirate, do you?" There was something hopeful in Hughie's tone. Nudnick laughed.

"You want to see science in action, don't you? Heh! I'm afraid I'm going to be a disappointment to you, youngster. We can't travel any faster than we're going now, and that ship quite obviously can."

Hughie flushed. "Well, professor, if you think it's all right—"

Nudnick shook his head. "I don't think it's all right," he said. "Now that we have established that fact, let's get back to your story. To think that Captain Jaundess would be careless enough to let his betrothed get into the clutches of that evil fellow! What will he do to her?"

"But, Professor Nudnick—"

Nudnick took Hughie's arm and steered him across the control room to his chair. "My dear, overanxious young crew, the ship that is pursuing us presents no problem until it overtakes us. That will be in forty-eight hours. In the meantime, Captain Jaundess' girl friend is in far greater danger than we are. Pray proceed."

Most unwillingly, Hughie read on.

FORTY-EIGHT hours later, the brisk crackle of an ultraradio ordered them to stand by to be boarded in the name of the Joint Patrol. The slim destroyer pulled alongside, and a life-

boat carried a slim, strong cable around the *Stoutfella* and, through the mooring eyes, back to the Patrol ship. The cable was used because magnetic grapples are useless on a Nudnick metal hull. A winch drew the craft together, and a "wind tunnel" boarding stage groped against the outside of the *Stoutfella's* air lock.

"What are you going to do?" asked Hughie desperately.

"We are going to say as little as possible," said Nudnick meaningly, "and we are going to let them in, of course." He actuated the air-lock controls; the boarding stage was hermetically sealed to their hull as the outer and inner doors slid back.

A purple-uniformed Martian yeoman stepped down into the room, followed by his equally ranking shipmate from Earth. The Martian swore and shut the nostril flaps on the sides of his stringy neck with an unpleasant click. "This air is saturated," he squeaked. "You might



have had the courtesy to dehydrate it."

"What?" grinned the Earth Patrolman. "And deprive me of the only breath of decent air I've had in nineteen days?" He drew a grateful breath, letting the moisture sink into his half-parched lungs.

The air in Patrol ships was always, since there was no happy medium, too dry for Earthlings and too humid for Martians; for the Martians, living for countless generations on a water-starved planet, had developed a water-hoarding metabolism which had never evolved a use for a water surplus.

"Who is in command?" piped the Martian. Nudnick gestured; the Martian immediately turned his back on Hughie. "We have orders from headquarters that this ship is to be searched and disarmed according to Section 398 of the Earth-Mars Code."

"Suspicion of piracy," supplemented the Earthman.

"Piracy?" shouted Hughie, his resentment at last breaking through. "Piracy? Who do you think you are? What do you mean by—"

Three tiny eyes in the back of the Martian's head flipped open. "Has this unpleasantly noisy infant a function?" he demanded, fingering the blaster at his hip.

"He's my crew. Be quiet, Hughie."

"Yeah—take it easy, kiddo," said the Earthman, not unkindly. "Orders are orders in this outfit. You got no fight with us. We just work here."

"Let them alone, Hughie," chimed in Nudnick. "We've little enough armament and they're welcome to it. They have every right." While the Martian stalked out, the scientist turned to the other Patrolman. "This is a Patrol Council order?"

"Of course."

"Who signed it?"

"Councilman Emil Bjornsen."

"Bjornsen? The new member? How has he the right?"

"Council regulations. If any matter should be put to a vote, the resulting decision shall be executed in the name of the president of the council, except in such cases where the decision is carried by one vote, when the order shall be executed in the name of the councilman whose vote carried the measure." Bjornsen, as the most recently appointed councilman, had the last vote. In this case the decision was deadlocked and his vote carried it."

"I see. Thank you: I suppose you can't tell me who proposed this order?"

"Sorry."

THE PATROLMAN moved swiftly about the room, covering every inch of space. In spite of his resentment, Hughie had to admire the man's efficiency. The kid stood sullenly against the bulkhead; when the man came to him, he ran his hands quickly over the boy, and with the skill of a practiced "dip," extracted a low-powered pellet-gun from Hughie's side pocket. "You won't want this," he said. "It won't kill anything but cockroaches, and they're too easily fumigated." Glancing around swiftly to see if the Martian had returned from the storerooms yet, he clapped his hand over Hughie's mouth and whispered something. When the Martian came back, the Patrolman was finishing up on the other side of the room, and Hughie was staring at him with an affectionately resentful wonderment.

"Hardly a thing," complained the Martian shrilly, displaying a sparse armload of side arms and one neuray bow chaser. "Never heard of a Mar-

tian councilman sending a destroyer after a couple of nitwits on a pleasure cruise."

They saluted and left. In two minutes the ships drifted apart; in five, the destroyer was nothing but a memory and a dwindling spot on the stern visiscreen. Nudnick smiled at Hughie.

"*Tsk!* You certainly flew off the handle, Hughie. When that fellow took away your peashooter, I thought you were going to bite him."

"Nah," said Hughie, embarrassed. "He was O. K. I guess I didn't want the gun much anyhow."

There was a silence, while Nudnick inspected the inner air-lock gate and then the air-pressure indicator. Finally Nudnick asked.

"Well, aren't you going to tell me?"

"What?"

"What it was that the Patrolman whispered in your ear. Or are you going to save it for a climax, in the best science-fiction tradition?"

Hughie was saving it for just that. "You don't miss much, do you?" he said. "It wasn't nothing much. He said, 'There's a lousy little Martian private ship on your tail. Probably will stay on our spot on your visiscreen for a few days and be on top of you before you know it. Better watch him.'"

"Hm-m-m." Nudnick stared at the screen. "Anything else?" He spoke as if he knew damn well there was something else. Hughie blushed, robbing of the choicest part of his secret.

"Only just that Bjornsen's aboard."

"That still isn't all." Nudnick approached the boy, absolutely dead pan.

"Honest," stammered Hughie, wide-eyed.

Nudnick shook his head, put his hand in his pocket, gave something to Hughie. "There's just this," he said. "He slipped it into my pocket on the way out, just as easily as he slipped it out of yours."

Hughie stared at the gun in his hand with a delight approaching tears.

"A very efficient young man," said Nudnick. "You will notice that he unloaded it."

THREE WEEKS LATER Professor Nudnick took it upon himself to disconnect the stern visiscreen because Hughie could not pry himself loose from it. The Patrolman had been right; the destroyer had dwindled there until it reached a .008 intensity and then had stayed right there for several days, after which it had grown again until the boy could make out the ship itself. It was no longer the destroyer; it was a plump-lined, wicked little Martian sportster. He knew without asking that the little ship was fast and maneuverable beyond all comparison with the *Stoutfella*. It annoyed him almost as much as Nudnick's calm acceptance of the fact that they were being followed, and that there was every possibility of their never returning to Earth, to say nothing of locating and claiming the prosydium asteroid. He took the trouble to say as much. Nudnick merely raised his eyebrows to uncover his logic and said,

"Don't go off half-cocked, younker. Granted, the Martian is following us. I was apparently right about Bjornsen's hunch; he knows that I have been looking all over the System for prosydium and that it is rather unusual for me to go sailing off personally into space. Ergo, I must have found some. But he doesn't want me, or you. All he

wants is the prosydium. He can get it only by following this ship. Until we tie on to something, we're as safe as a babe in a bassinet. So why worry?"

"Why worry?" The kid's brains almost crackled audibly in their attempt to transmit his worry to the scientist. "Here's something! Has it occurred to you that all the Martian has to do is to determine our course, continue it ahead on a chart, and then know our destination?"

"It has occurred to me," said Nudnick gently. "Our course will intercept Mercury in twenty days."

"Mercury!" Hughie cried. "You told me the prosydium was on an asteroid!"

"It is on an asteroid." Nudnick was being assiduously patient. "You know it, and I know it. But our course is for Mercury. That's all *they* know. If we lose them, we will change course for the Belt. If we don't lose them, we will go to Mercury. If they're persistent, we'll go back to Earth and try again some time, though I will admit that there's a billion to one chance of our slipping away without being followed again."

"I'm sorry," said Hughie after a while. "I have no business in trying to tell you off, Professor Nudnick. Only I hate like hell to see that Bjornsen guy keep you away from what you want to get. That heel. That lousy wart on the nose of progress!"

"End quotes," said Nudnick dryly, "Captain Jaundess."

"O. K., O. K.," said Hughie, grinning in spite of himself. "But I can't seem to get over that guy Bjornsen. He got in my hair for nearly two years at school, and now that he's kicked me out he seems to want to get under my scalp as well. I dunno—I never saw a guy

like that before. I can't figger him—the way he thinks. That rotten business of ganging up on kids. He's inhuman!"

"You may be right," said Nudnick slowly. "You may just possibly be right." After a long pause he said, "I picked the right assistant, Hughie. You're doing fine."

Hughie was so tickled by that remark that he didn't think to ask what provoked it.

TWO DAYS before they were due on Mercury, the professor heaved a sigh, glanced at Hughie, and connected up the stern visiscreen. "There you are," he said quietly. Hughie looked up from his magazine, dropped it with a gasp of horror. The Martian ship was not two hundred yards behind them, looming up, filling the screen. He sprang to his feet.

"Professor Nudnick! Do something!"

Nudnick shook his head, spread his hands. "Any ideas?"

"There must be something. Can't you blast them, professor?"

"With what? The Patrol took even our little neuro ray."

Hughie waved the defeatist philosophy aside impatiently. "There ought to be something you could do. Heck—you're supposed to be ten times the scientist that Harry Petrou is—"

"I beg your pardon?"

"Harry Petrou . . . Petrou!" Hughie swept up the magazine, thrust the too-bright cover in the scientist's face. "The writer! The author of—"

"Satan Strong!" The dried-up old man let out an astonishingly hearty peal of laughter.

"Well," said Hughie defensively,



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"anyway—" Furiously he began to shout half hysterical phrases. He was scared, and he had a bad case of hero worship, and he was also very young. He said, "You go ahead and laugh. But Harry Petrou has some pretty damn good ideas. Maybe they're not scientific. Not what you'd call scientific. Why doesn't anybody ever do anything scientific without studying for fifty years in a dusty old laboratory? Why does one of the greatest scientists in history," he half sobbed, "sit back and be bullied by a louse like Bjornsen?"

"Hughie—take it easy, there." Nudnick put out his hand, then turned away from those young, accusing eyes. "Things aren't done that way, Hughie. Science isn't like that—made to order for melodramatic adventures. I know—you'd like me to burrow into the air conditioner, throw a few connections around, and come out with a space-warp."

Hughie turned on the lower forward screen. It showed, blindingly, the flaming crescent of the inner planet. They were descending swiftly toward the night-edge of the twilight strip, the automatic pilot taking care of every detail of deceleration and gravity control.

Nudnick swung him around. "Hughie—don't you see the fallacy in that sort of thing—that Science on Short Notice business? The flaw isn't in the scientific end, at all. It's purely in the complexity of the thought-patterns required. Science will not deny the existence of a space-warp or a—what was it—a von Krockmeir hyper space lever. But science is not a complex thing. Broken up into facts, you find each fact essentially simple. Complexities are no good in an emergency,

Hughie. We don't look for twenty-seven busbars to spotweld to get out of this. We search for a fact—a little, simple one—elementary in itself; and we put that on everything we have, make it bear on all the facts that are already piled up. Then you have a complexity, but it was not that which served in your emergency. It was the one, intrinsically simple little fact."

"You're quitting," said Hughie, his lip quivering. "You're running away!" And he turned his back to Nudnick, to stare at the evil, menacing bulk of the Martiau ship.

Nudnick sighed, went and sat at the controls, and took over the ship from the pilot.

After two silent hours, Hughie observed that Nudnick was preparing to land. He said, in a dead voice,

"If you land, they'll catch us."

"That's right," Nudnick's voice was brisk.

"And if they catch us, they'll torture us."

"Yep." Nudnick glanced over his shoulder. "Will you obey my orders implicitly?"

"Sure," said Hughie hopelessly. His eyes were fixed in fearful fascination on the Martian ship.

"Start now, then. Get rid of all the metal on your clothes. Belt buckle, buttons—everything. You have fiber soled boots?"

"Mm-m-m."

"Put them on. Snap into it!"

An hour later the *Stoutfella* grated on a sandy clearing not far from a red and rocky bluff. The choking atmosphere of Mercury swirled about the portholes. Nudnick climbed out of the pilot seat and tore a pair of fiber boots out of a locker. He had already ripped his buttons off, tossed his wrist radio and identi-

fication ring on the chart table. "Come on!" he snapped.

"You . . . we're not going out there?"

"You're damn right we are!"

Hughie looked at him. If this old man was willing— He shrugged, picked up a magazine. It seemed as if he—stroked it. Then he tossed it aside and strode with Nudnick into the air lock.

As the inner gate shut them out of the little world that the ship afforded, Nudnick clapped him on the back. "Chin up, kiddo," he said warmly. "Now listen—do exactly as I tell you. When we get outside, move as fast as you can toward that bluff. The Martians won't shoot as long as they think we have any information. Na—no questions—there isn't time! Listen. It's hot out there. As hot as the oven my dear old mother used to bake ten-egg cakes in. The air's not so good, but we can breathe it—for a while. Long enough, I guess. Ready?"

The outer gate slid back and they plunged out.

IT WAS HOT. In seconds acrid dust was packing on Hughie's skin, washing away in veritable gushes of sweat, packing the pores again.

Blindly, he saw the reason for taking off all metal clothing. He had left his identification ring on; it began to sear his hand. He tore it off, and blistered flesh with it.

The air lacerated his throat, stung his eyes. Somehow he knew the location of three things—the red bluff, the hovering Martian ship, and the professor. He pounded on. Once he tripped, went down on one knee. His breeches burst into flame. Nudnick saw and helped him slap it out. Inside the charred edges of cloth he caught a glimpse of his own kneecap, a tiny spot of bone amid a circle of cooked flesh, where his knee had ground into the burning sand.

Nudnick tugged at his elbow. "How far do you think we are?" he wheezed.

Hughie suddenly realized that Nudnick's old eyes couldn't see very far in this kind of heat; he had to be eyes for two people now. "Ship—hundred and fifty—yards—"

"Not—far enough! Go—on!"

They struggled on, helping each other, hindering each other. The ground rose sharply; Nudnick stopped. "Beginning of . . . bluff . . . far . . . enough—" He began coughing.

Hughie held him up until he had



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finished. He began to understand. He had heard vague stories about Martian torture. Nudnick would rather die this way, then. They could have starved slowly in the ship. Maybe this was better—

Nudnick's shrill, dust-choked whisper reached him. "Martians?"

Hughie put one hand over his eyes and peered through the fingers. The Matrian ship had settled down beside the *Stoutfella*. The port swung open, three figures, two tall and lanky, one short and shriveled. "Three . . . coming . . . two Martians . . . Bjornsen." Talking was torture. Breathing was pulling living fire into the lungs. He heard a noise and looked down. Nudnick was clutching him and making the noise. Slowly he realized that the old man was laughing.

They lurched toward the three figures, clinging to each other. The two Martians grasped them, and just in time, or they would have fallen and died.

"Of all the crazy damn things to do!" shrieked Bjornsen. In spite of the blazing breeze, the insufferable heat, the old gestures returned to him, and he rubbed his hands together in that familiar, despised gesture.

Nudnick forced his eyes open and stared at the councilman worriedly, and then turned to each of the Martians. They were wilting a little in the heat, but their grip was still strong. Bjornsen spoke a few squeaky words in the Martian tongue, and the five of them began to struggle toward the ships.

Suddenly the Martian who had Hughie's arm began to cry out in a piercing, ululating whine. It was quite the most ghastly sound the boy had ever heard; he shuddered in spite of the heat and thrust at the creature. To his utter amazement the

Martian slumped to the ground, arched his back as it began to scorch, screamed deafeningly and then lay still. Nudnick laughed cacklingly again and shoved at his Martian, tripping him at the same time. The second Martian stumbled, regained his balance, and then began screaming. In a matter of seconds he fell. He took longer, but died also—

Bjornsen stood in front of them, watching the Martians, and then, shouting agonized curses, began a stumbling run toward his ship.

"Damn it, he's going to make it!" cried Nudnick; and stooping, he caught up a hot stone and hurled it.

Straight as an explosive pellet it flew, and caught Bjornsen between his narrow shoulders. Bjornsen threw up his hands, trying wildly to keep his feet. Gilhering crazily, Nudnick threw another stone. It missed by twenty feet. Hughie caught the old man as he fell, exhausted. When next he looked at Bjornsen, the councilman was down on his knees, his hand clutching at the sill of the Martian's air lock. He sagged, writhed, and died there.

Hughie stood for five seconds, tottering; then he shook his head, bent and let the scientist's limp body fall across his shoulder. It took him an eternity to straighten up, and then eternities to locate his nearby ship and begin that long, long, fifty-foot journey. Hughie knew later that if it had been five—three—feet more, he could not possibly have made it. But somehow he did—somehow he tumbled the old man into the lock, pitched forward on top of him. He scrabbled weakly around, found the lock control, pressed it.

HUGHIE SCREAMED when he came out of it. Then he opened his eyes and saw that he wasn't in that fiery

desert. He closed them again and realized that his knee hurt terribly. Then Nudnick was beside him, bathing his face, talking.

"Good stuff, kid. Fix you up in no time. Heh! Long chance just for a few tons of prosydium, eh? Well, we'll get it now. No one else around. No one else around."

"Bjornsen?"

"Dead. Remember? Like the Martians."

"Martians." The words brought horror into the heat-reddened young face. He raised his head and Nudnick slipped another pillow under it. "What happened to those Martians?"

Nudnick grinned. "They died of ignorance, son, and let that be a lesson to you." Hughie just stared. "You see, for generations now, Martians have lived on Earth and Earthmen on Mars. It made 'em forget something—that one little fact I was talking about before we landed. Water-hoarders, Hughie. *Martians can't sweat!* You see? A human can live beside a steak that's cooking, because he sweats. The evaporation cools him down. A Martian can't stand that kind of heat—he cooks like the steak!"

"But . . . Bjornsen wasn't—"

"Ah. You're wrong there. Bjornsen *was!* A freak, Hughie. Look at Martians. Unemotional—logical—well, isn't that Bjornsen? Y'know, when I walked in on him when he was ganging up on you at the Institute, I heard him rub his hands together. I knew I'd heard it somewhere before, but I don't know just where. But the other day when you said he was inhuman, it clicked. Bjornsen didn't have no mamma and no poppa, kiddo. He came out of a

Martian biochemical laboratory, or I miss my guess. Clever fellers, those Martians. Trained him from birth for that job. A key man in the middle of my little old institute. There may be more like him. I'll see to that. Heh! I won't be the first boss that's told his employees, "Work up a sweat or get canned!"

Hughie at last managed to grin a little. Nudnick kept on talking happily. "That knee'll be all right in a couple weeks. By that time we'll hook on to the prosydium. You're fixed for life, fella. Ah—hey, I've got a confession to make to you."

Hughie turned weak, amused eyes on him. The old man wagged his head. "Yep. About that prosydium. Didn't you wonder how I knew about it? I'll tell you. I was coming from Mars last year on a Martian liner. Very elegant. Humidifiers in every room. Radio. Recorded music. Lots of apparatus built into the staterooms. Would've delighted the heart of Satan Strong. Anyway, I got messing around. I . . . er—" He paused guiltily, then went on. "I sort of tore out some connections and spotwelded some busbars. Built me a dandy little detectograph. Located that prosydium as we passed the edge of the Belt. Sheer luck. Spotted it, by golly, right from a stateroom in a Martian ship!"

