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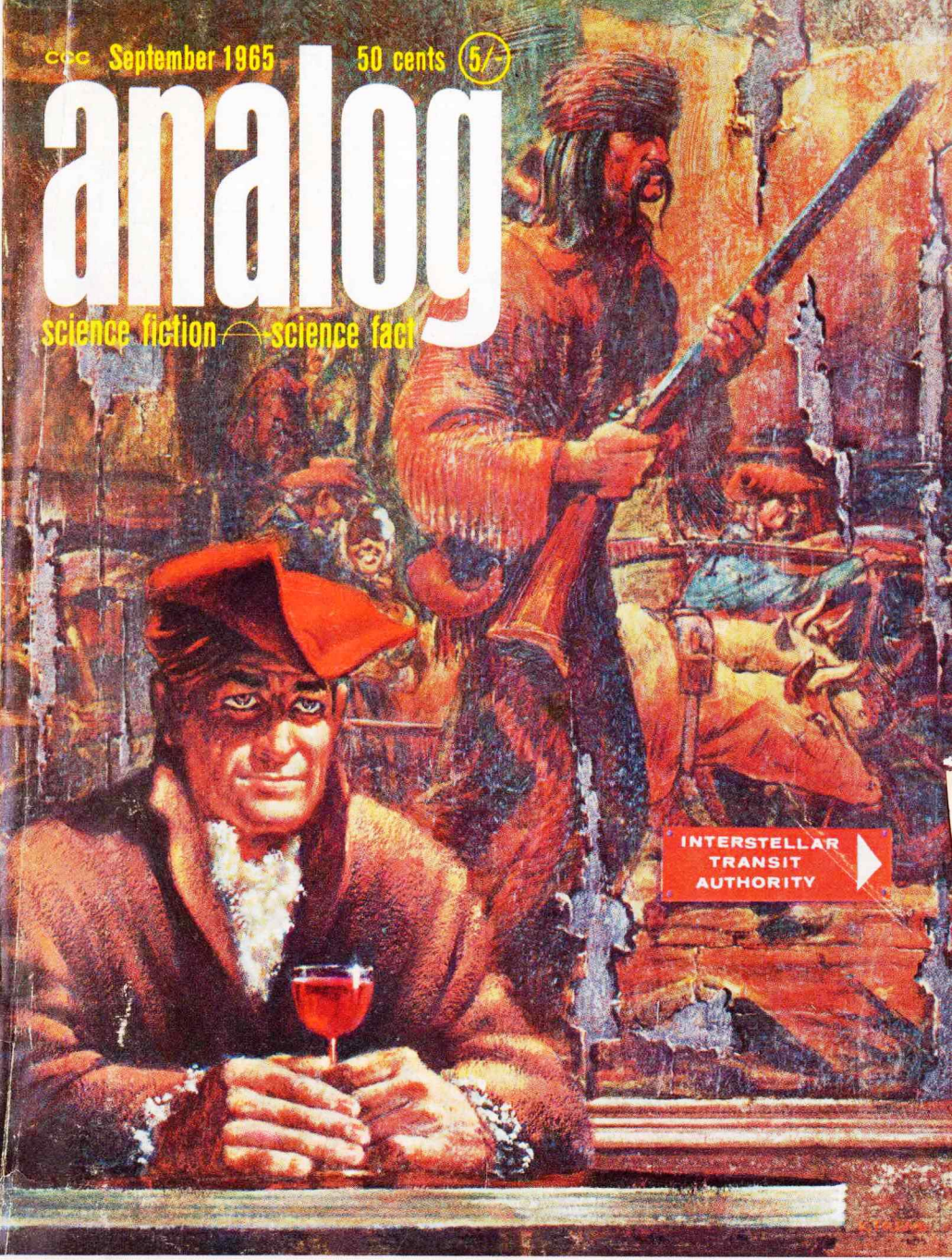

SPACE PIONEER BY **MACK REYNOLDS**

The record-smashing winner of the 1965 Masters, golf champion **JACK NICKLAUS,** tells you 55 ways to lower your golf score

JACK NICKLAUS

When to chip with a putting stroke from off the green. (See p. 91)

"THE VICTORY by Jack Nicklaus in the Masters," says Bobby Jones, in the *New York Times*, "was the greatest tournament performance in golf history."

Now, in his first book, MY 55 WAYS TO LOWER YOUR GOLF SCORE, Nicklaus shows you how to slash strokes from your game. It is a step-by-step revelation of his approach, his golf thinking, and his championship technique.

Here is what he has to say about his book:

"Some time ago, *Sports Illustrated* invited me to do a series of articles. They teamed me up with Francis Golden, a brilliant artist who knows the mechanics of the game of golf almost as well as I do. Between us, we came up with what I honestly feel is a *new kind* of golf instruction: *pictures* that so clearly show such things as firm grip, smooth stroke, movements of arms and legs, that the word explanations can always be short and absolutely to the point. The lavish use of as many as four colors per picture — plus a series of color arrows, properly placed — make this possible.

"Those magazine articles, which originally started out as a ten-parter, were so well received that they grew and grew — first into a regular feature, and now, this book. I'm very proud of my book, because over the years I've read just about everyone *else's* golf book. And while some of them were helpful, too many of them (in my opinion) take you too far back from where you happen to be. Others strain at picking the specks out of the pepper, or overemphasize one phase of the game at the expense of others. I don't fall into any of these traps.

Here we go . . . my 55 ways

"You're not going to agree with everything I say — because I don't believe in *all* the generally accepted principles of golf. But everything I tell you, I've profited from. And as you know, I've had a fair degree of success. So let's go.

"You'll find out why so many touring pros cock their heads just before starting their backswing . . . when a 1-iron is better than a 4-wood . . . how the proper tempo of your swing can make a big improvement on your present game.

"You'll see how to lick narrow holes with a controlled fade . . . how to execute an often overlooked but vital element in the intentional hook.

"If tension is high and you need only to put a medium approach shot into the middle of the 18th green and two-putt to break 90 (or take a Nassau or win the Club championship), I'll show you how the pros do it. I'll also show you how to hit a shot that is quite difficult for most golfers, but vital for a better score: the long full iron from a fairway sand trap.

How to use the right knee for extra power. (See p. 22)

You benefit from tournament tactics

"Every one of the 55 situations I tell you about in my book has come up in actual play. Many times, specific tournament instances are cited. And frequently, I'll tell you what *other pros* do. For example, you'll get a tip I learned from Jack Burke on how to get more accurate distance and aim on putts. And you'll see why Gary Player — who is only 5 feet 7 — uses a shaft one inch *longer* than most other pros.

"In my book you'll also get answers to the 'whys' and 'hows' that so often bug you in the course of play. How can you hit a long-iron approach shot that will clear bunkers and hazards in front of the green, yet stay out of trouble behind the green? How can you *easily* hit a ball in a divot mark or in a bad fairway lie?

"You'll learn how to determine *beforehand* which way a putt will break — even though it appears to break from left to right when viewed from behind, and from right to left from the other direction.

What to do when it 'looks like curtains'

"I'll show you what to do when your ball misses the green and nestles into high swirling rough . . . when you're trapped next to the green and the pin is much too close for a full explosion . . . when your ball rolls against the back edge of a trap in a way that makes it almost impossible to get the club head down into the ball.

"And while we're on the subject of "frustration," let's not forget that old bugaboo, putting. I show you how to eliminate those nightmare three-putt greens; how to get the short putts down consistently; when to putt from a *trap*.

"You'll get much more valuable know-how in my book — but space limitations keep me from elaborating here. Instead . . .

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HOW LITTLE WE KNOW

It's been pointed out that about ninety per cent of all the scientists who ever lived are alive today. Science, as what we mean today by the term, is only about three centuries old. And, now that science has barely gotten started, we're smothering in an information explosion.

Yet on this foundation, Science says with resounding certainty that no one can ever exceed the speed of light—and, until very recently, that the noble gases are totally incapable of chemical reaction, and that Mercury has no atmosphere and always faces with one side toward the Sun.

Radiotelescope work with the huge 1,000-foot dish in Puerto Rico has revealed that Mercuty does turn on its axis with respect to the Sun. And it's also known that Mercury has an atmosphere.

Science had proven that Mercury couldn't possibly have an atmosphere—except, perhaps (and very appropriately!) an atmosphere of mercury vapor. Since it was "known" that one side always faced the Sun, and that side had a temperature near the melting point of zinc, and Mercury was a small planet with only about a fifth of Earth's ability to hold gases against diffusion into space—obviously Mercury couldn't hold a gaseous atmosphere. Except, of course, for some high-boiling, very heavy atoms such as metallic mercury. And the "cold side" of Mercury, we were assured, was the coldest spot in the Solar System—even colder than Neptune's surface, because Neptune did expose all its surface to the weak sunlight.

Of course, it was easy to prove mathematically that Mercury long since stopped rotating with respect to the Sun, because of the immense tidal force of the nearby (36,000,000 miles) Sun. If it ever had rotated, those tidal drags had long, long since clutched it, and stopped it, as our Moon has been stopped by the tidal grip of Earth.

Unfortunately, these proofs turn out—now they tell us!—to be somewhat like the mathematically valid proof that a bumblebee can't fly. The proof is perfectly valid mathematically; it is a correct logi-

EDITORIAL BY JOHN W. CAMPBELL

cal consequence of the given postulates. Trouble is . . . in making the analysis they considered the bumblebee as a fixed-wing aerodynamic device, and the bumblebee doesn't happen to keep his wings fixed. Stop the rotor blades of a helicopter—convert it to a fixed-wing device—and it drops.

Science is great at finding the perfectly valid scientific explanation *after* the facts are demonstrated.

The overlooked factor in Mercury's behavior seems to be the Solar Wind. (There's no Earthly Wind equivalent blowing past the Moon, which is why the Lunar analogy didn't hold so good.)

The huge radar dish was able to get radar reflection data from Mercury. The return of a radar echo tells you—by time lapse—the distance from transmitter to target and back. This is, however, complicated somewhat when you're bouncing it off a spherical planet because the planet is not a flat disk at a uniform distance from the transmitter; the return echo is spread out in time because part is reflected from the nearest point of the sphere, while later echoes return from successively more distant annular rings.

By precision analysis of a radar echo, in other words, one could determine not only the distance to the center of the planet, but also the diameter of the planet.

But there are still more bits of information impressed on the echo.

The tail of the echo—that part reflected from a ring around the edges of the apparent disk—is distorted in another way. The signal transmitted was at a specific and exactly known frequency. If the planet is rotating rapidly, the echo transmitted from the north and south poles will be unaffected, since they are not rotating either toward or away from us. However, the reflection from the East and West limbs of the planet will be affected; the Doppler effect sets in. One edge is turning away from us; the echoes reflected from it come back at a slightly lower frequency. The other edge, turning toward us, imposes a slightly higher frequency.

The huge dish at Puerto Rico allowed the radio-astronomers to make accurate Doppler-radar determinations of Mercury's rotation. It doesn't allow them to determine whether it's rotating east-to-west or west-to-east—whether its rotation is retrograde or direct. But it does allow them to determine that it rotates on its axis with respect to the stars in a period markedly different from the period of its eighty-eight-day orbit. This means that the Sun rises and sets, as seen from the surface of Mercury. That knocks out a fine collection of astronomical theories—and a lot of good science-fiction yarns.

More important—more humbling!—is the fact that it clobbers, but good, all the maps of Mercury astronomical observers have drawn over the years. There's a beautiful painting of Mercury in one astronomical textbook I have—too bad it's strictly an optical illusion!

Mercury is, of course, extremely difficult to observe visually. It's smaller than Mars, has a very low reflective power—probably about as low as that of the Moon, which compares with the reflective power of a lava flow on Earth. Mercury at inferior conjunction is about 60,000,000 miles away—twice as far as Mars at Mars' inferior conjunction. But Mercury, when at inferior conjunction, is directly in line with the Sun, which is anything but helpful in observing planetary details.

At greatest elongation—i.e., when it's farther from the line between Earth and the Sun, and, therefore, least clouded by the dazzle of the Sun's immense brilliance—it's another 60,000,000 or so miles distant.

Even then, it's still so close to the Sun that there's some twilight glow left in Earth's atmosphere, if you wait till sunset. Of course, then you have to observe Mercury when it's near the horizon, so you're observing through miles and miles of thick and turbulent atmosphere. You can try observing during the day, when the Sun is still above the horizon, and Mercury is up near the zenith, with a minimum of Earth's thick atmosphere in the way.

This, however, has certain other difficulties; the Sun's intense radiation tends to stir things up pretty well during the day, making for poor seeing. Contrast is very poor, too; Venus can be observed readily under that type of condition, because Venus is a solid mass of brilliantly reflective clouds, but Mer-

continued on page 158

"CREATINE HAS NO KNOWN PHYSIOLOGICAL EFFECTS."

The FDA's recent blast at Krebiozen as being "nothing but creatine" is of interest in view of the following item—a letter which appeared in *Science* (17 November, 1964, P. 1113).

Pre-1962 Creatine sought.

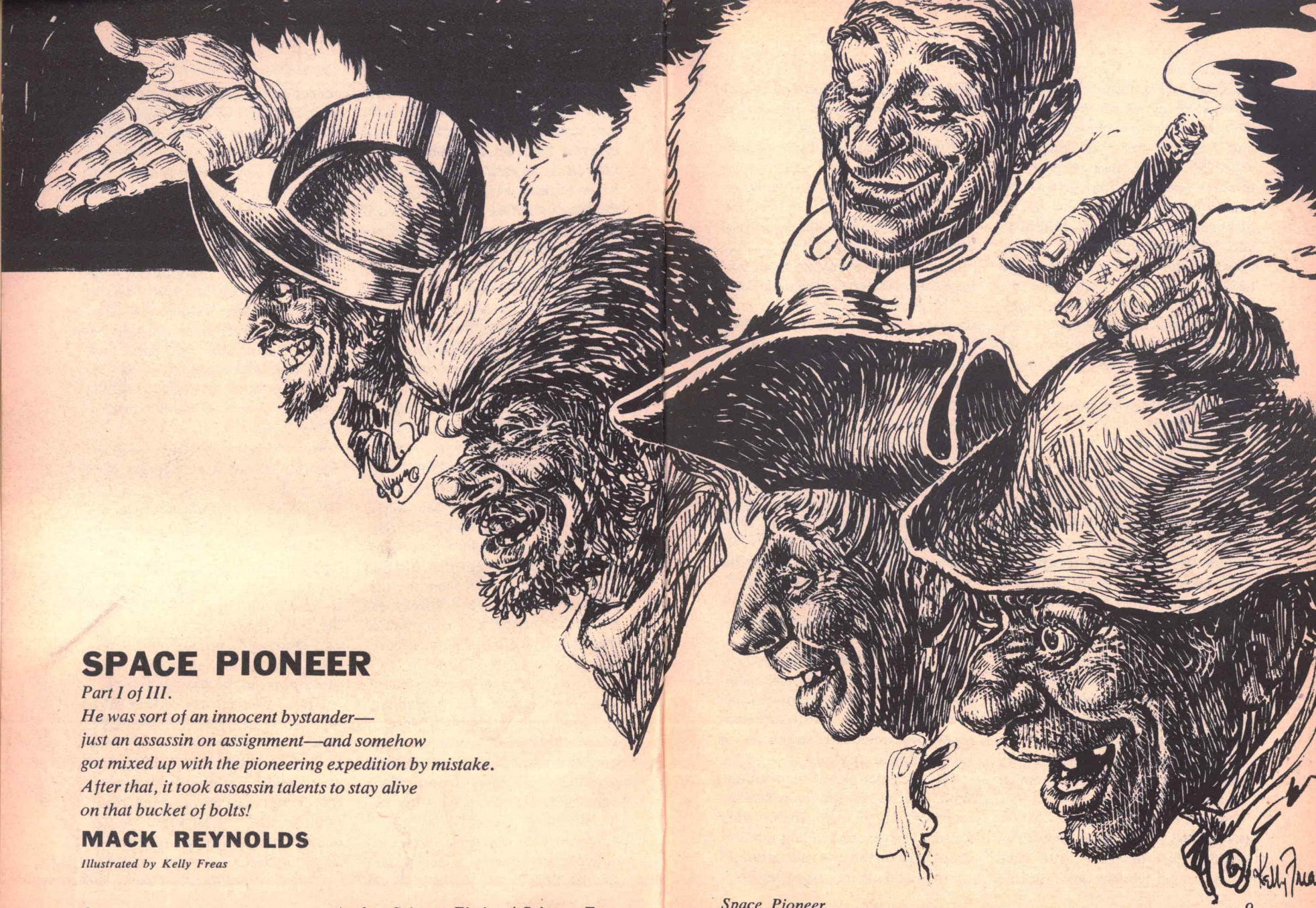
We are seeking help in finding 50 grams of Eastman (Distillation Products Corporation) creatine, catalog No. 951, purchased prior to 1962. We have been informed that the source of the creatine sold by Eastman has changed, and we find a different physiological response from that formerly found in rats fed creatine. Eastman has been unable to locate a supply of the earlier product for us.

W. R. Todd, Department of Biochemistry, University of Oregon Medical School, Portland.

Whether there was an impurity in the old which is not in the new, or vice versa, seems to be undetermined at this point.

But, of course, both lots were sold as being "nothing but creatine."

The rats appear to have considered otherwise.



SPACE PIONEER

Part I of III.

He was sort of an innocent bystander—
just an assassin on assignment—and somehow
got mixed up with the pioneering expedition by mistake.
After that, it took assassin talents to stay alive
on that bucket of bolts!

MACK REYNOLDS

Illustrated by Kelly Freas

He stood and stared at the great cigar that thrust itself Sequoia high into the day's low clouds. And in him was awe and a certain reverence. The dream had been strong to reach out to the stars, to join the lemming-like rush of man to far planets. The heroes of his childhood had been the conquistadores, the Pilgrims, the '49ers, the Boers who trekked into the Transvaal; the heroes of his present were those who even now were opening up new worlds in the reaches of space.

A voice said, "Hey, fella, move along."

He brought his eyes around to the other. "What?"

"I said, get along. You're blocking the entry."

"I'm not bothering anybody."

"Come on, come on," the guard snarled. "If we let every flat around hang out here, the passengers wouldn't be able to get through."

He looked at the man for a long moment. The other had little to do beyond standing at the gate and checking entry passes and was asserting his petty authority on the only available outlet.

He said, "Look, I want to locate somebody on board the s/s *Titov*. That's her, isn't it?"

"That's her," the guard said, projecting weariness. "Crew member or passenger?"

"I. . . I don't know."

The guard sneered at him. "You wouldn't just be some stute yoke wants to get aboard just for the glory of being on a space passenger freighter, would you? Just so he could tell the other yokes."

The other looked at him unblinkingly.

Something there is in the killer trained that is there to be felt through his eyes. A chill emptiness, the knowledge of the power to take life, or possibly to refrain from taking it, upon desire. A chill emptiness.

The guard saw a man in his mid-twenties. Medium of build, firm, well-cut features, quiet of voice, not overly well dressed. But he saw more than that. The chill in the dark eyes. The guard shifted his shoulders unhappily.

"Maybe you're thinking of stowing away. How'd I know?" the guard said grudgingly.

"You don't have to know. All I asked was how I went about locating someone on the *Titov*."

The guard indicated with his head. "Down there at the ad buildings. There's a couple of rooms for the *Titov*. Ask 'em there. And now, beat it."

He found the two rooms devoted to the business of the spaceship *Titov*. There was a considerable coming and going, mostly, he supposed, last minute emergencies of scatterbrained passengers.

He grunted self-deprecation. Who was he to call them scatterbrained? They were living their dream. They were heading out into deep space on the great adventure.

He stood there frowning, not knowing his approach. From the size of the space-bound passenger freighter, it held a large number of passengers and crew—hundreds. One of them was Peshkopi, but he didn't even know the other's first name.

A professionally kindly voice said, "May I help you, my son? You are one of the passengers?"

He ran his eyes over the other. A brown robe, a face that was plump, pink and looked freshly washed, a short rounded body. In short, a United Temple monk, or perhaps a friar or rabbi, or whatever they called them. He wasn't particularly up on contemporary religion. His family had long nourished itself on hate.

He said, "I was looking for somebody aboard."

The older man chuckled. "I am afraid I cannot help you. I have but arrived myself. Perhaps one of the ship's officers over there."

"Thanks, uh, Pater," he said. "They look busy. Perhaps I'd better come back later."

The Temple monk chuckled again and patted his well-rounded belly. "I suspect they shall get increasingly busy from now on. Burn off is set for tomorrow morning at seven."

"Well, thanks, Pater." He drifted away. He didn't like the idea of simply approaching a *Titov* officer and asking about the one he sought. There might be dangerous aftermaths to that.

He passed near two of the uniformed crew members. One, a solid, florid-faced type was grumbling, "I'm going for a nardy coffee break. I've been sitting here for hours listening to the nardiest curd ever inflicted on a man. That last curve wanted to know whether there were snakes on New Arizona. Snakes, yet! Whot's she think it is, the Garden of Eden?"

His companion, whose sleeve bore one stripe, as compared to the other's three, said, "Skipper said no more liberty, Jeff. We burn off . . ."

"I know when we nardy well burn off," the other rasped. "And I don't need your advice, laddy. I didn't say anything about liberty. I said I needed coffee!" He spun and started off, swinging stocky legs as though in a desperate urgency.

The younger officer stared after him worriedly, his mouth half open as though to call, but then snapped it shut.

He came up from behind and stared after the three stripper. He turned to the younger officer. "Wasn't that Jeff . . ." He let his sentence dribble off.

The officer, still frowning, looked at him. "That was Jefferson Ferguson," he said. "First engineer."

"Oh, yes," the other mumbled. "That's what somebody said." He drifted away, as though vaguely. The junior officer looked after him, then shrugged in dismissal and went back to his duties.

Upon losing the attention of the junior officer, he thoughtfully followed Jeff Ferguson, who was obviously heading for refreshment stronger than coffee. The way led to a small auto-bar, less than a quarter mile from the spaceport's administration complex.

The place was packed with both uniformed spacemen and civilians some of whom were already stupidly drunk.

The engineer, his hands on his hips in disgust, was looking about the dim interior, obviously in search of an empty table.

He came up from behind and said, "Pardon me, aren't you the *Titov's* chief engineer, sir?"

Ferguson's eye came around. "No, I am not the nardy *Titov's* nardy chief engineer. I'm the . . . and who in Zen might you be?"

He smiled, projecting shyness. "I . . . I'm one of the passengers, sir. Thought perhaps you would have a drink with me. One . . . well, sort of for the road."

"And why should I drink with you, laddy?" However, there was a milder tone.

The other's smile widened. "Well, sir, I've got these Earth exchange slugs. What good will they do me on New Arizona? I thought I might as well . . ."

"You one of these nardy funkers who're drivel-happy enough to buy a berth halfway across the nardy galaxy and then at the last minute be afraid to come aboard?"

The other stared at him blankly. "Well . . . no, sir." He saw it was obviously a pet peeve with the engineer and an opening wedge. "Why should anybody do that?"

Ferguson grumbled contempt. "Nardy cloddies. Sure, I'll have a drink with you, laddy. Come along." He led the way to a table which—supported is the only word—four blue denim uniformed crewmen with s/s *Titov* lettered on their breast pockets.

The first engineer bent a beady eye on them. "And whot in the nardy Zen are the four of you space rats doing here when the ship's all but set to burn off?"

They staggered to their feet, two steadying one who was listing seriously to starboard. The fourth muttered something that didn't come through and they all stumbled hurriedly for the door, without looking back.

"Nardy cloddies," Ferguson grumbled, sinking into one of the abandoned chairs and motioning to another for his benefactor.

"Now, laddy, whot will it be? You're right. It's a long trip to New Arizona and your exchange slugs will do you nothing there. So name your guzzle. These spaceport bars carry every drink known to man or beast." He chortled gruffly. "Save, of course, those lacking in alcohol."

"Lozovacka," his host said, scanning the extensive liquor list imprinted on the table top.

"Whot?" the engineer demanded.

"Traditional drink where my people originally came from." He was not a toper but he was familiar with one facet of those who are. In the same way that you don't play the other man's game if you wish to win at gambling, you don't drink the other man's liquor if you want to put him under the table. A Scotsman can drink Scotch until dawn, and a Mexican tequila, but switch one to the other and they're both drenched by midnight.

Jeff Ferguson glared at him, in lugubrious chagrin, but his newfound companion was innocent of face. He had found, somewhat to his surprise, the strong Montenegrin and Albanian liquor on the bar list and had already dropped exchange slugs and dialed it—doubles.

A drinking man will drink in any language and Jeff Ferguson was a drinking man. He took up the glass. "Lucky burn offs, luckier set downs!"

He tossed the fiery Balkan brandy down, stiff wristed.

So did his host, still keeping his face innocent of expression and as though the high proof potable was every day tipple.

Ferguson's breath came out heavily in a whoosh, and he glared again though for different reason. "Whot did you call that?"

The other told him, dialing again. "Good, no? In my part of the world they say whisky's for babies."

"Oh, they nardy well do, huh?"

The other pushed the fresh glass over to the engineer. "What was it you were saying about paying for a ticket and then missing the burn off?"

Ferguson indicated the crowded, smoky, dismal auto-bar. "Half of these cloddies. Save up their nardy exchange for years. Sell the family treasures. All that sort of jetsam. Big ambition. Migrate to one of the new planets. Get rich over-space. The big dream. And whot happens? Here they are, trying to keep up their courage with guzzle. Half or more will turn up missing in the morning."

His companion stared around at them. He had always had the dream himself. It seemed utterly fantastic, that these who were so close to realizing it . . .

"Space flap," Ferguson was grumbling. He took down half the drink before him and interrupted himself long enough to say, "Laddy, I admit a certain respect for your national beverage." And then, "Space flap. They read about it. Get to thinking about it. Something like seasickness in the old days. Nine tenths of it pure nardy imagination—which doesn't make it any less real. Ever see a man in space flap?"

"No." He wondered if he should dial still another round. He didn't want to push it. Couldn't afford to make the other suspicious. But, for that matter, he had no real plan of action as yet.

"Well," Ferguson grumbled, "it's just as well, laddy. It's highly contagious. Can sweep through a nardy ship like a fire. Starts with the flats aboard. Free fall, the instinctive dread of deep space, the monotony and boredom of space travel—and don't think it's not monotonous. Some nardy flat gets it, and it . . ."

He was interrupted by a fight which broke out at the table behind him. The engineer didn't bother to turn, reacting no more than to close his eyes momentarily in pain. When the noise had abated he said to his host, "That's the kind whot comes down with flap first. Nardy flats."