Hughie laughed admiringly. "You old son of a gun," he said disrespectfully. "And you sneered at Satan Strong?"

"Me?" The old man shook his head and stood up. "Why should I sneer at Satan Strong? I like Satan Strong. I ought to. I write those stories!"

COMMON SENSE

By Robert Heinlein

*The sequel to Heinlein's "Universe"—the tale
of a civilization that grew up in a giant
spaceship that had forever lost its way—*

Illustrated by Orban

"The Proxima Centauri Expedition, sponsored by the Jordan Foundation in 2119, was the first recorded attempt to reach the nearer stars of this galaxy. Whatever its unhappy fate, we can only conjecture—"

Quoted from "The Romance of Modern Astrography," by Franklin Buck, published by Lux Transcriptions, Ltd., 3.50 cr.

A GIANT cylinder, five miles long, two thousand feet thick, spinning slowly on its axis and drifting timelessly through the interstellar deep—Within its smooth and portless skin the concentric compartmented decks are piled, miles of passageway, acres of living room, workshop, hydroponic farm, assembly hall, storeroom, office, laboratory, library. The air is warm and moist and fresh, the corridors are lighted, the farms are green.

People live there.

People, Earth humans, to whom the Earth is a bodyless myth, a religious concept, a place forgotten. The unseen outer world has no meaning to them; mutiny and assassination generations past destroyed their racial continuity. Their whole world is the Ship, the inside of the Ship, a little Universe, complete in itself.

Savages in the upper levels, barbarians in the lower—barbarians ruled over by a priestly hierarchy

of "scientists" who know but little more than the unlettered peasants and misunderstand that little. To them all, priest, peasant, and savage, the Ship is the World, the only conceivable world.

Save for an inconsiderable handful—

Less than a handful—three. Joe-Jim, boss of a gang of savages, knew for he had read the ancient books and visited the ancient places without the advantage of a "scientific" education.

Hugh Hoyland knew, despite his training as a "scientist," for Joe-Jim had dragged him to the Control Room, shown him the stars, and rubbed his nose in the truth. Hugh had returned, preaching his strange new doctrine, and had been condemned to death for his pains.

Joe-Jim rescued him. The rescue had captured Bill Ertz. Hugh took him to the Control Room. Then Bill Ertz knew.

Joe, the left-hand head of the odd team of Joe-Jim Gregory—more than one man, not quite two—addressed his words to Hugh Hoyland. "All right, smart boy, you've convinced the Chief Engineer—" He gestured toward Bill Ertz with the blade of his knife, then resumed picking Jim's teeth with it. "So what? Where does it get you?"



There was one sun that grew visibly over the months as he watched—

"I've explained that," Hugh Hoyland answered irritably. "We keep on, until every scientist in the Ship, from the Captain to the greenest probationer, *knows* that the Ship moves and believes that we can make it move. Then we'll finish the Trip, as Jordan willed. How many knives can you muster?" he added.

"Well, for the love o' Jordan!

Listen—have you got some fool idea that we are going to *help* you with this crazy scheme?"

"Naturally. You're necessary to it."

"Then you had better think up another think. That's out. Bobo! Get out the checkerboard."

"O. K., boss." The microcephalic dwarf hunched himself up off the

floor plates and trotted across Joe-Jim's apartment.

"Hold it, Boho." Jim, the right hand head, had spoken. The dwarf stopped dead, his narrow forehead wrinkled. The fact that his two-headed master occasionally failed to agree as to what Bobo should do was the only note of insecurity in his tranquil bloodthirsty existence.

"Let's hear what he has to say," Jim continued. "There may be some fun in this."

"Fun! The fun of getting a knife in your ribs. Let me point out that they are my ribs, too. I don't agree to it."

"I didn't ask you to agree; I asked you to listen. Leaving fun out of it, it may be the only way to keep a knife out of our ribs."

"What do you mean?" Joe demanded suspiciously.

"You heard what Ertz had to say," Jim flicked a thumb toward the prisoner. "The Ship's officers are planning to clean out the upper levels. How would you like to go' into the Converter, Joe? You can't play checkers after we're broken down into hydrogen."

"Bunk! The Crew can't exterminate the muties—they've tried before."

Jim turned to Ertz. "How about it?"

Ertz answered somewhat diffidently, being acutely aware of his own changed status from a senior Ship's officer to prisoner of war. He felt befuddled anyhow; too much had happened and too fast. He had been kidnaped in the raid which rescued Hugh, he had been hauled up to the Captain's veranda, the one place in the Ship with a view port, a place whose existence he had never suspected, and had there gazed out at the stars—the stars.

His hardboiled rationalism included no such concept. If an Earth astronomer had demonstrated to him that the globe spun on its axis because someone turned a crank, the upset in evaluations could have been no greater.

Besides that he was acutely aware that his own continued existence hung in fine balance. Joe-Jim was the first upper level mutie he had ever met other than in combat, knife to knife. A word from him to that great ugly dwarf sprawled on the deck—

He chose his words. "I think the Crew would be successful, this time. We . . . they have organized for it. Unless there are more of you than we think there are and better organized, I think it could be done. You see . . . well, uh, I organized it."

"You?"

"Yes. A good many of the Council don't like the policy of letting the muties alone. Maybe it's sound religious doctrine and maybe it isn't, but we lose a child here and a couple of pigs there. It's annoying."

"What do you expect muties to eat?" demanded Jim belligerently. "Thin air?"

"No, not exactly: Anyhow, the new policy was not entirely destructive. Any muties that surrendered and could be civilized we planned to give to masters and put them to work as part of the Crew. That is, any that weren't, uh . . . that were—" He broke off in embarrassment, and shifted his eyes from the two-headed monstrosity before him.

"You mean any that weren't physical mutations, like me," Joe filled in nastily. "Don't you?" he persisted. "For the likes of me it's the Converter, isn't it?" He slapped the blade of his knife nervously on the palm of his hand.

Ertz edged away, his own hand

shifting to his belt. But no knife was slung there; he felt naked and helpless without it. "Just a minute," he said defensively, "you asked me; that's the situation. It's out of my hands. I'm just telling you."

"Let him alone, Joe. He's just handing you the straight dope. It's like I was telling you—either go along with Hugh's plan, or wait to be hunted down. And don't get any ideas about killing him—we're going to need him." As Jim spoke he attempted to return the knife to its sheath. There was a brief and silent struggle between the twins for control of the motor nerves to their right arm, a clash of will below the level of physical activity. Joe gave in.

"All right," he agreed surlily, "but if I go to the Converter, I want to take this one with me for company."

"Stow it," said Jim. "You'll have me for company."

"Why do you believe him?"

"He has nothing to gain by lying. Ask Alan."

ALAN MAHONEY, Hugh's friend and boyhood chum, had listened to the argument round-eyed, without joining it. He, too, had suffered the nerve-shaking experience of viewing the outer stars, but his ignorant peasant mind had not the sharply formulated opinions of Ertz, the Chief Engineer. Ertz had been able to see almost at once that the very existence of a world outside the Ship changed all of his plans and everything he had believed in; Alan was capable only of wonder.

"What about this plan to fight the muties, Alan?"

"Huh? Why, I don't know anything about it. Shucks, I'm not a scientist. Say, wait a minute—there was a junior officer sent in to help our village scientist, Lieutenant Nel-

son—" He stopped and looked puzzled.

"What about it? Go ahead."

"Well, he has been organizing the cadets in our village, and the married men, too, but not so much. Making 'em practice with their blades and slings. Never told us what for, though."

Ertz spread his hands. "You see?"

Joe nodded. "I see," he admitted grimly.

Hugh Hoyland looked at him eagerly. "Then you're with me?"

"I suppose so," Joe admitted. "Right!" added Jim.

Hoyland looked back to Ertz. "How about you, Bill Ertz?"

"What choice have I got?"

"Plenty. I want you with me wholeheartedly. Here's the layout: The Crew don't count; it's the officers we have to convince. Any that aren't too addlepated and stiff-necked to understand after they've seen the stars and the Control Room, we keep. The others"—he drew a thumb across his throat while making a harsh sibilance in his cheek—"the Converter."

Bobo grinned happily and imitated the gesture and the sound.

Ertz nodded. "Then what?"

"Muties and Crew together, under a new Captain, we move the Ship to Far Centaurus! Jordan's Will be done!"

Ertz stood up and faced Hoyland. It was a heady notion, too big to be grasped at once, but, by Jordan! he liked it. He spread his hands on the table and leaned across it. "I'm with you, Hugh Hoyland!"

A knife clattered on the table before him, one from the brace at Joe-Jim's belt. Joe looked startled, seemed about to speak to his brother, then appeared to think better of it. Ertz looked his thanks and stuck the knife in his belt.

The twins whispered to each other for a moment, then Joe spoke up. "Might as well make it stick," he said. He drew his remaining knife and, grasping the blade between thumb and forefinger so that only the point was exposed, he jabbed himself in the fleshy upper part of his left arm. "Blade for blade!"

Ertz's eyebrows shot up. He whipped out his newly acquired blade and cut himself in the same location. The blood spurted and ran down to the crook of his arm. "Back to back!" He shoved the table aside and pressed his gory shoulder against the wound on Joe-Jim.

Alan Mahoney, Hugh Hoyland, Bobo—all had their blades out, all nicked their arms till the skin ran red and wet. They crowded in, bleeding shoulders pushed together so that the blood dripped united to the deck.

"Blade for blade!"

"Back to back!"

"Blood to blood!"

"Blood brothers—to the end of the Trip!"

An apostate scientist, a kidnaped scientist, a dull peasant, a two-headed monster, an apple-brained moron—five knives, counting Joe-Jim as one; five brains, counting Joe-Jim as two and Bobo as none—five brains and five knives to overthrow an entire culture.

"BUT I don't want to go back, Hugh." Alan shuffled his feet and looked dogged. "Why can't I stay here with you? I'm a good blade."

"Sure you are, old fellow. But right now you'll be more useful as a spy."

"But you've got Bill Ertz for that."

"So we have but we need you, too. Bill is a public figure; he can't duck out and climb to the upper

levels without it being noticed and causing talk. That's where you come in—you're his go-between."

"I'll have a Huff of a time explaining where I've been."

"Don't explain any more than you have to. But stay away from the Witness." Hugh had a sudden picture of Alan trying to deceive the old village historian, with his searching tongue and lust for details.

"Keep clear of the Witness. The old boy would trip you up."

"Him? You mean the old one—he's dead. Made the Trip long since. The new one don't amount to nothing."

"Good. If you're careful, you'll be safe." Hugh raised his voice. Bill! Are you ready to go down?"

"I suppose so." Ertz picked himself up and reluctantly put aside the hook he had been reading—"The Three Musketeers," illustrated, one of Joe-Jim's carefully stolen library. "Say, that's a wonderful book. Hugh, is Earth really like that?"

"Of course. Doesn't it say so in the book?"

Ertz chewed his lip and thought about it. "What is a house?"

"A house? A house is a sort of a... a sort of a compartment."

"That's what I thought at first, but how can you ride on a compartment?"

"Huh? What do you mean?"

"Why, all through the hook they keep climbing on their houses and riding away."

"Let me see that hook," Joe ordered. Ertz handed it to him. Joe-Jim thumbed through it rapidly. "I see what you mean. Idiot! They ride horses, not houses."

"Well, what's a horse?"

"A horse is an animal, like a big hog, or maybe like a cow. You squat up on top of it and let it carry you along."

Ertz considered this. "It doesn't seem practical. Look—when you ride in a litter, you tell the chief porter where you want to go. How can you tell a cow where you want to go?"

"That's easy. You have a porter lead it."

Ertz conceded the point. "Anyhow, you might fall off. It isn't practical. I'd rather walk."

"It's quite a trick," Joe explained. "Takes practice."

"Can you do it?"

Jim sniggered. Joe looked annoyed. "There are no horses in the Ship."

"O. K., O. K. But look— These guys Athos, Porthos, and Aramis, they had something—"

"We can discuss that later," Hugh interrupted. "Bobo is back. Are you ready to go, Bill?"

"Don't get in a hurry, Hugh. This is important. These chaps bad knives—"

"Sure. Why not?"

"But they were better than our knives. They had knives as long as your arm—maybe longer. If we are going to fight the whole Crew, think what an advantage that would be."

"Hm-m-m—" Hugh drew his knife and looked at it, cradling it in his palm. "Maybe. You couldn't throw it as well."

"We could have throwing knives, too."

"Yes, I suppose we could."

The twins had listened without comment. "He's right," put in Joe. "Hugh, you take care of placing the knives. Jim and I have some reading to do." Both of Joe-Jim's heads were busy thinking of other books they owned, books that discussed in sanguinary detail the infinitely varied methods used by mankind to shorten the lives of enemies. He was about to institute a War College De-

partment of Historical Research, although he called his project by no such fancy term.

"O. K.," Hugh agreed, "but you will have to say the word to them."

"Right away." Joe-Jim stepped out of his apartment into the passageway where Bobo had assembled a couple dozen of Joe-Jim's henchmen among the muties. Save for Long Arm, Pig, and Squatty, who had taken part in the rescue of Hugh, Alan, and Bill—and they were all sudden death to strangers.

JOE-JIM motioned for the three from the lower decks to join him. He pointed them out to the muties, and ordered them to look closely and not to forget—these three were to have safe passage and protection wherever they went. Furthermore, in Joe-Jim's absence his men were to take orders from any of them.

They stirred and looked at each other. Orders they were used to, but from Joe-Jim only.

A big-nosed individual rose up from his squat and addressed them. He looked at Joe-Jim, but his words were intended for all. "I am Jack-of-the-Nose. My blade is sharp and my eye is keen. Joe-Jim with the two wise heads is my Boss and my knife fights for him. But Joe-Jim is my Boss, not strangers from the heavy decks. What do you say, knives? Is that not the Rule?"

He paused. The others had listened to him nervously, stealing glances at Joe-Jim. Joe muttered something out of the corner of his mouth to Bobo. Jack O'Nose opened his mouth to continue. There was a smash of breaking teeth, a crack from a broken neck; his mouth was stopped with a missile.

Bobo reloaded his slingshot. The body, not yet dead, settled slowly



to the deck. Joe-Jim waved a hand toward it. "Good eating!" Joe announced. "He's yours." The muties converged on the body as if they had suddenly been unleashed. They concealed it completely in a busy grunting pile-up. Knives out, they cuffed and crowded each other for a piece of the prize.

Joe-Jim waited patiently for the undoing to be finished, then, when the place where Jack O'Nose had been was no more than a greasy red stain on the deck and the several private arguments over the sharing had died down, he spoke again—Joe spoke. "Long Arm, you and Forty-one and the Axe go down with Bobo, Alan and Bill. The rest wait here."

Bobo trotted away in the long loping strides permitted by the low pseudogravity near the axis of rotation of the Ship. Three of the muties detached themselves from the pack and followed. Ertz and Alan Mahoney hurried to catch up.

When he reached the nearest staircase trunk, Bobo skipped out into space without breaking his stride and let centrifugal force carry him down to the next deck. Alan and the muties followed, but Ertz paused at the edge and looked back. "Jordan keep you, brothers!" he sang out.

Joe-Jim waved to him. "And you," acknowledged Joe.

"Good eating!" Jim added.

"Good eating!"

Bobo led them down forty-odd decks, well into the no man's land inhabited neither by mutie nor crew, and stopped. He pointed in succession to Long Arm, Forty-one, and the Axe. "Two Wise Heads say for you to keep watch here. You first," he added, pointing again to Forty-one.

"It's like this," Ertz amplified. "Alan and I are going down to

heavy-weight level. You three are to keep a guard here, one at a time, so that I will be able to send messages back up to Joe-Jim. Get it?"

"Sure. Why not?" Long Arm answered.

"Joe-Jim says it," Forty-one commented with a note of finality in his voice. The Axe grunted agreeably.

"O. K.," said Bobo. Forty-one sat down at the stairwell, letting his feet hang over, and turned his attention to an item which he had been carrying tucked under his left arm—the right hand and part of the forearm which had formerly served Jack O'Nose.

Bobo slapped Ertz and Alan on their backs. "Good eating," he bade them, grinning. When he could get his breath, Ertz acknowledged the courteous thought, then dropped at once to the next lower deck, Alan close after him. They had still many decks to go to "civilization."

COMMANDER Phineas Narby, Executive Assistant to Jordan's Captain, in rummaging through the desk of the Chief Engineer was amused to find that Bill Ertz had secreted therein a couple of Unnecessary books. There were the usual Sacred books, of course, including the priceless "Care and Maintenance of the Auxiliary Four-stage Converter" and the "Handbook of Power, Light, and Conditioning—Starship *Vanguard*." These were Sacred books of the first order, bearing the imprint of Jordan himself, and could lawfully be held only by the Chief Engineer.

Narby considered himself a skeptic and rationalist. Belief in Jordan was a good thing—for the Crew. Nevertheless the sight of a title page with the words "Jordan Foundation" on it stirred up within him a trace of religious awe such as he had not

felt since before he was admitted to scientisthood.

He knew that the feeling was irrational—probably there had been at some time in the past some person or persons called Jordan. Jordan might have been an early engineer or captain who codified the common sense and almost instinctive rules for running the Ship. Or, as seemed more likely, the Jordan myth went back much farther than this book in his hand, and its author had simply availed himself of the ignorant superstitions of the Crew to give his writings authority. Narby knew how such things were done—he planned to give the new policy with respect to the muties the same blessing of Jordan when the time was ripe for it to be put into execution. Yes, order and discipline and belief in authority were good things—for the Crew. It was equally evident that a rational, cool-headed common sense was a proper attribute for the scientists who were custodians of the Ship's welfare—common sense and a belief in nothing but facts.

He admired the exact lettering on the pages of the book he held. They certainly had excellent clerks in those ancient times—not the sloppy draftsmen he was forced to put up with, who could hardly print two letters alike.

He made a mental note to study these two indispensable handbooks of the engineering department before turning them over to Ertz's successor. It would be well, he thought, not to be too dependent on the statements of the Chief Engineer when he himself succeeded to the captaincy. Narby had no particular respect for engineers, largely because he had no particular talent for engineering. When he had first reached scientisthood and had been

charged to defend the spiritual and material welfare of the Crew, had sworn to uphold the Teachings of Jordan, he soon discovered that administration and personnel management were more in his line than tending the Converter or servicing the power lines. He had served as clerk, village administrator, recorder to the Council, personnel officer, and was now chief executive for Jordan's Captain himself—ever since an unfortunate and rather mysterious accident had shortened the life of Narby's predecessor in that post.

His decision to study up on engineering before a new chief engineer was selected brought to mind the problem of choosing a new chief. Normally the senior watch officer for the Converter would become chief engineer when a chief made the Trip, but in this case, Mort Tyler, the Senior Watch, had made the Trip at the same time—his body had been found, stiff and cold, after the mutie raid which had rescued the heretic, Hugh Hoyland. That left the choice wide open and Narby was a bit undecided as to whom he should suggest to the Captain.

One thing was certain—the new chief must not be a man with as much aggressive initiative as Ertz. Narby admitted that Ertz had done a good job in organizing the Crew for the proposed extermination of the muties, but his very efficiency had made him too strong a candidate for succession to the captaincy—if and when. Had he thought about it overtly Narby might have admitted to himself that the present Captain's life span had extended unduly because Narby was not absolutely certain that Ertz would not be selected.

What he did think was that this might be a good time for the old Captain to surrender his spirit to

Jordan. The fat old fool had long outlived his usefulness; Narby was tired of having to wheedle him into giving the proper orders. If the Council were faced with the necessity of selecting a new captain at this time, there was but one candidate available—

Narby put the book down, his mind made up.

The simple decision to eliminate the old Captain carried with it in Narby's mind no feeling of shame, nor sin, nor disloyalty. He felt contempt but not dislike for the Captain, and no mean spirit colored his decision to kill him. Narby's plans were made on the noble level of statesmanship. He honestly believed that his objective was the welfare of the entire Crew—common sense administration, order and discipline, good eating for everyone. He selected himself because it was obvious to him that he was best fitted to accomplish those worthy ends. That some must make the Trip in order that these larger interests be served he did not find even mildly regrettable, but he bore them no malice.

"WHAT in the Huff are you doing at my desk?"

Narby looked up to see the late Bill Ertz standing over him, not looking pleased. He looked again, then as an afterthought closed his mouth. He had been so certain, when Ertz failed to reappear after the raid, that he had made the Trip and was in all probability butchered and eaten—so certain that it was now a sharp wrench to his mind to see Ertz standing before him, aggressively alive. But he pulled himself together.

"Bill! Jordan bless you, man—we thought you had made the Trip!"

Sit down, sit down, and tell me what happened to you."

"I will if you will get out of my chair," Ertz answered bitingly.

"Ob—sorry!" Narby hastily vacated the chair at Ertz's desk and found another.

"And now," Ertz continued, taking the seat Narby had left, "you might explain why you were going through my writings."

Narby managed to look burt. "Isn't that obvious? We assumed you were dead. Someone had to take over and attend to your department until a new chief was designated. I was acting on behalf of the Captain."

Ertz looked him in the eyes. "Don't give me that guff, Narby. You know and I know who puts words in the Captain's mouth—we've planned it often enough. Even if you did think I was dead, it seems to me you could wait longer than the time between two sleeps to pry through my desk."

"Now really, old man—when a person is missing after a mutie raid, it's a common sense assumption that he has made the Trip."

"O. K., O. K., skip it. Why didn't Mort Tyler take over in the meantime?"

"He's in the Converter."

"Killed, eh? But who ordered him put in the Converter? That much mass will make a terrific peak in the load."

"I did, in place of Hugh Hoyland. Their masses were nearly the same, and your requisition for the mass of Hugh Hoyland was unfilled."

"Nearly the same isn't good enough in handling the Converter. I'll have to check on it." He started to rise.

"Don't get excited," said Narby. "I'm not an utter fool in engineering, you know. I ordered his mass

trimmed according to the same schedule you had laid out for Hoyland."

"Well—all right. That will do for now. But I will have to check on it. We can't afford to waste mass."

"Speaking of waste mass," Narby said sweetly, "I found a couple of unnecessary books in your desk."

"Well?"

"They are classed as mass available for power, you know."

"So? And who is the custodian of mass allocated for power?"

"You are, certainly. But what were they doing in your desk?"

"Let me point out to you, my dear Captain's Best Boy, that it lies entirely within my discretion where I



choose to store mass available for power."

"Hm-m-m—I suppose you are right. By the way, if you don't need them for the power schedule at once, would you mind letting me read them?"

"Not at all, if you want to be reasonable about it. I'll check them out to you—have to do that; they've already been centrifuged. Just be discreet about it."

"Thanks. Some of those ancients had vivid imaginations. Utterly crazy, of course, but amusing for relaxation."

ERTZ GOT OUT the two volumes and prepared a receipt for Narby to sign. He did this absent-mindedly, being preoccupied with the problem of how and when to tackle Narby. Phineas Narby he knew to be a key man in the task he and his blood brothers had undertaken—perhaps the key man. If he could be won over—

"Fin," he said, when Narby had signed, "I wonder if we followed the wisest policy in Hoyland's case."

Narby looked surprised, but said nothing.

"Oh, I don't mean that I put any stock in his story," Ertz added hastily, "but I feel that we missed an opportunity. We should have kidded him along. He was a contact with the muties. The worst handicap we work under in trying to bring mutie country under the rule of the Council is the fact that we know very little about them. We don't know how many of them there are, nor how strong they are, or how well organized. Besides that we will have to carry the fight to them and that's a big disadvantage. We don't really know our way around the upper decks. If we had played along with him and pretended to believe his

story, we might have learned a lot of things."

"But we couldn't rely on what he told us," Narby pointed out.

"We didn't need to. He offered us an opportunity to go all the way up to no-weight, and look around."

Narby looked astounded. "You surely aren't serious? A member of the Crew that trusted the muties' promise not to harm him wouldn't get up to no-weight; he'd make the Trip—fast!"

"I'm not so certain about that," Ertz objected. "Hoyland believed his own story—I'm sure of that. And—"

"What! All that utter nonsense about the Ship being capable of moving. The solid Ship." He pounded the bulkhead. "No one could believe that."

"But I tell you he did. He's a religious fanatic—granted. But he saw something up there, and that was how he interpreted it. We could have gone up to see whatever it was he was raving about and used the chance to scout out the muties."

"Utterly foolhardy!"

"I don't think so. He must have a great deal of influence among the muties; look at the trouble they went to just to rescue him. If he says he can give us safe passage up to no-weight, I think he can."

"Why this sudden change in opinion?"

"It was the raid that changed my mind. If anyone had told me that a gang of muties would come clear down to high-weight and risk their necks to save the life of one man, I would not have believed him. But it happened. I'm forced to revise my opinions. Quite aside from his story, it's evident that the muties will fight for him and probably take orders from him. If that is true, it would be worth while to cater to his

religious convictions if it would enable us to gain control over the muties without having to fight for it."

Narby shrugged it off. "Theoretically you may have something there. But why waste time over might-have-beens? If there was such an opportunity, we missed it."

"Maybe not. Hoyland is still alive and back with the muties. If I could figure out some way of getting a message to him, we might still be able to arrange it."

"But how could you?"

"I don't know exactly. I might take a couple of the boys and do some climbing. If we could capture a mutie without killing him, it might work out."

"A slim chance."

"I'm willing to risk it."

Narby turned the matter over in his mind. The whole plan seemed to him to be filled with long chances and foolish assumptions. Nevertheless if Ertz were willing to take the risk and it *did* work, Narby's dearest ambition would be much nearer realization. Subduing the muties by force would be a long and bloody job, perhaps an impossible job. He was clearly aware of its difficulty.

If it did not work, nothing was lost—but Ertz. Now that he thought it over, Ertz would be no loss at this point in the game. Hm-m-m.

"Go ahead," he said. "You are a brave man, but it's a worth-while venture."

"O. K.," Ertz agreed. "Good eating."

Narby took the hint. "Good eating," he answered, gathered up the books, and left. It did not occur to him until later that Ertz had not told him where he had been for so long.

And Ertz was aware that Narby had not been entirely frank with him,

but, knowing Narby, he was not surprised. He was pleased enough that his extemporaneous groundwork for future action had been so well received. It never did occur to him that it might have been simpler and more effective to tell the truth.

ERTZ BUSIED himself for a short time in making a routine inspection of the Converter and appointed an acting Senior Watch Officer. Satisfied that his department could then take care of itself during a further absence, he sent for his chief porter and told the servant to fetch Alan Mahoney from his village. He had considered ordering his litter and meeting Mahoney halfway, but he decided against it as being too conspicuous.

Alan greeted him with enthusiasm. To him, still an unmarried cadet and working for more provident men when his contemporaries were all heads of families and solid men of property, the knowledge that he was blood brother to a senior scientist was quite the most important thing that had ever happened to him, even overshadowing his recent adventures, the meaning of which he was hardly qualified to understand anyway.

Ertz cut him short, and hastily closed the door to the outer engineering office. "Walls have ears," he said quietly, "and certainly clerks have ears, and tongues as well. Do you want us both to make the Trip?"

"Aw, gosh, Bill . . . I didn't mean to—"

"Never mind. I'll meet you on the same stair trunk we came down by, ten decks above this one. Can you count?"

"Sure, I can count that much. I can count twice that much. One and one makes two, and one more makes three, and one more makes four, and one makes five, and—"

"That's enough. I see you can. But I'm relying more on your loyalty and your knife than I am on your mathematical ability. Meet me there as soon as you can. Go up somewhere where you won't be noticed."

FORTY-ONE was still on watch when they reached the rendezvous, the disarticulated remains of his last meal laid in a neat row beside him. Ertz called him by name while standing out of range of slingshot or thrown knife, a reasonable precaution in dealing with a creature who had grown to man size by being fast with his weapons. Once identification has been established, he directed the guard to find Hugh Hoyland. He and Alan sat down to wait.

Forty-one failed to find Hugh Hoyland at Joe-Jim's apartment. Nor was Joe-Jim there. He did find Bobo, but the pinhead was not very helpful. Hugh, Bobo told him, had gone up where-everybody-flies. That meant very little to Forty-one; he had been up to no-weight only once in his life. Since the level of weightlessness extended the entire length of the Ship, being in fact the last concentric cylinder around the Ship's axis—not that Forty-one could conceive it in those terms—the information that Hugh had headed for no-weight was not helpful.

Forty-one was puzzled. An order from Joe-Jim was not to be ignored and he had gotten it through his not overly bright mind that an order from Ertz carried the same weight. He woke Bobo up again. "Where is the Two Wise Heads?"

"Gone to see knifemaker." Bobo closed his eyes again.

That was better. Forty-one knew where the knifemaker lived. Every mutie had dealings with her; she was the indispensable artisan and trades-

man of mutie country. Her person was necessarily taboo; her workshop and the adjacent neighborhood were neutral territory for all. He scurried up two decks and hurried hence.

A door reading THERMODYNAMIC LABORATORY—KEEP OUT was standing open. Forty-one could not read; neither the name nor the injunction mattered to him. But he could hear voices, one of which he identified as coming from the twins, the other from the knifemaker. He walked in. "Boss—" he began.

"Shut up," said Joe. Jim did not look around but continued his argument with the Mother of Blades. "You'll make knives," he said, "and none of your lip."

She faced him, her four calloused hands set firmly on her broad hips. Her eyes were reddened from staring into the furnace in which she heated her metal; sweat ran down her wrinkled face into the sparse gray mustache which disfigured her upper lip, and dripped onto her bare chest. "Sure I make knives," she snapped. "Honest knives. Not pig-stickers like you want me to make. Knives as long as your arm—*ptui!*" She spat at the cherry-red lip of the furnace.

"Listen, you old Crew bait," Jim replied evenly, "you'll make knives the way I tell you to, or I'll toast your feet in your own furnace. Hear me?"

Forty-one was struck speechless. No one ever talked back to the Mother of Blades; the Boss was certainly a man of power!

The knifemaker suddenly cracked. "But that's not the *right* way to make knives," she complained shrilly. "They wouldn't balance right. I'll show you—" She snatched up two braces of knives from her workbench and let fly at a cross-shaped target across the room—not in succession,

but all four arms swinging together, all four blades in the air at once. They *spunged* into the target, a blade at the extreme end of each arm of the cross. "See? You couldn't do that with a long knife. It would fight with itself and not go straight."

"Boss—" Forty-one tried again. Joe-Jim handed him a mouthful of knuckles without looking around.

"I see your point," Jim told the knifemaker, "but we don't want these knives for throwing. We want them for cutting and stabbing up close. Get on with it—I want to see the first one before you eat again."

The old woman bit her lip. "Do I get my *usuals*?" she said sharply.

"Certainly you get your *usuals*," he assured her. "A tithe on every kill till the blades are paid for—and good eating all the time you work."

She shrugged her misshapen shoulders. "O. K." She turned, tongued up a long flat fragment of steel with her two left hands and clanged the stock into the furnace. Joe-Jim turned to Forty-one.

"WHAT is it?" Joe asked.

"Boss, Ertz sent me to get Hugh."

"Well, why didn't you do it?"

"I don't find him. Bobo says he's gone up to no-weight."

"Well, go get him. No, that won't do—you wouldn't know where to find him. I'll have to do it myself. Go back to Ertz and tell him to wait."

Forty-one hurried off. The Boss was all right, but it was not good to tarry in his presence.

"Now you've got us running errands," Jim commented sourly. "How do you like being a blood brother, Joe?"

"You got us into this."

"So? The blood-swearing was your idea."

AST—Sm

"Damn it, you know why I did that. *They* took it seriously. And we are going to need all the help we can get, if we get out of this with a skin that will hold water."

"Oh? So *you* didn't take it seriously?"

"Did *you*?"

Jim smiled cynically. "Just about as seriously as you do, my dear deceitful brother. As matters stand now, it is much, much healthier for you and me to keep to the bargain right up to the hilt. 'All for one and one for all.'"

"You've been reading Dumas again."

"And why not?"

"That's O. K. But don't be a damn fool about it."

"I won't be. I know which side of the blade is edged."

Joe-Jim found Squatty and Pig sleeping outside the door which led to the Control Room. He knew then that Hugh must be inside for he had assigned the two as personal bodyguards to Hugh. It was a foregone conclusion anyhow; if Hugh had gone up to no-weight, he would be heading either for Main Drive, or the Control Room—more probably the Control Room. The place held a tremendous fascination for Hugh. Ever since the earlier time when Joe-Jim had almost literally dragged him into the Control Room and had forced him to see with his own eyes that the Ship was not the whole world but simply a vessel adrift in a much larger world—a vessel that could be driven and *moved*—ever since that time and throughout the period that followed while he was still a captured slave of Joe-Jim's, he had been obsessed with the idea of moving the Ship, of sitting at the controls and making it *go!*

It meant more to him than it could possibly have meant to a space

pilot from Earth. From the time that the first rocket made the little jump from terra to the Moon, the spaceship pilot has been the standard romantic hero whom every boy wished to emulate. But Hugh's ambition was of no such picayune caliber—he wished to move his *world*. In Earth standards and concepts it would be less ambitious to dream of equipping the Sun with jets and go gunning it around the Galaxy.

Young Archimedes had his lever; he sought a fulcrum.

JOE-JIM PAUSED at the door of the great silver stellarium globe which constituted the Control Room and peered in. He could not see Hugh, but he knew that he must be at the controls in the chair of the chief astrogator, for the lights were being manipulated. The images of the stars were scattered over the inner surface of the sphere producing a simulacrum of the heavens outside the Ship. The illusion was not fully convincing from the door where Joe-Jim rested; from the center of the sphere it would be complete.

Sector by sector the stars snuffed out, as Hugh manipulated the controls from the center of the sphere. A sector was left shining on the far side forward. It was marked by a large and brilliant orb, many times as bright as its companions. Joe-Jim ceased watching and pulled himself hand over hand up to the control chairs. "Hugh!" Jim called out.

"Who's there?" demanded Hugh and leaned his head out of the deep chair. "Oh, it's you. Hello."

"Ertz wants to see you. Come on out of there."

"O. K. But come here first. I want to show you something."

"Nuts to him," Joe said to his brother. But Jim answered, "Oh,

come on and see what it is. Won't take long."

The twins climbed into the control station and settled down in the chair next to Hugh's. "What's up?"

"That star out there," said Hugh, pointing at the brilliant one. "It's grown bigger since the last time I was here."

"Huh? Sure it has. It's been getting brighter for a long time. Couldn't see it at all first time I was ever in here."

"Then we're getting closer to it."

"Of course," agreed Joe. "I knew that. It just goes to prove that the Ship is moving."

"But why didn't you tell me about this?"

"About what?"

"About that star. About the way it's been growing bigger."

"What difference does it make?"

"What difference does it make? Why, good Jordan, man—that's it. That's where we're going. That's the *End of the Trip!*"

Joe-Jim—both of him—was momentarily startled. Not being himself concerned with any objective other than his own safety and comfort, it was hard for him to realize that Hugh, and perhaps Bill Ertz as well, held as their first objective the recapturing of the lost accomplishments of their ancestors in order to complete the long-forgotten, half mythical Trip to Far Centaurus.

Jim recovered himself. "Hm-m-m—maybe. What makes you think that star is Far Centaurus?"

"Maybe it isn't. I don't care. But it's the star we are closest to and we are moving toward it. When we don't know which star is which, one is as good as another. Joe-Jim, the ancients must have had *some* way of telling the stars apart."

"Sure they did," Jim confirmed, "but what of it? You've picked the

one you want to go to. Come on. I want to get back down."

"All right," Hugh agreed reluctantly. They began the long trip down.

ERTZ SKETCHED OUT to Joe-Jim and Hugh his interview with Narby. "Now, my idea is coming up," he continued, "is this: I'll send Alan back down to heavy-weight with a message to Narby, telling him that I've been able to get in contact with you, Hugh, and urging him to meet us somewhere above Crew country to hear what I've found out."

"Why don't you simply go back and fetch him yourself?" objected Hugh.

Ertz looked slightly sheepish. "Because you tried that method on me—and it didn't work. You returned from mutie country and told me the wonders you had seen. I didn't believe you and had you tried for heresy. If Joe-Jim hadn't rescued you, you would have gone to the Converter. If you had not hauled me up to no-weight and forced me to see with my own eyes, I never would have believed you. I assure you Narby won't be any easier lock to force than I was. I want to get him up here, then show him the stars and make him see—peacefully if we can; by force if we must."

"I don't get it," said Jim. "Why wouldn't it be simpler to cut his throat?"

"It would be a pleasure. But it wouldn't be smart. Narby can be a tremendous amount of help to us. Jim, if you knew the Ship's organization the way I do, you would see why. Narby carries more weight in the Council than any other Ship's officer and he speaks for the Captain. If we win him over, we may never have to fight at all. If we don't—well, I'm not sure of the outcome,

not if we have to fight."

"I don't think he'll come up. He'll suspect a trap."

"Which is another reason why Alan must go rather than myself. He would ask me a lot of embarrassing questions and be dubious about the answers. Alan he won't expect so much of." Ertz turned to Alan and continued, "Alan, you don't know anything when he asks you but just what I'm about to tell you. Savvy?"

"Sure. I don't know nothing, I ain't seen nothing, I ain't heard nothing." With frank simplicity he added, "I never did know much."

"Good. You've never laid eyes on Joe-Jim, you've never heard of the stars. You're just my messenger, a knife I took along to help me. Now here's what you are to tell him—" He gave Alan the message for Narby, couched in simple but provocative terms, then made sure that Alan had it all straight. "All right—on your way! Good eating."

Alan slapped the grip of his knife, answered "Good eating!" and sped away.

It is not possible for a peasant to burst precipitously into the presence of the Captain's Executive—Alan found that out. He was halted by the master at arms on watch outside Narby's suite, cuffed around a bit for his insistence on entering, referred to a horridly unsympathetic clerk who took his name and told him to return to his village and wait to be summoned. He held his ground and insisted that he had a message of immediate importance from the Chief Engineer to Commander Narby. The clerk looked up again. "Give me the writing."

"There is no writing."

"What? That's ridiculous. There is always a writing. Regulations."

"He had no time to make a writ-



ing. He gave me a word message."

"What is it?"

Alan shook his head. "It is private, for Commander Narby only. I have orders."

The clerk looked his exasperation.