His new friend dialed another round. The engineer was already feeling the ultra-potent brandy and the other took the chance of dialing himself a dry wine that resembled in color the spirit the engineer was drinking. He was going to have to keep in control of his own powers, if his mission was to be accomplished by morning.

He said, "By the way, you wouldn't know a fella named, let's see, Peshkopi, would you?"

Jeff Ferguson looked at him, half closing one eye. "On the *Titov*?" He shook his head. "Might be a new crew member. We have a crew of almost sixty. He's not an officer."

"Possibly one of the passengers."

"How in nardy Zen would I know the passengers?" Ferguson grumbled reasonably. "This stuff isn't exactly bellywash, uh . . . what'd you say your name was?"

The other said, "Oh . . . Smith."

Ferguson said, his voice slurring. "I better get on back to the ship. Duties."

His companion looked at him in surprise. "You haven't even bought back once," he complained. "I thought the idea was to have one of your own national drinks."

"Course," Ferguson said, in ruffled dignity. "Scotch. Pot still malt whisky, whot?"

"Double for me."

They returned to the ship late.

The administration offices were closed, save for one or two night-shift clerks, busy with paperwork. At the gate were two of the *Titov's* crew. They looked at the first engineer unhappily.

"*Zen*," one muttered. "You know the skipper's orders, sir."

"The skipper," Jefferson Ferguson slurred in rebuttal, "is a flat, as you nardy well know, Samuelson. Nardy well know."

"Yes, sir," Samuelson admitted unhappily. Evidently, Jeff Ferguson was a popular officer. Possibly his drinking was a source of concern for his men, when they were in port, but popular.

Now he was leaning on his companion as though past ready for sleep.

Samuelson said, scowling, "Who're you? Where's your pass?"

Ferguson opened one eye and squinted at the guard accusingly. "Samuelson, don't you know a nardy passenger when you nardy well see

one? Pal of mine. Shipmates. All of us, New Arizona."

"Yes, sir."Samuelson squirmed. He was a small man with large ears stuck out from the side of his head, giving him a homely appearance. He glanced again at the ship. "The skipper said . . ."

"The skipper," Ferguson said gruffly, "is full of curd." He wavered forward. "Less go, ol' pal, ol' pal. Some drink, that guzzle of yours."

He awoke from no deep dream of peace, and stared upward in lack of comprehension at a metal overhead.

Elements of the dream were still with him. He had been in a great company, men, women and even some few children. And all had been almost godlike in their physical attributes and the sheen of idealism on their faces. All had been heroes and heroines about to participate in some great endeavor. All except one. He was the exception. The great endeavor was the conquest of space and all were about to embark in a great spaceship, embark for the far beyond.

He had tried to efface himself, remain inconspicuous, but still to join them, to stay among their number. But everywhere he went their scornful eyes sought him out. He didn't belong among this noble gathering and all knew he didn't belong. And all the time, deep within him, he knew that he would be rejected. That no matter how devious he was, they wouldn't allow him to participate in the great endeavor.

For they were heroes and he was a skulking killer.

He came fully awake and stared at the overhead and felt the taste of hangover in his mouth. And that alone was strange. In his time he had become drenched on occasion, but it was not his vice. He had been raised in the old tradition, so that he had been used to wine or beer, especially with meals, since earliest childhood. But his people practically never overindulged.

There was a humming, a faintest of throbs from somewhere. And now he realized that next to him was the warmth of a body. He was in bed with another.

He started when a voice said, officially, "Will Roger Bock please attend a preliminary meeting of the board being held in the lounge in officer's country?"

Before the sentence was finished, he realized it was coming from an intercom speaker located over a small desk on the far side of the Spartan compartment in which he found himself.

Even as he turned to find with whom he was bedded down, it was coming back to him. The night before.

And, yes, it was Ferguson. Fully clothed, as was he himself. The engineer was sprawled on his back, a faint line of spital drooling from

the side of his mouth and snoring uncomfortably, fitfully.

They had got back to the *Titov*. He had kept the drunken engineer lucid enough to get them through the gates and even up the gangplank and past the watch there. He couldn't have chosen a better front had he known the spaceship's personnel intimately. Evidently, crew and junior officers were used to Ferguson's binges and used to covering for him. Out of his cups, evidently the man was popular. Having witnessed him in his cups, it was hard to realize why.

The vibrating must mean they were underway.

He shot up bolt upright in the bunk.

Under way!

He had thought to sneak onto the *Titov* and accomplish his mission the night before, but in plying the engineer with sufficient liquor to get himself aboard, he had plied himself as well.

They were spaceborne! There was no turning back. A spacecraft didn't turn back for such minor matters as a discovered stowaway.

What did they do to stowaways? He didn't know.

He felt he had to get out of here. Possibly hide some place. Where could you hide on the s/s *Titov*? He didn't want to be present when Jeff Ferguson woke up. He had a suspicion the engineer would know it was no accident.

He maneuvered himself out of the large bunk, as carefully as he could make it. The solidly built engineer reacted no more than to grumble something in his sodden sleep.

He took the time to glance briefly at himself in the mirror which was sunk in the wall above the washbowl and shaving refresher. He felt worse than he looked. He glanced down at his clothes. They were really a mess. His clothes were not of the quality that would take sleeping in without protest.

The inter-com speaker said, "Will Roger Bock please join the meeting of the board in the lounge?"

He threw some water on his face, not up to a thorough refreshing, and escaped into the corridor. Why he thought himself safer there, he hadn't the vaguest idea.

He wasn't completely at a loss in this atmosphere. Although he had never been in a spacecraft before, he had had the dream since earliest youth and had stared himself glassy eyed at Tri-D shows whose theme was adventure over-space. Had made model spaceships. Had pored over illustrations, photographs, diagrams of spacecraft ranging from the first sputnik to the latest space cruiser exploration craft designed for the farthest frontiers man had as yet reached in his outpouring over his far out wing of the galaxy.

He wasn't at a complete loss, but he wasn't at home nor at ease.

He made his way slowly along the corridor, his mind racing. He was obviously in officer country. That had been the first engineer's cabin. The skipper, the chief engineer, the first officer and the first engineer would share the most desirable quarters on the s/s *Titov* along with any first-class passengers, or company officials of whatever line owned the spaceship.

What was probably a steward, by his natty uniform, scurried past, stopping only long enough to say, "Are you Citizen Bock, sir? Citizen Roger Bock?"

Before he could answer, the other had swept him quickly with his eyes, frowned slightly, undoubtedly at the clothing, evidently decided that this couldn't be Citizen Bock, and scurried on.

The corridor bent slightly to the left.

He had decided he was going to have to get out of this part of the ship. He was far too conspicuous. His best bet was probably to make it to the dormitories, the equivalent of third class, where the overwhelming majority of the colonists would be packed—like sardines, was the old expression. And if the Tri-Ds he had seen were at all accurate the expression was far more suited in this day than it had been when first utilized. Man had never so nearly approached the living conditions of the canned sardine as when he traveled dormitory style in a space transport.

Something hit his eye. A small nameplate on a door.

ROGER BOCK

The one they were calling over the loud-speaker. The one the steward had been seeking.

And then the remote possiblity came to him.

Those who at the last moment turned funker, were afraid to burn off into the unknown, or who feared space flap. There had been a score or more of them present at that auto-bar last night. Or, at least, that many who were potentially last moment funkers. Some would gain enough alcoholic courage to beat down their fears. But some, not. From what Ferguson said, there were at least a dozen on each trip.

But the possibility was there. Was Roger Bock one of those who, at the very last, couldn't bring himself to desert the security of the planet of his birth for unknown adventure?

He tried the door. It gave.

He pushed on through, an excuse ready to his mouth if he found he had made a mistake.

The cabin was almost identical in its monastic simplicity to that of Jeff Ferguson's. The bed had not been slept in. The luggage was untouched.

On the face of it, Roger Bock was not aboard. He sank into the small cabin's one chair, whistling air through his teeth. For the moment he was safe.

He grunted disgust. For the moment was right. As soon as he showed up for a meal, he would be spotted.

But then it came to him that the day before literally hundreds of persons had boarded the s/s *Titov*. Without doubt they were largely unknown to each other.

He hurriedly, hands trembling slightly, threw one of the bags up on the bunk and began fumbling with its latches. He had no need to break anything, it was unlocked. He opened it and began fussing through the contents.

A young man, obviously. One with a taste more to color than that of his own. Somewhat of a dandy. Someone with considerably more exchange than he had ever possessed, too. He held a flowery jerkin up to himself and found it a fairly good fit.

There was a heavy folder of papers. He thumbed quickly through them, his eyes in surprise. Their owner must have left his cabin and the ship with the intention of getting one or two spine strengthening last drinks, and then let the one or two parley up into a blacking out. Bock had left almost everything behind.

And then the bottom fell out of his hopes. He now found what the intercom summons to a meeting of the board meant. Roger Bock was a member of the company which for all practical purposes owned this colonizing expedition. Such being so, the other board members would know Citizen Bock. It was not as though he could merge, a single young man, into the confusion of the dormitory passengers. Oh, no. Roger Bock had to be one of the several most important persons aboard.

He stood, indecisive, for a moment.

At least he could clean up. Clean up and appropriate some fresh clothing. Bock certainly wasn't going to use it. He could clean up and then see if he could make his way down to dormitory class and disappear into anonymity with the hundreds of the common herd down there. His own type of people, he supposed.

He didn't expect to be interrupted immediately, so he took his time with his toilet. Took his time selecting from the missing Roger Bock's clothing that which suited and fitted him best. His own rejected things he considered for a moment, then flushed into the disposal chute. Had he left them here, they would have looked suspicious and set some steward's mind to wondering what Roger Bock was doing with clothing of a third-rate citizen.

He repacked the bags he had gone through, after selecting two or three items he thought might be of use before all was over, and stacked them into a corner.

He turned to go just as there was a knock at the door.

He froze, realizing that, like a

flat, he had failed to lock the door behind him. It was as open as when he, himself, had entered.

It opened, slowly, quietly, and after a moment a face came round the door and peered at him. The face smiled lazily.

The face said, "You Roger Bock?" And then, without waiting for answer, the door opened farther and the other entered.

The newcomer cast his eyes briefly around the cabin. "All these wretched compartments are identical," he complained. "We're ants. No, bees. Bees, swarming out into the stars." He made a humorous moue. "Like hell we are. We're the rejects of humanity, those who can't make the grade and seek an easier way somewhere else."

The other was staring at him.

The newcomer was not quite to his middle years, dapper and expensively dressed. Handsome of features, in a professional model's sort of way, but with the beginnings of jowls. More than a beginning of heavy waist, too. There was a twist of his mouth which he possibly didn't know about and which gave him a perpetual appearance of a stereotype cynic, a continual deprecation which was overdone.

He cleared his throat and said, "I don't believe we've met."

"Not my fault," the newcomer said, putting out a hand that was almost, not quite, limp. "You didn't show up for the big meeting. Where were you?"

"Sleeping off a drunk." They shook hands.

The newcomer nodded and sank into the cabin's one chair. "You didn't miss anything. Just kind of a get-together to make acquaintance. The board and the captain and his senior officers, all except the first engineer. The Temple monk," the newcomer twisted his mouth, "blessed the trip."

The other ran a suddenly dry tongue over a drier upper lip. "Get together? Didn't anybody know anybody?"

The newcomer looked at him. "Some did. The skipper knew his officers, of course. And our representative from the United Temple knew one of the board who came from some remote area down in South America. What was his name? Zorilla, or something like that. A bandit type, if I ever saw one. He'll probably own the colony before the decade is out. That is, if this old tub ever makes it. By the way, my name's Darleen. Leslie Darleen."

The other lowered himself onto the bunk's edge. He had to say something. He said, "What do you mean, tub? Isn't the *Titov* up to specifications?"

Leslie Darleen laughed as though it had been a joke. "Rog, old chap, I admire the way you delivered that line. A professional comedian couldn't have done it better. Why do you think we insured her to the tippy-top of the

hilt?" He twisted his mouth. "Why, above all, did the board lay out that fabulous amount for two spanking new small boats for officer country usage?"

II

The new Roger Bock, hardly at ease, inwardly expecting momentary exposure, sat in the ship's lounge of the s/s *Titov* with Leslie Darleen, First Officer Ben Ten Eyck, Richard Fodor, one of the board of the New Arizona Company, and the ship's communication officer whose name Bock had not caught. The others called him Sparks with lack of imagination which had come down through the centuries.

Roger Bock had been introduced around by Leslie Darleen, now he said, feeling need to say something, "Sorry I missed the meeting earlier. I'm afraid I overdid it last night. The first engineer and I . . ."

"Was that sot drunk again?" Ben Ten Eyck rasped. "I was afraid he'd missed burn off." He was a tall man with faded blond hair but a dark face that held an adolescent petulance.

Leslie Darleen clucked. "Rog, Rog, you mustn't tell tales out of school."

Richard Fodor, an ordinary looking business type, said dourly, "I'm surprised any of the crew showed up."

Ten Eyck looked at him without warmth and Fodor stared back as though in defiance. "The *Titov* isn't exactly as represented when I bought my chair on the New Arizona Company board," he said bluntly.

Rog Bock wasn't getting this but he hurried on, trying to sooth waters he hadn't expected to ruffle. "What I meant was, I'm sorry to have missed the meeting. It must have been, well, inspiring."

Leslie tittered.

Rog said, feeling more the fool by the minute, "Well, what I meant, here we all are, setting off on the greatest adventure of all. Founding a new colony. The *Titov*, of course, will go on back, take new colonists to a still newer world, and do it over and over. But as for us? It's possible not one of us will ever see Earth again."

Sparks said, his high voice irritated, "We'll be lucky if we ever see New Arizona, not to speak about taking new colonists to new worlds."

The first officer looked at him darkly. "That's enough of that, Sparks. There are regulations against upsetting passengers in space. What do you want to do, set off flap?"

Sparks said, argumentatively, "Nobody here at this table's a flat. We all know where we stand."

Things were going by that missed Rog Bock, but he gained the impression that he had set off something inadvertently. He said, trying

to recoup, "What I meant was, it's the big adventure, and I'm sorry to have not been in on the first meeting of the board."

Fodor grunted sourly. "You didn't miss anything. We introduced ourselves around, reaffirming everything we've settled before by correspondence." His mouth turned dour. "I suppose you know, Matthew Hunt isn't aboard."

To this point, Rog Bock had never heard of Matthew Hunt. He kept his mouth closed, his attention open.

Leslie tittered his snide humor. "Now there's a man to admire. We're playing it safe two ways, he's playing it safe three."

Ben Ten Eyck rasped, "What is that supposed to mean?"

Leslie shrugged humorously. "Why do you play innocent, Mister Mate? Surely you know that the *Titov* cleared her papers only with the aid of a bit of chicanery. That she and the New Arizona Company are insured to the hilt. That if anything goes wrong, two spacious lifecraft are available to the ship's officers and we first-class passengers, but that otherwise the lifecraft are a scandal. But if we do make it to New Arizona, we of the board still have it well arranged. The contracts signed by our fellow colonists, down there in the filth of the holds, are so binding that Earth laws would not have condoned them."

"The yokes signed, didn't they?" Richard Fodor demanded bluntly.

Leslie turned to him and laughed lazily. "In fact, they signed twice. Once, legal papers we could file in Greater Washington. Then, a second contract which we have kept to ourselves. When and if we arrive in New Arizona, we of this board become the law, *nous sommes l'Etat,* with bows to Louis the Fourteenth. We own New Arizona and every tool, every seed, every book, every bit of equipment that will be landed. Our fellow colonists have signed themselves over to a condition of servitude that . . ."

"They signed, didn't they? It's not involuntary servitude." Fodor said. "What's your point, Darleen?"

Leslie looked at him amusedly. "No point, simply stating of facts. We of the board can't lose. If the ship fails, we collect a preposterous insurance. If it does make it, we inherit a whole world there to be exploited." He tossed back his head and laughed. "But old Matthew Hunt who organized the whole thing is playing it safer still. He hasn't even come along! If the ship falls apart he assumes his share of the inflated insurance. If we do make it, and are able to exploit New Arizona profitably he'll turn up at his leisure, after all the tears have been shed, and collect. Oh, our super-entrepeneur can hardly lose."

"You're talking curd," Ten Eyck rasped. "Come along, Sparks, we've

got some odds and ends." He turned, in an obvious huff, and swung off. The communications officer shrugged and followed.

The counterfeit Rog Bock looked after them thoughtfully. He'd almost stuck his foot into it a couple of times already. He was going to have to keep his mouth tight. He was on the taciturn side by nature, but he was going to have to be all but mute if he was to put this over.

Remaining mute, for the moment, was going to be difficult. Through the lounge door stepped the first woman Rog Bock had seen thus far upon the *Titov*. And she could have been designed to his specifications.

He was not an overly tall man but she was a good two inches the less and trended to the dark complexioned beauties found in the mountains of South Slavonia, Montenegro and Albania; high foreheads, rich black hair, very good teeth and full, wide mouths.

Behind her came the Temple monk Rog had spoken to briefly the evening before, looking as newly washed and pink as ever and as pleasantly round of tummy.

Leslie Darleen murmured, "Pater Bill and our aloof Citizeness Bergman."

Rog Bock opened his mouth and shut it again, abruptly. He had almost asked a question that possibly he should have known the answer to, had he been the person he presented himself. Instead, he scrambled to his feet. Darleen and Fodor followed him in, more leisurely.

The Temple monk and the girl —she was a girl, rather than a woman, Rog had decided—approached them. The *Titov*'s lounge, which doubled as officer's and passenger's mess, was hardly so large that it was practical for one grouping to ignore another even had they desired.

Darleen said, "Citizeness Bergman, Pater William, may I introduce the missing member of the board, Roger Bock? Or, since we are to be the closest of companions in the glorious future, should I say, Cathy, Pater Bill and Rog?"

Both the girl and the Temple monk weren't too happy at his terminology by their expressions.

"Do you mock the United Temple, my son?" Pater William said in heavy dignity.

Darleen drew back. "Zen, no!" he disclaimed. "Would I want to be struck down by lightning?" His mouth twisted and he looked about the compartment. "I guess I'd have to be struck down by something else, though, wouldn't I? No lightning in space."

The girl nodded to Rog Bock without displaying even the imitation of pleasure that usually goes with the amenities of introduction. "The name is *Catherine* Bergman," she said.

Rog managed to mutter something. The girl's appearance threw him off. He—he didn't know why—hadn't expected this element.

In the way of reopening conversation, Leslie said lazily, "Our Rog, here, has been telling us just how distressed he was to have missed the opening meeting of our board. The inspiration of it all, embarking on the new adventure. I suspect our young partner in crime to have been a poet before a colonist."

Pater William said with a sharpness that belied his brown robes. "*Crime,* Citizen Darleen?"

Leslie grinned. "A jest, Pater Bill. I should have said, our partner in our great, glorious and holy —wasn't that one of the terms you used?—project in opening the planet of New Arizona to the civilization of man."

Catherine Bergman had been looking at Leslie, quietly. "You don't seem to think of our expedition as much of a crusade . . . Leslie," she said, hesitating before using his first name.

He laughed disparagement. "Crusade? That's about the last term I'd use. This shipload of ragtail malcontents, adventurers, opportunists and probably fugitives, hardly qualify as crusaders."

"My son," Pater William said unctuously, "these good people in transit on the *Titov* are the equivalent of those who once sailed in the *Mayflower,* those who once crossed the great plains in the covered wagons, those who . . ."

Leslie's soft laugh grew. "Right!" he insisted. "I agree completely."

Rog was frowning at him. The man had a certain attraction, that was undeniable, but he seemed incapable of agreeing with anything. There was always a snide rebuttal to the most obvious remark.

Rog said quietly, "You don't seem to think much of pioneers and frontiersmen, Leslie."

The other caught him up. "Rog, old chap, and you Catherine, and possibly even you, Pater Bill, sound as though you've been passing the shining hours by muddying up your minds with a lot of chauvinistic jetsam. Let's not be flats. The least of serious investigation reveals that the pioneer, far from being a hero complete with halo, has always been the misfit of society. The dregs, the malcontents, the crackpots and fanatics; those who couldn't make out back home, become pioneers."

He twisted his mouth wryly. "Often your brave colonists were convicts sent from the mother country to get rid of them. Georgia and Australia are examples. Many of our heroes of the frontier were nothing but gunmen, sometimes on one side of the law, sometimes the other. Wyatt Earp, Doc Halliday, Wild Bill Hickock were gamblers cum crooked politicians who made their own laws in the towns they dominated. Billy the Kid was a neurotic delinquent who lived far too many years. Davy Crockett, Jim

Bowie, Sam Huston? Opportunists who couldn't make the grade in the States and embarked upon an adventure in aggression that has few parallels though comparable to the 'liberation' of Mexico and Peru by the conquistadores."

The Temple monk was looking honestly bewildered. "And do you, my son, equate me with your, ah, Billy the Kid, or Wild Bill Hickock?"

The other's grin was malicious. "Hardly, Pater Bill. Both of your namesakes died by the gun and in poverty. I doubt if either of those two fates will be yours. You'll get by, Pater Bill."

The older man came to his feet in red-faced anger. "Have you no respect for the cloth!"

Leslie took in the other's brown robes in amusement. He said, "I thought you United Temple chaps took an oath of poverty. How does that work in with you being a partner in the New Arizona Company, Pater Bill?"

The Temple monk's voice trembled. "The United Temple, my son, has the duty of spreading the word of its faiths throughout all creation where man journeys, including the new worlds. We must open up temples, schools, hospitals and all such projects are dependent upon our resources. It is hardly surprising that most companies such as this have one representative of the United Temple upon their boards." He turned and waddled to the farthest end of the room, fished a dark book from within his clothing and sat down to read.

Rog was chill of dark eye. He wanted no controversy, especially with the sharp, and sharp-tongued Leslie Darleen, but the other was treading rather hard on sensibilities.

The girl had kept quiet through all this, although obviously following the discourse, as was Fodor the other member of the group.

She said now, quietly, "You're over simplifying, Leslie. Obviously, a good many of the frontier types are ne'er-do-wells. But hardly all. For instance, how do you rank yourself?"

He threw back his head and laughed happily. Obviously, the man loved controversy. He leaned forward.

"Cathy, my dear. I am a typical example. Do you remember the English second-son types? No place for them in England, so they were shipped out to America, to South Africa, to India, to Australia to make their fortunes if they could, and then, the fortune made, return to the home country. Well, my dear, that's me. The family got a bit tired of ne'er-do-well Leslie and his cynicism so father and two of his brothers got together and, hearing about Matthew Hunt's newly forming company bought me a share. And here I am. If all goes well, then I'll return and be welcomed back into the bosom of the clan. But, now

Leslie was frowning amused puzzlement at her. "You don't make much sense, Cathy. You're a board member yourself."

She said quietly, "A good many of the colonists down in the holds aren't quite the cloddies you think. Some of them are fully aware of the degree of exploitation that can take place on a new planet, far from Earth laws."

"So—where do you come in?" said Richard Fodor, who had been following in dour silence.

She held her tongue for a moment, as though sorry now that she had let the subject take its trend. However, she breathed in a sigh and said quietly, "None of those in the dormitories could have possibly afforded a partnership in the company. It was almost all they could do to raise the fare. There are more than two thousand in all, and all of them at the mercy of the members of the board of this company."

"Oh, I wouldn't put it that way," Leslie laughed. "We're all noble pioneers together, opening up a new world."

Her eyes sharpened noticeably and she said, "So they took what measures they could by pooling their resources and buying one partnership between them all."

"What!" Fodor blurted.

Cathy said sweetly, "And elected me as their representative."

"You're joking," Leslie laughed.

She shook her head.

really, look at me. Of what use will I be on New Arizona—except to milk others of the products of their specialized abilities?" He turned to Rog. "And how about you, my poet dreaming of adventure colonizing the stars? What motivated you, and how in Zen did you ever raise the funds to buy in with Hunt?"

Rog Bock was on uncertain grounds. He had no idea whatsoever of his namesake's background. Perhaps when he had the time to peruse what papers there were in the cabin, he might have a better picture.

He twisted his shoulders in an uncomfortable shrug. "About the same thing. The family has money. I was able to buy a partnership."

For some reason he didn't understand, Catherine Bergman looked at him less than approvingly. He was stung to say, "Well, how about you, Citizeness?"

"Touché!" Leslie tittered.

Her eyes went from one of them to the other, and there was the beginning of color at her neck. For the moment the wide mouth tightened as though in refusal, but she shook her head and said, "Perhaps I'm here because there are such men on the frontiers as British second sons. As your opportunists Davy Crockett and Jim Bowie. As your quick buck, to use early idiom, artists such as you have admitted to be, Leslie Darleen. The more average colonist has to be defended from such."

"But you're no flat, no cloddy of a stinking yoke fated to sweat your life away doing the drudgery of a new colony."

"Why, Citizen Darleen," she said demurely. "I didn't know I meant so much to you." Her voice evened. "I have a cousin and an aunt down there in the holds. And they aren't cloddies, any more than I am. As you'll possibly find out."

Richard Fodor stood up, his sour aplomb for once teetering. "But this is ridiculous. The membership of the New Arizona Company is highly restricted."

Feminine eyebrows rose. "On what basis, Citizen? Let us face reality, the only criterion Matthew Hunt really set when the company was being formed was sufficient money to buy a seat."

He snapped, "This calls for a special meeting. I'm going to see the captain."

She smiled up at him, still dripping sweetness. "Just be sure that I'm present at any such meetings."

He snorted and marched off.

Leslie chuckled and followed after. "I don't want to miss this."

Catherine Bergman looked back at Rog Bock who had sat silently through it all. She pursed her mouth in a grimace of self-disgust. "I'm a fool," she complained. "It was to have been kept a secret."

Rog mumbled uncomfortably, "Well, it'll probably work out. And meanwhile, from what I've heard about the dormitories, it's more comfortable to be up here in officer's country."

The eye she turned on him was less than friendly. "That's not exactly my motivation, Citizen Bock."

He cleared his throat. "Call me Rog. I . . . I suppose we're going to see a lot of each other."

A frown had replaced her glare. She said, puzzled. "Did you know there's a young man masquerading as you back on Earth?"

He tried to keep his face from registering complete dismay. "Me?" he said blankly.

She said, her high forehead creased attractively. "I met him the night before burn off, at the Far Horizons club. He was a bit drenched and I got the impression, nervous about the trip. But he called himself Roger Bock and talked about the *Titov* as though he knew all about it and New Arizona as well."

Rog Bock swallowed. "Mystery to me," he said. "I don't know what he had in mind. You sure he told you he was *Roger Bock*?"

The counterfeit Rog Bock met the balance of the ship's senior officers and first-class passengers at dinner, at twenty hours, Earth time.