But, being only a probationer, he forwent the satisfaction of direct and immediate disciplining of the recalcitrant churl in favor of the safer course of passing the buck higher up.

The chief clerk was brief. "Give me the message."

Alan braced himself and spoke to a scientist in fashion he had never used in his life, even to one as junior as this passed clerk. "Sir, all I ask is for you to tell Commander Darby that I have a message for him from Chief Engineer Ertz. If the message is not delivered, I won't be the one to go to the Converter! But I don't dast give the message to anyone else."

The under official pulled at his lip,

and decided to take a chance on disturbing his superior.

Alan delivered his message to Narby in a low voice in order that the orderly standing just outside the door might not overhear. Narby stared at him. "Ertz wants me to come along with *you* up to mutie country?"

"Not all the way up to mutie country, sir. To a point in between, where Hugh Hoyland can meet you."

Narby exhaled noisily. "It's preposterous. I'll send a squad of knives up to fetch him down to me."

Alan delivered the balance of his message. This time he carefully raised his voice to insure that the orderly, and, if possible, others might hear his words. "Ertz said to tell you that if you were *afraid* to go, just to forget the whole matter. He will take it up with the Council himself."

Alan owed his continued existence

thereafter to the fact that Narby was the sort of man who lived by shrewdness rather than by direct force. Narby's knife was at his belt; Alan was painfully aware that he had been required to deposit his own with the master at arms.

Narby controlled his expression. He was too intelligent to attribute the insult to the oaf before him, though he promised himself to give said oaf a little special attention at a more convenient time. Pique, curiosity, and potential loss of face all entered into his decision. "I'm coming with you," he said savagely. "I want to ask him if you got his message straight."

Narby considered having a major guard called out to accompany him, but he discarded the idea. Not only would it make the affair extremely public before he had an opportunity to judge its political aspects, but also it would lose him almost as much face as simply refusing to go. But he inquired nervously of Alan as Alan retrieved his weapon from the master at arms, "You're a good knife?"

"None better," Alan agreed cheerfully.

Narby hoped that the man was not simply boastful. Muties—Narby wished that he himself had found more time lately for practice in the manly arts.

Narby gradually regained his composure as he followed Alan up toward low-weight. In the first place nothing happened, no alarms; in the second place Alan was obviously a cautious and competent scout, one who moved alertly and noiselessly and never entered a deck without pausing to peer cautiously around before letting his body follow his eye. Narby might have been more nervous had he heard what Alan did hear—little noises from the depths of the

great dim passageways, rustlings which told him that their progress was flanked on all sides. This worried Alan subconsciously, although he had expected something of the sort—he knew that both Hugh and Joe-Jim were careful Captains who would not neglect to cover an approach. He would have worried more if he had *not* been able to detect a reconnaissance which should have been present.

When he approached the rendezvous some twenty decks above the highest civilized level, he stopped and whistled. A whistle answered him. "It's Alan," he called out.

"Come up and show yourself." Alan did so, without neglecting his usual caution. When he saw no one but his friends—Ertz, Hugh, Joe-Jim, and Boho, he motioned for Narby to follow him.

The sight of Joe-Jim and Boho broke Narby's restored calm with a sudden feeling that he had been trapped. He snatched at his knife and backed clumsily down the stairs—turned. Boho's knife was out even faster. For a split moment the outcome hung balanced, ready to fall either way. But Joe-Jim slapped Boho across the face, took his knife from him and let it clatter to the deck, then relieved him of his sling-shot.

Narby was in full flight, with Hugh and Ertz calling vainly after him. "Fetch him, Boho!" Jim commanded, "and don't hurt him." Boho lumbered away.

He was back in fairly short order. "Run fast," he commented. He dropped Narby to the deck where the officer lay almost quiet while he fought to catch his breath. Boho took Narby's knife from his own belt and tried it by shaving coarse black hairs from his left forearm. "Good blade," he approved.

"Give it back to him," Jim ordered. Bobo looked extremely startled but complied wistfully. Joe-Jim returned Bobo's own weapons to him.

NARBY matched Bobo's surprise at regaining his sidearm, but he concealed it better. He even managed to accept it with dignity.

"Look," Ertz began in worried tones, "I'm sorry you got your wind up, Fin. Bobo's not a bad sort. It was the only way to get you back."

Narby fought with himself to regain the cool self-discipline with which he habitually met the world. Damn! he told himself, this situation is preposterous. Well—"Forget it," he said shortly. "I was expecting to meet you; I didn't expect a bunch of armed muties. You have an odd taste in playmates, Ertz."

"Sorry," Bill Ertz replied, "I guess I should have warned you"—a piece of mendacious diplomacy. "But they're all right. Bobo you've met. This is Joe-Jim. He's a . . . a sort of a Ship's officer among the muties."

"Good eating," Joe acknowledged politely.

"Good eating," Narby replied mechanically.

"Hugh you know, I think." Narby agreed that he did. An embarrassed pause followed. Narby broke it.

"Well," he said, "you must have had some reason to send word for me to come up here. Or was it just to play games?"

"I did," Ertz agreed. "I—Shucks, I hardly know where to start. See here, Narby, you won't believe this, but I've *seen*. Everything Hugh told us was true. I've been in the Control Room. I've seen the stars. I *know*."

Narby stared at him. "Ertz," he said slowly, "you've gone out of your head."

Hugh Hoyle spoke up excitedly. "That's because you haven't *seen*. It *moves*, I tell you. The Ship *moves* like a—"

"I'll handle this," Ertz cut in. "Listen to me, Narby. What it all means you will soon decide for yourself, but I can tell you what I saw. They took me up to no-weight and into the Captain's veranda. That's a compartment with a glass wall. You can stare right out through into a great empty black space—big—bigger than anything could be. Bigger than the Ship. And there were lights out there, stars, just like the ancient myths said."

Narby looked both amazed and disgusted. "Where's your logic, man? I thought you were a scientist. What do you mean: 'bigger than the Ship.' That's an absurdity, a contradiction in terms. By definition, the Ship is the Ship. All else is a part of it."

Ertz shrugged helplessly. "I know it sounds that way. I can't explain it; it defies all logic. There's the Control Room, too. It's— Oh, Huff! You'll know what I mean when you see it."

"Control yourself," Narby advised him. "Don't talk nonsense. A thing is logical or it isn't. For a thing to be it must occupy space. You've seen, or thought you saw, something remarkable, but whatever it was, it can be no larger than the compartment it was in. You can't show me anything that contradicts an obvious fact of nature."

"I told you I couldn't explain it." "Of course you can't."

The twins had been whispering disgustedly, one head to the other. "Stop the chatter," Joe said in louder tones. "We're ready to go. Come on."

"Sure," Ertz agreed eagerly, "let's drop it, Narby, until you have seen

it. Come on now—it's a long climb."

"What?" Narby demanded. "Say, what is this? Go where?"

"Up to the Captain's veranda, and the Control Room."

"Me?" Don't be ridiculous. I'm going down at once."

"No, Narby," Ertz denied. "That's why I sent for you. You've got to see."

"Don't be silly—I don't need to see; common sense gives sufficient answer. "However," he went on, "I do want to congratulate you on making a friendly contact with the muties. We should be able to work out some means of co-operation. I think—"

Joe-Jim took one step forward. "You're wasting time," he said evenly. "We're going up—you, too. I really do insist."

Narby shook his head. "It's out of the question. Some other time, perhaps, after we have worked out a method of co-operation."

Hugh stepped in closer to him from the other side. "You don't seem to understand. You're going now."

Narby glanced the other way at Ertz. Ertz nodded. "That's how it is, Narby."

Narby cursed himself silently. Great Jordan! What in the Ship was he thinking of to let himself get into such a position? He had a distinct feeling that the two-headed man would rather that he showed fight. Impossible, preposterous situation. He cursed again to himself, but gave way as gracefully as he could. "Oh, well! Rather than cause an argument I'll go now. Let's get on with it. Which way?"

"Just stick with me," advised Ertz. Joe-Jim whistled loudly in a set pattern. Muties seemed to grow out of the floor plates, the bulkheads, the overhead, until six or eight more

had been added to the party. Narby was suddenly sick with the full realization of just how far he had strayed from the way of caution. The party moved up.

IT TOOK THEM a long time to get up to no-weight, as Narby was not used to climbing. The steady reduction in weight as they raised from deck to deck relieved him somewhat but the help afforded was more than offset by the stomach qualms he felt as weight dropped away from him. He did not have a true attack of spacesickness—like all born in the Ship, muties and Crew, he was more or less acclimated to lessened weight, but he had done practically no climbing since reckless adolescence. By the time they reached the innermost deck of the Ship he was acutely uncomfortable and hardly able to proceed.

Joe-Jim sent the added members of the party back below and told Bobo to carry Narby. Narby waved him away. "I can make it," he protested, and by sheer stubborn will forced his body to behave. Joe-Jim looked him over and countermanded the order. By the time a long series of gliding dives had carried them as far forward as the transverse bulkhead beyond which lay the Control Room, he was reasonably comfortable again.

They did not stop first at the Control Room, but, in accordance with a plan of Hugh's, continued on to the Captain's veranda. Narby was braced for what he saw there, not only by Ertz's confused explanation, but because Hugh had chattered buoyantly to him about it all the latter part of the Trip. Hugh was feeling warmly friendly to Narby by the time they arrived—it was wonderful to have somebody to listen!

Hugh floated in through the door

ahead of the others, executed a neat turn in midair, and steadied himself with one hand on the back of the Captain's easy-chair. With the other he waved at the great view port and the starry firmament beyond it. "There it is!" he exulted. "There it is. Look at it—isn't it wonderful?"

Narby's face showed no expression, but he looked long and intently at the brilliant display. "Remarkable," he conceded at last, "remarkable. I've never seen anything like it."

"'Remarkable' ain't half," protested Hugh. "Wonderful is the word."

"O. K.—'wonderful,'" Narby assented. "Those bright little lights—you say those are the stars that the ancients talked about?"

"Why, yes," agreed Hugh, feeling slightly disconcerted without knowing why, "only they're not little. They are big, enormous things, like the Ship. They just look little because they are so far away. See that very bright one, that big one, down to the left? It looks big because it's closer. I think that is Far Centaurus—but I'm not sure," he admitted in a burst of frankness.

Narby glanced quickly at him, then back to the big star. "How far away is it?"

"I don't know. But I'll find out. There are instruments to measure such things in the Control Room, but I haven't gotten the hang of them entirely. It doesn't matter, though. We'll get there yet!"

"Huh?"

"Sure. Finish the Trip."

Narby looked blank, but said nothing. His was a careful and orderly mind, logical to a high degree. He was a capable executive and could make rapid decisions when necessary, but he was by nature inclined to reserve his opinions when possible, until he had had time to chew over

the data and assess it.

He was even more taciturn in the Control Room. He listened and looked, but asked very few questions. Hugh did not care. This was his toy, his gadget, his hobby. To show it off to someone who had never seen it and who would listen was all he asked.

At Ertz's suggestion the party stopped at Joe-Jim's apartment on the way back down. Narby must be committed to the same course of action as the blood brotherhood and plans must be made to carry out such action, if the stratagem which brought Narby to them was to be fruitful. Narby agreed to stop reluctantly, having become convinced of the reality of the truce under which he made this unprecedented sortie into mutant country. He listened quietly while Ertz outlined what they had in mind. He was still quiet when Ertz had finished.

"Well?" said Ertz at last, when the silence had dragged on long enough to get on his nerves.

"You expect some comment from me?"

"Yes, of course. You figure into it." Narby knew that he did and knew that an answer was expected from him; he was stalling for time.

"Well—" Narby pursed his lips and fitted his fingertips together. "It seems to me that this problem divides itself into two parts. Hugh Hoyland, as I understand it, your purpose of carrying out the ancient plan of Jordan cannot be realized until the Ship as a whole is pacified and brought under one rule—you need order and discipline for your purpose from Crew country clear to the Control Room. Is that right?"

"Certainly. We have to man the Main Drive and that means—"

"Please. Frankly, I am not qualified to understand things that I have seen so recently and have had no opportunity to study. As to your chances of success in that project, I would prefer to rely on the opinion of the Chief Engineer. Your problem is the second phase; it appears that you are necessarily interested in the first phase."

"Of course."

"Then let's talk abouf the first phase only. It involves matters of public policy and administration—I feel more at home there; perhaps my advice will be useful. Joe-Jim, I understand that you are looking for an opportunity to effect a peace between the muties and the members of the Crew—peace and good eating? Right?"

"That's correct," Jim agreed.

"Good. It has been my purpose for a long time and that of many of the Ship's officers. Frankly, it never occurred to me that it could be achieved other than by sheer force. We had steeled ourselves to the prospect of a long and difficult and bloody war. The records of the oldest Witness, handed down to him by his predecessors clear back to the time of the mythical Mutiny, make no mention of anything but war between muties and the Crew. But this is a better way—I am delighted."

"Then you're with us!" exclaimed Ertz.

"Steady—there are many other things to be considered. Ertz, you and I know, and Hoyland as well I should think, that not all of the Ship's officers will agree with us. What of that?"

"That's easy," put in Hugh Hoyland. "Bring them up to no-weight one at a time, let them see the stars and learn the truth."

Narby shook his head. "You have

the litter carrying the porters. I told you this problem is in two phases. There is no point in trying to convince a man of something he won't believe when you need for him to agree to something he can understand. *After* the Ship is consolidated it will be simple enough then to let the officers experience the Control Room and the stars."

"But—"

"He's right," Ertz stopped him. "No use getting cluttered up with a lot of religious issues when the immediate problem is a practical one. There are numerous officers whom we could get on our side for the purpose of pacifying the Ship who would raise all kinds of fuss if we tackled them first on the idea that the Ship moves."

"But—"

"No 'buts' about it. Narby is right. It's common sense. Now, Narby—about this matter of those officers who may not be convinced—here's how we see it: In the first place it's your business and mine to win over as many as we can. Any who hold out against us—well, the Converter is always hungry."

Narby nodded, completely undismayed by the idea of assassination as a policy. "That seems the safest plan. Mightn't it be a little bit difficult?"

"That is where Joe-Jim comes in. We'll have the best knives in the Ship to back us up."

"I see. Joe-Jim is, I take it, Boss of all the muties?"

"What gave you that idea?" growled Joe, vexed without knowing why.

"Why, I supposed . . . I was given to understand—" Narby stopped. No one had told him that Joe-Jim was king of the upper decks; he had assumed it from appearances. He felt suddenly very uneasy. Had he

been negotiating uselessly? What was the point in a pact with this two-headed monstrosity if he did not speak for the muties?"

"I should have made that clear," Ertz said hastily. "Joe-Jim helps us to establish a new administration, then we will be able to back him up with knives to pacify the rest of the muties. Joe-Jim isn't Boss of all the muties, but he has the largest, strongest gang. With our help he soon will be Boss of all of them."

NARBY quickly adjusted his mind to the new data. Muties against muties, with only a little help from the cadets of the Crew, seemed to him a good way to fight. On second thought, it was better than an outright truce at once—for there would be fewer muties to administer when it was all over, less chance of another mutiny. "I see," he agreed. "So—Have you considered what the situation will be afterwards?"

"What do you mean?" inquired Hoyland.

"Can you picture the present Captain carrying out these plans?"

Ertz saw what he was driving at, and so did Hoyland—vaguely.

"Go on," said Ertz.

"Who is to be the new Captain?" Narby looked squarely at Ertz.

Ertz had not thought the matter through; he realized now that the question was very pertinent, if the *coup d'état* was not to be followed by a bloody scramble for power. He had permitted himself to dream of being selected as Captain—sometime. But he knew that Narby was pointed that way, too.

Ertz had been as honestly struck by the romantic notion of moving the Ship as Hoyland. He realized that his old ambition stood in the way of the new; he renounced the old with only a touch of wistfulness.

"You will have to be Captain, Fin. Are you willing to be?"

Phineas Narby accepted gracefully. "I suppose so, if that's the way you want it. You would make a fine Captain yourself, Ertz."

Ertz shook his head, understanding perfectly that Narby's full co-operation turned on this point. "I'll continue as Chief Engineer—I want to handle the Main Drive for the Trip."

"Slow down!" Joe interrupted. "I don't agree to this. Why should *he* be Captain?"

Narby faced him. "Do you want to be Captain?" He kept his voice carefully free of sarcasm. A mutie for Captain!

"Huff's name—no! But why should you be? Why not Ertz or Hugh?"

"Not me," Hugh disclaimed. "I'll have no time for administration. I'm the astrogator."

"Seriously, Joe-Jim," Ertz explained, "Narby is the only one of the group who can get the necessary co-operation out of the Ship's officers."

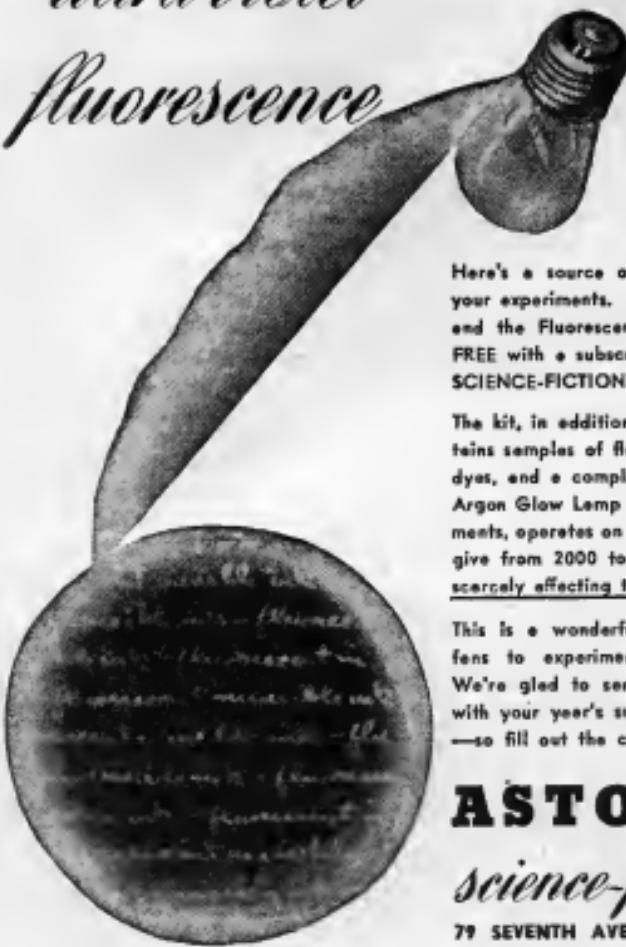
"Damn it—if they won't co-operate we can slit their throats."

"With Narby as Captain we won't have to slit throats."

"I don't like it," groused Joe. His brother shushed him. "Why get excited about it, Joe? Jordan knows we don't want the responsibility."

"I quite understand your misgivings," Narby suggested suavely, "but I don't think you need worry. I would be forced to depend on you, of course, to administer the muties. I would administer the lower decks, a job I am used to, and you would be vice Captain, if you are willing to serve, for the muties. It would be folly for me to attempt to administer directly a part of the Ship I'm not familiar with and people whose

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customs I don't know. I really can't accept the captaincy unless you are willing to help me in that fashion. Will you do it?"

"I don't want any part of it?" protested Joe.

"I'm sorry. Then I must refuse to be Captain—I really can't undertake it if you won't help me that much."

"Oh, go ahead, Joe," Jim insisted. "Let's take it—for the time being at least. The job has to be done."

"All right," Joe capitulated, "but I don't like it."