He had spent the hours intervening in his cabin, desperately catching up to the extent he could on Roger Bock and his dealings with the New Arizona Company. He went through every paper in the luggage he found, a luggage consisting of two large bags. He assumed that Roger Bock had considerably more personal possessions, but that they were stored away elsewhere on the ship. The bags represented only his expected needs on the trip proper. Evidently, the youthful Bock hadn't trusted the *Titov's* entertainment potentialities. Included in the luggage were two liters of an excellent cognac, two decks of cards and even a pair of dice.

When the new Rog Bock had come upon the dice, he had picked them up and idly tossed them out on the small desk, rolling a seven. He muttered amusement. At least it was a good omen. He rolled again with the same result, scowled and rolled them out again. And again, and again. Seven evidently couldn't be avoided.

He wasn't up on the latest in loaded dice and examined them curiously. He had made his seven at least ten times in a row, but now could find nothing untoward in the construction of the cubes. Impatient, since he actually had no time for this diversion, right now, he rolled them again and got a ten, again for a six, again for a trey.

He picked the dice up and scowled uncomprehendingly at them. He was no mathematician, but he knew enough of the laws of chance to realize that rolling a seven ten times in a row didn't readily come under the head of fortune. But now he didn't seem to be able to get even a single one.

He gave them an impatient twist and tossed them away, to turn his attention elswehere. It was several minutes later before his eyes hit upon them again and he saw the seven had turned up, once more.

It took him a full quarter hour to figure out the workings of these descendents of man's earliest known gambling device. It was a matter of how they were held before being thrown. He could either get a seven any time he wished, or avoid getting one. Satisfied, he grunted and put them away.

The papers he found told him a bit about his newly acquired partnership in the New Arizona Company, but little of the personal side and background of Roger Bock. Evidently, the other had carried his more intimate identity and other papers on his person.

Still there were examples enough of his namesake's handwriting for the new Rog Bock to practice forging. He need not worry too much about this. He doubted that there was anything beyond his signature in the possession of the *Titov's* captain, or in the archives of the newly organized New Arizona Company.

He read his contract thoroughly. It would hardly do for him to show ignorance of its contents, in view of the large amount of money that had been expended on purchasing the partnership. He was not business orientated, nor was he much acquainted with Earth laws pertaining to the colonization of new plan-

ets, but he could see that he had bought into what amounted to a monopoly of the newly discovered New Arizona, passingly described in one document as being Earth type to the nineteenth category, which meant nothing at all to him. He hadn't the vaguest idea if the atmosphere of the planet would consist of methane-ammonia-hydrogen as so often on the raw, young planets which occurred repeatedly near the brilliant super-giant stars, or be such a near duplicate of Mother Earth as to be immediately inhabitable without need of spacesuit, or habitation dome.

All such knowledge, he assumed, would come. All he need do was keep his peace and sooner or later the conversation at the lounge would cover his inadequacies.

Things were going unbelievably well for him. The future, of course, was another thing. Somewhere back on Earth the real Roger Bock was probably still nursing a hangover. And, very possibly, trying to find a reasonable excuse for the fact that he had missed the burn off of the *Titov*. Very likely, the partnership had been subsidized, in much the same manner as had that of Leslie Darleen.

Sooner or later, the true Roger Bock would communicate with the s/s *Titov* or, if that proved difficult or impossible, with the new colony on New Arizona once it was established. The fat would then be in the fire.

He shrugged it off. By that time, his mission might have been accomplished. Perhaps, things going well, and if he was successful in ingratiating himself with the powerful board members, he might even be allowed to join the colony.

As ever, when the loathed name came to mind, and the reason for his mission, there was a burning of red before his eyes, a gall in his mouth. The Peshkopi! Where, on this huge ship, was the other hiding?

III

The speaker above his desk announced the twentieth hour meal and he replaced the documents he had been working over in a drawer and carefully consigned to the disposal chute those pieces of paper on which he had been practicing forging the Bock name.

The passenger freighter s/s *Titov* was not so large, as spaceships went, to have overly elaborate quarters even in officer's country. In emergency, the combination lounge and dining salon would have had a top capacity of twenty persons seated at two tables. Under her present circumstances, the total numbered twelve which included the captain and his five senior officers and the first-class passengers who were six in all including Curro Zorilla, met now for the first time by Rog Bock.

There was something disturbing about the Latin American and for a moment Rog wondered if the other knew his identity was false. But no, it wasn't that. At least, if it was, Zorilla made no immediate step toward exposing the imposter.

Given a red kerchief about the head, a gold earring and a cutlass at his waist and Curro Zorilla would have gone far as a sixteenth century buccaneer. He was so dark as obviously to have a strain of Amerind, or perhaps Moor, in his background. His face was habitually empty of expression and particularly when expression might have been expected. His shoulders were huge, so that it was almost unbelievable that his clothing was not padded in a time when padded shoulders were unknown. The strength was to be found, too, in huge hands, blunt fingered, which seemed continually curled, as the hands of a chimp or gorilla are continually curled.

He looked into the face of Rog Bock as they shook hands upon introduction and grunted what was meant for a greeting. His eyes had narrowed, but Rog was unable to find meaning in that. He turned then and sat down, although Catherine Bergman, who had just entered, was yet to be seated. He reached one of his great paws across the table and seized a piece of bread and began to gnaw on it, as though thoughtfully.

Captain Bruno Gluck had come in then, and it was a matter of Rog Bock being introduced to him and the balance of his two senior deck and two senior engineer officers. He had, of course, already met Ben Ten Eyck and Jeff Ferguson, the first officer and the first engineer. There were too many of the ship's officers for Rog to get an immediate impression of them, but the captain of the s/s *Titov* came as an unpleasant surprise.

One becomes accustomed in the drama of stage, movie, television and, recently, Tri-D to the brute type military villain. He was a stock character long before Von Stronheim became the man you loved to hate. Stone of face, starched of back, curt of speech, an overall projection of cruelty and of iron adherence to discipline. It came over Rog Bock that he was glad to be aboard the *Titov* as a passenger, rather than one of the crew.

The captain, upon introduction, nodded infinitesimally, made no offer to shake hands. He stood next to his chair at the head of the first table until Catherine Bergman had been seated, then clumped down into his own place, as though exercising a thoroughly drilled order.

He rapped, "Please be seated, gentlemen." His slate gray eyes went bleakly to Jeff Ferguson, evidently almost completely recovered now from his bout with the bottle. "And you also, Mr. Ferguson."

In actuality, both Curro Zorilla and Leslie Darleen were already seated. The first, possibly in ignorance of protocol, the second in amused indifference.

Rog beat Pater William to Catherine's chair and received her indifferent thanks.

The captain stared down the length of his own table, occupied by his officers, and to the others at the second table. He said, curtly, "Before the steward serves, I think it well to reiterate some matters that seem poorly understood."

Rog Bock hadn't the slightest idea of the man's meaning. But then he realized that Richard Fodor had obviously told the skipper of Cathy's revelation. What business it was of the *Titov's* commander, Rog couldn't imagine.

Captain Gluck rapped, "This colonization project is far from routine. The New Arizona Company is unique in various respects." His flinty eyes went to Catherine Bergman. "Unique enough, already, without added complications, Citizeness."

Cathy's mouth thinned but she said nothing. Her eyes were attempting to be as level as his.

The captain said, "As you know, some three years ago, Citizen Matthew Hunt in a space yacht which had lost its way, stumbled upon what developed to be a planet of nineteenth category Earth type, previously uncharted. Had such a category planet been known to the Space Forces it would, without doubt, have been claimed, annexed and developed in another manner than we now propose."

He paused before entering into what was obviously the meat of his talk. Then, "As you know, Citizen Hunt was then faced by Earth law, if he would retain his claim, with the problem of colonizing New Arizona, within five years, with a population of at least two thousand persons, equipped adequately to support themselves on the new world. Citizen Hunt had handled nothing before of this magnitude. His resources didn't cover it. You know the story. He formed the New Arizona Company, divided into ten shares two of which he kept for himself. To raise the cash necessary, he sold six of the shares."

Six? Rog Bock thought. Then where were the other two? The answer was yet coming.

"The major problems were still to be met, however. Transportation and a minimum of two thousand colonists. The first he met by coming to agreement with myself and these, my officers, who owned in partnership the freighter *Titov* . . ."

"Scheduled at the time to be junked," Leslie Darleen said lazily.

The captain glared at him. "You are a member of the New Arizona Company, Citizen Darleen, but I demand the respect due me as master of this space vessel."

Leslie's eyebrows went up, all but mockingly. "What did I say? I merely pointed out that the *Titov* is an antiquated, outdated mass of junk which has been patched up and juryrigged."

Captain Bruno Gluck held the glare for another long moment before going on. "In return for the use of the *Titov,* two company shares were granted us. One for myself, one in equal shares to my five senior officers. It was then a matter of recruiting two thousand persons desirious of colonizing a new planet. Since time was of essence, this problem was met by offering passage at a fantastically small minimum rate."

He paused for a moment again as though expecting someone to interrupt. "In view of such philantrophy, Citizen Hunt realized it was only just that the colonists agree to certain conditions, that sometimes do not apply to other Earth colonies."

Richard Fodor grunted.

Pater William said, unctuously, "However, it must be remembered that New Arizona is not, in the usual sense, an Earth colony, but is owned in entirety by the company."

"Exactly," the captain rapped. His eyes went to Catherine Bergman who had sat, thus far, in silence, her face a shade darker than Rog Bock had remembered it.

The ship's master said, "I wish to make it clear that I have no prejudice against yokes. I don't know how they might have got to the position in life which they occupy. If Providence put them there, as possibly Pater William would have it, or if it was sheer laziness or inability. However, I accept what I find. Yokes are yokes, and few change."

Cathy Bergman's voice was straining for level but the tremble of anger was there. "But even what you call a yoke, Captain Gluck, has his rights."

"Correct, Citizeness, and they shall receive them. Their rights and no more. No collusion, no scheming, is going to change the New Arizona Company charter. Most of us here in this salon have put their all into this development of a planet as rich today as Earth was in the times of the Neanderthal. Untouched, virgin, unexploited. An opportunity to enrich ourselves beyond the dreams of Midas."

Leslie murmured softly to Rog, "We find for you a fellow poet in the captain."

Cathy said, her voice far from the assurance of the dominating male who it was obvious had largely directed his aggressive speech at her, "I—and the colonists I represent—are fully aware of the company charter, Captain. Some of it is so worded as to cause anxiety, but we shall see."

The captain had evidently signaled, since Zogbaum, the chief steward, entered at this point with the meal's first course.

Something had occurred to Rog Bock as the truth of Cathy Bergman's position on the *Titov* had become clear. Following the meal proper which had largely been eaten in a strained atmosphere, he had taken his coffee around to where she sat temporarily, at least, alone.

She looked at him with an air of defiance as he sidled into the chair next to her.

Rog shook his head negatively. "I didn't come to argue," he said. "What I wanted to ask you was, do you have a complete list of the third-class passengers?"

"I have a list of all the passengers," she told him. "Why they call them third class, I don't know. There is no second class. There are only us, here in this comparative paradise in officer's country, and the colonists, crammed into quarters that would be shocking for criminals. The *Titov* is inadequate by half for carrying this large a number."

It wasn't his game, but he said, "Why did they sign on if it's as bad as all this?"

She eyed him sharply, as though there was personal insult in his words. "Because even what the captain calls a yoke can have the dream. Perhaps the greater number of us are attempting to escape the very atmosphere that condemns us to be labeled yokes."

He had no desire to argue with her. For that matter, although the term wasn't readily in his vocabulary, he supposed that he himself came under the category of yoke, a bit of idiom that he assumed must originally have been derived from yokel—a bumpkin, a member of the lower levels of the working class.

She said, ready for argument, "Why did you want a list of the colonists? Wouldn't Gluck have one? Evidently with Matthew Hunt remaining on Earth, our good captain has assumed the chairmanship of the company board—without bothering to hold an election, of course."

Rog said, "I didn't want to bother him." In actuality, he would have just as well kept it a secret that he was searching out an individual somewhere on the ship.

He said, shrug in his voice, "You know how coincidence goes. It's just possible that I know somebody among the passengers. I'd think, from your viewpoint, you'd encourage any friendship between members of the board and colonists."

His point was obviously valid. She thought about it for a moment. "I don't see why not," she said. "Come along to my cabin."

As they left together, Leslie Darleen raised a cynical eyebrow at Rog Bock who ignored the other.

Cathy Bergman's cabin was a twin of that of Bock's and located three cabins down from him. There was little foofaraw about the accommodations aboard the *Titov*. But then, why should there have been? She was basically a freighter, her ordinary complement of passengers being limited to a dozen or so. The present load of colonists were in quarters formerly meant as cargo holds.

She opened the top drawer of her desk, turned to him and offered a sheaf of papers. He took it, his eyes touching hers at the same moment his fingers touched hers. It flashed over him again what a beautiful girl Cathy Bergman was—in the Albanian, Montenegrian tradition. This was . . .

He brought himself up short.

He was not aboard the *Titov* for the purpose of finding a wife.

There were approximately ten sheets of paper in the sheaf. He pretended to scan hurriedly down the lists which were arranged alphabetically. When he reached the "P"s he slowed.

There was no Peshkopi.

For a moment he was nonplused. But there had to be! He had been sure the other would be among the *Titov's* dormitory class passengers. It hadn't occurred to him that it would be otherwise. For a brief second he wondered, wildly, if his information had been inaccurate. If he had been sent on a wild goose chase. If so, all was lost. His chances of returning to Earth from New Arizona were remote, but even if he did, most surely he would be well along in life by then.

But then came back what Jeff Ferguson had told him. The *Titov* had a crew of about sixty, and each trip they would lose part of the ship's complement and gain another number to replace them. Obviously, the elusive Peshkopi was among the ship's crew, though not among the officers because Ferguson would have known the names of all the officers, new or otherwise.

No, Peshkopi was an ordinary spaceman who had signed onto the *Titov* for the first time this trip.

He pretended to go through the list, then finally shook his head and handed it back to her. "No. Nobody I recognize. I didn't notice any Bergmans, either. I thought you said you had some relatives among the colonists."

"They carry a different name," she said briefly. She wasn't being unfriendly but there was a strained quality in their communication. He realized what it was. She was, in actuality, one of the colonists. He, she thought, the scion of some powerful family which had bought him a seat on the New Arizona Company board. They didn't exactly move in the same circles.

Rog said, "Well, thanks. I'll see you later, Citizeness . . . uh, Catherine. In the lounge, I suppose."

"Oh, call me Cathy," she said wearily. "How can you maintain a facade of dignity with a Leslie Darleen aboard?"

He repeated, "See you later, Cathy," and left.

Thoughtfully, he made his way to his own cabin. His task was going to be the greater, eliminating a member of the ship's crew, rather than one of more than two thousand colonists. The assassin's lot wasn't as simple as all that, he reflected somberly.

Still in thought, he threw open the door of his quarters and entered. He was fully into the room

before he realized that the light was off and that he had left it on.

He began to bring his hand up for the eye button, the thought going through his mind that one of the junior stewards had made the cabin up and . . .

And it was then that the rush of the attack hit him.

Trained though he was in hand-to-hand combat, sudden surprise bowled him over. On top of the rest, the light from the corridor was behind him. His assailant could operate, Rog was as though blind, facing the dark.

He tried to fall into a defensive Zen-kutsu-dachi position, but was off balance under the other's assault before he could organize even a retreat. A heavy blow to the side of his head sent him reeling against the bunk and to the floor.

He pushed himself to hands and feet, his head bursting from the blow, and felt a heavy shoe slug into his stomach, sickeningly.

He needed a moment of respite, the shortest of time to organize, to take breath, to get himself into action—and couldn't find it.

A hand grasped his hair, pulled his head back, and another blow smashed into his jaw. He reeled back against the bunk again. Tried to swing his hands out to ward off further attack.

The further attack didn't come. He heard movement, the light from the corridor was the less for a short second, and then he knew he was alone. The whole thing had lasted only a few seconds.

Shaking his head, in daze, he made his way again in the direction of the eye button, waved his hand over it, and brought light. He staggered to the washbowl, after closing the door, and vomited into it. He stared into the mirror. To his amazement, other than angry red patches where he had taken the blows to his head, there was little sign of the fight. He splashed water on his face, and turned to take inventory.

The room had been ransacked and no effort made to disguise the fact.

His first reaction was to continue his trend of thought before the attack. His thoughts of Peshkopi. The other had discovered that someone was on his trail. The other, pursued, had turned on the pursuer.

But he brought himself to a halt. Nonsense! There was no reason to believe this Peshkopi knew of his existence. It was one of the reasons he must confront the other, when the bets were all down, and tell him why his life was forfeit. The victim might not understand, otherwise.

But if not the elusive Peshkopi, then why the search of his quarters?

He went through the drawers of his desk, and through the bags the true Roger Bock had bequeathed him. He hadn't had time, as yet, thoroughly to unpack.

Nor was he adequately familiar

with his new possessions to take stock. He had no idea of what might have been taken, if anything. It was possible that the ransacking had been the work of a steward or other member of the crew. From what several had said, he suspected that a goodly portion at least were less than top hands, by spacemen standards. A sneak thief might very well be among them.

But somehow it didn't ring true. A thief would have been too easily detected. Ordinary crew members or passengers third class had no access to officer country. A thief would have to have been one of the steward department, or one of the officers themselves, and would have been too easily apprehended to take his chances.

He went through his things twice, and could remember nothing that was now missing. The prowler had evidently been interrupted in his pilfering by Rog's approach, had given up his search for valuables, switched out the light, and then attacked his victim.

He had spent an uneasy night of recapitulation and it had gained him naught. As matters stood, all he could do was continue on the present basis. One thing was sure. His strike must come before they reached New Arizona. If his Peshkopi quarry was a crew member, it meant that following set down on the new planet, there would be little opportunity to get at him. And, although it would probably take a bit of time completely to unload the *Titov*, sooner or later it would blast off again, leaving Rog Bock stranded there with the rest of the colonists.

His problem now was that he couldn't simply approach the captain and ask if there was a crewman named Peshkopi aboard. If he did and within the next few days the said Peshkopi was found dead, there would be little question who had done the man in. He was going to have to be circumspect.

Thus it was that when Cathy Bergman announced at breakfast that the colonists had various complaints to make to the ship's master and to the board of the New Arizona Company, Rog Bock supported her, at least to the point of declaring himself willing to act as board representative when the captain confronted the colonist committee.

It had been nip and tuck, at first, whether Captain Gluck was going to condescend to meet the committee at all.

He had stared, flinty eyed, at Cathy. "Citizeness Bergman, we have taken every measure possible to see to the comfort of the third-class passengers. There is nothing more that can be done."

Pater William said, "Perhaps my presence, a few words, might help alleviate those of their troubles which are less than spiritual."

Leslie had chuckled at that. "Did

you ever hear the ancient term, double-talk?" he asked.

Fodor said dourly, "They signed the contract. They knew what they were getting into. Now, only a couple of days out, they've got demands. Cut out their breakfast for a day or two. Show them who is in authority."

Cathy, her breath sharp, spun on him. "That is one of the complaints, Citizen Fodor. They are given no breakfast. They are served one meal every twenty-four Earth hours."

Curro Zorilla rumbled, "In my time, I've spent many a week on only one meal a day—or less."

She turned her defiance to him. "You're a big man. Some of those two thousand colonists are children in arms!"

Leslie Darleen was slouched back in his chair, looking at the rest mockingly. "Fellow members of the board," he drawled, "perhaps we should keep in mind a parallel. Recall the days when the sanctimonious churchgoers of England and America were hauling blacks across the Atlantic from the West Coast of Africa to the slave markets? There came a point, in the packing them in and underfeeding them, of no return—that is, no financial return. You might start off with a thousand blacks, when your ship was designed for no more than five hundred, but if you did, you ran a fine chance of turning up in New Orleans with no cargo left alive at all."

Captain Gluck rapped, "You have a point I assume, Citizen Darleen."

"The point's obvious," Fodor said sourly, "And for once he's right, if we like it or not. We can't afford to mistreat our colonists to the point a percentage of them die before we reach New Arizona."

Pater William put in gently, "We might also remember Earth law pertaining to colonization. If the private discoverer of a planet is not able within five years to place two thousand able colonists on his new world, the planet reverts to Earth government control."

"What did you think I was talking about?" Fodor said sourly.

First Officer Ben Ten Eyck said, "The number we've got in the holds isn't any too much in excess of two thousand. Let a couple of hundred die and we'd be short."

"Nobody is going to die, blast it!" the skipper blatted. "What's the matter with you all? You'd think this was a pest ship!"

It had come to Rog Bock that he might profitably build up a reputation of being interested in all aspects of the *Titov's* journey, and all areas of the ship, as though he were more than ordinarily curious, if not down-right nosy. Later on, it might gain him entry to crew's country, where he could forward his search.

He said now, "I'll be glad to go along with Captain Gluck as a representative of the board to meet the colonist delegation."

Leslie Darleen had laughed lazily. "Better you than me," he drawled. "Be sure and hold your nose when you enter the third-class dormitories."

The captain, who was on his feet now, glowered at him. "And that means, Citizen Darleen?"

Leslie grinned. "It means that there are too many passengers in third class for there to be adequate bathing facilities."

Cathy said heatedly, "There are no bathing facilities at all. The only water available, and that rationed, is for drinking and cooking."

The captain, in a fury, headed for the door. "Very well, we'll confront these malcontents. Mr. Ferguson!"

Jeff Ferguson got up from his own place, tossed his napkin to the table and stolidly trailed along behind his commanding officer. Cathy and Rog followed.

For the first time since boarding the s/s *Titov* Rog Bock left the confines of officer's country. The barriers between that rarified area and the balance of the spacecraft's available for living interior was, he noted, a substantial one, almost as though designed to repel attack. Perhaps it had been. A vessel of the *Titov* type might, in its day, be used to carry any cargo from pure bulk to consignments of exotic wild life from one planet to the zoos of another. It might even transport prisoners, convicts, exiles; though Bock couldn't think of any such example. In actuality, the *Titov* was a latter day tramp, the equivalent of the tramp steamer of yesteryear which plied the oceans carrying anything, anywhere, so long as profit was to be found.

Once outside officer country, they took individual seats on the inter-ship conveyer and rode down long corridors, past compartments large and small stored with freight, with ship's supplies; and with elements of the endless equipment necessary to the life of a vessel in deep space.

Rog Bock found himself close to Jeff Ferguson and said, in the way of made conversation, "Why you?"

"Whot, laddy?" the chunky engineer said.

"Why did the skipper want you along, Jeff?"

Ferguson scowled at him. "Now I remember. You're the laddy I got drenched with the night before burn off. Whot was the name of that nardy guzzle?"

Rog grinned at him. "We must have drunk a dozen. You suspected I was a funker who'd be afraid to come aboard at the last minute."

Ferguson, still scowling, as though trying to dredge up a memory, grumbled, "Wouldn't've blamed you if you were, whot with this nardy craft. I thought you said your name was . . . Smith."

"No," Rog said. "Bock. Roger Bock. You didn't answer my question."

"Why did the skipper want me to come along now? I'll tell you nardy well why, laddy. Because if some question comes up pertaining to the ship's workings, he has to have somebody along whot knows something about it."

Rog stared at him. "But isn't he the captain? Surely he knows his own ship."

"Laddy," the engineer sighed, "Captains and deck officers know how to navigate a ship. They know the business involved in commerce. They know space law. They know how to load the holds of a ship. But they don't know anything about the *workings* of a ship. The old man couldn't get a glass of water, or a pint of nardy oil through a pipe from one end of the *Titov* to the other, if it meant preventing crack-up. That takes an engineer."

Rog was still surprised. "But, why not Thor Kaivokatu, the chief engineer then?"

Ferguson grunted deprecation. "For a member of this nardy New Arizona Company, you don't seem to know much about whot's going on, laddy. Among the officers, only the skipper, Sparks and I have ever burned off in the *Titov* before. Among the crew, it's a bit different. We took on twelve new men, but all of them are engine department; the skipper's bullyboys he's had with him a long time."

The obvious question, Rog couldn't ask. Possibly he was supposed already to know it. But he said, "You mean the only new crew members are all in your department?"

"That's right, laddy," Ferguson said gruffly. "And a ragtail bunch of cloddies they are, as could be supposed. Any engine man worth his salt would know better than to crew the *Titov*." He grunted deprecation again and gave Bock the answer to the question he had wanted to ask.

"We had to have officers with enough money to buy in on this hulk and with valid papers, if the ship was going to be allowed to burn off, and the only way the skipper could sign them on was to promise them plenty. Whot it amounts to is one tenth of New Arizona, split up between the five of us senior officers. So we got Ben Ten Eyck and Roy MacDonald, the second officer, both of whom have never shipped out on a passenger freighter before. And Thor Kaivokatu for chief engineer, who's never been on anything bigger than a solar system yacht till now. And for second engineer, Manuel Sanches, who like Ten Eyck and MacDonald, is a Space Forces officer with a dishonorable discharge but who managed to retain his papers."

Rog was staring again, but the conveyor chairs had reached their destination, and Cathy and the captain had dismounted.

The captain turned his grim eyes on Ferguson. "What've you been jabbering about?" he demanded.

The florid faced engineer was not a man to kowtow, and obviously long since the relationship between the two had solidified. "We've been jabbering about the nardy inadequacies of the nardy officers and crew of the nardy *Titov*."

The captain glared at him, spun on his heel and made a gesture to a crewman who stood, evidently guard, at a dogged-down metal compartment door.

Now that he noticed, Rog Bock realized that the crewman had obviously at one time performed military service. From what Jeff had said, the *Titov* was largely officered and crewed by such elements, some, at least, with dishonorable discharges.

IV

The door was opened and the four stepped through, Cathy leading. And now Roger Bock realized what Leslie had meant when he mentioned holding his nose when he entered the third-class compartments. There was already a stench reeking toward them as they walked a few feet into the packed, and overpacked interior of the once cargo hold. Only forty-eight hours or so and already the stench of sweat, urine, bad breath and other animal odors was overwhelmingly evident.

The captain halted and, Prussian stiff, waited coldly. Obviously, it was up to Cathy and her people to take the initiative.

The colonists-to-be largely sat or stretched out upon their bunks which reached six high from bottom bunk, which was only an inch above the deck plating, to a few inches from the compartment overhead. When a passenger sprawled on the top bunk, his face was no more than two or three inches from the metal above. The corridors between bunks were narrow and a chaos of baggage, dirty clothing, unkempt children noisy in their attempts to play, mothers trying to dress, undress, quiet or nurse babies in arms.

Rog Bock stared in blank dismay. Was this the manner in which the Pilgrims had once crossed the Atlantic in the *Mayflower?* His stomach tightened. He wondered how a claustrophobe would react to these circumstances. Undoubtedly—he hoped—each colonist had been thoroughly checked out by the doctors before burn off.

Hardly forty-eight hours, but already there was an element of despair in the ultra-cramped quarters. Rog wondered how they were fed; how toilet facilities were managed; what happened to the sick.

And above all he wondered how the stench would be after a week in space. Two weeks. How long was the voyage to New Arizona to take? He hadn't the slightest idea. He doubted that even the strongest of humankind could stand a month of this and survive.

A group of three, two men and a woman, were approaching them.

Obviously, a committee. And obviously, also, a cut above average in intelligence, cleanliness and grooming as the colonists-to-be went. There was no indication of servility before the ship's master and the two members of the board of the New Arizona Company. If anything, to the direct contrary. There was an air of open hostility.

Cathy stood to one side, as though refereeing and said, in way of introduction, "Captain Gluck, Citizen Roger Bock and First Engineer . . ."

"Ferguson," Jeff supplied.

"May I present Dr. Florence James, Dr. Hugo Miltiades and Dr. Francis Kelly, members of the elected committee to act as liaison between the colonists and the ship's command and New Arizona Company board."

"Doctor?" the captain rapped. "Medical doctors?"

Hugo Miltiades, the older of the three though by appearance no more than possibly forty, nodded. "I would think you'd be pleased we are aboard, Captain Gluck. Word has got about that the ship's doctor you had signed up refused to accompany the *Titov* upon checking the situation aboard."

"Funker," Ferguson grumbled.

Miltiades looked at him hollowly. "No, evidently not a coward Citizen Ferguson, but a man of intelligence." His eyes went back to the captain. "Our problems, sir, are largely medical ones—or could soon become so."

The ship's master, his nostrils high, as though conscious of the odors of humanity but above the open noticing of them, rapped, "I am informed by Citizeness Bergman that you have some malcontents among you."

Florence James was a feisty looking, dried out female of the dedicated type. She said snappishly, "The malcontents aboard the *Titov*, Captain, number two thousand, two hundred and sixty-three. That is, assuming you have no additional ones in officer's country."

The captain ignored her. He rapped, "I assume you have a spokesman. I can't spend my time jabbering haphazardly."

Dr. Miltiades said, "The food is inadequate as to quality, but perhaps that could be borne. However, it is also inadequate in quantity. Our young people are already hungry."

The captain rapped, "You knew before embarking that the *Titov* was to be highly laden not only with passengers but with the supplies necessary to set up the new colony once we have arrived. It has been figured out with care by competent nutritionists. There is sufficient food aboard to bring this vessel's human cargo to New Arizona, but we had no room to bring additional delicacies of the type to which you are undoubtedly used. For the time, all must sacrifice alike. We simply haven't the galley facilities to provide you with breakfast, luncheon, tea and supper."

"Such as we enjoy in officer's country," Cathy murmured.

"In addition," Hugo Miltiades said doggedly, holding out a list, "we must immediately be supplied with these disinfectants and pharmaceutic supplies, and provided with a sizable area to establish a ship's hospital, including an isolation ward."

"Isolation ward!" the captain blurted, astonished. "Blast it! You think this is a passenger liner with thousands of cubic feet of public rooms? Ship's hospital! Do you . . ."

Jeff Ferguson's eyes had been going around the compartment. He interrupted his commander now by muttering, "Flap."

"What?" Gluck rasped.

"You heard me," Ferguson grumbled. "This nardy place is a breeding ground for it."

Dr. Francis Kelly who thus far had held his peace, said, "I agree with your engineer, Captain. If space flap broke out in these ultra-confined quarters, it would race through the ship quicker than plague. We are going to have some of it anyway. The best we can do is catch symptoms quickly and isolate the patients."

Florence James snapped, "This is not a request, Captain. It's an ultimatum. More food, a ship's hospital, an isolation ward. Perhaps there will be other demands later."

He rapped back at her. "There *is* no more food available."

Ferguson grumbled thoughtfully, "We could convert Number Three compartment to a hospital, shifting the equipment I have in there to Number Seventeen."

The captain rapped, "Number Three has more than your equipment in it. It's also full of provisions for New Arizona."

"We could move them into the immediate supply room of the third-class passengers, sir," Jeff Ferguson said.

"And what do we do, you blasted flat, when we get to New Arizona? Starve to death?"

Ferguson said with ruffled dignity, "We solve that problem when we get to it. If this planet is nineteenth category, Earth, then there'll be local food we can eat. Animals, fish, fruits . . . something to augment our supplies."

The captain's eyes glared around again, frustrated.

Dr. Francis Kelly said without inflection, "Space flap."

The captain rapped, "I'll take it up with the board. I'll communicate with you further through Citizeness Bergman. Zen knows, I'll avoid if possible any unneeded intercourse with yokes."

He turned and strode angrily toward the compartment door.

Rog Bock had half turned to follow when the scream came. It was a shrill, piercing, hysterical ululation of hate and murder. For the briefest of moments it had the effect of the lion's roar to its would-be kill, or of the kiai scream of the karate prac-

titioner. It paralyzed listeners in the immediate vicinity.

From the side of his eyes, Rog Bock could see the source of the mad yell. A huge, ragged, berserker of a man, rolling from the second level of bunks, grabbing up what seemed to be a foot-long length of pipe as he came.

Screaming still, he dashed, bowling a few of his neighbors out of his way as he came, toward the captain. His eyes were stark, his hair wild and his skin—he was naked to the waist—was dripping with the sweat of he who is amuck.

From behind him, Rog could hear a sucking in of air and then an alarmed rasp from Jeff Ferguson, the beginning of another scream from Cathy. Or was it Dr. James, who didn't seem the screaming type?

The pipe was coming up for a side-swiping blow, the brute rush almost to its goal. Rog Bock smelled the hate smell that comes in combat or in other great danger of life—or in mania.

Without thought he stepped forward with his left leg, his right, half bent. As the other came on, in his great rush, Bock walked in grabbing the other's right shoulder with his right hand and slugging the man's chin with an elbow punch. Simultaneously, he moved in quickly with his right foot, came around to the other's right side rear. He shot his right foot forward, and then quickly backward against the crazed man's rear leg, forcing him to the deck. He had grabbed the other's right wrist, which held the pipe length, and now didn't let go. He held him, brought up his left heel and stamped it into the solar plexus as as he held him to the deck.

From the time he had stepped forward until the man's air gushed from him in complete agony, more than two seconds couldn't have elapsed.

Rog Bock, in a half crouch, stepped back, his face in killer's alert. But then he realized there would be no further attack and let his hands drop to his sides.

Two of the doctors were immediately on their knees before the fallen demented colonist.

Ferguson came forward quickly and grabbed Rog Bock's arm growling, meaninglessly under the circstances, "You all right?"

Rog shook him off, without answer.

The captain rapped to the doctors, "What's the matter with that man?" Almost as meaninglessly as Ferguson's question to Rog.

Florence James looked up, her face empty. "He's dead."

The captain's eyes went from his attacker of a moment ago to Rog Bock and then to Ferguson and Cathy Bergman. He said curtly to the colonists' committee, "Take care of him." And to his own party. "Come along."

Cathy said, her voice higher than

Rog had heard it before, "I'll stay here for the time!"

Rog stepped toward her, one hand went out and he began to say, "I didn't . . ."

The captain rapped, "That will be all, Citizen Bock. We can be informed later of developments."

And now Rog could hear the angry hum permeating the vast compartment. He looked again at Cathy, looked again at the fallen man, shook his head and followed after the ship's master and Ferguson who was holding the compartment door.

Dr. Kelly who has stood silently thus far, said to the captain's back. "You'll appreciate the need for that isolation ward. I assume you recognized the symptoms of this unfortunate man's illness."

In the corridor, the captain snapped to the spaceman stationed there. "Dog down that door. I'll send another man to assist you. Nobody is to come through it without my permission."

"Citizeness Bergman," Rog said tightly.

The captain held a silence for a moment. Then, "Except for Citizeness Bergman, of course." He turned and led the way back to the conveyer chairs.

Ferguson looked at Rog Bock, respect behind his eyes but also something else. "What did you do there?" he said. "I couldn't even follow it, and I've been in some nardy free-for-alls in my time."

Rog Bock said tightly, "It was an accident." He began following the captain.

Jeff Ferguson grumbled, "That it wasn't, laddy."

Rog said, quietly, "By the way, Jeff. I notice the ship's lounge doesn't provide much in the way of liquid refreshment."

Ferguson groused in disgust, "I suppose you could use a quick guzzle at that, but no nardy liquor in space, laddy. Not even for first-class passengers. Anybody knows that."

Rog cleared his throat and still held his voice low. "Well, I inadvertently seem to have brought a bottle of stone-age cognac aboard in my baggage."

Jeff's eyes gleamed at him. "Laddy," he said, "I'll come around to your cabin after my watch. It would seem we have some fond memories to talk over."

Captain Bruno Gluck, poker rigid as ever, had turned to face them before mounting his chair. His slate eyes were coldly level but his words seemed to come hard. He rapped, "I shall leave my compliments to a more suitable occasion, Citizen Bock. However, I can say that I have misjudged you and that your presence on New Arizona is going to fit in with my plans more than I had first thought."

There seemed nothing to say to that. Rog Bock held his silence.

Later, in the security of his cabin, Rog allowed Jeff Ferguson to dwell upon the fight in the dormitories only briefly before changing the subject.

Actually, while waiting for the engineer to be free, he had gone over it in detail himself. So far as he could see, there had been an alternative. The attacker was mad, murderously insane, and armed. Theoretically it would have been possible for Gluck, Ferguson and Bock to have subdued the other, without overly harming him. In actuality, Rog knew that in his berserk rage the maniac would have claimed at least one victim, and that the ship's master.

And, hated though the captain might be by the colonists and possibly even by his own crew, it was becoming increasingly clear that he was probably the only man aboard competent to get the *Titov* safely to New Arizona. The other officers were largely inexperienced on this type of spacecraft.

No, expendable the captain was not. Rog Bock had done the only thing possible to do. He had taken the attacker out of action as quickly as possible. It was unfortunate the other had succumbed; in the heat of combat, pulling punches isn't always practical.

So that was space flap.

It could hit that hard, and that quickly.

When Jeff Ferguson knocked discreetly on the door, Rog had the glasses out, the bottle tucked handily in the deep drawer of the desk.

He poured the preliminary drinks, suffered for a time the engineer's comments upon the fight, pretending still that his hand-to-hand combat abilities were but accident. The other didn't accept it, he knew, but it was the only stand he could take. He was in no position to reveal that he had spent the greater part of his adult life in learning to kill. And that training included Mongolian Hoppa Ken and India's Nanpa Ken, studied in this age only by students of the mayhem of the past.

As at the auto-bar, a few Earth days before, Rog took the first couple with Jeff Ferguson, drink for drink. Then, with the fine edge of the other's sensibilities fuzzed off, began hedging, watering down his own portions, or once or twice even disposing of them surreptitiously. He wanted the other well drenched before trying to extract the information he wished.

Finally, after they had disposed of most matters they held in common, he said idly, "Take on many new men this trip?"

"Nardy well right," Jeff grumbled applying himself to his glass. "Twelve nardy cloddies. Nobody else'd be flat enough to sign onto the *Titov* this trip."

This wasn't Rog Bock's immediate interest. He poured fresh drinks and said, "Did you ever notice how one nationality will be drawn to one branch of the service and another a different one. For instance, those

of Scottish descent will become engineers, but deck officers are more apt to be British and stewards tend to be French or Italian."

"I wouldn't say that, laddy. A Scot makes just as good a skipper as a nardy . . ."

"Oh, I wasn't arguing against the Scots," Rog interrupted, pretending an equal load of alcohol. "I just say the tendency's there. For instance, those twelve new men you took on. What're their names?"

It took the drink bemused Jeff Ferguson a full five minutes to remember them all. And when he was through, Rog Bock was staring at him.

He ran a dry tongue tip over his upper lip. "You're sure?"

Jeff finished his drink and looked at the two or three ounces remaining in the bottle, hopefully. "Sure of whot, laddy?"

"Those are all the new crew members who signed on when we crewed the *Titov*."

"Sure, I'm nardy well sure. And not a nardy Scot among them."

In despair, Rog poured him the balance of the cognac. "No more for me," he explained. "I've had it."

"Never so drenched I can't put away one more guzzle," Jeff told him slyly. He stiff wristed it down neat, as though Rog might change his mind and demand half.

Rog decided to leave subtlety behind. "You mean there's nobody with a name like, say, Peshkopi, among the crew?"

Ferguson looked at him blearily," Phestkopti? What kind of a name is that?"

"Peshkopi," Rog said. "I guess it's Albanian, or something."

"Never heard of it," the sodden enginer said, staggering to his feet. The liquor gone, he was prepared to depart. "Never heard no name like that. Shurtunly not on the . . . the *Titov*."

Rog Bock stared at the door for long minutes after the other had made his thankful good-byes.

He turned to the desk, sought out the message he had received . . . how long ago? It could be no more than a week. In actuality, he should have destroyed it upon assuming the identity of Roger Bock. Somehow, he couldn't bring himself to do so.

He read the cable still once again.

SOLE SURVIVING PESHKOPI EMBARKING S/S TITOV ON COLONIZING TRIP TO NEW ARIZONA STOP BURN OFF NEUVE ALBUQUERQUE THURSDAY

But the fact was, there wasn't a Peshkopi on board the *Titov*, of that he had made finally sure tonight. There simply wasn't. And then for a moment a thought came through to him that chilled. One of the funkers, there in the auto-bar, one of the last moment fearful ones who were unable to face boarding the spacecraft and confronting the dangers of space.

Could Peshkopi have been among that number?

But no, the percentage was against that.

And then another thought chilled him. No sex was mentioned in the hurried message. The Peshkopi aboard the *Titov* might be a woman, in which case, were she married, the name would be different.

It was then that the second knock of the evening came.

It was Curro Zorilla, the Latin American member of the New Arizona Company. Heavy of shoulder, thick of waist, short of leg and long of arm Rog Bock decided, all over again, a throwback to the anthropoid.

The other's expressionless face took in the empty cognac bottle and the two glasses. "I wondered where the sottish engineer managed to find his guzzle," he rumbled, disinterestedly. "Were you trying to pry something out of him?"

Rog Bock looked at the other. He had taken enough of the cognac himself to know he must watch out in a battle of wits, but he couldn't understand Zorilla's presence here. He said nothing.

Zorilla took the chair that Ferguson had only recently deserted. He brought a long stogie from a jerkin pocket, bit off the end with beautifully white and even teeth, and spit it to the floor—unconsciously, rather than in deliberate provocation.

Rog said finally, "What can I do for you, Citizen?"

Zorilla exhaled smoke and contemplated his host. He said, "I've heard about you killing that drivel-happy colonist down in the dormitories. At first I would have thought you weren't the type, but on second look I see you could be . . . Bock."

"It was an accident," Rog said quietly.

Zorilla drew on the stogie again, checking to see if it burned evenly. "Maybe," he rumbled. Then, "There are eight votes out of ten of the board of the New Arizona Company on the *Titov* right now . . . Bock. With Matthew Hunt remaining on Earth, eight votes control the expedition."

That meant nothing, thus far. Rog Bock lowered himself to the edge of the bunk, crossed his legs and waited cautiously.

Zorilla said, "Of these eight, Captain Gluck controls one, his own, outright, and figures he controls another. That's the one owned in partnership by his five senior officers. The rest of us, me, you, Darleen, Fodor, Pater William, control one apiece."

Rog said, just to say something, "There's Catherine Bergman. She has one."

The South American took his stogie from his mouth, and shook his head. "Two thousand colonists control her vote. They'll vacillate, this way, that way, according to what good they think they can do themselves."

"So?" Rog said.

"So when we land and decisions are being made, important decisions such as just who is going to get the oil concession, or mineral concessions, or whatever, it'd be better if I could swing more than just one vote."

It was clear. Factions were already developing. Rog wondered vaguely who Leslie Darleen was going to side with. If anyone could control five votes, the others would be largely squeezed out.

"So," Rog said, nodding, "you want to be able to vote my partnership."

Zorilla looked at the end of his stogie, expressionlessly and shook his head in negation. "I want to vote Roger Bock's partnership," he rumbled.

Rog looked at him as though the words hadn't registered.

Zorilla reached into a pocket and brought forth a wallet. He fished in it with stubby fingers, finally finding what he wanted. He held it up so that his host could see, but not so close that it might be seized.

"So far as I know," Zorilla rumbled, "this is the only photo of Roger Bock on board the *Titov*."

Rog recognized it then. It had been in the large envelope of papers he found in the real Bock's luggage that first day out. It was a quarantine clearance and had evidently required a passport type photo. He cursed himself now for not having flushed it down the disposal chute.

"So it was you who searched my room?"

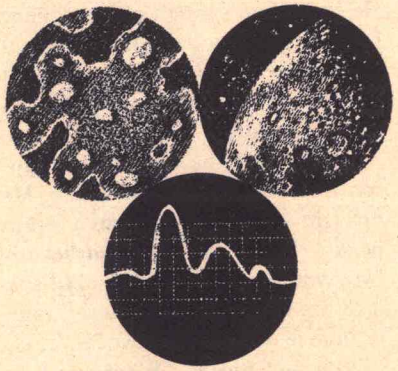
Zorilla nodded, heavily, and returned the wallet complete with picture to his pocket.

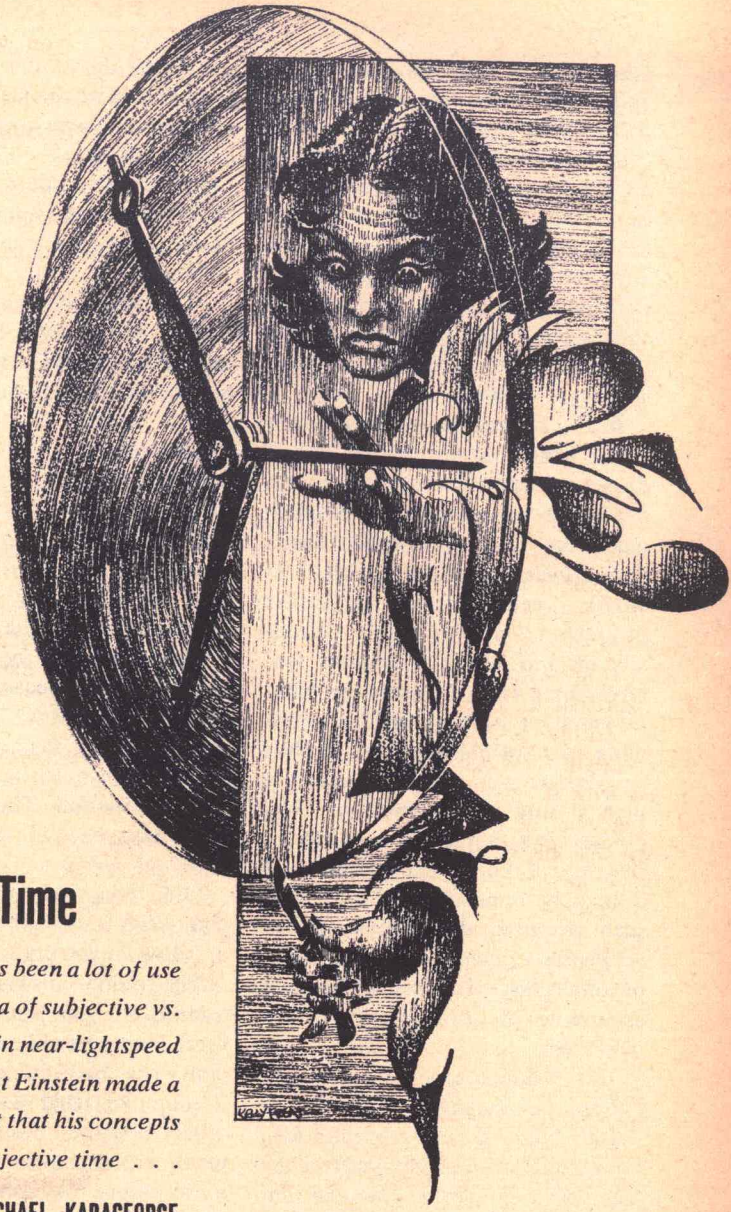
"You see, I met young Bock, a sloppy drunken molly, at the bar of the Far Horizons just before burn off. He wanted to play cards for some ridiculously high stakes. At any rate, I knew you weren't really Bock when we were introduced in the lounge, but I needed proof." He tapped his pocket. "This is the proof."

"And," Rog said emptily.

"And from now on you vote the way I vote. Otherwise, I don't give a damn about how and why you moved in on Bock and what you'll eventually get out of it. But so long as you keep that name, you're my man. Understand?"

To be continued





The Life of Your Time

There's been a lot of use of the idea of subjective vs. objective time in near-lightspeed travel . . . but Einstein made a careful point that his concepts did not *apply to subjective time . . .*

MICHAEL KARAGEORGE

Illustrated by Kelly Freas

The *Emissary* had been half a year under way before her people knew that something had gone awry within themselves. They could have noticed earlier—the human organism is that sensitive—but they were too occupied with their work and with getting used to the grotesquerie that gleamed and blazed and shivered and hummed around them. Also, the interior change was very slow . . . at first.

Isabel McAndrew broke through to the truth, but not till the end of the seventh month.

She stirred awake as a chime signaled the start of another watch period. Her husband Arch was moving likewise, beside her in the tiny cabin that was theirs. Gradually his red hair and angular features came from beneath the blanket, as if he were an animal grumbling out of hibernation. (They could have set room temperature higher and done without bed clothes. But they liked cool air for sleeping. Then, too, blankets were a homely remembrance of Earth, such as one needed here where the very stars crawled toward patterns of otherness.) He swung his feet around to the deck, yawned, and stretched.

But I didn't touch a drop last "night," he thought.

Isabel sat up and regarded him for a long while. Her heartshaped face was so grave, beneath the tangled dark locks, that he felt a stab of worry.

"What's the matter, sweetheart?" he asked. The words dropped out of his mouth one by one, like pellets of buckshot.

"You," she murmured. "Me." Drowsiness fled. Her eyes widened. "Every one of us!"

"Huh?"

"The way you feel. Have been feeling. More and more." Isabel took hold of his arm. She didn't move fast, though the gesture was almost frantic. "Suddenly, watching you, I know. And I know it's true of the others."

"You mean— Wait." The physicist curbed himself, wet his lips and said carefully. "All right. For some time I've felt, uh, a bit funny. It's progressive, I think, though too gradual for me to be sure. I didn't worry about it because, well, what I mainly noticed was that I seemed to be thinking faster than normal. I put it down to being stimulated by our situation. The first manned expedition beyond the Solar System!"

"But today," she said, "you were comparing it to a hangover."

"How do you know that?"

She didn't answer. Such questions had arisen between them before. Unpredictably, but not unseldom, she had an eerily accurate intuition of what was going on in other people's head. The psych team, probing every aspect of her mind before they O.K.'d her enlistment, had found indications of some telepathic talent. But that was as hard to pin down and study as most psi phenomena. So Isabel McAndrew was signed on just because she could rapidly assimilate training in advanced linguistics, and because she could cook, sing, organize games, soothe nerves: in general, be the morale officer of what was otherwise a crew of specialists.

I wonder, though, flashed across her husband's consciousness. When we get to Tau Ceti, when we're eye to eye with those beings whose radio we detected (if they have anything like our concept of eyes) —the psych men may well have hoped her gift would serve us better in getting to know them than any number of language courses.

Then he realized she had not spoken for what was apparently quite some time. He cleared his throat and said: "Don't get scared, sweetheart. I'm not sick. No headache. Only, well, when I do have a mild hangover, time drags for me. It takes forever to do something, even though the clock says I'm proceeding at my usual speed. I suppose it's because of being especially aware of my body. Or maybe, I don't know, maybe the aftermath of alcoholic irritation gears up the brain a little. But anyhow, yes, I do feel sort of like that, now."

"Me, too." Her fingers tightened on him. "It's been creeping up on me, too. I didn't mention it for the same reason you didn't. It looked like such a minor thing, something that'd cure itself. But if we *all*—!"

"How can you tell?" McAndrew grinned and patted her cheek. "Never mind. You've told me often enough that you don't know. Probably your subconscious puts different subtle clues together. Come to think of it, when we were last playing bridge with Jerry and Lisette, I did notice their manner was the least bit odd." Gently, he disengaged her grasp on him and hauled his lanky frame erect. "I'll check with Doc. Chances are that if this means anything whatsoever, it's due to environment. They warned us to expect psychological consequences. Doc will prescribe us a pill or a brain stimulation sequence or something, and we'll be O.K. again."

She smiled. He could read the tinge of forlornness underneath. They had more rapport than the other three couples. Theirs was the only love match aboard. The rest got along fine—they'd better!—but the marriages were of convenience. Even in ship's time, they would take a couple of years to reach Tau Ceti, and then they might spend as much as five years there before returning. So you had to have one woman for each man. And she must meet the same standards as he, of youth, health, skill, and dedication. McAndrew had found his girl for himself, before this expedition was organized, and the luck was fantastic that they both qualified.

He wanted much to comfort her. The eternal murmur of the vessel, ventilators, pumps, chemical converters, was as eternally underlaid by the bone-deep pulse of the drive. The deck thrust against him with an Earth gravity of acceleration, but metal, not the warm live soil he remembered. The overhead was no sky, the fluoropanel no sun, the ecological plant no forest. Outside this thin skin lay near-total vacuum, seething with hard radiations. Sol was shrunken to another star, ghastly far aft, and now that they had reached some sixty per cent of light speed, Doppler effect made it an ember. The same effect discolored the whole heavens, and aberration was drawing the constellations into distorted clumps. Not easy to ship on the Flying Dutchman!

But for that exact reason, you dared not confess to fear. You had to keep the tone light. He glanced at the indicator on the door to the bath cubicle, which the four residential cabins surrounded. "Well, whaddaya know," he exclaimed. "Unoccupied. The first time in recorded history. I better grab while I can." He popped in. Rather, he tried to, but somehow his body resisted speed.

Emerging and dressing, he was surprised to note how few minutes had passed. And, for that matter, how quick Isabel was in her turn; for she seemed to be dawdling. While he waited for her, he opened the panel which folded down to make a table and accepted what the autochef sent from the galley. Dinners were ceremonious affairs, cooked by Isabel and eaten in the saloon, but otherwise the couples clung to their privacy. They wanted to remain good friends.

Her normal breakfast chatter was absent, and he was too worried to jolly her. He swallowed his last coffee in haste and got onto the intercom. "Hullo, Jerry?"