Narby ignored the fact that Joe-Jim had not specifically agreed to Narby's elevation to the captaincy; no further mention was made of it.

The discussion of ways and means was tedious and need not be repeated. It was agreed that Ertz, Alan, and Narby should all return to their usual haunts and occupations while preparations were made to strike.

Hugh detailed a guard to see them safely down to bigh-weight. "You'll send Alan up when you are ready?" he said to Narby as they were about to leave.

"Yes," Narby agreed, "but don't expect him soon. Ertz and I will have to have time to feel out friends—and there's the matter of the old Captain, I'll have to persuade him to call a meeting of all the Ship's officers—he's never too easy to bandle."

"Well, that's your job. Good eating!"

"Good eating."

ON THE few occasions when the scientist priests who ruled the Ship under Jordan's Captain met in full assembly they gathered in a great hall directly above the Ship's offices on the last civilized deck. Forgotten generations past, before the time of the mutiny led by Ship's Metal-

smith Roy Huff, the hall had been a gymnasium, a place for fun and healthy exercise, as planned by the designers of the great starship—but the present users knew nothing of that.

Narby watched the roster clerk check off the Ship's officers as they arrived, worried under a bland countenance. There were only a few more to arrive; he would soon have no excuse not to notify the Captain that the meeting was ready—but he had received no word from Joe-Jim and Hoyland. Had that fool Alan managed to get himself killed on the way up to deliver the word? Had he fallen and broken his worthless neck? Was he dead with a mutie's knife in his belly?

Ertz came in, and, before seeking his seat among the department heads, went up to where Narby sat in front of the Captain's chair. "How about it?" he inquired softly.

"All right," Narby told him, "but no word yet."

"Hm-m-m—" Ertz turned around and assayed his support in the crowd. Narby did likewise. Not a majority, not a *certain* majority, for anything as drastic as this. Still—the issue would not depend on voting.

The roster clerk touched his arm. "All present, sir, except those excused for sickness, and one on watch at the Converter."

Narby directed that the Captain be notified, with a sick feeling that something bad gone wrong. The Captain, as usual, with complete disregard for the comfort and convenience of others, took his time about appearing. Narby was glad of the delay, but miserable in enduring it. When the old man finally waddled in, flanked by his orderlies, and settled heavily into his chair, he was, again as usual, impatient to get the meeting over. He waved for the

others to be seated and started in on Narby.

"Very well, Commander Narby, let's have the agenda—you have an agenda, I hope?"

"Yes, Captain, there is an agenda."

"Then have it read, man, have it read! Why are you delaying?"

"Yes, sir." Narby turned to the reading clerk and handed him a sheaf of writings. The clerk glanced at them, looked puzzled, but, receiving no encouragement from Narby, commenced to read: "Petition, to Council and Captain: Lieutenant Braune, administrator of the village of Sector 9, being of frail health and advanced age, prays that he be relieved of all duty and retired—" The clerk continued, setting forth the recommendations of the officers and departments concerned.

The Captain twisted impatiently in his chair, finally interrupted the reading. "What is this, Narby? Can't you handle routine matters without all this fuss?"

"I understood that the Captain was displeased with the fashion in which a similar matter was lately handled. I have no wish to trespass on the Captain's prerogatives."

"Nonsense, man! Don't read Regulations to me. Let the Council act, then bring their decision to me for review."

"Yes, sir." Narby took the writing from the clerk and gave him another. The clerk read.

It was an equally fiddling matter. Sector 3 village, because of an unexplained blight which had infected their hydroponic farms, prayed for relief and a suspension of taxes. The Captain put up with still less of this item before interrupting. Narby would have been sorely pressed for any excuse to continue the meeting had not the word he awaited arrived at that moment. It was a mere

scrap of parchment, brought in from outside the hall by one of his own men. It contained the single word, "Ready." Narby looked at it, nodded to Ertz, and addressed the Captain:

"Sir, since you have no wish to listen to the petitions of your Crew, I will continue at once with the main business of this meeting." The veiled insolence of the statement caused the Captain to stare at him suspiciously, but Narby went on. "For many generations, through the lives of a succession of Witnesses, the Crew has suffered from the depredations of the muties. Our livestock, our children, even our own persons have been in constant jeopardy. Jordan's Regulations are not honored above the levels where we live. Jordan's Captain himself is not free to travel in the upper levels of the Ship.

"It has been an article of faith that Jordon so ordained it, that the children pay with blood for the sins of their ancestors. It was the will of Jordan—we were told.

"I, for one, have never been reconciled to this constant drain on the Ship's mass." He paused.

The old Captain had been having some difficulty in believing his ears. But he found his voice. Pointing, he squealed, "Do you dispute the Teachings?"

"I do not. I maintain that the Teachings do not command us to leave the muties outside the Regulations, and never did. I demand that they be brought under the Regulations!"

"You . . . you— You are relieved of duty, sir!"

"Not," answered Narby, his insolence now overt, "until I have had my say."

"Arrest that man!" But the Captain's orderlies stood fast, though

they shuffled and looked unhappy—Narby himself had selected them.

Narby turned back to the amazed Council, and caught the eye of Ertz. "All right," he said. "Now!" Ertz got up and trotted toward the door. Narby continued, "Many of you think as I do, but we always supposed that we would have to fight for it. With the help of Jordan, I have been able to establish a contact with the muties and arrange a truce. Their leaders are coming here to negotiate with us. There!" He pointed dramatically at the door.

Ertz reappeared; following him came Hugh Hoyland, Joe-Jim, and Bobo. Hoyland turned to the right along the wall and circled the company. He was followed single file by a string of muties—Joe-Jim's best butcher boys. Another such column trailed after Joe-Jim and Bobo to the left.

Joe-Jim, Hugh, and half a dozen more in each wing were covered with crude armor which extended below their waists. The armor was topped off with clumsy helms, latticeworks of steel, which protected their heads without greatly interfering with vision. Each of the armored ones, and a few of the others, carried unheard-of knives—long as a man's arm!

The startled officers might have stopped the invasion at the bottleneck through which it entered had they been warned and led. But they were disorganized, helpless, and their strongest leaders had invited the invaders in. They shifted in their chairs, reached for their knives, and glanced anxiously from one to another. But no one made the first move which would start a general blood letting.

Narby turned to the Captain. "What about it? Do you receive

this delegation in peace?"

It seemed likely that age and fat living would keep the Captain from answering, from ever answering anything again. But he managed to croak, "Get 'em out of here! Get 'em out! You—You'll make the Trip for this!"

Narby turned back to Joe-Jim and jerked his thumb upward. Jim spoke to Bobo—and a knife was buried to the grip in the Captain's fat belly. He squawked, rather than screamed, and a look of utter bewilderment spread over his features. He plucked awkwardly at the hilt as if to assure himself that it was really there. "Mutiny—" he stated. "Mutiny—" The word trailed off as he collapsed into his chair, and fell heavily forward to the deck on his face.

Narby shoved it with his foot and spoke to the two orderlies. "Carry it outside," he commanded. They obeyed, seeming relieved at having something to do and someone to tell them to do it. Narby turned back to the silent watching mass. "Does anyone else object to a peace with the muties?"

An elderly officer, one who had dreamed away his life as judge and spiritual adviser to a remote village, stood up and pointed a bony finger at Narby, while his white beard jutted indignantly. "Jordan will punish you for this! Mutiny and sin—the spirit of Huff."

Narby nodded to Joe-Jim; the old man's words gurgled in his throat, the point of a blade sticking out under one ear. Bobo looked pleased with himself.

"There has been enough talk," Narby announced. "It is better to have a little blood now than much blood later. Let those who stand with me in this matter, get up and come forward."

Ertz set the precedent by striding forward and urging his surest personal supporters to come with him. Reaching the front of the room, he pulled out his knife and raised the point. "I salute Phineas Narby, Jordan's Captain!"

His own supporters were left with no choice. "Phineas Narby, Jordan's Captain!"

The hard young men in Narby's clique—the backbone of the dissident rationalist bloc among the scientist priests—joined the swing forward in mass, points raised high and shouting for the new Captain. The undecided and the opportunists hastened to join, as they saw which side of the blade was edged. When the division was complete, there remained a handful only of Ship's officers still hanging back, almost all of whom were either elderly, or hyper-religious.

Ertz watched Captain Narby look them over, then pick up Joe-Jim with his eyes. Ertz put a hand on his arm. "There are few of them and practically helpless," he pointed out. "Why not disarm them and let them retire?"

Narby gave him an unfriendly look. "Let them stay alive and breed mutiny. I am quite capable of making my own decisions, Ertz."

Ertz bit his lip. "Very well, Captain."

"That's better." He signaled to Joe-Jim.

The long knives made short work.

Hugh hung back from the slaughter. His old teacher, Lieutenant Nelson, the village scientist who had seen his ability and selected him for scientishtood, was one of the group. It was a factor he had not anticipated.

WORLD conquest—and consolidation. Faith, or the Sword. Joe-

Jim's bullies, amplified by hot-blooded young cadets supplied by Captain Narby, combed the middle decks and the upper decks. The muties, individualists by the very nature of their existence and owing no allegiance higher than that to the leaders of their gangs, were no match against the planned generalship of Joe-Jim, nor did their weapons match the strange, long knives that bit before a man was ready.

The rumor spread through mutie country that it was better to surrender quietly to the gang of the Two Wise Heads—good eating for those who surrendered, death unescapable for those who did not.

But it was nevertheless a long slow process—there were so many, many decks, so many miles of gloomy corridors, so many countless compartments in which unreconstructed muties might lurk. Furthermore, the process grew slower as it advanced, as Joe-Jim attempted to establish a police patrol, an interior guard, over each sector, deck, and stairway trunk, as fast as his striking groups mopped them up.

To Narby's disappointment, the two-headed man was not killed in his campaigns. Joe-Jim had learned from his own books that a general need not necessarily expose himself to direct combat.

HUGH BURIED himself in the Control Room. Not only was he more interested in the subtle problems of mastering the how and why of the complex controls and the parallel complexity of starship ballistics, but also the whole matter of the blood purge was distasteful to him—because of Lieutenant Nelson. Violence and death he was used to; they were commonplace even on the lower levels—but the incident made him vaguely unhappy, even though his

own evaluations were not sufficiently clean-cut for him to feel personal responsibility for the old man's death.

He just wished it had not happened.

But the controls—ah! There was something a man could put his heart into. He was attempting a task that an Earthman would have rejected as impossible—an Earthman would have *known* that the piloting and operation of an interstellar ship was a task so difficult that the best possible technical education combined with extensive experience in the handling of lesser spacecraft would constitute a barely adequate groundwork for additional intensive highly-specialized training for the task.

Hugh Hoyland did not know that. So he went ahead and did it anyhow.

In which attempt he was aided by the genius of the designers. The *controls* of most machinery may be considered under the head of simple pairs, stop-and-go, push-and-pull, up-and-down, in-and-out, on-and-off, right-and-left, their permutations and combinations. The real difficulties have to do with upkeep and repair, adjustments and replacements.

But the controls and main drive machinery of the starship *Vanguard* required no upkeep and no repair; their complexities were below the molar level, they contained no moving parts, friction took no toll and they did not fall out of adjustment. Had it been necessary for him to understand and repair the machines he dealt with, it would have been impossible. A fourteen-year-old child may safely be intrusted with a family skycar and be allowed to make thousand-mile jaunts overnight unaccompanied; it is much more probable that he will injure himself on the trip by overeating than by find-

ing some way to mismanage or damage the vehicle. But if the skycar *should* fall out of adjustment, ground itself, and signal for a repair crew, the repair crew is essential; the child cannot fix it himself.

The *Vanguard* needed no repair crew—save for nonessential auxiliary machinery such as transbelts, elevators, automassagers, dining services, and the like. Such machinery which necessarily used moving parts had worn out before the time of the first Witness; the useless mass involved had gone into the auxiliary Converter, or had been adapted to other simpler purposes. Hugh was not even aware that there ever had been such machinery; the stripped condition of most compartments was a simple fact of nature to him, no cause for wonder.

HUGH was aided in his quest for understanding by two other facts:

First, spaceship ballistics is a very simple subject, being hardly more than the application of the second law of motion to an inverse-square field. That statement runs contrary to our usual *credos*; it happens to be true. Baking a cake calls for much greater, though subconscious, knowledge of engineering; knitting a sweater requires a grasp of much more complex mathematical relationships. The topology of a knitted garment—but try it yourself sometime!

For a complex subject, consider neurology, or catalysts—but don't mention ballistics.

Second, the designers had clearly in mind that the *Vanguard* would reach her destination not sooner than two generations after her departure; they wished to make things easy for the then-not-yet-born pilots who would control her on arrival. Although they anticipated no such

hiatus in technical culture as took place, they did their best to make the controls simple, self-explanatory, and foolproof. The sophisticated fourteen-year-old mentioned above, oriented as he would be to the concept of space travel, would doubtless have figured them out in a few hours. Hugh, reared in a culture which believed that the Ship was the whole world, made no such quick job of it.

He was hampered by two foreign concepts, *deep* space and *metrical* time. He had to learn to operate the distance finder, a delayed-action, long-base, parallax type especially designed for the *Vanguard*, and had taken readings on a couple of dozen stellar bodies before it occurred to him that the results he was getting could possibly mean anything. The readings were in parsecs and meaningless emotionally. The attempt with the aid of the Sacred books to translate his readings into linear units he could understand resulted in figures which he felt sure were wrong, obviously preposterous. Check and recheck, followed by long periods of brooding, forced him unwillingly into some dim comprehension of astronomical magnitudes.

The concepts frightened him and bewildered him. For a period of several sleeps he stayed away from the Control Room, and gave way to a feeling of futility and defeat. He occupied the time in sorting over the women available, it being the first time since his capture by Joe-Jim long ago that he had had both the opportunity and the mood to consider the subject. The candidates were numerous, for, in addition to the usual crop of village maidens, Joe-Jim's military operations had produced a number of prime widows. Hugh availed himself of his leading position in the Ship's new set-up to select two



women. The first was a widow, a strong competent woman, adept at providing a man with domestic comforts. He set her up in his new apartment, high up in low-weight, gave her a free hand, and allowed her to retain her former name of Chloe.

The other was a maiden, untrained and wild as a mutie. Hugh could not have told himself why he picked her. Certainly she had no virtues, but—she made him feel funny. She had bitten him while he was inspect-

ing her; he had slapped her, naturally, and that should have been an end to the matter. But he sent word back later for her father to send her along.

He had not gotten around to naming her.

Metrical time caused him as much mental confusion as astronomical distances, but no emotional upset. The trouble was again the lack of the concept in the Ship. The Crew had the motion of topological time; they understood "now," "before," "after," "has been," "will be," even such notions as long time and short time, but the notion of measured time had dropped out of the culture. The lowest of earth-bound cultures has some idea of measured time, even if limited to days and seasons, but every earthly concept of measured time originates in astronomical phenomena—the Crew had been insulated from all astronomical phenomena for uncounted generations.

Hugh had before him, in the control consoles, the only working time-pieces in the Ship—but it was a long, long time before he grasped what they were for, and what bearing they had on other instruments. But until he did, he could not control the Ship. Speed, and its derivatives, acceleration and flexure, are based on *measured* time.

But when these two new concepts were finally grasped, chewed over, and ancient books reread in the light of these concepts, he was, in a greatly restricted and theoretical sense, an astrogator.

HUGH sought out Joe-Jim to ask him a question. Joe-Jim's minds were brilliantly penetrating when he cared to exert himself; he remained a superficial dilettante because he rarely cared.

Hugh found Narby just leaving.

In order to conduct the campaign of pacification of the muties it had been necessary for Narby and Joe-Jim to confer frequently; to their mutual surprise they got along well together. Narby was a capable administrator, able to delegate authority and not given to useless elbow juggling; Joe-Jim surprised and pleased Narby by being more able than any subordinate he had ever dealt with before. There was no love wasted between them, but each recognized in the other both intelligence and a hard self-interest which matched his own. There was respect and grudging contemptuous liking.

"Good eating, Captain," Hugh greeted Narby formally.

"Oh—hello, Hugh," Narby answered, then turned back to Joe-Jim. "I'll expect a report, then."

"You'll get it," Joe agreed. "There can't be more than a few dozen stragglers. We'll hunt them out, or starve them."

"Am I butting in?" Hugh asked.

"No—I'm just leaving. How goes the great work, my dear fellow?" He smiled irritably.

"Well enough, but slowly. Do you wish a report?"

"No hurry. Oh, by the bye, I've made the Control Room and Main Drive, in fact the entire level of no-weight, taboo for everyone, muties and Crew alike."

"So? I see your point, I guess. There is no need for any but officers to go up there."

"You don't understand me. It is a general taboo, applying to officers as well. Not to ourselves, of course."

"But . . . but— That won't work. The only effective way to convince the officers of the truth is to take them up and show them the stars!"

"That's exactly my point. I can't have my officers upset by disturbing

ideas while I am consolidating my administration. It will create religious differences and impair discipline."

Hugh was too upset and astounded to answer at once. "But," he said at last, "but that's the point. That's why you were made Captain."

"And as Captain I will have to be the final judge of policy. The matter is closed. You are not to take anyone to the Control Room, nor any part of no-weight until I deem it advisable. You'll have to wait."

"It's a good idea, Hugh," Jim commented. "We shouldn't stir things up while we've got a war to attend to."

"Let me get this straight," Hugh persisted. "You mean this is a temporary policy?"

"You could put it that way."

"Well—all right," Hugh conceded. "But wait—Ertz and I need to train assistants at once."

"Very well. Nominate them to me and I'll pass on them. Whom do you have in mind?"

Hugh thought. He did not actually need assistance himself; although the Control Room contained acceleration chairs for half a dozen, one man, seated in the chief astro-gator's chair, could pilot the Ship. The same applied to Ertz in the Main Drive station, save in one respect. "How about Ertz? He needs porters to move mass to the Main Drive."

"Let him. I'll sign the writing. See that he uses porters from the former muties—but no one goes to the Control Room save those who have been there before." Narby turned and left with an air of dismissal.

HUGH watched him leave, then said, "I don't like this, Joe-Jim."

"Why not?" Jim asked. "It's reasonable."

"Perhaps it is. But—well, damn it! It seems to me, somehow, that truth ought to be free to anyone—any time!" He threw up his hands in a gesture of baffled exasperation.

Joe-Jim looked at him oddly. "What a curious idea," said Joe.

"Yeah, I know. It's not common sense, but it seems like it ought to be. Oh, well, forget it! That's not what I came to see you about."

"What's on your mind, Bud?"

"How do we—Look, we finish the Trip; see? We've got the Ship touching a planet, like this—" He brought his two fists together.

"Yes. Go on."

"Well, when that's done, *how do we get out of the Ship?*"

The twins looked confused, started to argue between themselves. Finally Joe interrupted his brother. "Wait a bit, Jim. Let's be logical about this. It was intended for us to get out—that implies a door, doesn't it?"

"Yeah. Sure."

"There's no door up here. It must be down in high-weight."

"But it isn't," objected Hugh. "All that country is known. There isn't any door. It has to be up in mutie country."

"In that case," Joe continued, "it should be either all the way forward, or all the way aft—otherwise it would not go anywhere. It isn't aft. There's nothing back of Main Drive but solid hulkheads. It would need to be forward."

"That's silly," Jim commented. "There's the Control Room and the Captain's veranda. That's all."