"Hi," said Greenberg, who was his scientific assistant as well as the communications officer. The syllable was prolonged.

"I'll be late for work. Can you finish that spectroscope-computer linkage alone?" They were gathering a glorious hoard of data, in this place and under these conditions which men had never known before. Hitherto it had kept them cheerful.

"I . . . I'm not sure."

"Something wrong?"

"No. Not exactly. But to tell the truth, I've been a little off my feed of late. Slow and awkward."

McAndrew exchanged a look with Isabel.

"O.K., then, wait for me," he said. "I do want to nail down those observations while we're still in this velocity range, but we're not accelerating that fast. And what the hell, if we don't make it, we'll get another chance coming back."

If we come back, said the forbidden part of him.

He called Vincent Norrington, arranged to see the biologist-physician, kissed Isabel—this time-stretching did have some compensations!—and left. The corridor reached blank and murmurous before him. On the way, he passed Denis Romano, the captain, and Sylvia Norrington, the engineer. Neither of them had any duties while the passage lasted. The *Emissary* was totally automatic en route: had to be, when such masses and speeds and energies were involved. But they kept busy, maintaining the ecosystem, tinkering improvements into the service equipment, assisting Clarice Romano with her biochemical experiments. Two years in space should not have proved a burden.

Nonetheless, McAndrew noticed that they looked haggard.

Norrington, a large and soft-spoken Negro, was already in his consulting room. The bulkheads were paneled in oak, hung with old-fashioned prints, dominated by a stereopic frame which showed moving, ever-changing scenes of Earth. A layout calculated to be restful, McAndrew knew. He wondered if Norrington's old briar pipe was part of the same act. No one else had wasted any personal baggage allowance on tobacco.

"Hullo, Arch. Sit yourself. What can I do for you?" Norrington blew a leisurely cloud and relaxed into his armchair.

"How have you been feeling lately?" McAndrew demanded.

"Hm-m-m?" Norrington raised his brows. "This is a new twist. I'm supposed to ask you that."

McAndrew tautened on the edge of his seat. "I mean it, Doc. I've got reason to believe something odd is happening to the bunch of us. Have you noticed anything in yourself?"

"I see." Norrington sat quiet a moment, before he opened the console on his desk. Switches, knobs, meters bristled forth. "Suppose you tape an account while I cover my ears," he said. "Then I'll do the same, and we'll play them back."

McAndrew nodded. "Good idea."

The reports were nearly identical. Even to the slowness of speech.

The men regarded each other while the walls seemed to grow close. Finally Norrington said, "Let's test this. Observe the sweep-second hand on my clock here. Count off time for yourself: one hippopotamus, two hippopotamus, and so on. Compare."

"I've always counted thousand-and-one, thousand-and-two."

"If you prefer. I think hippopotamuses are more fun."

The results, for both of them, were oddly uneven. McAndrew noted down several series of correlations and averaged them. "The mean discrepancy," he said, "is about oh-point-two-five. That is, our personal time sense has accelerated by some twenty-five per-

cent. But why such a large probable error?"

"Because our biological clocks are out of whack." Norrington rose. "This apparatus here is only good for routine diagnosis. Come on into the med lab. I want to check you within a centimeter of your soul."

Even with the superb automated equipment available—it would later be used to study the unforeseeably alien life forms around Tau Ceti—the process took a couple of hours. They tried to joke meanwhile, but with scant success.

In the end, Norrington pondered the data printouts for minutes before he said in a flat voice, "Let's go back to the office." When they were there, he got out a bottle. "I know how small our liquor supply is," he said, "but I, at least, need a drink."

McAndrew's hand was not quite steady, taking his glass. "What's the verdict?" he heard himself ask.

"Clean."

"Huh?"

"As far as the tests can tell, you're in virtually perfect shape. A touch of neurological and physiochemical imbalance, but nothing to worry about, obviously a mere by-product of nervous strain due to this time phenomenon." Norrington sipped, put down his glass, stoked his pipe anew, and made an elaborate business of getting it lit. "I'll have to check everyone, including myself," he said, "but I'm quite sure the results will be the same."

"What can the cause be?"

Norrington shook his head. "I don't know."

"Our environment—"

"I doubt that. You remember that volunteer groups spent two years under identical conditions of confinement, noise, vibration, with no ill effects. And the plants and animals on the automatic probes came back in good shape."

"But people aren't animals," McAndrew protested.

"Oh, yes, they are," Norrington said. "I'll agree, though, the human mind is unique."

He scowled and puffed before continuing: "We have to take that into account, always and forever. Remember why a strictly American crew was selected? That made for a lot of grumbling and trouble throughout the Hegemony. Our troops even had to suppress riots, here and there around the world. But the reason was not imperial pride. No, it was only that the psych boys figured there would be enough mental stress without adding intercultural conflict."

"So maybe . . . you mean . . . the knowledge of how alone we are, that's causing us to break down?" McAndrew suppressed a shiver. The ultimate betrayal: one's own self.

"I do not," Norrington stated. "Each of us was handpicked for stability. And nothing like this happened while the Solar System was being explored, nor on the Alpha Centauri expedition; and *its* ship could barely get up to a fourth of our ultimate velocity. No, men in the past have been just as isolated, and a lot less comfortable and safe."

"So what is the trouble?"

"Some new kind of energy field? Maybe you'd better get busy looking."

"Nonsense!" McAndrew collected himself. "Sorry. But I can't see that either."

"We're edging toward the speed of light," Norrington reminded him. "Men have never gone this fast before. Couldn't there be some unsuspected effect?"

"We've pushed atoms within a cat's whisker of *c*, for centuries, and not found anything but—" McAndrew jarred to a halt.

"What?" Norrington took the pipe from between his lips and clenched the bowl close to breaking force.

"Wait a minute." McAndrew leaned across the desk and scribbled with a stylus on a reusable tablet. How well their loneliness was measured by the fact they couldn't afford scratch paper. "Damn," he muttered, "but I wish I'd brought my slide rule . . . Yeh. Got it."

Norrington waited. The bleakness grew and grew in the other man. Finally he spoke:

"I've inverted the time relationship we found. Are we really thinking twenty-five per cent faster? Or are we thinking at our ordinary rate, while everything else has slowed down to eighty per cent of normal?"

"Is that even a meaningful question?"

"It sure as hell is. Look, we've reached sixty per cent of *c*. That gives you a tau function of oh-point-eight. In other words, as you well know, if an observer on Earth could see us now, he'd see our clocks, chemical processes, radioactive decay, everything—our time rate—going at eighty per cent of his own. Same factor as we've observed in ourselves, you and me. I can't believe that's a coincidence."

Norrington's face turned a peculiarly horrible grayish color. McAndrew saw him sit motionless, as if he were already locked in stasis. The physicist nodded and spat:

"Yeah. Exactly what you're thinking. The tau factor approaches zero, faster and faster, as we approach the speed of light. We'll be very close to that in less than five months. What happens to us then?"

It spoke well for them that they were not shattered by the announcement. They had been worried when Norrington put them through his tests without saying why and McAndrew searched so desperately for a trace of some hitherto unknown physical phenomenon and didn't find any. The knowledge had become common, after they realized that *something* must be wrong with everybody,

that time had gone askew. But most had thought of . . . well, psychophysiology, energy seeping past radiation screens . . . not this.

They sat around the saloon table, couple by couple, when Norrington finished and seated himself. Husbands and wives clasped hands, except for the Romanos. The captain doubled both fists together and leaned on them, as if to crumple the tabletop.

Silence waxed. Weaving beneath it, around it, through it went the relentless rhythm of the ship. And McAndrew imagined crazily that he could hear the unhearable noise beyond the hull, hydrogen atoms dying in the fusion generator or flung aft in one torrent or shuddering with the shock waves of the *Emissary*'s transit; cosmic rays sleeting through light-years, photons that were old before this galaxy came into being, the synchrotron fury of magnetically whirled electrons. Certainly he felt the pulsations in the metal that enclosed him, and to his awareness they had dropped in frequency, become a bass growl within his flesh. The slugging of his heart, the acrid smell of his fear, were by contrast things of home, human, almost as dear to him as the pressure of Isabel's fingers.

"No!" Romano smote the table so it rang. "Impossible!"

"The truth is never impossible, Skipper," Isabel said quietly. Because he could have no secrets from her, McAndrew had told her the facts already, and there had been time for her to find some measure of calm. Which had helped him more than he dared reckon up.

"But your explanation's absurd," Romano sputtered. "What you're saying is that we're moving at six-tenths *c* while our brains are sitting still!"

"Not our brains," Norrington corrected. "Those are physical organs, subject to the same laws of nature as anything else. Our minds."

"You mean the mind is not subject?"

"Different aspect of natural law," McAndrew said. "You don't expect stars to act like molecules, do you? Or men like stones?"

He took some of the brandy Norrington had ordered set out. "I agree, Denny," he went on, "it is absurd to suppose that our bodies are moving while our minds are not. There must be some other cause. The fact does appear to be, though, that the human mind is permanently in ordinary cosmic time, and the rate at which it functions is not affected by speed."

"Hey, wait!" Jerry Greenberg protested. "Do you mean there is a distinction between subjective and objective time? Everybody knows that. I seem to remember Einstein himself pointed it out. Wasn't his example the way an hour spent with your best girl on the porch swing is ever so much shorter than an hour spent sitting on a hot stove? O.K., no argument. I can see how our organisms might in some way resent these unnatural conditions and—"

"No, that is not what I'm getting at," McAndrew said. "Doc's tests pretty well rule out physiology or psychology as a cause for this thing. What I mean is that our minds, not our bodies or brains but our minds, are somehow still operating at the same rate as they did on Earth."

Greenberg shook his head. "You're implying that there is one inertial frame of reference which is unique. That was disproved back when the foundations of relativity were first laid."

"Not exactly," McAndrew said. "I've given this matter some thought. What we might as well call the cosmic frame does have one peculiarity, namely that most of the accessible physical universe is in it. I mean to say, after all, leaving aside the galactic recession business . . . throughout an enormous volume of space, not many masses travel at any substantial fraction of light velocity. We had to accelerate to get moving this fast, and we'll have to decelerate at journey's end. That takes the problem out of special and into general relativity. The old twin paradox doesn't arise. When we return to Earth—if we do—no, damn it, when we do!"—he tossed off his drink—"we will in fact be younger than the people who stayed behind."

"So?"

"So there is, strictly speaking, one *set* of inertial frames, not very different from each other, which are indeed unique within any galactic family. The low-velocity set, that all stars and planets and interstellar atoms belong to. The cosmic set. Evidently the mind—as opposed to the brain—is somehow tied in to the cosmic set."

"Stow that, you two," Romano barked. "We've got a survival problem to lick. Doc, if this goes on, what'll happen to us?"

"I'll tell you straight," Norrington said. His words lacked tone, and how slowly they fell! "Matters will get worse and worse as the tau factor shrinks. We'll feel more and more inert, less and less able to coordinate will and action. Only a nuisance, at first. But eventually, for practical purposes, we'll be stiffened into motionlessness. As far as our perceptions are concerned, that is. We'll stare at the same object for days, weeks, before we can drag our eyes away, or close them, or anything. We won't even have any noticeable sensation of interior life, pulse beat, breath, all stopped. It'll be the most extreme sensory deprivation human beings have ever undergone." He filled his lungs. "Eleven years of that before we commence deceleration. Forty-eight hours is considered sufficient to induce radical psychosis."

"We'll go insane," said Lisette

Greenberg into the thrumming. She gasped and buried her face against her husband's shoulder.

"Whoa, there." McAndrew spoke briskly, as much for his own sake as anyone else's. "Things are not quite that bad. We have to get pretty close to light speed before the effect becomes overwhelming. Four months from now, we'll be moving at ninety-five per cent of *c*, but the tau factor will be oh-point-three. A little more than three hours will pass in your consciousness while one hour passes outside. No fun, of course, but you can stand it."

"Beyond that, though—" Clarice Romano whispered.

"Uh-huh," McAndrew nodded. "The process accelerates. In a couple of weeks more, the ratio will be ten to one. Four days later, two thousand to one. And on and on. But we can count on four months, I'd say, in which to solve our problem."

"Solve it how?" Sylvia Norrington challenged. "If we could get in touch with Earth, and they turned the entire scientific force of the human race out to help us, what could they do in that time? We've stumbled on a whole new field of knowledge. We don't even know what data to look for, let alone how to look or how to theorize about them."

She appeared calmer than the rest, whose jaws were clamped together as if they held onto sanity by their teeth. Only Isabel matched her evenness in asking, "Don't you plan to try?"

"Certainly, dear," Sylvia answered. "I'll work like hell, if we can decide what to work at. But let's be honest. We won't succeed." She shrugged broad smooth shoulders. "We knew there were risks. We were trained to accept the fact we might die. When I've failed, and can't stand any more what's happening to me, I'll ask Doc for some pills and go quietly to sleep."

Norrington traded a glance with McAndrew. They'd talked about this. A mind, trapped in dreams for the days or weeks the brain took to die, would not go out easily.

But best not speak of that now.

McAndrew was jarred to note that Isabel's eyes had joined the silent exchange. Did she read this in them, too?

She smiled, released her clasp on him, and raised her glass. "The sooner we get organized, the better," she said. "But first, how about a toast to our victory?"

On and out the ship plunged, a web of force and a blaze of energy, within which the hull was little but a control center. As her speed mounted toward that of light, and mass with speed, she became herself a cosmic object; space was troubled by her passage, and perhaps—not impossible—a sun did or did not form, billions of years later, because she had crossed those particular kilometers.

Space is not empty. Look out a port and try to count the stars; and then there are planets, meteorites, dust clouds beyond imagination. True, the way is long from one to the next. But more than radiation pervades space. There is matter: the primordial hydrogen, and every other element born in the suns and spat forth in their death pangs, but all-dominatingly the interstellar medium is hydrogen. In our part of the galaxy, the atoms number one to a cubic centimeter.

The *Emissary* departed Sol on a standard reaction drive. Had that been her only means of travel, she could never have come near the ultimate speed. The mass ratio would have been too huge. But she had not accelerated very long when she could begin gathering the mass which everywhere surrounded her, the hydrogen, and use it.

One atom per cubic centimeter? No, the thought is not ridiculous. At speeds close to light, every square centimeter of ship will encounter thirty billion atoms per second. And the energy of encounter is stupendous. Had the *Emissary* run directly into that interstellar atmosphere, her crew would have died: at one-half of *c*, they would have been blasted by thirty million Roentgens per hour.

Since the hydrogen must be warded off in any event, why not take advantage? Scoop it up and blow it backwards, a ram jet which becomes ever more efficient as velocity increases. Light speed is the limit, but you approach that limit asymptotically, you can accelerate the entire distance. One year roughly, to come very near it: in the course of which, you will travel half a light-year. Then—scarcely any time, weeks at most, just a few days if your route takes you through a denser-than-usual region—to cover the bulk of the trip; though the cosmos will measure your transit in years.

At midpoint, you make turnover and decelerate. A new configuration of forces is established, to interact with the gas like some titanic drogue. Even so, the engine must be operated, too. The atoms you collect must have their relative velocities reversed. No matter. You have power to spare, for the energies involved are enough to maintain a thermonuclear fire. In the end, half a light-year from journey's termination, you will begin to come down to something like a reasonable speed, and you will note the passage of a year while you brake to rendezvous with your goal.

Such was the theory. Practice was something else again. The airscoops, the jets, the very power plant could not be material: not when such orders of magnitude were involved, a trap whose diameter was four million kilometers at the mouth, an atmosphere cloven at three hundred thousand kilometers per second, a center of fusion reaction which was like a small sun,

and which must be kept far away from the ship lest its own radiation pour too strongly through the hull shields. Nothing could have carried out the task, nothing could control that monstrousness, except the forces themselves. To balance those had been the work of three generations of engineers.

Nor could the ship maneuver. Once launched, she was less guidable than a hurled rock. The least attempt to change the pattern of action programmed into her would have upset the force equilibrium; she would have vanished in a nova-like burst visible halfway across the galaxy.

She might yet. A single flaw, or an unnoticed pebble afloat in her path, would spell the end. Surely they were brave who launched her. Who had dreamed more majestically than those who rode her?

Arch McAndrew writhed in his bed. Horror mouthed at him. He had slipped into darkness, and now he fell, while an eyeless face that was his own receded before him, then came back, swelled until it filled the universe, until it was the universe, until nothing lived and nothing had ever been or would be except wrongness, they had put the sky on crooked so that he could see past the horizon into the nonexistence which lay infinite beyond, and for centuries he screamed.

Heavy as the world, arms enfolded him. He struggled through great waters that roared, up through a surface that resisted and clung, broke past and gasped for air. Light was hideous about him. Inchmeal, his wife's countenance moved into his view. He lay and drew life from the vision; now he could feel the breath that dragged in and out of him, the heart that wearily pumped a bloodstream gone viscous, the slow, slow cold trickle of each sweat drop down his ribs; Isabel, Isabel, you are become a statue, only an idol of what I have served, God has departed from the Ark of the Covenant and you are blank before me.

No. No. The same dear play of expression was there. He could see it creep across her lips and eyes, the words belled in him,

"Oh,
"darling,
"wake
"up.
"It's
"all
"right,
"the
"Face
"was
"only
"a
"nightmare,
"I
"am
'here
"and
"I
"love
"you

He summoned what strength of will was left him. Not only had the past months of futile, frantic toil, scurrying from hypothesis to hypothesis and experiment to experiment like a rat in a bottle, worn him down. He could have taken that. But his body, his brain, no longer supplied what his mind needed at the rate he needed. And now they had come so far that he could feel the gap widen slowly—hourly.

Power, he thought. Rate of doing work. But rates are relative.

The dry, physics concept was something to cling to in his exhausted confusion. He looked at the tears that slipped over Isabel's lashes and cheeks, and wondered: How did she know what I was dreaming?

Word by word—while goblin birds flapped wearily past, however much he tried to believe they were hallucinations spewed out by a mind starved for knowledge of any reality beyond itself—she answered, "You didn't yell. I just knew, in my own sleep."

Sleep, that knits up the ravel'd sleeve of care. Doc Norrington had gotten them onto that approach. They should be able, with a drug or a brain-wave playback, to knock themselves unconscious. They could have on Earth. They would rig automatic intravenous systems to maintain their bodies, and wait through the eleven years. Not too difficult; as far as those bodies were concerned, the question was of mere weeks, or even less.

It should be possible.

It wasn't. The mind does not cease to function during sleep. It only functions differently. Prolonged coma, through accident, experiment, or therapy, had not damaged the psyche before. But that was back on Earth, where the mind worked as the brain did, where thought or dream slowed down likewise. Here, the discrepancy had become too great. Even stunned, the self knew it was coffined in a darkness that would not lift for days, and went mad with terror and loneliness.

We're pretty near the edge, McAndrew rehearsed. Jerry's quit his own pet approach, finding some electronic means to slow down physiology, and sits and stares at his apparatus, the whole watch through. Lisette does nothing but giggle to herself. The Romanos have moved into separate quarters, after she tried to kill him. Doc's hogging the liquor supply, I suspect, unless he's raiding the drugs instead, to keep himself looped. Sylvia says never a word to anyone. And we two? Isabel's stopped cooking—not that the crew want to watch each other eat, any more. Mostly she sits and listens to her Beethoven collection on a speeded-up taper. Me, I get one idea after another, each crazier than the last; I can't concentrate; I can't sleep

for the nightmares, and when I'm awake they go right on gibbering at me.

We'd better kill ourselves soon. I don't want to spend a year feeling the bullet crash through my head. As the brain disintegrated, day by mental day, I'd know I was becoming less than human, less than real.

—Are you so sure?

Of course I am. We dropped long ago the silly notion that this phenomenon proves we have immortal souls. If consciousness were not produced by the brain, how could we be destroyed as we are?

—Yet the mind isn't affected by speed.

Oh, it is, it is, as witness our destruction. I see what you mean, though. Well, Doc and Jerry and I developed a hypothesis that accounts for the facts. Obviously the mind is not a material object. Instead, we've decided it's a, well, a space-time pattern.

—Like music?

Hm-m-m, I never thought of that. A good analogy. (*That is NOT a real snake crawling down my throat!*) In one sense, music doesn't exist except when played: which requires material instruments and players. But in another sense, it does. I mean, the pattern of a symphony, the relationship between notes, is not identical with the sound waves. That pattern is as real on the printed page as in the air of the concert hall. It isn't affected by acoustics . . . or velocity, or anything. The mind must be something similar. Of course, it's a hitherto unsuspected law of nature that a pattern of this sort continues to operate within the inertial frame where it was first established.

—And maybe even when the brain is gone?

No! Can't be, or we wouldn't be going to pieces right now. The pattern is created and maintained by the physical organism; when that goes haywire, so does the output. When the brain dies, the process of maintaining the ego must end. Theoretically, you could recreate the ego in another matrix, just as you can play a symphony with different orchestras. But we've no means for doing that. We have to accept that we're under a death sentence, and make a decent end while we still can.

What the devil is going on?

He had been talking to himself, within his own head, as he did more and more. Only . . . this time it had felt different. There had been a warmth which had long left him, a resurgence of strength and courage that drove back the inward-crowding phantasms. Besides, why should he carry on such a mono-dialogue? He'd threshed this notion out with Jerry and Doc, *ad nauseam*. But not with anyone else. Denis Romano had been curtly uninterested, wanting only an engineering solution, until he sank into witless apathy. Clarice, Lisette, and Sylvia had become unapproachable even earlier. McAndrew had not mentioned the idea to Isabel, because speech had grown too hard, better that they simply smile at each other.

He looked into his wife's face and saw the same puzzlement there. Slowly her lips parted.

A scream came forth.

The sound dragged on, without end. He knew that they both surged from the bed and that she led him in a race through the door and around the hall enclosing the cabins; but he had multiple minutes to spend with his ghosts. He saw that a corridor fluoroplate had been installed half a degree out of true, and could not take his gaze away from that, but brooded on the fact, on the final ugly chaos which underlay creation, while his foot rose and came down; and the chill white light, the humming and seething, took him and he went under.

No! called through the dream. *Come to me, my only dearest!*

Like a fish on a hook, he was drawn back to the universe he did not want to be in. The door stood open to the Norringtons' cabin. Doc wasn't there. Probably in his office, drunk or doped. Sylvia lay stretched on the deck. The blood that surrounded her was impossibly red, a shout of scarlet that also went on and on. One of her husband's scalpels was in her hand.

I will turn her over, McAndrew knew, and stare at the gash which grins across her throat for a day that will become a month and a year. That will be the end of my own last sanity.

Isabel shrieked again. Not because of the sight. Through and through McAndrew burst the reason.

Blackness, nothingness, oh, help me, I am so alone. I cry and there is no voice. There is only myself, and I am nothing. I whirl away in a million fragments, horrible in shape, fading, dying, but why must I be so slow about ceasing to exist? I am dead, but it will not let me be dead, I did not know death was haunted, I thought there would be nothing except the blessed peace. There is no silence WAIL BUZZZZ MMMMM no darkness HELL'S BLUE FLAMES no end no end no end

Isabel stumbled toward her man. But long before she touched him, they were one.

—Arch, she cried, Arch she's gone and still I hear her!

—And I hear her through you, he answered.

Eyes were upon eyes, hands reaching toward hands, he had time in which to savor the beauty before him, until contact was made and he could know warmth and litheness as well. But meanwhile his mind leaped into the Real.

The whole of six fellow human beings was opened to him. He felt Isabel's self: no more should be said. He felt the anguish in Doc, the inward-aimed rage in Denis,

the ultimate surrender of Jerry; so strange and wonderful was it to sense, to be, the femaleness of Lisette and Clarice that he did not at once read their thoughts. Lunacy fled like mist before the sun. For beyond them and beyond them—the fire that was an atom, a mind old and wise in the body of a creature light-years removed, a planet which would be born fifty million years hence and bear a race which was to find one salvation.

But he had no chance, then, to explore. Poor Sylvia screamed so loudly. Before she became the nothing she had wished to be, she must be helped. Arch and Isabel meshed their minds. They were awkward as yet, but they spanned death and touched her.

—Sylvia, here-now we are!

The howling gave way to stillness, despair to joy. She clung to them, and they pulled her from the dark, world-drowning tide, made her one with them, shared what they sensed and gave reality back to her.

All the while, McAndrew's body had been in motion. He paused for the briefest of instants, not even many interior minutes, to hold Isabel. Then he stooped, picked up Sylvia's drained flesh, and ran toward the hospital bay.

His thought ran before him: Doc! Without words, he projected the entire pattern of what had happened.

—She's dead? wept in Norrington.

—Clinically, yes, McAndrew flung in reply. But that simply means the body has stopped functioning. Not even in entirety. Most of the cells are still alive.

—Can you bring me back? swirled Sylvia.

—Sure. Why not? We've supplies and equipment. Brain deterioration doesn't set in for five minutes or so, even at room temperature, and yonder clock says it's only been two minutes since we found you. Put your body in an ice bath, hook in a heart-lung machine, supply blood and oxygen, clamp off the slashed vessels till we can do surgical repair —of course, of course.

The wave of shame and grief that smote McAndrew was so monstrous that he lurched. Almost, he could materially hear Norrington's cry: "I can't! I'm too doped, too clumsy. My own wife has to die because I was a coward."

—No, laughed Isabel. Don't blame yourself. You did your best, and when that failed, you didn't surrender, you merely tried to numb yourself as much as necessary. Don't be afraid. You still know what to do. You can tell us. We have hours to learn the motions before we need start to work.

A chorus of selves shouted the length and breadth of the ship: What's happening? What woke us?

Together, McAndrew and Isabel told them, and healed them.

—The mind is a pattern, created and maintained by the nervous system as music is by an orchestra. But music is also a set of sound waves: physical. Even so must the set of experiences-thoughts-emotions-memories which is the mind have some physical embodiment. In the light of what we have just learned, we must think of the brain as a transducer, converting the energy of the cells into that ever-changing energy-field we name the human psyche. Because of its pattern character, the self remains in the cosmic frame of reference where it was born. How that can be, we don't know; but we'll find out! (I/We think perhaps there is some kind of signal involved which is not bound by the speed of light; because we are now listening in across the whole space-time continuum. Perhaps that signal-energy is the simple existence of everything that is.)

—But what happened when I died? asked Sylvia, calm now, save as wonder filled her awareness.

Grimly: Much the same thing, dear, as was happening to us. The mind-pattern does persist, for a while, after the brain ceases to work—like a note of music continuing through the air. But there are no more senses. No more data come in. The final isolation. The mind belongs in the cosmos. Cut off, it disintegrates and goes back to nothing, to noise, to chaos. (Oh, our beloved dead whom we are too late to save!)

(Unless one day we can reach into the veritable past.)

—How did you save me? Sylvia sang.

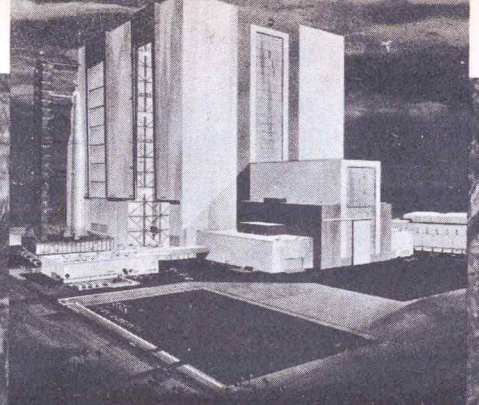
—Isabel, said McAndrew, as much by himself as was possible. She had the greatest telepathic potentiality; though some must be latent in every human being. Under these conditions, with less and less distraction from outside, while her own inner strength was so complete that she could endure the aloneness, her power grew. It was spurred on by her wish to live and to keep me with her. It burst into bloom when she sensed death beyond the bulkhead. Now she is awakening it in all of us.

We will not go crazy. For eleven years, we will explore ourselves, each other, the universe: more data input than we'll know what to do with. We'll change—it hurts to put away childish things—but we'll grow. And . . . maybe we will never die. When our bodies are too old to live, as long as there are younger beings who will take us into their fellowship, our selves will continue.

This is the first word we must send back to Earth. By radio from Tau Ceti, if we can't trumpet it from the ship before then. No matter the expedition. We'll carry through with that, and have a glorious time doing so. But this is more important. This is what we came to find. ■

GREGORY STUDIO

Scene on Cape Kennedy before conversion to a launch pad.



LUT

THE GIANT MOVER

The problems the space-age boys encounter aren't always such esoteric things; sometimes they're all too down-to-Earth. Like opposition from the local natives at the launching base—jaguars and alligators, for instance. Or just the fact that contrary to Biblical injunction, they're trying to build their house on sand!

By Lyle R. Hamilton

It's the year 1971. At Cape Kennedy the free world's first manned Moon rocket moves from the Vertical Assembly Building to launch pad 39, three miles to the northeast. It's the largest moving job in history. One half million pounds of spacecraft. It's no job for a moving van; it's a job for LUT.

Next to a slide rule, the rocket engineer's best friend is a large economy sized bottle of aspirin. LUT is the last major step in a series of headaches involved with placing men on the Moon.

The extremes of trouble may be classified as problems, headaches and difficulties. In order, they are created by requirements, technicalities and engineering compromise. The Saturn V difficulties have not yet been seen because engineering compromise enters the picture only when the project is finally put together as a system.

Often in rocket and space development and probably in automobiles and refrigerators, it's difficult to find a meeting of the minds. After endless staff meetings and weeks of brain storming the man in charge will find that absolutely nothing has been done. He'll discover that they've solved no problems, scaled no walls and made no decisions.

These are periods that cause ulcers and nervous breakdowns. Periods when top-level administrators like Dr. Kurt Debus, of NASA, decide to "do anything, even if it's wrong."

Accordingly, certain plans are made. The huddle of so-called decision-makers concentrate on the boss' singular decision and ignore, for a while, all the other existing headaches.

Slowly an overall plan is effected. The general procedure is laid out, complete with vacant spaces where, "We'll do something when we get around to it."

Finally all the pieces to the puzzle are purchased and laid out in a nice neat row. The next step is assembling it into a workable picture —a complete functional system.

This is when the fun begins; the problems and headaches are past. When system integration begins, the engineers get a chance to sit back and give out with a big belly laugh at the simple bothersome human mistakes he and his colleagues have made. This is the time when two cables which are supposed to mate are discovered to both have female connectors or to be six inches too short.

Rocket development, in the United States, has some built-in handicaps. Funds are one of these, coming, as they do, from a legislative body made up of lawyers, small businessmen and general population, without a scientist in the bunch. We're never asked, "How much do you need?" It's always, "Submit a budget, cut it by twenty per cent, then we'll see if we can do something."

There are many people in this country, some of them in Washington, who fully expect and will be totally surprised, if the Moon isn't in reality green cheese.

The continual attention to money brings about some peculiar working conditions. We generally always have enough manpower. The concept that there's an engineer shortage is misleading. Most of us think it's an industrial conspiracy to get people into engineering schools, flood the market and run the pay scale down. There are some shortages and it is a growth field. But most companies have a stockpile of a few extra men just in case. Generally, we run short of minor hardware, nuts, bolts, screws and electronic components. Such as a ½ watt 420 ohm carbon resistor that costs fifteen cents at the local, off cape, supplier. Only it takes two days and one hundred twenty dollars worth of paper work to get the part from him.

Cape workers, from top level management down to the lowliest of janitors, soon become adept at scrounging, visiting the dump for a valuable part or borrowing from another system.

Occasionally the parts problem arises from hiring stockroom people that know absolutely nothing about parts. We need one who knows a flashlight battery from a 10-32 screw, an electronic technician or a mechanic, not a shoe clerk.

In May of 1961, President Kennedy was worried about space conquest. The competition across the polar cap had put a man into orbit and we were clearly behind.

We had plans on paper. The Apollo spacecraft was defined as a lunar orbiting vehicle. It was seen that it could be adapted for lunar landing. At Huntsville, Wernher Von Braun had specifications written for a series of rockets called Saturn and a giant of giants called NOVA.

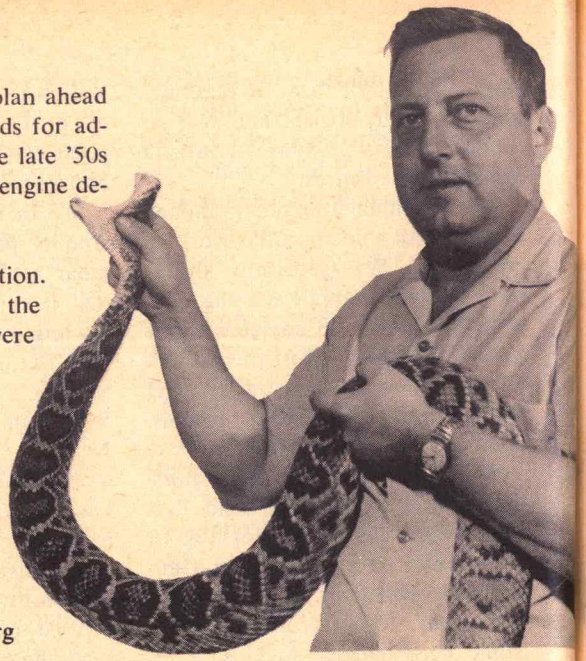
President Kennedy wanted the United States to be first on the Moon. He put pressure on NASA and Congress for concentrated attention toward this goal. (Kennedy refused to allow political answers to scientific problems. A trait never seen before in that post.)

The Saturn series were designated with the letter C and a number. They went from C1 through C5. Each one more powerful than the other. The C1 and C2 planned to use clusters of existing engines while C3 and above would use engines developed for NOVA.

Because the lunar mission was still undefined it was impossible to project exactly what was required. NASA was still studying the methods of reaching the Moon and could not commit themselves to a rigid plan.

One of Von Braun's first lessons, upon moving to the United States, was that Congress could be fickle. That no matter what funds he asked, some would be allocated.

He's able to continually plan ahead and miraculously get funds for advanced projects. Since the late '50s he's been able to provide engine development money to Rocketdyne, a division of North American Aviation. The engines, the F-1 and the J-2, assigned to NOVA were ahead of schedule.
The first real decision was out of the scientist's hand—into the politician's.
There was a well-organized plan to move Saturn and NOVA testing to California, at Vandenburg Air Force Base.



The engineers had some trouble with uncooperative natives.

This was squashed when it opened a monkey cage of political bickering. Someone even suggested moving the launch site into Kansas or Nebraska. If the government would buy up enough farm land, it might solve some of the Nation's agricultural problems. The idea's backers gave no consideration to the Eastern seaboard residents who would have to contend with bombarding first-stage engine cases. Cape Canaveral, now Cape Kennedy was chosen.

Congress bought eighty-eight thousand acres of Merritt Island, west and north of the Cape.

The Cape is one hundred eighty miles north of Miami. It's an offshore sandbar twenty miles east of the Florida mainland. It was formed in an ancient era by the breakers churning the shallow coastline.

From bedrock, 150 to 170 feet down, up to the surface is nothing more than sand and sea shells. The surface consists of dunes, marshland, lakes and subtropical foliage.

This land purchase created two groups of irate citizens. The grove owners, who had a financial and time investment, and the sportsman, whose favorite fishing hole was soon to be closed. Total access control wasn't established until the end of 1964. Until then one could roam the entire Merritt Island area except for the construction sites.

As soon as the first land purchases were made, the government set up means to protect the wildlife. They named the area a game refuge, to control hunting and fishing. The public was invited to take fish and, in season, duck. All other creatures were deemed to be "off limits."

Merritt Island is a naturalist's paradise deer, panther, alligator and diamond back rattlesnake flourish. The waters teem with fish as do the marshes with rare exotic birds, blue heron, pink flamingo and white egret. Curtis Wilson, the game refuge manager estimates that one could identify one hundred thirty species of bird on any given day.

Before the government became owner Florida protected the rare animals and bird. Without control, naturalists feared the wildlife would be destroyed.
Now that the area is closed, the public may still gain access. By applying for a fishing permit one is issued a temporary badge and given run of the many lakes in the northern part of the island, away from the Lunar build up.

The grove owners, even though paid cash for their groves, would suffer from losing their income source. Again the government made concessions. Each owner was allowed, at moderate cost, to lease his grove back. He was given entrance for himself and his workers and encouraged to continue working the land. This plan will continue until 1968 when it will be renegotiated.

Actually this isn't a new move. Before the space age began, a small fishing town existed on the Cape. When the town was bought out it was agreed that the government would maintain the cemetery and that the citizens would be allowed

"In the late Fifties over on pad 4 (Bomarc) the last man out one Friday night was stopped at the door by a 12-foot alligator. He got on the phone and called Security. It took two hours to scare the creature away."

GREGORY STUDIO

escort to visit their relatives' graves.

In August 1961, proposals were requested for the Apollo spacecraft. It was estimated that the spacecraft might weight between 50 and 75 tons. The command module would be about 13 to 15 feet wide and perhaps 12 feet long.

The weight specification quickly put the project into the skids. Now there was no real reason to develop the Saturn C-2. The C-1 could be used to man-rate the spacecraft, propelling it into an unmanned Earth orbit. A C-3 would be needed to launch the system toward the Moon. In space it would rendezvous with the third stage of a C-5 and continue to the Moon.

By the end of the year, D. Brainerd Holmes, NASA director of Manned Space Flight, Houston, announced that the Apollo would consist of four major modules. Command module, service module, orbiting laboratory and a lunar landing propulsion unit. The laboratory would not be part of the lunar program but would be used instead for Earth-orbiting experiments. Weight problems continued to plague the designers. They dropped the C-3 and picked up the C-4.

Bidding began on the boosters. Of all the companies, Boeing was the most needy and the least experienced. They had phased out of heavy bomber production and had done no big booster work. Saturn was the only project in sight and Boeing set out to get a piece of it. The C-1 first stage went to Chrysler and Boeing went back to the drawing board. The C-1 second stage went to Douglas. Boeing didn't even compete, they were still working to improve their knowledge. They wanted a contract and knew they had to offer something good. The C-4 contract was being held up for further study. The C-5 first stage went out for proposals and Boeing won the contract.

The lunar attack was planned to be done in several stages. A fully manned Apollo and return fuel tank would be placed into Earth orbit by a Saturn C-4. A C-5 would put its third stage into orbit and the two would rendezvous and continue to the Moon. There, just like in the movies, the spacecraft and return tank would land.

For six months NASA top officials fought an in-house battle royal. Holmes contended that if the Apollo Command Module was parked into a lunar orbit, two men could ride to the Moon in a lightweight space buggy. The bug would be designed to weigh between 4,000 and 14,000 pounds. By not lifting the command module from the lunar surface and leaving the bug behind in lunar orbit, Holmes and his staff reasoned that ninety per cent of the payload's weight could be eliminated. The weight-saving would allow using a single C-5 for launch, eliminating the C-4 and two launch pads.

Von Braun rebutted by claiming that the C-5 would be overstressed. The bug couldn't be built to weigh 14,000 pounds that 25,000 pounds was more realistic. The 25,000-pound bug coupled with the weight pared 25-ton capsule would weigh 75,000 pounds. The exact capacity of the C-5. Holmes' plan, Von Braun contended, would be suicidal.

They had Boeing slap another F-1 engine onto their first stage, adding an additional 1.5 million pounds of thrust. A lucky step because the bug's weight came out, not 14,000 or 25,000 but 30,000 pounds. The combind weight of the lunar system—85,000 pounds. This decision firmed the Saturn program. NASA dropped the alph-numerical designators C-1, C1B and C-5, replacing them with Roman numerals, I, IB, and V. People stopped talking about NOVA and it's seldom mentioned any more.

By 1962, rocket assembly had become a routinized procedure. The rockets were assembled in some aircraft manufacturer's home plant and flown to the Cape. Here they were given a fairly thorough checkout to find any transit damage, moved to the launch pad, given a cursory test to determine that they were still functional and launched. The Saturn series of rockets was due to blast that routine.

Saturn I was planned for production in 1960. Its first stage, eventually made by Chrysler, was to be floated by barge from Huntsville to Cape Kennedy. At dockside it was transferred to a special trailer, hauled to the launch area, upended by a crane mounted on the gantry's top and placed on the launch pad.

The second stage would be built in California by Douglas and flown to the Cape in the Pregnant Guppy. (A drawn and quartered KC 97, reassembled into an awesome flying monster.) At Cape Kennedy's skid strip it would be put on its own trailer and taken to hangar AF for inspection and pre-mate functional test. It would then be transferred to the launch pad and raised above the first stage. The interconnecting cables would be mated and given a continuity check. The second stage would then be fastened to the first and the entire system prepared for launch.

This concept of Vertical Assembly was born with Saturn I and would mature with Saturn V. The big rockets must be put together in the vertical position because the tremendous structural force on the joints, during erection, would tear them apart. Another factor is the ungainliness of transportation. Imagine walking down your hall at home with a one-hundred foot two by four on your shoulder. Now make a left turn into your bedroom.

The same assembly method could be used for the Saturn V but there were several points against it. Several more headaches to consider before commitments could be made.

The assembly and check-out ties

up the entire complex for three to six months. A wholesale lunar onslaught would require ten or maybe twelve launch complexes. An expensive proposition.

There was also the underlying factor of exposure. Hurricane Donna, the first big storm in years, had missed the Cape in 1960. Could the rocket men be that lucky in the future?

Scientists don't place much faith in Indian hexes and even though Canaveral tribesman Chester Shoals had put a hex in 1875 to ward off future hurricanes—he'd been caught in a big one and didn't like it—it would be best not to have the rockets exposed to high winds. With several rockets under construction and standing in the open, a hurricane could cost billions and set the time schedule back a year or more.

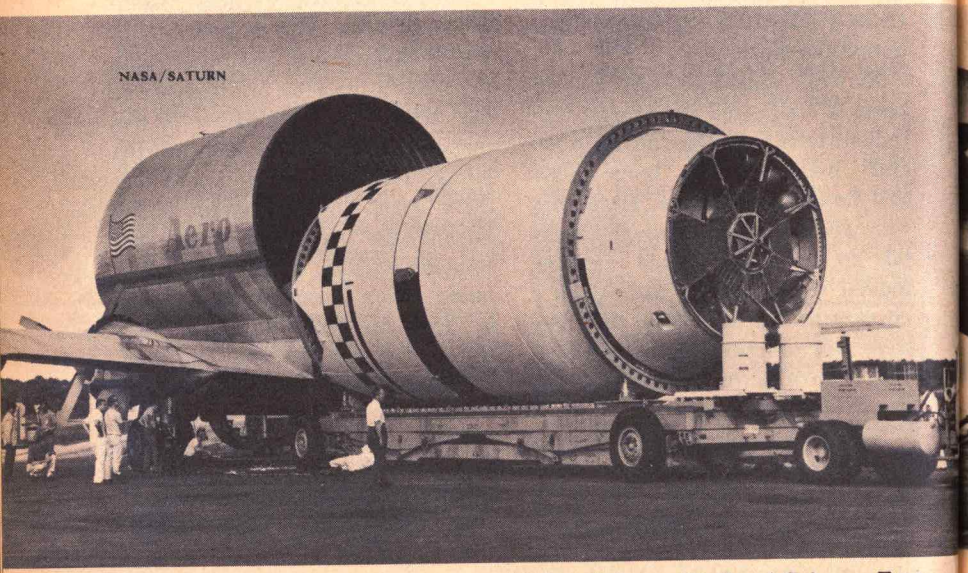
In early 1962, when the word NOVA still existed, Dr. Kurt H. Debus, director of NASA's Launch Operation Center—now Kennedy Space Center—advised Holmes to commit themselves to a Vertical Assembly Building. This would get the rockets out of the weather and allow some sort of an assembly line. It was to be constructed on Merritt Island, squeezed into NOVA territory, on Highway A1A adjacent to Banana Creek. The location would give eastward access at the narrowest part of the Banana River. Launch pads could be built near the ocean's edge in an isolated area.

Two related problems now loomed up. The cape's sand wasn't a good bearing surface. A change in tide twists a light-weight rocket, such as the Titan a measurable amount. On Minuteman, the sand had created a different puzzle. The silos from which the missile was to be fired had to be sunk into the sand. One silo wouldn't stay. It kept bobbing up out of the watery soil. When finally sunk it was discovered that it was three inches higher than planned and rotated, counterclockwise, a foot and a half. Saturn V's weight would demand something be done to stabilize the land area.

They wondered, too, how they could build a blockhouse strong enough to take a direct hit from the giant rocket. How could they protect the launch area crew from being injured by a wayward launch? A significant problem because blockhouses have been struck by erractic missiles.

Rocket failures, "aborts" in Capeese, were once very common. Each rocket, as a range requirement, contains a destruct system. They use ex-

The "Pregnant Guppie" was specially redesigned and rebuilt; the Saturn S-IV-stage wouldn't fit through railroad or highway tunnels. And—well, it was intended to fly anyway, wasn't it?



Since it's too big to go through any hatch—they "build the plane around it." The "Pregnant Guppie" was designed to come apart in the middle. On the ground, that is!

plosive "primacord" wire which rips the engine case open or a "shape charge," a dynamite driven chisel, that tears a hole into the rocket's side. This is coupled to a radio receiver. When the range safety officer sends a destruct command, a coded message, the off-course projectile is supposed to simply shred itself to bits and fall harmlessly to the ground. When one does as designed it's a scene similar to a five million dollar Fourth of July.

A unique abort was a Snark, an early intercontinental missile, actually a pilotless jet bomber. When it flew off-course to the south the destruct system failed. Fighter planes from Key West Naval Air Station and Guantanomo gave chase but the Snark was a few miles per hour faster.

Months later it was found in Brazil. Natives were trekking out of the jungle selling sourvenirs torn from the wrecked craft.

More spectacular have been the Polaris and Minuteman missiles. Polaris had an early design problem. On ignition, the first-stage engine had a bad habit of blowing out the forward bulkhead. This fired the second stage. The first time it happened the second stage flew straight up thirty-five feet, turned over on its back and headed for Cocoa, twenty miles southwest.

The destruct system failed again and the out of control booster went off the reservation like a drunken wildman, falling into the Banana River. It was dubbed the IBRM, Into Banana River Missile. Another time and for the same reason, the second stage slithered along the ground and smacked into the Pershing blockhouse.

An early Minuteman came out of the silo with all three stages separated and ignited. The reason is still unexplained. The first stage landed just to the south of the silo's mouth. It burned a forty-foot aluminum light pole and destroyed the upper two inches of the concrete apron. The second and third stage blew up spraying the area with burning pieces of fuel.

Another Minuteman, this time a night launch, was two hundred feet into the sky when it blew up by itself. It was a modern space-age version of the Roman candle. Imagine, a thousand two-foot thick chunks of burning black powder, sailing half a mile through the air. One of them struck a THOR on an adjacent launch pad. Another destroyed a mobile home used as an office.

Until 1964 the only casualty from exploding rockets was a broken leg. (In 1964 three men died when an Agena rocket ignited during a dynamic balance test. This wasn't a launch abort, only an unfortunate industrial accident.)

It was hard to forecast just how dangerous the Saturn would be. A lot of failures had been due to successfully proving that a certain concept was unworkable. Saturn would use proven concepts and the engine design would be given long grueling tests.

Other failures happened because important tests were ignored or because known troubles were written off "use as is." But there is always the random unpredictable failure. This means that a rigidly thorough test approach using parts of proven reliability would lessen a rocket's potential to become a killer. But the capacity for a random failure demanded that the Saturn people acquire space, the more the safer.

While blockhouses come in a variety of sizes their construction techniques are standardized. Concrete, the thicker the better. Reinforced with steel bars, a blockhouse could be made to withstand the force of a direct hit. But there was still another wrinkle in the wind, vibration. It was projected, from sound measurements on Saturn I, that Saturn V's vibration and noise would kill any man near the launch area. No blockhouse could be designed to protect the men from the new creation.

Someone suggested doing away with both the launch pad and the blockhouse. Why not build a barge with all the equipment necessary to launch the rocket installed on board? A canal could easily be dredged from the VAB to the launch area. The rocket could be floated out and fired by an automatic process. This would clear everyone out of the blast danger area and alleviate the need to stabilize the sand.

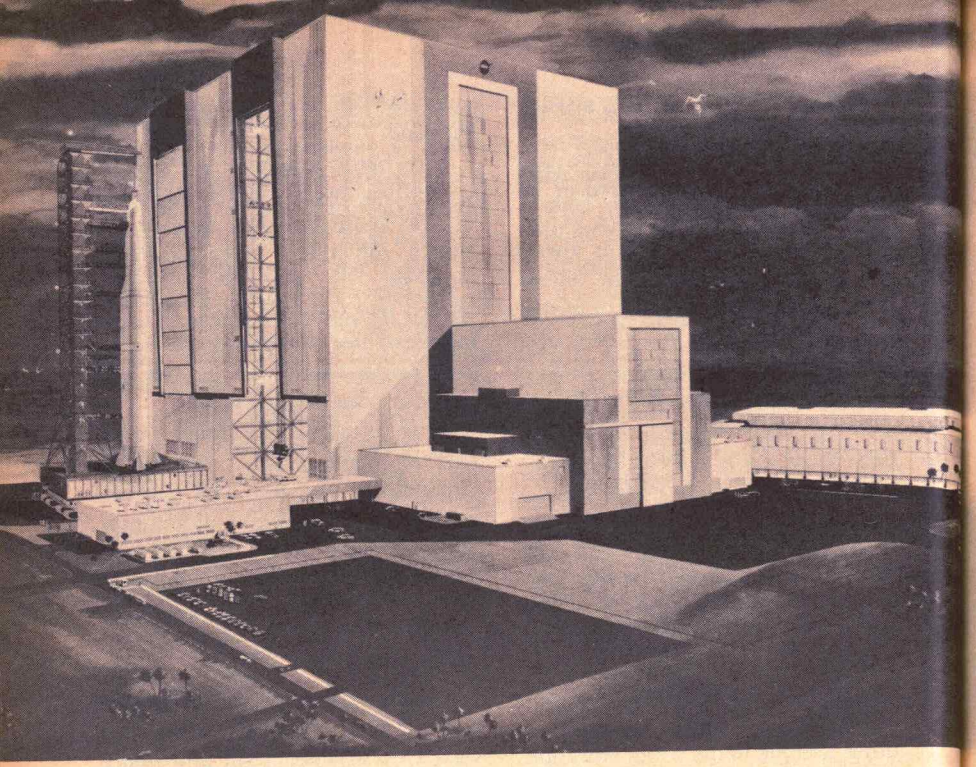
This barge idea was quickly discarded because a slight wind would tilt the floating rocket, making the launch difficult if not disastrous. However, the idea of a mobile launch pad sounded good. Dr. Debus described something on tracks —a crawler-like device. No one had any idea what might emerge.

They set aside two launch areas. One at "False Cape," and one at "Playalinda Beach." The surface would be stabilized by building pyramids of sand eighty feet tall and covering a quarter of a square mile at their base. The tops would be lopped off after the weight compressed the underlying soil.

The area chosen would give three miles of blast clearance. It was traversed by a single road and easily blocked off, to keep anyone from entering. If Saturn failed, the Command Module will separate from the booster and its escape rocket would propel the astronauts to safety.

If the booster headed south along the mainland or west toward the VAB, it would have to be destroyed quickly. To the northwest and north it would have twenty miles before it reached civilization. If the destruct system failed, even though Saturn flies a duplicate system for safety, and it strikes the VAB, the world's largest building may well become the world's largest instant junkpile.

By late 1962 the VAB design was



NASA

The plans for the Saturn V launch system calls for something that looks like this. Here, an assembled Saturn V is riding out through the immense open doors of the assembly building, erected on LUT—the Launch Umbilical Tower.

firm. It would be 525-feet high, 716-feet long and 518-feet wide. The tallest structure south of the Washington Monument and the world's largest building in volume. It would have to withstand a one hundred twenty mile wind. It was divided into a high and a low bay area. The high bay would accommodate four fully assembled Saturn Vs and the low bay could prepare eight upper sections. In middle 1962 they started driving piling to provide the huge building with firm footing. The pilings were of one-foot steel pipe. After a year, when the driving was complete, the length of the pipe, if put end to end, was one hundred twenty-eight miles.

In 1965, the building is nearing completion. Just how does it compare in size? The Pentagon contains 72 million cubic feet and the Great Pyramid of Cheops 96 million. The VAB will contain 125,208,000 ft^3.

Sue Butler, of the Daytona Beach *New Journal*, aptly describes the building's capacity: "It could swallow the Empire State Building, digest Washington's Pentagon and gobble up a few major hotels as an after dinner snack."

The task was so great that even the giant construction firm of Morrison-Knudsen took in two partners, The Pereni Corporation and Paul Hardeman Inc. This was just to oversee the work. There are hundreds of subcontractors who will work on it before completion.

Building the VAB presented headaches enough to inspire the average man to alcoholism or suicide. Its size, coupled with the subtropical climate, would produce rain clouds—inside. It took two hundred people just to design the distribution system for the 10,000-ton air conditioner. Equivalent to melting 20 million pounds of ice per hour.