"Oh, yeah? How about the locked compartments?"

"Those aren't doors—not to the Outside anyway. That hulkhead's ahaft the Control Room."

"No, stupid, but they might lead to doors."

"Stupid, eh? Even so, how are you going to open them—answer me that, bright boy?"

"What," demanded Hugh, "are the 'locked compartments'?"

"Don't you know? There are seven doors, spaced around the main shaft in the same bulkhead as the door to the Main Control Room. We've never been able to open them."

"Well, maybe that's what we're looking for. Let's go see!"

"It's a waste of time," Jim insisted. But they went.

Bobo was taken along to try his monstrous strength on the doors. But even his knotted swollen muscles could not budge the levers which appeared to be intended to actuate the doors. "Well?" Jim sneered to his brother. "You see?"

Joe shrugged. "O. K.—you win. Let's go down."

"Wait a little," Hugh pleaded. "The second door back—the handle seemed to turn a little. Let's try it again."

"I'm afraid it's useless," Joe commented. But Jim said, "Oh, all right, as long as we're here."

Bobo tried again, wedging his shoulder under the lever and pushing from his knees. The lever gave suddenly, but the door did not open. "He's broken it," Joe announced.

"Yeah," Hugh acknowledged. "I guess that's that." He placed his hand against the door.

It swung open easily.

THE DOOR did not lead to outer space, which was well for the three, for nothing in their experience warned them against the peril of the outer vacuum. Instead a very short and narrow vestibule led them

to another door which was just barely ajar. The door stuck on its hinges, but the fact that it was slightly ajar prevented it from binding anywhere else. Perhaps the last man to use it left it so as a precaution against the metal surfaces freezing together—but no one would ever know.

Bobo's uncouth strength opened it easily. Another door lay six feet beyond. "I don't understand this," complained Jim, as Bobo strained at the third door. "What's the sense in an endless series of doors?"

"Wait and find out," advised his brother.

Beyond the third door lay, not another door, but a compartment, a group of compartments, odd ones, small, crowded together and of unusual shapes. Bobo shot on ahead and explored the place, knife in teeth, his ugly body almost graceful in flight. Hugh and Joe-Jim proceeded more slowly, their eyes caught by the strangeness of the place.

Bobo returned, killed his momentum skillfully against a bulkhead, took his blade from his teeth, and reported, "No door. No more door any place. Bobo look."

"There *has* to be," Hugh insisted, irritated at the dwarf for demolishing his hopes.

The moron shrugged. "Bobo look."

"We'll look." Hugh and the twins moved off in different directions, splitting the reconnaissance between them.

Hugh found no door, but what he did find interested him even more—an impossibility. He was about to shout for Joe-Jim, when he heard his own name called. "Hugh! Come here!"

Reluctantly he left his discovery, and sought out the twins. "Come see what I've found," he began.

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"Never mind," Joe cut him short. "Look at that."

Hugh looked. "That" was a Converter. Quite small, but indubitably a Converter. "It doesn't make sense," Jim protested. "An apartment this size doesn't need a Converter. That thing would supply power and light for half the Ship. What do you make of it, Hugh?"

Hugh examined it. "I don't know," he admitted, "but if you think this is strange, come see what I've found."

"What have you found?"

"Come see."

THE TWINS followed him, and saw a small compartment, one wall of which appeared to be of glass—black, as if the far side were obscured. Facing the wall were two acceleration chairs, side by side. The arms and the lap desks of the chairs were covered with patterns of little shining lights of the same sort as the control lights on the chairs in the Main Control Room.

Joe-Jim made no comment at first, save for a low whistle from Jim. He sat down in one of the chairs and started experimenting cautiously with the controls. Hugh sat down beside him. Joe-Jim covered a group of white lights on the right hand arm of his chair; the lights in the apartment went out. When he lifted his hand the tiny control lights were blue instead of white. Neither Joe-Jim nor Hugh was startled when the lights went out; they had expected it, for the controls involved corresponded to similar controls in the Control Room.

Joe-Jim fumbled around, trying to find controls which would produce a simulacrum of the heavens on the blank glass before him. There were no such controls and he had no way of knowing that the glass was an

actual view port, obscured by the hull of the Ship proper, rather than a view screen.

But he did manage to actuate the controls that occupied the corresponding position. These controls were labeled LAUNCHING; Joe-Jim had disregarded the label because he did not understand it. Actuating them produced no very remarkable results, except that a red light blinked rapidly and a transparency below the label came into life. It read: AIR LOCK OPEN.

Which was very lucky for Joe-Jim, Hugh, and Bobo. Had they closed the doors behind them and had the little Converter contained even a few grams of mass available for power, they would have found themselves launched suddenly into space, in a Ship's boat unequipped for a trip and whose controls they understood only by analogy with those in the Control Room. Perhaps they could have maneuvered the boat back into its cradle; more likely they would have crashed attempting it.

But Hugh and Joe-Jim were not yet aware that the "apartment" they had entered was a spacecraft; the idea of a Ship's boat was still foreign to them.

"Turn on the lights," Hugh requested. Joe-Jim did so.

"Well?" Hugh went on. "What do you make of it?"

"It seems pretty obvious," answered Jim. "This is another Control Room. We didn't guess it was here because we couldn't open the door."

"That doesn't make sense," Joe objected. "Why should there be two Control Rooms for one Ship?"

"Why should a man have two heads?" his brother reasoned. "From my point of view, you are obviously a supernumerary."

"It's not the same thing; we were born that way. But this didn't just happen—the Ship was *built*."

"So what?" Jim argued. "We carry two knives, don't we? And we weren't born with 'em. It's a good idea to have a spare."

"But you can't control the Ship from here," Joe protested. "You can't *see* anything from here. If you wanted a second set of controls, the place to put them would be the Captain's veranda, where you can see the stars."

"How about that?" Jim asked, indicating the wall of glass.

"Use your head," his brother advised. "It faces the wrong direction. It looks into the Ship, not out. And it's not an arrangement like the Control Room; there isn't any way to mirror the stars on it."

"Maybe we haven't located the controls for it."

"Even so, you've forgotten something. How about that little Converter?"

"What about it?"

"It must have some significance. It's not here by accident. I'll bet you that these controls have something to do with that Converter."

"Why?"

"Why not? Why are they here together if there isn't some connection?"

Hugh broke his puzzled silence. Everything the twins had said seemed to make sense, even the contradictions. It was all very confusing. But the Converter, the little Converter—"Say, look," he burst out.

"Look at what?"

"Do you suppose—Do you think that maybe this part of the Ship could *move*?"

"Naturally. The whole Ship moves."

"No," said Hugh, "no, no, I don't

mean that at all. Suppose it moved by *itself*. These controls and the little Converter—suppose it could move right away from the Ship."

"That's pretty fantastic."

"Mayhe so—but if it's true, *this is the way out*."

"Huh?" said Joe. "Nonsense. No door to the Outside here either."

"But there would be if this apartment were moved away from the Ship—the way we came in!"

THE TWO HEADS snapped simultaneously toward him as if jerked by the same string. Then they looked at each other and fell to arguing. Joe-Jim repeated his experiment with the controls. "See?" Joe pointed out. "Launching.' It means to start something, to push something away."

"Then why doesn't it?"

"'Air Lock Open.' The doors we came through—it has to be that. Everything else is closed."

"Let's try it."

"We would have to start the Converter first."

"O. K."

"Not so fast. Get out, and maybe you can't come back. We'd starve."

"Hm-m-m—we'll wait a while."

Hugh listened to the discussion while snooping around the control panels, trying to figure them out. There was a stowage space under the lap desk of his chair; he fished into it, encountered something, and hauled it out. "See what I've found?"

"What is it?" asked Joe. "Oh—a book. Lot of them back in the room next to the Converter." "Let's see it," said Jim.

But Hugh had opened it himself. "'Log, Starship *Vanguard*,'" he spelled out, "'2 June 2172. Cruising as before—'"

"What!" yelled Joe. "Let me see that!"

"3 June. Cruising as before. 4 June. Cruising as before. Captain's mast for rewards and punishments held at 1300. See Administration Log. 5 June. Cruising as before—"

"Gimme that!"

"Wait!" said Hugh. "6 June. Mutiny broke out at 0431. The watch became aware of it by visiplate. Huff, Metalsmith Ordinary, screened the control station and called on the watch to surrender, designating himself as "Captain." The officer of the watch ordered him to consider himself under arrest and signaled the Captain's cabin. No answer.

"0435 Communications failed. The officer of the watch dispatched a party of three to notify the Captain, turn out the chief proctor, and assist in the arrest of Huff.

"0441 Converter power off; free flight.

"0502 Lacy, Crewman Ordinary, messenger-of-the-watch, one of the party of three sent below, returned to the control station alone. He reported verbally that the other two, Malcolm Young and Arthur Sears, were dead and that he had been permitted to return in order to notify the watch to surrender. The mutineers gave 0515 as a deadline."

The next entry was in a different hand: "0545 I have made every attempt to get into communication with other stations and officers in the Ship, without success. I conceive it as my duty, under the circumstances, to leave the control station without being properly relieved, and attempt to restore order down below. My decision may be faulty, since we are unarmed, but I see no other course open to me.

"Jean Baldwin, Pilot Officer Third Class, Officer of the Watch."

"Is that all?" demanded Joe.

"No," said Hugh. "1 October (approximately) 2172. I, Theodor Mawson, formerly Storekeeper Ordinary, have been selected this date as Captain of the *Vanguard*. Since the last entry in this log there have been enormous changes. The mutiny has been suppressed, or more properly, has died out, but with tragic cost. Every pilot officer, every engineering officer is dead, or believed to be dead. I would not have been chosen Captain had there been a qualified man left.

"Approximately ninety percent of the personnel are dead. Not all of that number died in the original outbreak; no crops have been planted since the mutiny; our food-stocks are low. There seems to be clear evidence of cannibalism among the mutineers who have not surrendered.

"My immediate task must be to restore some semblance of order and discipline among the Crew. Crops must be planted. A regular watch must be instituted at the auxiliary Converter on which we are dependent for heat and light and power."

The next entry was undated. "I have been far too busy to keep this log up properly. Truthfully, I do not know the date even approximately. The Ship's clocks no longer run. That may be attributable to the erratic operation of the auxiliary Converter, or it may possibly be an effect of radiations from outer space. We no longer have an antiradiation shield around the Ship, since the main Converter is not in operation. My Chief Engineer assures me that the Main Converter could be started, but we have no one fitted to astrogate. I have tried to teach myself astrogation from the books at hand, but the mathematics involved are very difficult.

"About one newborn child out



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of twenty is deformed. I have instituted a Spartan code—such children are not permitted to live. It is harsh, but necessary.

"I am growing very old and feeble and must consider the selection of my successor. I am the last member of the crew to be born on Earth, and even I have little recollection of it—I was five when my parents embarked. I do not know my own age, but certain unmistakable signs tell me that the time is not far away when I, too, must make the Trip to the Converter.

"There has been a curious change in orientation in my people. Never having lived on a planet, it becomes more difficult as time passes for them to comprehend anything not connected with the Ship. I have ceased trying to talk to them about it—it is hardly a kindness anyhow, as I have no hopes of leading them out of the darkness. Theirs is a hard life at best; they raise a crop only to have it raided by the outlaws which still flourish on the upper levels. Why speak to them of better things?

"Rather than pass this on to my successor I have decided to attempt to hide it, if possible, in the single Ship's boat left by the mutineers who escaped. It will be safe there a long time—otherwise some witless fool may decide to use it for fuel for the Converter. I caught the man on watch feeding it with the last of a set of *Encyclopedia Terrestriana*—priceless books. The idiot had never been taught to read! Some rule must be instituted concerning books.

"This is my last entry. I have put off making the attempt to place this log in safekeeping, because it is very perilous to ascend above the lower decks. But my life is no longer

valuable; I wish to die knowing that a true record is left.

"Theodor Mawson, Captain."

Even the twins were silent for a long time after Hugh stopped reading. At last Joe heaved a long sigh and said, "So that's how it happened."

"The poor guy," Hugh said softly.

"Who? Captain Mawson? Why so?"

"No, not Captain Mawson. That other guy, Pilot Officer Baldwin. Think of him going out through that door, with *Huff* on the other side." Hugh shivered. In spite of his enlightenment, he subconsciously envisioned Huff, "*Huff the Accursed, first to sin*," as about twice as high as Joe-Jim, twice as strong as Bobo, and having fangs rather than teeth.

HUGH BORROWED a couple of porters from Ertz—porters which Ertz was using to fetch the pickled bodies of the war casualties to the Main Converter for fuel—and used them to provision the Ship's boat; water, breadstuffs, preserved meats, mass for the Converter. He did not report the matter to Narby, nor did he report the discovery of the boat itself. He had no conscious reason—Narby irritated him.

The star of their destination grew and grew, swelled until it showed a visible disk and was too bright to be stared at long. Its bearing changed rapidly, for a star; it pulled across the backdrop of the stellarium dome. Left uncontrolled, the Ship would have swung part way around it in a broad hyperbola and receded again into the depths of the darkness. It took Hugh the equivalent of many weeks to calculate the elements of the trajectory; it took still longer for Ertz and Joe-Jim to check his figures and satisfy themselves that the preposterous answers were

right. It took even longer to convince Ertz that the way to rendezvous in space was to apply a force that pushed one away from where one wished to go—that is to say, dig in the heels, put on the brakes, kill the momentum.

In fact it took a series of experiments in free flight on the level of weightlessness to sell him the idea—otherwise he would have favored finishing the Trip by the simple expedient of crashing headlong into the star at top speed. Thereafter Hugh and Joe-Jim calculated how to apply acceleration to kill the speed of the *Vanguard* and warp her into an eccentric ellipse around the star. After that they would search for planets.

Ertz had a little trouble understanding the difference between a planet and a star. Alan never did get it.

"If my numbering is correct," Hugh informed Ertz, "we should start accelerating any time now."

"O. K.," Ertz told him. "Main Drive is ready—over two hundred bodies and a lot of waste mass. What are we waiting for?"

"Let's see Narby and get permission to start."

"Why ask him?"

Hugh shrugged. "He's Captain. He'll want to know."

"All right. Let's pick up Joe-Jim and get on with it." They left Hugh's apartment and went to Joe-Jim's. Joe-Jim was not there, but they found Alan looking for him, too.

"Squatty says he's gone down to the Captain's office," Alan informed him.

"So? It's just as well—we'll see him there. Alan, old boy, you know what?"

"What?"

"The time has arrived. We're

going to do it! Start moving the Ship!"

Alan looked round-eyed. "Gee! Right now?"

"Just as soon as we can notify the Captain. Come along, if you like."

"You bet! Wait while I tell my woman." He darted away to his own quarters nearby.

"He pampers that wench," remarked Ertz.

"Sometimes you can't help it," said Hugh with a faraway look.

Alan returned promptly, although it was evident that he had taken time to change to a fresh breechcloth. "O. K.," he bubbled. "Let's go!"

ALAN approached the Captain's office with a proud step. He was an important guy now, he exulted to himself—he'd march on through with his friends while the guards saluted—no more of this business of being pushed around.

But the doorkeeper did not stand aside, although he did salute—while placing himself so that he filled the door. "Gangway, man!" Ertz said gruffly.

"Yes, sir," acknowledged the guard, without moving. "Your weapons, please."

"What! Don't you know me, you idiot? I'm the Chief Engineer."

"Yes, sir. Leave your weapons with me, please. Regulations."

Ertz put a hand on the man's shoulder and shoved. The guard stood firm. "I'm sorry, sir. No one approaches the Captain wearing weapons. No one."

"Well, I'll be damned!"

"He remembers what happened to the old Captain," Hugh observed *sotto voce*. "He's smart." He drew his own knife and tossed it to the guard, who caught it neatly by the hilt. Ertz looked, shrugged, and handed over his own. Alan, consid-

erably crestfallen, passed his own pair over with a look that should have shortened the guard's life.

Narby was talking; Joe-Jim was scowling on both his faces; Bobo looked puzzled, and naked, unfinished, without his ubiquitous knives and slingshot. "The matter is closed, Joe-Jim. That is my decision. I've granted you the favor of explaining my reasons, but it does not matter whether you like them or not."

"What's the trouble?" inquired Hugh.

Narby looked up. "Oh—I'm glad you came in. Your mutie friend seems to be in doubt as to who is Captain."

"What's up?"

"He," growled Jim, hooking a thumb toward Narby, "seems to think he's going to disarm all the muties."

"Well, the war's over, isn't it?"

"It wasn't agreed on. The muties were to become part of the Crew. Take the knives away from the muties and the Crew will kill them off in no time. It's not fair. The Crew have knives."

"The time will come when they won't," Narby predicted, "but I'll do it at my own time in my own way. This is the first step. What did you want to see me about, Ertz?"

"Ask Hugh." Narby turned to Hugh.

"I've come to notify you, Captain Narby," Hugh stated formally, "that we are about to start the Main Converter and move the Ship."

NARBY looked surprised but not disconcerted. "I'm afraid you will have to postpone that. I am not yet ready to permit officers to go up to no-weight."

"It won't be necessary," Hugh explained. "Ertz and I can handle the first maneuvers alone. But we can't

wait. If the Ship is not moved at once, the Trip won't be finished in your lifetime nor mine."

"Then it must," Narby replied evenly, "wait."

"What?" cried Hugh. "Narby, don't you want to finish the Trip?"

"I'm in no hurry."

"What sort of damn foolishness is this?" Ertz demanded. "What's gotten into you, Fin? Of course we move the Ship."

Narby drummed on his desk top before replying. Then he said, "Since there seems to be some slight misunderstanding as to who gives orders around here, I might as well let you have it straight. Hoyland, as long as your pastimes did not interfere with the administration of the Ship, I was willing for you to amuse yourself. I granted that willingly, for you have been very useful in your own way. But when your crazy beliefs become a possible source of corruption to good morals and a danger to the peace and security of the Ship, I have to crack down."

Hugh had opened and closed his mouth several times during this speech. Finally he managed to get out. "Crazy? Did you say crazy?"

"Yes, I did. For a man to believe that the solid Ship can move means that he is either crazy, or an ignorant religious fanatic. Since both of you have the advantage of a scientist's training, I assume that you have lost your minds."

"Good Jordan!" said Hugh. "The man has seen with his own eyes, he's seen the immortal stars—yet he sits there and calls us crazy!"

"What's the meaning of this, Narby?" Ertz inquired coldly. "Why the razzle-dazzle? You aren't kidding anyone—you've been to the Control Room, you've been to the

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Captain's veranda, you *know* the Ship moves."

"You interest me, Ertz," commented Narby, looking him over. "I've wondered whether you were playing up to Hoyland's delusions, or were deluded yourself. Now I see that you are crazy, too."

Ertz kept his temper. "Explain yourself. You've seen the Control Room; how can you contend that the Ship does not move?"

Narby smiled. "I thought you were a better engineer than you appear to be, Ertz. The Control Room is an enormous hoax. You know yourself that those lights are turned on and off by switches—a very clever piece of engineering. My theory is that it was used to strike awe in the minds of the superstitious and make them believe in the ancient myths. But we don't need it any more, the Crew believe without it. It's a source of distraction now—I'm going to have it destroyed and the door sealed up."

Hugh went all to pieces at this, sputtered incoherently, and would have grappled with Narby had not Ertz restrained him. "Easy, Hugh," he admonished. Joe-Jim took Hugh by the arm, his own faces stony masks.