The logistics, keeping delivery of raw materials on schedule, kept Frank Robertson, head man for Morrison-Knudsen-Pereni-Hardeman, busy. There's a new method of controlling production. It's called PERT-CRITICAL PATH. The controller lays out the assembly of each part on a time line. When two parts are to be assembled, the time lines intersect. The resultant time-line intersects with the next higher assembly's line and the maze of lines continue intersecting until final complete assembly. Frank's wall-sized chart contains four thousand intersecting lines.

Early in 1963 Rocketdyne announced that the F-1 engine suffered from combustion instability. In simple terms the engine, at times, ran ragged causing a vibration. While this condition had occurred in only seven out of two hundred fifty firings, the engineers, had to get to the root of it. They built up a special instrumentation package to locate the cause.

Holmes met with Congress the first week in March. He explained to them that there were two possible trouble sources, injection problems and oxygen dome design. He stressed that the trouble wouldn't hold up the project. They redesigned the oxygen dome to give a smoother flow, tried several new sizes and locations of injectors—indicating just how much we don't know about rocket engine design, having to use "cut and try" procedures—and a new injector using the *cavitating venturi* principle, to keep the oscillations from feeding back from the nozzle into the oxygen line.

Because the condition of combustion instability had occurred so few times they estimated it would take six months and two hundred test firings to find if they'd solved anything. Even then, Boeing was waiting for the engines so they could test-fit the fuel tanks. But the project wouldn't be slowed down because of this singular problem.

Apollo had some delay time of its own building up. Flight hardware that wouldn't pass environmental checks and ideas which needed further refinement before being deemed flight worthy.

Ideas for LUT began to emerge. It would have to be strong enough to support the fueled rocket and be mobile. Saturn V coupled with the spacecraft would stand 360 feet and be 33 feet in diameter. It would be capable of accelerating a 120-ton payload into a 345-mile orbit, 43 tons to escape velocity and 30 tons into deep space. Without a drop of fuel it would weigh 250 tons. LUT stands for Launch Umbilical Tower. It's a box 25 feet high, 135 feet wide and 160 feet long. With the umbilical tower it stands 441 feet and weighs in at 3,500 tons. It will rest on support pedestals at the VAB and launch pad.

A detachable subassembly, the crawler-transporter, which provides motive power, weighs an additional 2,750 tons. It consists of a large flat bed and four double-tracked base units, from the Marion Power and Shovel Co., under each corner. Two 5,600-horsepower generators produce the electrical power which drives a motor in each track base. Its top speed is 2 mph. At that speed its inertia is so great it would take two and one half miles to stop. The unit moves under LUT and four six-foot hydraulic cylinders lift up the flat bed and LUT. Each end has a control cab. The driver chooses one facing the direction of motion.

In the past, rocket-testing has been a series of duplications, at the factory, at the Cape's industrial area and at the launch pad. The rocket was tested system by system and then all systems together as a functional unit. At each point the checkout equipment is duplicated, power supplies to operate the airborne electronics—converting industrial power to D.C.—a sequencer to remove ground power and apply airborne power and a guidance and control routine to calibrate the onboard auto-pilot.

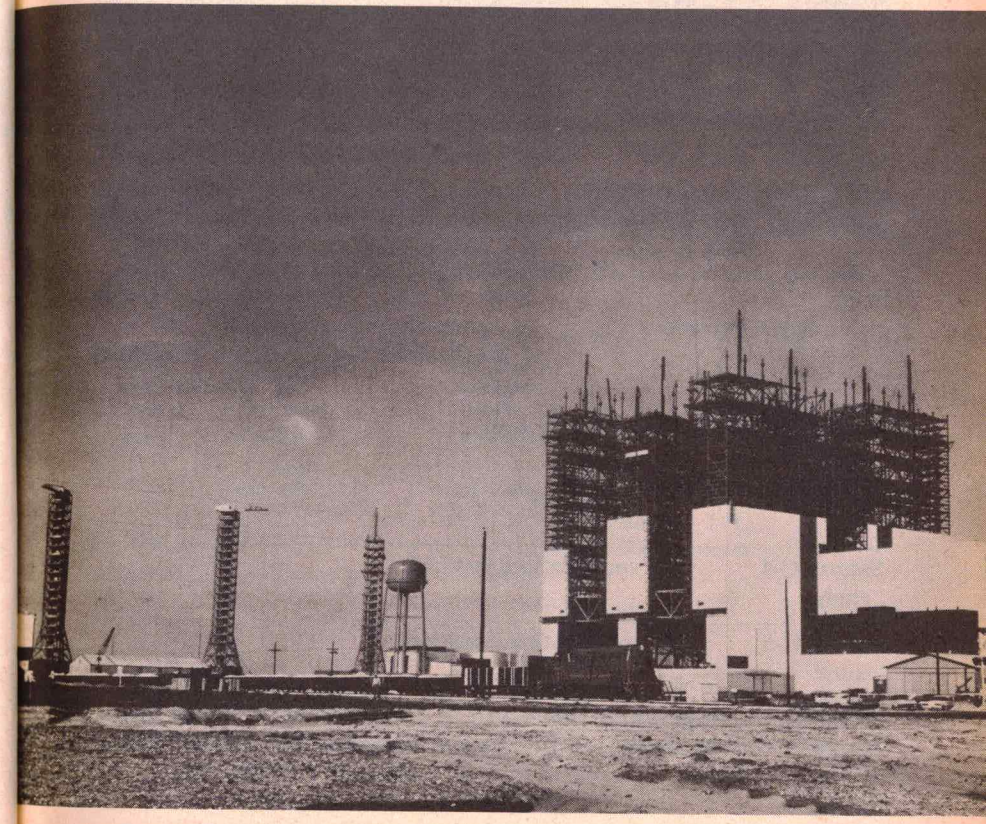
At the factory and in the Industrial area the operations were directed from a control room, or control area. In the launch area the blockhouse assumed control.

LUT contains, in its two-story base, all of the primary electrical equipment necessary to check out and launch the Moon rocket. It houses all functions of a power transfer room and blockhouse plus a computer to do away with the equipment operators. In addition it generates its own power. It can be used then in final assembly as a test bed for system testing.

Saturn V's assembly, recently awarded to the Boeing Company, begins in the low bay area. The third stage, made by Douglas, is mounted to the second, constructed by North American Aviation. The Apollo space system, Command

The real thing under construction. It would have been a lot simpler, and cheaper, if the "stern and rockbound coast of Maine" had only been located in a somewhat more favorable latitude! Sand may be nice for bathers, but it's hell for super-heavy construction!

NASA



LUT The Giant Mover

Module, Service Module and Lunar Excursion Module are mated to the third stage.

In the high bay, the first stage, manufactured by Boeing, will be mounted onto the LUT, over a large gaping hole through which the rocket's exhaust will pass. The upper sections will be swung over the first stage and mated.

At this time LUT will be used to initiate the first system evaluation test. After the rocket is thoroughly checked out, the astronauts will be inserted and LUT will maintain the launch configuration. That is, all systems will be held in readiness. The crawler-transporter moves in and the mobile launch begins.

The Moon bound system moves toward the launch pad over a 150-foot wide roadbed. The rocket is steadied by the crawler's flat bed's hydraulic system which senses any motion and moves to counteract it.

The crawlerway was constructed by filling in a runway of Florida sand. To this was added three feet of crushed rock. It will shrink four inches under the 15 million pound forces of LUT, crawler-transporter and Saturn V. As the weight passes, the roadbed will spring back three inches. Subsequent launches will pack the surface.

At the launch area, LUT is deposited over an eighty-foot deep flame bucket. The crawler returns to a halfway point and picks up the arming tower. From the tower men install the explosive squibs used to eject the umbilicals and power other one-shot mechanical units.

The crawler retreats with the arming tower and workmen. The fueling is complete. The rocket now weighs 6,102,000 pounds. It's a reservoir of power. If anything goes wrong LUT will shut down the count automatically.

At launch time, LUT and the rocket set alone. No one, except for the astronauts, is closer than three miles. Flame spews from the rocket's stern. 7.5 million pounds of thrust. It passes through the opening in LUT's center and sears the flame bucket's refractory brick-lined sides and bottom. The rocket lifts off for its lunar voyage.

Only LUT remains—to be used again. As long as man needs her.

SATURN SCORECARD JULY 1961

The ultimate moon rocket was nothing more than a dream.

System	First-stage designation	Second-stage designation	Third-stage designation
Saturn C-1 status R&D	S-1 Marshal Center 8 Rocketdyne H-1 engines	S-2 Douglas 6 Pratt and Whitney 115 engines	none planned
Saturn C-2 status R&D	As above	S-2B no contractor 4 Rocketdyne J-2 engines	S-4 Douglas 6 Pratt & Whitney LR 115 engines
Saturn C-3 study	S-1B no contractor 2-Rocketdyne F-1 engines.	S-2B As above	S-4 As above
Saturn C-4 study	No specifications assigned		
Saturn C-5 study	No specifications assigned.		
NOVA study	Stage one 8 Rocketdyne F-1	Stage two 2 Rocketdyne F-1	Stage three 4 Rocketdyne J-2	Stage four 6 Pratt Whitney R1 10

SATURN SCORECARD 1965

Nomenclature and alpha-numeric designation is confusing. The chart attempts to clarify.

System	First-stage designation	Second-stage designation	Third-stage designation
Saturn I (one)	S-I (one) Chrysler 8 Rocketdyne H-1 engines.	S-IV (four) Douglas 6 Pratt Whitney RL-10-A3 engines.	none
Saturn I-B (one B)	S-1 as above	S-IVB (four B) Douglas 1 North American J-2 engine.	none
Saturn V (five)	S-IC (one C) Boeing 5 North American F-1 engines.	S-II (two) North American 5 North American J-2 engines.	S-IV B Same as Saturn IB second stage.

GORDON R. DICKSON

COMPUTERS DON'T ARGUE

A computer
is the Ultimate Bigot.
Since it's absolutely and
totally lacking in
imagination,
it can't possibly imagine
that it could be wrong!
Or, of course, that
another computer could
be wrong . . .

Illustrated by John Schoenherr

Treasure Book Club
PLEASE DO NOT FOLD,
SPINDLE OR MUTILATE
THIS CARD
Mr: Walter A. Child Balance: $4.98
Dear Customer: Enclosed is your latest book selection. "Kidnapped," by Robert Louis Stevenson.

Woodlawn Drive
Panduk, Michigan
Nov. 16, 1965

Treasure Book Club
1823 Mandy Street
Chicago, Illinois
Dear Sirs:

I wrote you recently about the computer punch card you sent, billing me for "Kim," by Rudyard Kipling. I did not open the package containing it until I had already mailed you my check for the amount on the card. On opening the package, I found the book missing half its pages. I sent it back to you, requesting either another copy or my money back. Instead, you have sent me a copy of "Kidnapped," by Robert Louis Stevenson. Will you please straighten this out?

I hereby return the copy of "Kidnapped."

Sincerely yours,
Walter R. Child

Treasure Book Club
SECOND NOTICE
PLEASE DO NOT FOLD,
SPINDLE OR MUTILATE
THIS CARD
Mr: Walter A. Child Balance: $4.98
For "Kidnapped," by Robert Louis Stevenson
(If remittance has been made for the above, please disregard this notice)

437 Woodlawn Drive
Panduk, Michigan
Jan. 21, 1966

Treasure Book Club
1823 Mandy Street
Chicago, Illinois

Dear Sirs:

May I direct your attention to my letter of November 16, 1965? You are still continuing to dun me with computer punch cards for a book I did not order. Whereas, actually, it is your company that owes *me* money.

Sincerely yours,
Walter A. Child

Treasure Book Club
1823 Mandy Street
Chicago, Illinois
Feb. 1, 1966

Mr. Walter A. Child
437 Woodlawn Drive
Panduk, Michigan
Dear Mr. Child:

We have sent you a number of reminders concerning an amount owing to us as a result of book purchases you have made from us. This amount, which is $4.98 is now long overdue.

This situation is disappointing to us, particularly since there was no hesitation on our part in extending you credit at the time original arrangements for these purchases were made by you. If we do not receive payment in full by return mail, we will be forced to turn the matter over to a collection agency.

Very truly yours,
Samuel P. Grimes
Collection Mgr.

437 Woodlawn Drive
Panduk, Michigan
Feb. 5, 1966

Dear Mr. Grimes:

Will you stop sending me punch cards and form letters and make me some kind of a direct answer from a human being?

I don't owe you money. *You* owe me money. Maybe I should turn your company over to a collection agency.

Walter A. Child

FEDERAL COLLECTION OUTFIT
88 Prince Street
Chicago, Illinois
Feb. 28, 1966

Mr. Walter A. Child
437 Woodlawn Drive
Panduk, Michigan
Dear Mr. Child:

Your account with the Treasure Book Club, of $4.98 plus interest and charges has been turned over to our agency for collection. The amount due is now $6.83. Please send your check for this amount or we shall be forced to take immediate action.

Jacob N. Harshe
Vice President

FEDERAL COLLECTION OUTFIT
88 Prince Street
Chicago, Illinois
April 8, 1966

Mr. Walter A. Child
437 Woodlawn Drive
Panduk, Michigan
Dear Mr. Child:

You have seen fit to ignore our courteous requests to settle your long overdue account with Treasure Book Club, which is now, with accumulated interest and charges, in the amount of $7.51.

If payment in full is not forthcoming by April 11, 1966 we will be forced to turn the matter over to our attorneys for immediate court action.

Ezekiel B. Harshe
President

MALONEY, MAHONEY, MACNAMARA and PRUIT
Attorneys
89 Prince Street
Chicago, Illinois
April 29, 1966

Mr. Walter A. Child
437 Woodlawn Drive
Panduk, Michigan
Dear Mr. Child:

Your indebtedness to the Treasure Book Club has been referred to us for legal action to collect.

This indebtedness is now in the amount of $10.01. If you will send us this amount so that we may receive it before May 5, 1966, the matter may be satisfied. However, if we do not receive satisfaction in full by that date, we will take steps to collect through the courts.

I am sure you will see the advantage of avoiding a judgment against you, which as a matter of record would do lasting harm to your credit rating.

Very truly yours,
Hagthorpe M. Pruitt Jr.
Attorney at law

437 Woodlawn Drive
Panduk, Michigan
May 4, 1966

Mr. Hagthorpe M. Pruitt, Jr.
Maloney, Mahoney, MacNamara and Pruitt
89 Prince Street
Chicago, Illinois
Dear Mr. Pruitt:

You don't know what a pleasure it is to me in this matter to get a letter from a live human being to whom I can explain the situation.

This whole matter is silly. I explained it fully in my letters to the Treasure Book Company. But I might as well have been trying to explain to the computer that puts out their punch cards, for all the good it seemed to do. Briefly, what happened was I ordered a copy of "Kim," by Rudyard Kipling, for $4.98. When I opened the package they sent me, I found the book had only half its pages, but I'd previously mailed a check to pay them for the book.

I sent the book back to them, asking either for a whole copy or my money back. Instead, they sent me a copy of "Kidnapped," by Robert Louis Stevenson—which I had not ordered; and for which they have been trying to collect from me.

Meanwhile, I am still waiting for the money back that they owe me for the copy of "Kim" that I didn't get. That's the whole story. Maybe

you can help me straighten them out.

Relievedly yours,
Walter A. Child

P.S.: I also sent them back their copy of "Kidnapped," as soon as I got it, but it hasn't seemed to help. They have never even acknowledged getting it back.

MALONEY, MAHONEY, MACNAMARA and PRUITT
Attorneys
89 Prince Street
Chicago, Illinois
May 9, 1966

Mr. Walter A. Child
437 Woodlawn Drive
Panduk, Michigan
Dear Mr. Child:

I am in possession of no information indicating that any item purchased by you from the Treasure Book Club has been returned.

I would hardly think that, if the case had been as you stated, the Treasure Book Club would have retained us to collect the amount owing from you.

If I do not receive your payment in full within three days, by May 12, 1966, we will be forced to take legal action.

Very truly yours,
Hagthorpe M. Pruitt Jr.

COURT OF MINOR CLAIMS
Chicago, Illinois

Mr. Walter A. Child:
437 Woodlawn Drive,
Panduk, Michigan

Be informed that a judgment was taken and entered against you in this court this day of May 26, 1966 in the amount of $15.66 including court costs.

Payment in satisfaction of this judgment may be made to this court or to the adjudged creditor. In the case of payment being made to the creditor, a release should be obtained from the creditor and filed with this court in order to free you of legal obligation in connection with this judgment.

Under the recent Reciprocal Claims Act, if you are a citizen of a different state, a duplicate claim may be automatically entered and judged against you in your own state so that collection may be made there as well as in the State of Illinois.

COURT OF MINOR CLAIMS
Chicago, Illinois
PLEASE DO NOT FOLD, SPINDLE OR MUTILATE THIS CARD

Judgment was passed this day of May 27, 1966, under Statute $15.66

Against: Child, Walter A. of 347 Woodlawn Drive, Panduk, Michigan. Pray to enter a duplicate claim for judgment

In: Picayune Court—Panduk, Michigan

For Amount: Statute 941

437 Woodlawn Drive
Panduk, Michigan
May 31, 1966

Samuel P. Grimes
Vice President, Treasure Book Club
1823 Mandy Street
Chicago, Illinois
Grimes:

This business has gone far enough. I've got to come down to Chicago on business of my own tomorrow. I'll see you then and we'll get this straightened out once and for all, about who owes what to whom, and how much!

Yours,
Walter A. Child

From the desk of the Clerk
Picayune Court
June 1, 1966

Harry:

The attached computer card from Chicago's Minor Claims Court against A. Walter has a 1500-series Statute number on it. That puts it over in Criminal with you, rather than Civil, with me. So I herewith submit it for your computer instead of mine. How's business?

Joe

CRIMINAL RECORDS
Panduk, Michigan
PLEASE DO NOT FOLD, SPINDLE OR MUTILATE THIS CARD

Convicted: (Child) A. Walter
On: May 26, 1966
Address: 437 Woodlawn Drive, Panduk, Mich.
Crim: Statute: 1566 (Corrected) 1567
Crime: Kidnap
Date: Nov. 16, 1965
Notes: At large. To be picked up at once.

POLICE DEPARTMENT, PANDUK, MICHIGAN. TO POLICE DEPARTMENT CHICAGO ILLINOIS. CONVICTED SUBJECT A. (COMPLETE FIRST NAME UNKNOWN) WALTER, SOUGHT HERE IN CONNECTION REF. YOUR NOTIFICATION OF JUDGMENT FOR KIDNAP OF CHILD NAMED ROBERT LOUIS STEVENSON, ON NOV. 16, 1965. INFORMATION HERE INDICATES SUBJECT FLED HIS RESIDENCE, AT 437 WOODLAWN DRIVE, PANDUK, AND MAY BE AGAIN IN YOUR AREA.

POSSIBLE CONTACT IN YOUR AREA: THE TREASURE BOOK CLUB, 1823 MANDY STREET, CHICAGO, ILLINOIS. SUBJECT NOT KNOWN TO BE ARMED, BUT PRESUMED DANGEROUS. PICK UP AND HOLD, ADVISING US OF CAPTURE . . .

TO POLICE DEPARTMENT, PANDUK, MICHIGAN. REFERENCE YOUR REQUEST TO PICK UP AND HOLD A. (COMPLETE FIRST NAME UNKNOWN) WALTER, WANTED IN PANDUK ON STATUTE 1567, CRIME OF KIDNAPPING.

SUBJECT ARRESTED AT OFFICES OF TREASURE BOOK CLUB, OPERATING THERE UNDER ALIAS WALTER ANTHONY CHILD AND ATTEMPTING TO COLLECT $4.98 FROM ONE SAMUEL P. GRIMES, EMPLOYEE OF THAT COMPANY.

DISPOSAL: HOLDING FOR YOUR ADVICE.

POLICE DEPARTMENT PANDUK, MICHIGAN TO POLICE DEPARTMENT CHICAGO, ILLINOIS.

REF: A. WALTER (ALIAS WALTER ANTHONY CHILD) SUBJECT WANTED FOR CRIME OF KIDNAP, YOUR AREA, REF: YOUR COMPUTER PUNCH CARD NOTIFICATION OF JUDGMENT, DATED MAY 27, 1966. COPY OUR CRIMINAL RECORDS PUNCH CARD HEREWITH FORWARDED TO YOUR COMPUTER SECTION.

CRIMINAL RECORDS
Chicago, Illinois
PLEASE DO NOT FOLD,
SPINDLE OR MUTILATE
THIS CARD

SUBJECT (CORRECTION—OMITTED RECORD SUPPLIED)

APPLICABLE STATUTE NO. 1567

JUDGMENT NO. 456789

TRIAL RECORD: APPARENTLY MISFILED AND UNAVAILABLE

DIRECTION: TO APPEAR FOR SENTENCING BEFORE JUDGE JOHN ALEXANDER MCDIVOT, COURTROOM A JUNE 9, 1966

From the Desk of
Judge Alexander J. McDivot

June 2, 1966

Dear Tony:

I've got an adjudged criminal coming up before me for sentencing Thursday morning—but the trial transcript is apparently misfiled.

I need some kind of information (Ref: A. Walter—Judgment No. 456789, Criminal). For example, what about the victim of the kidnapping. Was victim harmed?

Jack McDivot

June 3, 1966

Records Search Unit

Re: Ref: Judgment No. 456789—was victim harmed?

Tonio Malagasi
Records Division

June 3, 1966

To: United States Statistics Office
Attn.: Information Section
Subject: Robert Louis Stevenson
Query: Information concerning

Records Search Unit
Criminal Records Division
Police Department
Chicago, Ill.

June 5, 1966

To: Records Search Unit
Criminal Records Division
Police Department
Chicago, Illinois
Subject: Your query re Robert Louis Stevenson (File no. 189623)
Action: Subject deceased. Age at death, 44 yrs. Further information requested?

A. K.
Information Section
U. S. Statistics Office

June 6, 1966

To: United States Statistics Office
Attn.: Information Division
Subject: Re: File no. 189623

No further information required. Thank you.

Records Search Unit

Criminal Records Division
Police Department
Chicago, Illinois

June 7, 1966

To: Tonio Malagasi
Records Division
Re: Ref: judgment No. 456789—victim is dead.

Records Search Unit

June 7, 1966

To: Judge Alexander J. McDivot's Chambers
Dear Jack:
Ref: Judgment No. 456789. The victim in this kidnap case was apparently slain.

From the strange lack of background information on the killer and his victim, as well as the victim's age, this smells to me like a gangland killing. This for your information. Don't quote me. It seems to me, though, that Stevenson—the victim—has a name that rings a faint bell with me. Possibly, one of the East Coast Mob, since the association comes back to me as something about pirates—possibly New York dockage hijackers—and something about buried loot.

As I say, above is only speculation for your private guidance..

Any time I can help . . .

Best,
Tony Malagasi
Records Division

MICHAEL R. REYNOLDS
Attorney-at-law

49 Water Street
Chicago, Illinois
June 8, 1966

Dear Tim:

Regrets: I can't make the fishing trip. I've been court-appointed here to represent a man about to be sentenced tomorrow on a kidnapping charge.

Ordinarily, I might have tried to beg off, and McDivot, who is doing the sentencing, would probably have turned me loose. But this is the damndest thing you ever heard of.

The man being sentenced has apparently been not only charged, but adjudged guilty as a result of a comedy of errors too long to go into here. He not only isn't guilty—he's got the best case I ever heard of for damages against one of the larger Book Clubs headquartered here in Chicago. And that's a case I wouldn't mind taking on.

It's inconceivable—but damnably possible, once you stop to think of it in this day and age of machine-made records—that a completely innocent man could be put in this position.

There shouldn't be much to it. I've asked to see McDivot tomorrow before the time for sentencing, and it'll just be a matter of explaining to him. Then I can discuss the damage suit with my freed client at his leisure.

Fishing next weekend?

Yours,
Mike

MICHAEL R. REYNOLDS
Attorney-at-law
49 Water Street
Chicago, Illinois
June 10

Dear Tim:

In haste—

No fishing this coming week either. Sorry.

You won't believe it. My innocent-as-a-lamb-and-I'm-not-kidding client has just been sentenced to death for first-degree murder in connection with the death of his kidnap victim.

Yes, I explained the whole thing to McDivot. And when he explained his situation to me, I nearly fell out of my chair.

It wasn't a matter of my not convincing him. It took less than three minutes to show him that my client should never have been within the walls of the County Jail for a second. But—get this—McDivot couldn't do a thing about it.

The point is, my man had already been judged guilty according to the computerized records. In the absence of a trial record—of course there never was one (but that's something I'm not free to explain to you now)—the judge has to go by what records are available. And in the case of an adjudged prisoner, McDivot's only legal choice was whether to sentence to life imprisonment, or execution.

The death of the kidnap victim, according to the statute, made the death penalty mandatory. Under the new laws governing length of time for appeal, which has been shortened because of the new system of computerizing records, to force an elimination of unfair delay and mental anguish to those condemned, I have five days in which to file an appeal, and ten to have it acted on.

Needless to say, I am not going to monkey with an appeal. I'm going directly to the Governor for a pardon—after which we will get this farce reversed. McDivot has already written the Governor, also, explaining that his sentence was ridiculous, but that he had no choice. Between the two of us, we ought to have a pardon in short order.

Then, I'll make the fur fly . . .

And we'll get in some fishing.

Best,
Mike

OFFICE OF THE
GOVERNOR OF ILLINOIS
June 17, 1966

Mr. Michael R. Reynolds
49 Water Street
Chicago, Illinois

Dear Mr. Reynolds:

In reply to your query about the request for pardon for Walter A. Child (A. Walter), may I inform you that the Governor is still on his trip with the Midwest Governors Committee, examining the Wall in Berlin. He should be back next Friday.

I will bring your request and letters to his attention the minute he returns.

Very truly yours,
Clara B. Jilks
Secretary to the Governor

June 27, 1966

Michael R. Reynolds
49 Water Street
Chicago, Illinois

Dear Mike:

Where is that pardon?

My execution date is only five days from now!

Walt

June 29, 1966

Walter A. Child (A. Walter)
Cell Block E
Illinois State Pententiary
Joilet, Illinois

Dear Walt:

The Governor returned, but was called away immediately to the White House in Washington to give his views on interstate sewage.

I am camping on his doorstep and will be on him the moment he arrives here.

Meanwhile, I agree with you about the seriousness of the situation. The warden at the prison there, Mr. Allen Magruder will bring this letter to you and have a private talk with you. I urge you to listen to what he has to say; and I enclose letters from your family also urging you to listen to Warden Magruder.

Yours,
Mike

June 30, 1966

Michael R. Reynolds
49 Water Street
Chicago, Illinois

Dear Mike: (This letter being smuggled out by Warden Magruder)

As I was talking to Warden Magruder in my cell, here, news was brought to him that the Governor has at last returned for a while to Illinois, and will be in his office early tomorrow morning, Friday. So you will have time to get the pardon signed by him and delivered to the prison in time to stop my execution on Saturday.