Ertz went on quietly, "Suppose what you say is true. Suppose that the Main Converter and the Main Drive itself are nothing but dummies and that we can never start them, what about the Captain's veranda? You've *seen* the stars there, not just an engineered shadow show."

Narby laughed. "Ertz, you are stupider than I ever guessed. I admit that the display in the veranda had me mystified at first—not that I ever believed in it! But the Control Room gave the clue—it's an illusion, a piece of skillful engineering. Behind that glass is another

compartment, about the same size and unlighted. Against that darkness those tiny moving lights give the effect of a bottomless hole. It's essentially the same trick as the one used in the Control Room.

"It's obvious," he went on. "I'm surprised that you did not see it. When an apparent fact runs contrary to logic and common sense, it's obvious that you have failed to interpret the fact correctly. The most obvious fact of nature is the reality of the Ship itself, solid, immutable, complete. Any so-called fact which appears to dispute that is bound to be an illusion. Knowing that, I looked for the trick behind the illusion and found it."

"Wait," said Ertz. "Do you mean that you have been on the other side of the glass in the Captain's veranda and seen these trick lights you talk about?"

"No," admitted Narby, "it wasn't necessary. No doubt it would be easy enough to do so, but it isn't necessary. I don't have to cut myself to know that knives are sharp."

"So—" Ertz paused and thought a moment. "I'll make a deal with you. If Hugh and I are crazy in our beliefs, no harm is done as long as we keep our mouths shut. We'll try to move the Ship. If we fail, we're wrong and you're right."

"The Captain does not bargain," Narby pointed out. "However—I'll consider it. That's all. You may go."

Ertz turned to go, unsatisfied but checked for the moment. He caught sight of Joe-Jim's faces, and turned back. "One more thing," he said. "What's this about the muties? Why are you shoving Joe-Jim around? He and his boys made you Captain—you've got to be fair about this."

Narby's smiling superiority

cracked for a moment. "Don't interfere, Ertz! Groups of armed savages can't be tolerated. That's final."

"You can do what you like with the prisoners," Jimi stated, "but my own gang keep their knives. They were promised good eating forever if they fought for you. They keep their knives. And that's final!"

Narby looked him up and down. "Joe-Jim," he remarked, "I have long believed that the only good mutie was a dead mutie. You do much to confirm my opinion. It will interest you to know that, by this time, your gang is disarmed—and dead in the bargain. That's why I sent for you!"

The guards piled in, whether by signal or previous arrangement it was impossible to say. Caught flat-footed, naked, weaponless, the five found themselves each with an armed man at his back before they could rally. "Take them away," ordered Narby.

Bobo whined and looked to Joe-Jim for guidance. Joe caught his eye. "Up, Bobo!"

The dwarf jumped straight for Joe-Jim's captor, careless of the knife at his back. Forced to split his attention, the man lost a vital half second. Joe-Jim kicked him in the stomach, and appropriated his blade.

Hugh was on the deck, deadlocked with his man, his fist clutched around the knife wrist. Joe-Jim thrust and the struggle ceased. The two-headed man looked around, saw a mixed pile-up of four bodies, Ertz, Alan, two others. Joe-Jim used his knife judiciously, being careful to match the faces with the bodies. Presently his friends emerged. "Get their knives," he ordered superfluously.

His words were drowned by a high, agonized scream. Bobo, still without a knife, had resorted to his primal weapons. His late captor's



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face was a bloody mess, half bitten away.

"Get his knife," said Joe.

"Can't reach it," Bobo admitted guiltily. The reason was evident—the hilt protruded from Bobo's ribs, just below his right shoulder blade.

Joe-Jim examined it, touched it gently. It was stuck. "Can you walk?"

"Sure," grunted Bobo, and grimaced.

"Let it stay where it is. Alan! With me. Hugh and Bill—cover rear. Bobo in the middle."

"Where's Narby?" demanded Ertz, dabbing at a wound on his cheek bone.

But Narby was gone—ducked out through the rear door back of his desk. And it was locked.

Clerks scattered before them in the outer office; Joe-Jim knifed the guard at the outer door while he was still raising his whistle. Hastily they retrieved their own weapons and added them to those they had seized. They fled upward.

Two decks above inhabited levels Bobo stumbled and fell. Joe-Jim picked him up. "Can you make it?"

The dwarf nodded dumbly, blood on his lips. They climbed. Twenty decks or so higher it became evident that Bobo no longer could climb, though they had taken turns in boosting him from the rear. But weight was lessened appreciably at that level; Alan braced himself and picked up the solid form as if it were a child. They climbed.

Joe-Jim spelled Alan. They climbed.

Ertz spelled Joe-Jim. Hugh spelled Ertz.

They reached the level on which they lived forward of their group of apartments. Hugh turned in that direction. "Put him down," com-

manded Joe. "Where do you think you are going?"

Hugh settled the wounded man to the deck. "Home. Where else?"

"Fool! That's where they will look for us first."

"Where do we go?"

"Nowhere—in the Ship. We go out of the Ship!"

"Huh?"

"The Ship's boat."

"He's right," agreed Ertz. "The whole Ship's against us now."

"But . . . but—" Hugh surrendered. "It's a long chance—but we'll try it." He started again in the direction of their homes.

"Hey!" shouted Jim. "Not that way."

"We have to get our women."

"To Huff with the women! You'll get caught. There's no time." But Ertz and Alan started off without question. "Oh—all right!" Jim snorted, "but hurry! I'll stay with Bobo."

Joe-Jim sat down, took the dwarf's head in his lap, and made a careful examination. His skin was gray and damp; a long red stain ran down from his right shoulder. Bobo sighed bubbly and rubbed his head against Joe-Jim's thigh. "Bobo tired, Boss."

Joe-Jim patted his head. "Easy," said Jim, "this is going to hurt." Lifting the wounded man slightly, he cautiously worked the blade loose and withdrew it from the wound. Blood poured out freely.

Joe-Jim examined the knife, noted the deadly length of steel, and measured it against the wound. "He'll never make it," whispered Joe.

Jim caught his eye. "Well?"

Joe nodded slowly. Joe-Jim tried the blade he had just extracted from the wound against his own thigh, and discarded it in favor of one of

his own razed-edged tools. He took the dwarf's chin in his left hand and Joe commanded, "Look at me, Bobo!"

Boho looked up, answered inaudibly. Joe held his eye. "Good Bobo! Strong Bobo!" The dwarf grinned as if he heard and understood, but made no attempt to reply. His master pulled his head a little to one side; the blade bit deep, snicking the jugular vein without touching the windpipe. "Good Bobo!" Joe repeated. Bobo grinned again.

When the eyes were glassy and breathing had unquestionably stopped, Joe-Jim stood up, letting the head and shoulders roll from him. He shoved the body with his foot to the side of the passage, and stared down the direction in which the others had gone. They should be back by now.

He stuck the salvaged blade in his belt and made sure that all his weapons were loose and ready.

THEY ARRIVED on a dead run. "A little trouble," Hugh explained breathlessly. "Squatty's dead. No more of your men around. Dead, maybe—Narby probahly meant it. Here—" He handed him a long knife and the body armor that had been built for Joe-Jim, with its great wide cage of steel, fit to cover two heads.

Ertz and Alan wore armor, as did Hugh. The women did not—none had been built for them. Joe-Jim noted that Hugh's younger wife bore a fresh swelling on her lip, as if someone had persuaded her with a heavy hand. Her eyes were stormy though her manner was docile. The older wife, Chloe, seemed to take the events in her stride. Ertz's woman was crying softly; Alan's wench re-

flected the bewilderment of her master.

"How's Bobo?" Hugh inquired, as he settled Joe-Jim's armor in place."

"Made the Trip," Joe informed him.

"So? Well, that's that—let's go."

They stopped short of the level of no-weight and worked forward, because the women were not adept at weightless flying. When they reached the bulkhead which separated the Control Room and boat pockets from the body of the Ship they went up. There was neither alarm nor ambush, although Joe thought that he saw a head show as they reached one deck. He mentioned it to his brother but not to the others.

The door to the boat pocket stuck and Bobo was not there to free it. The men tried it in succession, sweating with the strain. Joe-Jim tried it a second time, Joe relaxing and letting Jim control their muscles, that they might not fight each other. The door gave. "Get 'em inside!" snapped Jim.

"And fast!" Joe confirmed. "They're on us." He had kept lookout while his brother strove. A shout from down the line re-inforced his warning.

The twins faced around to meet the threat while the men shoved the women in. Alan's fuzzy headed mate chose that moment to go to pieces, squalled, and tried to run, but weightlessness defeated her. Hugh nabbed her, headed her inside and boosted her heartily with his foot.

Joe-Jim let a blade go at long throwing range to slow down the advance. It accomplished its purpose; his opponents, half a dozen of them, checked their advance. Then,

apparently on signal, six knives cut the air simultaneously.

Jim felt something strike him, felt no pain, and concluded that the armor had saved him. "Missed us, Joe," he exulted.

There was no answer. Jim turned his head, tried to look at his brother. A few inches from his eye a knife stuck through the bars of the helmet; its point was buried deep in Joe's left eye.

His brother was dead.

HUGH STUCK his head back out the door. "Come on, Joe-Jim," he shouted. "We're all in."

"Get inside," ordered Jim. "Close the door."

"But—"

"Get inside!" Jim turned, and shoved him in the face, closing the door as he did so. Hugh had one startled glimpse of the knife and sagging, lifeless face it pinned. Then the door closed against him, and he heard the lever turn.

Jim turned back at the attackers. Shoving himself away from the bulkhead with legs which were curiously heavy, he plunged toward them, his great arm-long knife, more a bolo than a sword, grasped with both hands. Knives sang toward him, clattered against his breastplate, bit into his legs. He swung—a wide awkward two-handed stroke which gutted an opponent—nearly cut him in two. "That's for Joe!"

The blow stopped him. He turned in the air, steadied himself, and swung again. "That's for Bobo!"

They closed on him; he swung widely, caring not where he hit as long as his blade met resistance. "And that's for me!"

A knife planted itself in his thigh. It did not even slow him up; legs were dispensable in no-weight. "One for all!"

A man was on his back now—he could feel him. No matter—there was one before him, too—one who could feel steel. As he swung, he shouted, "All for o—" The words trailed off, but the stroke was finished.

Hugh tried to open the door which had been slammed in his face. He was unable to do so—if there were means provided to do so, he was unable to figure them out. He pressed an ear against the steel and listened, but the air-tight door gave back no clue.

"Ertz touched him on the shoulder. "Come on," he said. "Where's Joe-Jim?"

"He stayed behind."

"What! Open the door—get him!"

"I can't, it won't open. He meant to stay, he closed it himself."

"But we've got to get him—we're blood-sworn."

"I think," said Hugh, with a sudden flash of insight, "that's why he stayed behind." He told Ertz what he had seen.

"Anyhow," he concluded, "it's the *End of the Trip* to him. Get on back and feed mass to that Converter. I want power." They entered the Ship's boat proper; Hugh closed the air lock doors behind them. "Alan!" he called out. "We're going to start. Keep those damned women out of the way."

He settled himself in the pilot's chair, and cut the lights.

In the darkness he covered a pattern of green lights. A transparency flashed on the lap desk: DRIVE READY. Ertz was on the job. Here goes! he thought, and actuated the launching combination. There was a short pause, a short and sickening lurch—a *twist*. It frightened him, since he had no way of knowing that the launching tracks were pitched to

The Real Meaning of SELECTIVE SERVICE

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offset the normal spinning of the Ship.

The glass of the view port before him was speckled with stars; they were free—moving!

But the spread of jeweled lights was not unbroken, as it invariably had been when seen from the veranda, or seen mirrored on the Control Room walls; a great, gross, ungainly shape gleamed softly under the light of the star whose system they had entered. At first he could not account for it. Then with a rush of superstitious awe he realized that he was looking at the Ship itself, the true Ship, seen from the Outside. In spite of his long intellectual awareness of the true nature of the Ship, he had never visualized looking at it. The stars, yes—the surface of a planet, he had struggled with that concept—but the outer surface of the Ship, no.

When he did see it, it shocked him.

Alan touched him. "Hugh, what is it?"

Hoyland tried to explain to him. Alan shook his head, and blinked his eyes. "I don't get it."

"Never mind. Bring Ertz up here. Fetch the women, too—we'll let them see it."

"All right. But," he added, with sound intuition, "it's a mistake to show the women. You'll scare 'em silly—they ain't even seen the stars."

LUCK, sound engineering design, and a little knowledge. Good design, ten times that much luck, and a precious little knowledge. It was luck that had placed the Ship near a star with a planetary system, luck that the Ship arrived there with a speed low enough for Hugh to counteract it in a ship's auxiliary craft, luck that he learned to handle it after a fashion before they starved

or lost themselves in deep space.

It was good design that provided the little craft with a great reserve of power and speed. The designers had anticipated that the pioneers might need to explore the flar-flung planets of a solar system; they had provided for it in the planning of the Ship's boats, with a large factor of safety. Hugh strained that factor to the limit.

It was luck that placed them near the plane of planetary motion, luck that, when Hugh did manage to gun the tiny projectile into a closed-orbit, the orbit agreed in direction with the rotation of the planets.

Luck that the eccentric ellipse he achieved should cause them to crawl up on a giant planet so that he was eventually able to identify it as such by sight.

For otherwise they might have spun around that star until they all died of old age, ignoring for the moment the readier hazards of hunger and thirst, without ever coming close enough to a planet to pick it out from the stars.

There is a misconception, geocentric and anthropomorphic, common to the large majority of the earth-bound, which causes them to visualize a planetary system stereoscopically. The mind's eye sees a sun, remote from a backdrop of stars, and surrounded by spinning apples—the planets. Step out on your balcony and look. Can you tell the planets from the stars? Venus you may pick out with ease, but could you tell it from Canopus, if you had not previously been introduced? That little red speck—is it Mars, or is it Antares? How would you know, if you were as ignorant as Hugh Hoyland? Blast for Antares, believing it to be a planet, and you will never live to have grandchildren.

The great planet that they crawled

up on, till it showed a visible naked-eye disk, was larger than Jupiter, a fit companion to the star, somewhat younger and larger than the Sun, around which it swung at a lordly distance. Hugh blasted back, killing his speed over many sleeps, to bring the Ship into a path around the planet. The maneuver brought him close enough to see its moons.

Luck helped him again. He had planned to ground on the great planet, knowing no better. Had he been able to do so they would have lived just long enough to open the air lock.

But he was short of mass, after the titanic task of pulling them out of the headlong hyperbolic plunge around and past the star and warping them into a closed orbit about the star, then into a subordinate orbit around the great planet. He pored over the ancient books, substituted endlessly in the equations the ancients had set down as the laws for moving bodies, figured and re-figured, and tried even the calm patience of Chloe.

The other wife, the unnamed one, kept out of his sight after losing a tooth, quite suddenly.

But he got no answer that did not require him to use some, at least, of the precious, irreplaceable ancient books for fuel. Yes, even though they stripped themselves naked and chucked in their knives, the mass of the books would still be needed.

He would have preferred to dispense with one of his wives. He decided to ground on one of the moons.

Luck again. Coincidence of such colossal proportions that one need not be expected to believe it—for the moon-planet was suitable for human terrestrial life. Never mind—skip over it rapidly; the combination of circumstances is of the same order needed to produce such a planet in the first place. Our own planet, under our feet, is of the



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DOC SAVAGE

"There ain't no such animal!" variety. It is a ridiculous improbability.

Hugh's luck was a ridiculous improbability.

GOOD DESIGN handled the next phase. Although he had learned to maneuver the little Ship out in space where there is elbow room, landing is another and a ticklish matter. He would have crashed any spacecraft designed before the designing of the *Vanguard*. But the designers of the *Vanguard* had known that the Ship's auxiliary craft would be piloted and grounded by at least the second generation of explorers; green pilots must make those landings unassisted. They planned for it.

Hugh got the vessel down into the stratosphere and straightened it triumphantly into a course that would with certainty kill them all.

The autopilots took over.

Hugh stormed and swore, producing some words which diverted Alan's attention and admiration from the view out the port. But nothing he could do would cause the craft to respond. It settled in its own way and leveled off at a thousand feet, an altitude which it maintained regardless of changing contour.

"Hugh, the stars are gone!"

"I know it."

"But Jordan! Hugh—what happened to them?"

Hugh glared at Alan. "I—don't—know—and—I—don't—care! You get aft with the women and stop asking silly questions."

Alan departed reluctantly with a backward look at the surface of the planet and the bright sky. It interested him, but he did not marvel much at it—his ability to marvel had been overstrained.

It was some hours before Hugh

discovered that a hitherto ignored group of control lights set in motion a chain of events whereby the autopilot would ground the Ship. Since he found this out experimentally he did not exactly choose the place of landing. But the unwinking stereo-eyes of the autopilot fed its data to the "brain"; the submolar mechanism selected and rejected; the Ship grounded gently on a rolling high prairie near a clump of trees.

Ertz came forward. "What's happened, Hugh?"

Hugh waved at the view port. "We're there." He was too tired to make much of it, too tired and too emotionally exhausted. His weeks of fighting a fight he understood but poorly, hunger, and lately thirst—years of feeding on a consuming ambition, these left him with little ability to enjoy his goal when it arrived.

But they had landed, they had finished Jordan's Trip. He was not unhappy, at peace rather, and very tired.

Ertz stared out. "Jordan!" he muttered. Then, "Let's go out."

"All right."

Alan came forward, as they were opening the air lock, and the women pressed after him. "Are we there, Captain?"

"Shut up," said Hugh.

The women crowded up to the described view port; Alan explained to them, importantly and incorrectly, the scene outside. Ertz got the last door open.

They sniffed at the air. "It's cold," said Ertz. In fact the temperature was perhaps five degrees less than the steady monotony of the Ship's temperature, but Ertz was experiencing weather for the first time.

"Nonsense," said Hugh, faintly annoyed that any fault should be found with "his" planet. "It's just your imagination."

"Maybe," Ertz conceded. He paused uneasily. "Going out?" he added.

"Of course." Mastering his own reluctance, Hugh pushed him aside and dropped five feet to the ground. "Come on—it's fine."

Ertz joined him, and stood close to him. Both of them remained close to the Ship. "It's big, isn't it?" Ertz said in a hushed voice.

"Well, we knew it would be," Hugh snapped, annoyed with himself for having the same lost feeling.

"Hie!" Alan peered cautiously out the door. "Can I come down? Is it all right?"

"Come ahead."

Alan eased himself gingerly over

the edge and joined them. He looked around and whistled. "Gosh!"

THEIR first sortie took them all of fifty feet from the Ship. They huddled close together for silent comfort, and watched their feet to keep from stumbling on this strange uneven deck. They made it without incident until Alan looked up from the ground and found himself for the first time in his life with nothing close to him. He was hit by vertigo and acute agoraphobia; he moaned, closed his eyes and fell.

"What in the Ship?" demanded Ertz, looking around. Then it hit him.

Hugh fought against it. It pulled him to his knees, but he fought it, steadying himself with one hand on the ground. However, he had the advantage of having stared out

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through the view port for endless time—neither Alan nor Ertz were cowards.

"Alan!" his wife shrilled from the open door. "Alan! Come back here!" Alan opened one eye, managed to get it focused on the Ship, and started inching back on his belly.

"Alan!" commanded Hugh. "Stop that! Sit up."

Alan did so, with the air of a man pushed too far. "Open your eyes!" Alan obeyed cautiously, re-closed them hastily.

"Just sit still and you'll be all right," Hugh added. "I'm all right already." To prove it he stood up. He was still dizzy, but he made it. Ertz sat up.

THE SUN had crossed a sizable piece of the sky, enough time had passed for a well-fed man to become hungry—and they were not well fed. Even the women were outside—that had been accomplished by the simple expedient of going back in and

pushing them out. They had not ventured away from the side of the Ship, but sat huddled against it. But their menfolk had even learned to walk singly, even in open spaces. Alan thought nothing of strutting a full fifty yards away from the shadow of the Ship, and did so more than once, in full sight of the women.

It was on one such journey that a small animal native to the planet let his curiosity exceed his caution. Alan's knife knocked him over and left him kicking. Alan scurried to the spot, grabbed his fat prize by one leg, and hore it proudly back to Hugh. "Look, Hugh, look! Good eating!"

Hugh looked with approval. His first strange fright of the place had passed and had been replaced with a warm deep feeling, a feeling that he had come at last to his long home. This seemed a good omen.

"Yes," he agreed. "Good eating. From now on, Alan, always Good Eating."

THE END.

* * * * *

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* * * * *

Continued from page 6

How about documentary films that gave some idea of what could be expected—with the difficulties as well as the benefits—before people went wild.

Given that hypothetical announcement, there would be plenty of time to get things organized smoothly—if people didn't get panicky. It would take ten years of rapid, heavy-construction work to convert any major portion of present power systems to use the new methods, a period of adjustment and reorganization wherein the slack would be taken up by expanding purchasing power due to cheaper products. Coal—as recently pointed out—would be far from valueless in any case; oil, as a starting point for almost any organic synthesis is immensely valuable. And if you could make copper—or gold or platinum for that matter—from iron and carbon, there would be no profit in it. If a reaction between atoms tends to absorb energy, it won't happen except under the most terrific sort of conditions. That's why the old bombardment methods of atom-smashing didn't work. If it gives off energy, on the other hand, it will be reasonably easy to work, once it's started. But—if it gives off energy on the scale of atomic reactions, the production of a ton of copper would mean the simultaneous production of such a stupendous amount of raw, flaming heat as to require equally Gargantuan heat-dissipators. A plant producing a few tons of copper a day could probably convert the Mississippi River into a steam jet.

Mr. O. C. Wilson has asked me to suggest that those interested in producing amateur documentary movies of tomorrow get in touch with him at National Film Secretary, 172 Wellington Street, Ottawa, Canada.

Aside from that, but reminded by the foregoing photographic interest, I'd like to mention those argon glow lamps advertised in this issue with the subscription offer. Still-camera fans who do their own photofinishing will find those glow lamps amazing little gadgets. The light they give out is so rich in the ultraviolet that printing paper emulsions will react to the two-and-one-half-watt glow more quickly than to a fifty-watt tungsten bulb. A contact printer using three fifteen-watt lamps took sixty seconds to make a print; with three two-and-one-half-watt glow lamps it printed in approximately three-quarters of a second. In taking photographs by the ultraviolet light, a different effect is encountered. Panchromatic film is red-sensitive, and hence there is less difference between tungsten and argon glow light for such film, but it is still not to be judged on the basis of equivalent wattage. If a picture is to be taken by the glow-lamp illumination, a seemingly low-level lighting will actually give a surprisingly dense negative.

In photographing fluorescence under the glow lamp, a panchromatic film must be used with a filter to cut out the blue and ultraviolet which tend to register much too strongly for satisfactory results. It tends to drown out the fluorescence. The color of the filter used will, of course, vary with the color of the fluorescence involved. Yellow-green fluorescence is, unfortunately, most common, and most difficult to photograph. Panchromatic film has a minimum of sensitivity in the yellow-green, and a terrific maximum in the exact region where the direct light of the glow lamp is strongest. Those experimentally inclined can have some fun with that problem. And this one: many a red filter that will stop blue light will not stop ultraviolet. Glass is reasonably transparent to the near ultraviolet.

THE EDITOR.



BRASS TACKS

Concerning our barbarous descendants.

Dear JWC:

First the ballot: Heinlein is clearly an unbentable. I have always been a sucker for mutually consistent stories—and wish I had the logical make-up that enables one to work out such a system—and stick to it.

My ratings for July, then, are these: (1) "Methuseiah's Children"; (2) "The Probable Man"; (3) "The Seesaw"; (4) "The Geometries of Johnny Day"—although Johnny's solution on page 120 would probably carry the lead squarely across a door or row of windows in a well-designed office of that shape; (5) "We Also Walk Dogs"; (6) "Brown"; (7) "Spaceship in a Flask"; (8) "Vermin of the Sky"—because this is a factual article whose facts I already knew. On second thought, rate "The Probable Man" first and Heinlein second: Bester seems really to have worked out the time-travel business as sensibly as anyone I have ever seen.

And now for the question Sprague raises, that of Our Barbarous Descendants. If a fight starts, I hope it is with someone less well-armed than he, because in addition to a considerably greater knowledge of history and anthropology than I have—despite my interest in archaeology—he has the N. Y. P. D. at hand for ammunition and considerably more time than I to load it into the guns.

However, in the matter of OBD. The

great unknown variable in the situation is, of course, psychological. Granted the right psychological set-up, almost anything can follow. We have seen, in Germany, a situation which could conceivably lead to the deliberate destruction of all books not written by Germans, or, in retaliation, of all books written by Germans. It wouldn't be complete—books would always be hidden away—but for the mass of the public of a conquered or barbarized country it could mean the blotting out of a large chunk of human knowledge. We could have automobiles without knowing the Einstein theory—but we'd have to rediscover relativity to get back to our present total culture.

Illiteracy would spread faster, I think, than the loss of books: if our culture reached a stage where reading was not useful, and where all available time and effort were needed to keep alive, reading might be lost even with some books on hand. In any case, a culture would result with some curious blind spots.

However, to me, the really critical factor is not the immediate loss of books or knowledge of the previous culture: it is the practical physical result of any very radical backward change in our economy. This isn't new, but it is vitally important, and the thing which could do more to produce savagery than illiteracy, Nazi or anti-Nazi ideologies, or any similar situation. If the nation's present system of food distribution were to break down under conditions which

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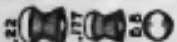
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Psychology would work on the results of this first collapse. It might permit restoration of central rule, planned economy—or it might lead to tribalism. It might permit a stable state of undernourished balance like what Europe seems to be facing now, which might hold until distribution of food and other essentials could be restored. Psychology would determine whether or not there would be any united attempt to get back to our present state, or whether reaction and hate and evangelism and other molders of the mob would check the restoration long enough for books to be burned, mechanical skills lost, and barbarism given its start.

The writer who convincingly writes of OBD must go to as much trouble as Heinlein is doing, to work out this progress of degeneration logically, postulate the psychology that permits it to take place, and go on from there. Because the savages which would result in the fall from grace would not, as Sprague has pointed out, be the same kind that preceded the rise to glory.

Culture is a queer thing. The Mayas built stone cities with stone tools three thousand years after the Egyptians—but they never had the wheel. They invented zero, computed the goings and comings of Venus—but it is questionable whether they intelligently made bronze. Here in New York State was a group—the Laurentian culture, so-called—which at one stage used copper and made slate implements so beautifully shaped and finished that the Museum of Modern Art listed them as precision tools in their recent show of Indian art—but which lacked agriculture and pottery. You had California Indians who could weave watertight baskets—and who lived on acorns and what else they could grub up. You have the Eskimos: in the sense that their culture is—or was before gumdrops and polar explorers—almost perfectly adapted to their environment, among the most civilized people on the planet—yet regarded by most as savages.

Cultures do backslide; the question is, as I see it, whether in the opinion of the brethren we have reached too high a pinnacle to hit bottom before we can stop ourselves, and whether we would immediately climb back and continue climbing. The

Mayas of old have modern descendants, living in the same jungles, among the ruins of the cities their ancestors built, who qualify perfectly as savages. Black tribes in Africa built Zimbabwe, discovered how to smelt and use iron without having passed through the copper-bronze stage—and forgot how to do both. The Tasmanians reached Tasmania somehow, but when the whites arrived they didn't know how to make boats. Some of the Plains Indians adopted wild horses and evolved an entirely different culture—without the pottery they had made when they raised corn in the woods along the edges of the prairie.

There are plenty of precedents for a people hitting bottom and staying there. It can happen again. I hope that there can be a hearty and suitably ill-tempered argumentation on the how and why.—P. Schuyler Miller, 108 Union Street, Schenectady, New York.

The art question seems to be acute. It's not every artist who can handle science-fiction.

Dear Mr. Campbell:

Just some comments anent your July issue. On the whole this issue was rather good. Although not quite up to the standard of the past two or three months. The following are my ratings of the stories:

1. "Methuselah's Children"—again Heinlein scores first place with a story which promises to be one of the finest.

2. "The Prohabile Man"—a good science-fiction yarn and a good author. The story was reminiscent of de Camp's "Divide And Rule."

3. "The Geometrics Of Johany Day"—a very humorous and entertaining story written by a master of nutty logic. More of this type, please.

4. "The Seesaw"—Van Vogt seems to be resting on his laurels since "Slan," because this certainly wasn't up to his usual fiction.

5. "Spaceship in a Flask"—the title was very misleading. I expected a civilization of micro-beings making a voyage to the outer world. Still a good yarn.

6. "We Also Walk Dogs"—no plot to speak of, but MacDonald's good writing held it above the hack level.

7. "Beown"—I dunno; this story didn't click at all with me, and I don't know why.

The article was fair. But not anywhere near de Camp's writing. Your editorial was fine, but then it always is. It is really a pleasure to read an editorial once in a while

that does not gab about future issues.

The art work is the only flaw in an otherwise perfect magazine. Schneeman was good a year or so ago, but since he's changed his style the pictures have lost dramatic quality. Kolliker, no, emphatically his illustrations have no life whatsoever. Hubert Rogers is probably the best cover artist in the field but his interiors aren't so hot, but still passable. The only artist I'm not decided upon is Kramer. Sometimes he's great; other times—The Isip brothers are awful. Please get Virgil Finlay and Elliot Dold.—Vincent Scullin, Hotel Traymore, Atlantic City, N. J.

I liked the Little People, too—

Dear Mr. Campbell:

It looks as if Heinlein's "Methuselah's Children" will not only be the longest yarn he has ever written, but also the best. With this, the second installment—and a nice, meaty one at that—MC develops more fully from the point of view of plot, turning into an even better story than the first part portended. Hm-m-m, wonder what the Jockaira have up their collective sleeves?

One extremely interesting point stands out in all of Heinlein's tales: if the story is laid in the future, the thought-patterns are of the future, logically based on those of today, but with a correspondingly greater or smaller degree of difference as regards the distance in the future. Thus I continually run across small incidents which seem strange or even ludicrous at first, but which, on second thought, are entirely possible in the future. As you once said, it is the application to small detail that helps make Heinlein the writer he is.

"Backlash" is a nice little yarn and places an easy second in the ratings of this month. Williamson once again demonstrates his writing ability and mastery of the time-theme plot. Schachner's new series is far superior to the "Past, Present, and Future" one—"Jurisdiction," the second of the space lawyer stories, coming in third. At least Schachner can make his own laws to fit his plots! In "A Meteor Legacy"—following closely in fourth place—Gallun has taken a rather threadbare idea and resuscitated it with a new twist, turning it into a really good short. I have an idea that this will be another issue where one story will take a consistent first place with the votes split on the rest.

Rogers' August cover—like the last August cover—seems destined to become

Astounding's best of the year, though Rogers himself might do the seemingly impossible and paint one even better. I could add a few raves about this painting, but I would only have a sense of futility in so doing, for I doubt if anyone but a person of A. Merritt's or E. E. Smith's descriptive powers could do justice to it.

Still think an improvement on the interior work could be made by the addition of Finlay or even Thorp—a new artist doing an excellent job in two of your contemporaries. Best pics of this issue are by M. Isip, Rogers and Schneeman.

Ley is one of those few writers who can pen articles in an informative and interesting manner, easily understandable to the lay mind, "Prelude to Engineering" bearing out this point. Also of interest was the all too rare book reviews. De Camp missed a chance to review his own book! The idea of Astounding books, propounded in Brass Tacks, is noteworthy.—Bill Stoy, 140-92 Burden Crescent, Jamaica, New York.

*If the atoms of the dust wouldn't work,
neither would the atoms of human
bodies!*

Dear Mr. Campbell:

First, I am again going to make you gnash your teeth and tear your hair with wild rage by saying: "We want Wesso." Next, I am going to make somebody crazy by saying: "We don't want Dold." Having contributed my share to the miseries of his world and the next, I turn to the present issue of Astounding.

Well, well. Good old Heinlein. Maybe that phrase is odd to use on a comparative newcomer, but it still applies. The Rogers pics, however, don't do him justice; neither does the cover, which isn't nearly as good as the ones for Heinlein's "Universe" and "Logic of Empire."

Van Vogt, our other new favorite, is also appreciated—same issue, too! Would it be asking too much to have a sequel? No, not about the main character, of course—I meant about the inhabitants of the future "Gun Shop."

This seems to be Newcomer Month; we also have the most recent author of all, Anson MacDonald, with a dizzily crazy yarn that screams for a number of sequels. There are a lot of other problems to be cracked by General Services, you know!

And there is one more "new" man—Alfred Bester. And a swell yarn, too. Then,

to offset these four recent arrivals, who pops up but Clifford Simak?

Which brings me to the grouse-of-the-month: Several places in Simak's tale we find the word "Mercurian." Why? How come all the authors have begun going wild over new adjectives to fit to the planets? "Mercurians," "Jupiterans," "Plutians," "Uranians," "Martiens"—ugh! Really, now—besides being more correct, isn't it easier to say "Jovian" and "Uranian"? Of course, I don't want to start anything about Venus, because one authority says "Venusian" is correct. But those others! Please, Mr. Campbell, do something!

As for "Solution Unsatisfactory," how about moving to some planet where the "dust" wouldn't work?—Paul Carter, 156 South University Street, Blackfoot, Idaho.

It wasn't so much a "whodunit" as a "whozitdunit."

Dear Mr. Campbell:

I don't ordinarily like "whodunits" in science-fiction—they're unfair. But I liked Rocklynne's "Time Wants a Skeleton," which skated sort of close to the Whodunitland border. The trouble with detective stories in science-fiction is that the original idea of a detective yarn—can the reader guess the answer before the detective explains—is absolutely hopeless.

It's this way; if Odious Q. Blackhart is found to have been trisected in all three dimensions with his component particles scattered around a locked room, in a here-and-now story, we've got a new version of the dear, old sealed-room mystery. All doors and windows, et cetera, thoroughly locked. How did the trisector get at the trisection and depart, leaving the room sealed? A sound sort of problem, wherein the detective and the reader have a chance to get to work.

But if Odious was born about 1900 and died, but violently, about 2039, the whole thing is different. The author of the yarn is then at liberty to have his trisector operate on Odious with a honeycomb force field, which is remotely controlled and doesn't have to enter the locked room at all. It's created there. Or it may be that the worm that turned on Blackhart was a hot-shot inventor who's learned to operate from the fourth dimension, and the elaborate trisectioning of poor Odious was just the inevitable result of a single hefty swing of a fourth-dimensional meat ax, allowing

the carver to walk out through the fourth-dimensional exit he entered by.

Again, the author may have decided the fourth dimension was too old an idea, and fallen back on radio transmission of matter—one murderer, complete with snicker-snack having been shipped in and shipped out again via radio.

Of course, the detective's got a tough job with all those methods to worry about, plus the possibility that the murderer and his weapon simply locked themselves in the room, dispatched Odious Q., and hung around waiting for someone to break in—having first rendered himself invisible so he could walk out unseen, after someone else publicly broke down the door.

But the reader's problem is even worse. The detective can artificially limit his creator's imagination to make the problem solvable; the reader hasn't any idea what limits—or what wacky ideas—the author's planning to spring.

No fair, says I.

And—while I'm forced to admit that Adam the Skeleton was "planted" fairly early in Rocklyane's yarn—I don't think his sudden appearance was too fair either. One of the six should have been that skeleton.—Bob Martin, New York City.

"Remember when" session.

Dear Mr. Campbell:

It's rather odd, but the return of Harry Bates with "A Matter of Speed" has set up within me a highly nostalgic feeling to return to the year 1934, wherein was published "A Matter of Size," that gem written by the same author.

It's not that your present staff of authors aren't satisfying, for the most part they're grand; but I possess an undefinable yearning for higher recognition of the older writers, for without such recognition we have no stories written by them. And when your present readers placed Harry Bates' latest story on top followed by Nat Schachner's Kerry Dale yarn, my innards really glowed.

Schachner's latest is far superior to anything he has done since 1937; yet, I'm still waiting for something more like those others: "Ancestral Voices," "He From Procyon," "Redmask," "I Am Not God," "Pacific," and "Entropy."

In comparison to 1934 your later issues contain many more good and far fewer poor stories, but only a sprinkling of those kind that leave indelible impressions. The stories now are better written, have better style; the magazine is edited better, it's

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circulation is undoubtedly greater—still, I miss those old top-heavy "power" stories. I wonder what percentage of the readers now have read "Colossus," "Finality Unlimited," by Wandrei; "Rebirth," by McClary; "Legion of Space," by Williamson; "Brain of Light," "Before Earth Canse," by Fearn; "Sidewise in Time," "The Incredible Invasion," by Leinster; "The Bright Illusion," "Greater Glories," by Moore; "Twilight," "Night," by Stuart.

While I'm in this reminiscent vein, I'd like to nominate the best all-time issue **Astounding** has ever presented, and I'm willing to bet that nine out of ten readers will agree with my choice. The issue is December, 1934. For therein lies "The Skylark of Valeron," by Smith; "The Mightiest Machine," by "Author" Campbell; "Old Faithful," by Gallun—the three best stories by three fine writers—along with "Colossus Eternal," by Wandrei; "The Irrelevant," by van Campen, and "Atomic Power," by Stuart—who goes there behind that name?—plus Coblenz and Graham.

If you ever top that line-up, Mr. Campbell, the issue will have to contain a dual serial by Smith and Merritt, novelettes by Hubbard, Heinlein, van Vogt, and McDonald add with a de Camp article thrown in.

When does it go to press?—George E. Crancer, 1731 E. Street, Lincoln, Nebraska.

How a novel gets its name. The Galactic Roamers finally agreed with Doc Smith on "Second Stage Lensmen."

Dear Mr. Campbell:

The boys of the Galactic Roamers, who have been following with especial interest the writing of Dr. Smith's third Lensman story, have asked me to write you regarding the title. We know that Doc used "Kinnison, Co-ordinator" merely as a working title, and did not particularly care for it, especially as, during the story, Kim was too busy doing other things to work at his Co-ordinating job. And all of us believe the title should be "Red Lensman," the title given Chris by all her legion of friends. This seems a "natural," inasmuch as it follows "Gray Lensman," and would lead the readers of that second book to wonder what a "Red" Lensman could be, when the story had sort of intimated that Gray was as high as they could go. We are not, of course, trying to give you orders—but we are trying to influence you to see it our way.—E. Everett Evans, Chief Communications Officer, The Galactic Roamers, 191 Capitol Avenue, S. W., Battle Creek, Michigan.



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