Accordingly, I have turned down the Warden's kind offer of a chance to escape; since he told me he could by no means guarantee to have all the guards out of my way when I tried it; and there was a chance of my being killed escaping.

But now everything will straighten itself out. Actually, an experience as fantastic as this had to break down sometime under its own weight.

Best,
Walt

FOR THE SOVEREIGN
STATE OF ILLINOIS

I, Hubert Daniel Willikens, Governor of the State of Illinois, and invested with the authority and powers appertaining thereto, including the power to pardon those in my judgment wrongfully convicted or otherwise deserving of executive mercy, do this day of

July 1, 1966 do announce and proclaim that Walter A. Child (A. Walter) now in custody as a consequence of erroneous conviction upon a crime of which he is entirely innocent, is fully and freely pardoned of said crime. And I do direct the necessary authorities having custody of the said Walter A. Child (A. Walter) in whatever place or places he may be held, to immediately free, release, and allow unhindered departure to him . . .

Interdepartmental Routing Service
PLEASE DO NOT FOLD, MUTILATE, OR SPINDLE THIS CARD

Failure to route Document properly.

To: Governor Hubert Daniel Willikens

Re: Pardon issued to Walter A. Child, July 1, 1966

Dear State Employee:

You have failed to attach your Routing Number.

PLEASE: Resubmit document with this card and form 876, explaining your authority for placing a TOP RUSH category on this document. Form 876 must be signed by your Departmental Superior.

RESUBMIT ON: Earliest possible date ROUTING SERVICE office is open. In this case, Tuesday, July 5, 1966

WARNING: Failure to submit form 876 WITH THE SIGNATURE OF YOUR SUPERIOR may make you liable to prosecution for misusing a Service of the State Government. A warrant may be issued for your arrest.

There are NO exceptions. YOU have been WARNED.

IN TIMES TO COME

Next issue features a yarn titled "Overproof," by Johnathan Blake MacKenzie.

Everybody knows what "human" means—it's just that, at any given moment, they can't quite define what it means. Here's a colony planet where there are local life forms that are primates, and a local life form that looks somewhat like an octopus riding on a cat's body, and it's easy to tell the "human" isn't it? Or . . . is it? How do you prove it to the dedicated do-gooder type that insists that a thing that looks like a man, and acts like an animal *must* be human . . .

Also coming up an article concerning a genuinely original discovery in medicine! The discoverer is a kid; so what? The discovery works!

The Editor.

Illustrated by Kelly Freas

BY BEN BOVA

One trouble with present-day spacesuits is they're exceedingly clumsy and nonmaneuverable. And another is that—with sun-glare shields in place—they're equally anonymous . . .

test IN ORBIT

Kinsman snapped awake when the phone went off. Before it could complete its first ring he had the receiver off its cradle.

"Captain Kinsman?" the motel's night clerk asked.

"Yes," he whispered back, squinting at the luminous dial of his wristwatch: *three twenty-three.*

"I'm awfully sorry to disturb you, Captain, but Colonel Murdock called . . ."

"How did he know I was here?"

"He said he's calling all the motels around the base. I didn't tell him you were here. He said when he found you he wanted you to report to him at once. Those were his words. Captain: at once."

Kinsman frowned in the darkness. "O.K. Thanks for playing dumb."

"Not at all, sir. Hope it isn't trouble."

"Yeah." Kinsman hung up. He sat for a half-minute on the edge of the bed. *Murdock making the rounds of the motels at three in the morning and the clerk hopes it's not trouble. Very funny.*

He stood up, stretched his wiry frame.

He flipped the light switch and turned on the coffee machine on the wall next to the doorway. *It's lousy, but it's coffee.* As the machine started gurgling, he rummaged through his travelkit for the electric razor. The face that met him in the mirror was lean and long-jawed, with jet black hair cut down to military length and soft gray eyes that were, at the moment, just the slightest bit bloodshot.

Within a few minutes he was shaved, showered, and back in Air Force blues. He went out to find his car.

He put down the top on his old convertible and gunned her out onto the coast road. As he raced through the pre-dawn darkness, wind whistling all around him, Kinsman could feel the excitement building up. A pair of cars zoomed past him, doing eighty, heading for the base. Kinsman held to the legal limit and caught them again at the main gate, lined up while the guard sergeant checked ID badges with extra care. Kinsman's turn came.

"What's the stew, Sergeant?"

The guard flashed his handlight on the badge Kinsman held in his outstretched hand.

"Dunno, sir. We got the word to look sharp."

The light flashed full in Kinsman's face. *Painfully sharp,* he thought to himself.

The guard waved him on.

There was that special crackle in the air as Kinsman drove toward the Administration Building. The kind that comes only when a launch is imminent. As if in answer to his unspoken hunch, the floodlights on Complex 17 bloomed into life, etching the tall silver rocket standing there, embraced by the dark spiderwork of the gantry tower.

Pad 17. Manned shot.

People were scurrying in and out of the Administration Building: sleepy-eyed, disheveled, but their feet were moving doubletime. Colonel Murdock's secretary was coming down the hallway as Kinsman signed in at the reception desk.

"What's up, Annie?"

"I just got here myself," she said. There were hairclips still in her blond curls. "The boss told me to flag you down the instant you arrived."

Even from completely across the colonel's spacious office, Kinsman could see that Murdock was a round little kettle of nerves. He was standing by the window behind his desk, watching the activity on Pad 17, clenching and unclenching his hands behind his back. His bald head was glistening with perspiration, despite the frigid air conditioning. Kinsman stood at the door with the secretary.

"Colonel?" she said softly.

Murdock spun around. "Kinsman. So here you are."

"What's going on? I thought the next manned shot wasn't until . . ."

The colonel waved a pudgy hand. "The next manned shot is as fast as we can make it." He walked around the desk and eyed Kinsman. "You look a mess."

"Hell, it's four in the morning!"

"No excuses. Get over to the medical section for preflight checkout. They've been waiting for you."

"I'd still like to know . . ."

"Probably ought to test your blood for alcohol content," Murdock grumbled.

"I've been celebrating my transfer," Kinsman said. "I'm not supposed to be on active duty. Six more days and I'm a civilian spaceman. Get my picture in *Life* and off to the Moon. Remember?"

"Cut the clowning. General Hatch is flying in from Norton Field and he wants you."

"Hatch?"

"That's right. He wants the most experienced man available."

"Twenty guys on base and you have to make me available."

Murdock fumed. "Listen. This is a military operation. I may not insist on much discipline, but don't think you're a civilian glamour boy yet. You're still in the Air Force and there's a hell of a bind on. Hatch wants you. Understand?"

Kinsman shrugged.

"Get down to the medical section. On the double. Anne, you stick with him and bring him to the briefing room the instant he's finished. General Hatch will be here in twenty minutes; I don't want to keep him waiting any longer than I have to."

Kinsman stood at the doorway, not moving. "Will you please tell me just what this scramble is all about?"

"Ask the general," Murdock said, walking back toward his desk. He glanced out the window again, then turned back to Kinsman. "All I

know is that Hatch wants the man with the most hours in orbit ready for a shot immediately."

"Manned shots are all volunteer missions," Kinsman pointed out.

"So?"

"I'm practically a civilian. There are nineteen other guys who . . ."

"Kinsman, if you . . ."

"Relax, Colonel. Relax. I won't let you down. Not when there's a chance to get a few hundred miles away from all the brass on Earth."

Murdock stood there glowering as Kinsman took the girl out to his car. As they sped off toward the medical section, she looked at him.

"You shouldn't bait him like that," she said. "He feels the pressure a lot more than you do."

"He's insecure," Kinsman said, grinning. "There're only twenty men in the Air Force qualified for orbital missions, and he's not one of them."

"And you are."

"Damned right, honey. It's the only thing in the world worth doing. You ought to try it."

She put a hand up to her wind-whipped hair. "Me? Flying in orbit? No gravity?"

"It's a clean world, Annie. Brand new every time. Just you and your own little cosmos. Your life is completely your own. Once you've done it, there's nothing left on Earth but to wait for the next shot."

"You sound as though you really mean it."

"I'm serious," he insisted. "The Reds have female cosmonauts. We're going to be putting women in orbit eventually. Get your name on the top of the list."

"And get locked in a capsule with you?"

His grin returned. "It's an intriguing possibility."

"Some other time, Captain," she said. "Right now we have to get you through your preflight and off to meet the general."

General Lesmore D. ("Hatchet") Hatch sat in dour silence in the small briefing room. The oblong conference table was packed with colonels and a single civilian. *They all look so damned serious,* Kinsman thought as he took the only empty chair, directly across from the general.

"Captain Kinsman." It was a flat statement of fact.

"Good morning, General."

Hatch turned to a moon-faced aide. "Borgeson, let's not waste time."

Kinsman only half-listened as the hurried introductions went around the table. He felt uncomfortable already, and it was only partly due to the stickiness of the crowded little room. Through the only window he could see the first glow of dawn.

"Now then," Borgeson said, introductions finished, "very briefly, your mission will involve orbiting and making rendezvous with an unidentified satellite."

"Unidentified?"

Borgeson nodded. "Whoever launched it has made no announcement whatsoever. Therefore, we must consider the satellite as potentially hostile. To begin at the beginning, we'll have Colonel McKeever of SPADATS give you the tracking data first."

As they went around the table, each colonel adding his bit of information, Kinsman began to build up the picture in his mind.

The satellite had been launched from the mid-Pacific, nine hours ago. Probably from a specially-rigged submarine. It was now in a polar orbit, so that it covered every square mile on Earth in twelve hours. Since it went up, not a single radio transmission had been detected going to it or from it. And it was big, even heavier than the ten-ton *Voshkods* the Russians had been using for manned flights.

"A satellite of that size," said the colonel from the Special Weapons Center, "could easily contain a nuclear warhead of one hundred megatons or more."

If the bomb were large enough, he explained, it could heat the atmosphere to the point where every combustible thing on the ground would ignite. Kinsman pictured trees, plants, grass, buildings, people, the sky itself, all bursting into flame.

"Half the United States could be destroyed at once with such a bomb," the colonel said.

"And in a little more than two hours," Borgeson added. "The satellite will pass over Chicago and travel right across the heartland of America."

Murdock paled. "You don't think they'd . . . set it off?"

"We don't know," General Hatch answered. "And we don't intend to sit here waiting until we find out."

"Why not just knock it down?" Kinsman asked. "We can hit it, can't we?"

Hatch frowned. "We could reach it with a missile, yes. But we've been ordered by the Pentagon to inspect the satellite and determine whether or not it's actually hostile."

"In two hours?"

"Perhaps I can explain," said the civilian. He had been introduced as a State Department man; Kinsman had already forgotten his name. He had a soft, sheltered look about him.

"You may know that the Disarmament Meeting in Geneva is discussing nuclear weapons in space. It seemed last week we were on the verge of an agreement to ban weapons in space, just as testing weapons in the atmosphere has already been baned. But three days ago the conference suddenly became deadlocked on some very minor issues. It's been very difficult to determine who is responsible for the deadlock and why. The Russians, the Chinese, the French, even some of the smaller nations, are

apparently stalling for time—waiting for something to happen."

"And this satellite might be it," Kinsman said.

"The Department of State believes that this satellite is a test, to see if we can detect and counteract weapons placed in orbit."

"But they know we can shoot them down!" the general snapped.

"Yes, of course," the civilian answered softly. "But they also know we would not fire on a satellite that might be a peaceful research station. Not unless we were certain that it was actually a bomb in orbit. We must inspect this satellite, to prove to the world that we can board any satellite and satisfy ourselves that it is not a threat to us. Otherwise we will be wide open to nuclear blackmail, in orbit."

The general shook his head. "If they've gone to the trouble of launching a multi-ton vehicle, then military logic dictates that they placed a bomb in it. By damn, that's what I'd do, in their place."

"Suppose it is a bomb," Kinsman asked, "and they explode it over Chicago?"

Borgeson smiled uneasily. "It could take out everything between New England and the Rockies."

Kinsman heard himself whistle in astonishment.

"No matter whether it's a bomb or not, the satellite is probably rigged with booby traps to prevent us from inspecting it," one of the other colonels pointed out.

Thanks a lot, Kinsman said to himself.

Hatch focused his gunmetal eyes on Kinsman. "Captain, I want to impress a few thoughts on you. First, the Air Force has been working for nearly twenty years to achieve the capability of placing a military man in orbit on an instant's notice. Your flight will be the first practical demonstration of all that we've battled to achieve over those years. You can see, then, the importance of this mission."

"Yes, sir."

"Second, this is strictly a voluntary mission. Because it is so important to us, I don't want you to try it unless you're absolutely certain . . ."

"I realize that, sir. I'm your man."

"I understand you're transferring out of the Air Force next week."

Kinsman nodded. "That's next week. This is now."

Hatch's well-seamed face unfolded into a smile. "Well said, Captain. And good luck."

The general rose and everyone snapped to attention. As the others filed out of the briefing room, Murdock drew Kinsman aside.

"You had your chance to beg off."

"And miss this? A chance to play cops and robbers in orbit?"

The colonel flushed angrily. "We're not in this for laughs. This is important. If it is a bomb—"

"I'll be the first to know," Kinsman snapped. To himself he added, *I've listened to you long enough for one morning.*

Countdowns took minutes instead of days, with solid-fueled rockets. But there were just as many chances of a man or machine failing at a critical point and turning the intricate, delicately poised booster into a pyre of twisted metal.

Kinsman sat tauntly in the contoured couch, listening to them tick off the seconds. He hated countdowns. He hated being helpless, completely dependent on a hundred faceless voices that flickered through his earphones, waiting childlike in a mechanical womb, not alive, waiting, doubled up and crowded by the unfeeling impersonal machinery that automatically gave him warmth and breath and life. He could feel the tiny vibrations along his spine that told him the ship was awakening. Green lights started to blossom across the control panel, a few inches in front of his faceplate, telling him that everything was ready. Still the voices droned through his earphones in carefully measured cadence: *three . . . two . . . one . . .*

And she bellowed into life. Acceleration pressure flattened Kinsman into the couch. Vibration rattled his eyes in their sockets. Time became meaningless. The surging, engulfing, overpowering noise of the mighty rocket engines made his head ring, even after they burned out into silence.

Within minutes he was in orbit, the long slender rocket stages falling away behind, together with all sensations of weight. Kinsman was alone now in the squat, delta-shaped capsule: weightless, free of Earth.

Still he was the helpless, unstirring one. Computers sent guidance instructions from the ground to the capsule's controls. Tiny vectoring rockets placed around the capsule's black hull squirted on and off, microscopic puffs of thrust that maneuvered the capsule into the precise orbit needed for catching the unidentified satellite.

Completely around the world Kinsman spun, southward over the Pacific, past the gleaming whiteness of Antarctica, and then north again over the wrinkled, cloud-spattered land mass of Asia. As he crossed the night-shrouded Arctic, nearly two hours after being launched, the voices from his base began crackling in his earphones again. He answered them as automatically as the machines did, reading off the numbers on the control panel, proving to them that he was alive and functioning properly.

Then Murdock's voice cut in: "There's been another launch, fifteen minutes ago. From somewhere near Mongolia as near as we can determine it. It's a high-energy boost; looks as though you're going to have company."

Kinsman acknowledged the information, but still sat unmoving.

He saw it looming ahead of him, seemingly hurtling toward him.

He came to life. To meet and board the satellite he had to match its orbit and speed exactly. He was approaching it too fast. No computer on Earth could handle this part of the job. Radar and stabilizing gyros helped, but it was his own eyes and the fingers that manipulated the retro-rocket controls that finally eased the capsule into a rendezvous orbit.

Finally the big satellite seemed to be stopped in space, dead ahead of his capsule, a huge inert hulk of metal, dazzlingly brilliant where the sun lit its curving side, totally invisible where it was in shadow. It looked ridiculously like a crescent moon made of flush-welded aluminum. A smaller crescent puzzled Kinsman until he realized it was a dead rocket nozzle hanging from the satellite's tailcan.

"I'm parked alongside her, about fifty feet off," he reported into his helmet microphone. "She looks like the complete upper stage of a *Saturn*-class booster. Can't see any markings from this angle. I'll have to go outside."

"You'd better make it fast," Murdock's voice answered. "That second ship is closing in fast."

"What's the E.T.A.?"

A pause while voices mumbled in the background. "About fifteen minutes . . . maybe less."

"Great."

"You can abort if you want to."

Same to you, pal, Kinsman said to himself. Aloud, he replied, "I'm going to take a close look at her. Maybe get inside, if I can. Call you back in fifteen minutes."

Murdock didn't argue. Kinsman smiled grimly at the realization that the colonel had not reminded him that the satellite might be booby-trapped. Old Mother Murdock hardly forgot such items. He simply had decided not to make the choice of aborting the mission too attractive.

Gimmicked or not, the satellite was too near and too enticing to turn back now. Kinsman quickly checked out his pressure suit, pumped the air out of his cabin and into storage tanks, and then opened the air-lock hatch over his head.

Out of the womb and into the world.

He climbed out and teetered on the lip of the air lock, balancing weightlessly. *The real world.* No matter how many times he saw it, it always caught his breath. The vast sweep of the multi-hued Earth, hanging at an impossible angle, decked with dazzling clouds, immense and beautiful beyond imagining. The unending black of space, sprinkled with countless gleaming jewels of stars that shone steadily, solemnly, the unblinking eyes of infinity.

I'll bet this is all there is to heaven, he said to himself. *You don't need anything more than this.*

Then he turned, with the careful deliberate motions of a deep-sea diver, and looked at the fat crescent of the nearby satellite. Only ten minutes now. Even less.

He pushed off from his capsule and sailed effortlessly, arms outstretched. Behind him trailed the umbilical cord that carried his air and electrical power for heating/cooling. As he approached the satellite, the sun rose over the humped curve of its hull and nearly blinded him, despite the automatic darkening of the photochromic plastic in his faceplate visor. He kicked downward and ducked behind the satellite's protective shadow again.

Still half-blind from the sudden glare, he bumped into the satellite's massive body and rebounded gently. With an effort, he twisted about, pushed back to the satellite, and planted his magnetized boots on the metal hull.

I claim this island for Isabella of Spain, he muttered foolishly. *Now where's the hatch?*

The hatch was over on the sunlit side, he found at last. It wasn't too hard to figure out how to operate it, even though there were absolutely no printed words in any language anywhere on the hull. Kinsman knelt down and turned the locking mechanism. It clicked open.

For a moment he hesitated. *It might be booby-trapped,* he heard the colonel warn.

Kinsman yanked the hatch open. No explosion, no sound at all. A dim light came from within the satellite. Carefully he slid down inside. A trio of faint emergency lights were on; there were other lights in place, he saw, but not operating.

"Saving the juice," he muttered to himself.

It took a moment for his eyes to accustom themselves to the dimness. Then he began to appreciate what he saw. The satellite was packed with equipment. He couldn't understand what most of it was, but it was clearly not a bomb. Surveillance equipment, he guessed. Cameras, recording instruments, small telescopes. Three contoured couches lay side by side beneath the hatch. He was standing on one of them. Up forward of the couches was a gallery of compact cabinets.

"All very cozy."

He stepped off the couch and onto the main deck, crouching to avoid bumping his head on the instrument rack, above. He opened a few of the cabinets. *Murdock'll probably want a few samples to play with.* He found a set of small hand wrenches, unfastened them from their setting.

With the wrenches in one hand, Kinsman tried the center couch. By lying all the way back on it, he could see through the satellite's only observation port. He scanned the instrument panel: Cyrillic letters and Arabic numerals on all the gauges.

Made in CCCR. Kinsman put the wrenches down on the armrest of the couch. They stuck magnetically. Then he reached for the miniature camera at his belt. He took four snaps of the instrument panel.

Something flashed in the corner of his eye.

He tucked the camera back in its belt holster and looked at the observation port. Nothing but the stars: beautiful, impersonal. Then another flash, and this time his eye caught and held the slim crescent of another ship gliding toward him. Most of the ship was in impenetrable shadow; he would have never found it without the tell-tale burst of the retrorockets.

Kinsman grabbed his tiny horde of stolen wrenches and got up from the couch. In his haste, he stumbled over his trailing umbilical cord and nearly went sprawling. A weightless fall might not hurt you, but it could keep you bouncing around for some very precious minutes before you regained your equilibrium.

Kinsman hoisted himself out of the satellite's hatch just as the second ship made its final rendezvous maneuver. A final flare of its retrorockets, and the ship seemed to come to a stop alongside the satellite.

Kinsman ducked across the satellite's hull and crouched in the shadows of the dark side. Squatting in utter blackness, safely invisible, he watched the second ship.

She was considerably smaller than the satellite, but built along the same general lines. Abruptly, a hatch popped open. A strange-looking figure emerged and hovered dreamlike for a long moment.

The figure looked like a tapered canister, with flexible arms and legs and a plastic bubble over the head. Kinsman could see no umbilical cord. There were bulging packs of equipment attached all around the canister.

Self-contained capsule, Kinsman said to himself. *Very neat.*

A whispy plume of gas jetted from the canister, and the cosmonaut sailed purposefully over to the satellite's hatch.

Got his own reaction motor, too. Kinsman was impressed.

Unconsciously, he hunched down deeper in the shadows as the figure approached. Only one of them; no one else appeared from the second ship. The newcomer touched down easily beside the still-open hatch of the satellite. For several minutes he did not move. Then he edged away from the satellite slightly and, hovering, turned toward Kinsman's capsule, still hanging only a few hundred feet away.

Kinsman felt himself start to sweat, even in the cold darkness.

The cosmonaut jetted away from the satellite, straight toward the American capsule.

Damn! Kinsman snapped at himself. *First rule of warfare: Keep your line of retreat open!*

He leaped off the satellite and started floating back toward his own capsule. It was nightmarish, drifting through space with agonizing slowness while the weird-looking cosmonaut sped on ahead. The cosmonaut spotted Kinsman as soon as he cleared the shadow of the satellite and emerged into the sunlight.

For a moment they simply stared at each other, separated by a hundred feet of nothingness.

"Get away from that capsule!" Kinsman shouted, even though he knew that the intruder could not possibly hear him.

As if to prove the point, the cosmonaut put a hand on the lip of the capsule's hatch and peered inside. Kinsman flailed his arms and legs, trying to raise some speed, but still he moved with hellish slowness. Then he remembered the wrenches he was carrying.

Almost without thinking, he tossed the whole handful at the cosmonaut. The effort spun him wildly off-balance. The Earth slid across his field of vision, then the stars swam by dizzyingly. He caught a glimpse of the cosmonaut as the wrenches reached the capsule—most of them missed and bounced noiselessly off the capsule. But one banged into the intruder's helmet hard enough to jar him, then rebounded crazily out of sight.

Kinsman lost sight of the entire capsule as he spun around. Grimly, he fought to straighten himself, using his arms and legs as counterweights. Finally, the stars stopped whirling. He turned and found the capsule again, but it was upside-down. Very carefully, Kinsman turned himself to the same orientation as the cosmonaut.

The intruder still had his hand on the capsule hatch, and his free hand was rubbing along the spot where the wrench had hit. He looked ludicrously like a little boy rubbing a bump on his head.

"That means get off, stranger," Kinsman muttered. "No trespassing. U.S. property. Beware of the eagle. Next time I'll crack your helmet in half."

The newcomer turned slightly and reached for one of the equipment packs on the canister suit. A weird-looking tool appeared in his hand. Kinsman drifted helplessly and watched the cosmonaut take up a section of the umbilical line. Then he applied the hand tool to it. Sparks flared.

Electrical torch! He's trying to cut the line! He'll kill me!

Frantically, Kinsman began clambering along the umbilical line, hand over hand. All he could see, all he could think of, was that flashing torch eating into his lifeline.

Almost without thinking, he grabbed the line in both hands and snapped it viciously. Again he tumbled wildly, but he saw the wave created by his snap race down the

line. The intruder found the section of line he was holding suddenly bounce violently out of his hand. The torch spun away from him and winked off.

Both men moved at once.

The cosmonaut jetted away from the capsule, looking for the torch. Kinsman hurled himself directly toward the hatch. He planted his magnetized boots on the capsule's hull and grasped the open hatch in both hands.

Duck inside, slam shut, and get out of here.

But he did not move. Instead, he watched the cosmonaut, a weird sun-etched outline figure now, mostly in shadow, drifting quietly some fifty feet away, sizing up the situation.

That glorified tin can tried to kill me.

Kinsman coiled like a cat on the edge of the hatch and then sprang at his enemy. The cosmonaut reached for the jet controls at his belt but Kinsman slammed into him and they both went hurtling through space, tumbling and clawing at each other. It was an unearthly struggle, human fury in the infinite calm of star-studded blackness. No sound, except your own harsh breath and the bone-carried shock of colliding arms and legs.

They wheeled out of the capsule's shadow and into the painful glare of the sun. In a cold rage, Kinsman grabbed the airhose that connected the cosmonaut's oxygen tank and helmet. He hesitated a moment and glanced into the bulbous plastic helmet. All he could see was the back of the cosmonaut's head, covered with a dark, skintight flying hood. With a vicious yank, he ripped out the airhose. The cosmonaut jerked twice, spasmodically, then went inert.

With a conscious effort, Kinsman unclenched his teeth. His jaws ached. He was trembling, and covered with a cold sweat. He released his death grip on the enemy. The two human forms drifted slightly apart. The dead cosmonaut turned gently as Kinsman floated beside him. The sun glinted brightly on the metal canister and shone full onto the enemy's lifeless, terror-stricken face.

Kinsman looked into that face for an eternally-long moment, and felt the life drain out of him. He dragged himself back to the capsule, sealed the hatch and cracked open the air tanks with automatic, unthinking motions. He flicked on the radio and ignored the flood of interrogating voices that streamed from the ground.

"Bring me in. Program the autopilot to bring me in. Just bring me in."

It was six days before Kinsman saw Colonel Murdock again. He sat tensely before the wide mahogony desk while Murdock beamed at him, almost as brightly as the sun outside.

"You look thinner in civvies," the colonel said.

"I've lost a little weight."

Murdock made a meaningless gesture. "I'm sorry I haven't had a chance to see you sooner. What with the Security and State Department people holding you for debriefings, and now your mustering-out . . . I haven't had a chance to, eh, congratulate you on your mission. It was a very fine piece of work."

Kinsman said nothing.

"General Hatch was very pleased. You'd be up for a decoration, but . . . well, you know, this has to be quiet."

"I know."

"But you're a hero, son. A real honest-to-God hero."

"Stow it."

Murdock suppressed a frown. "And the State Department man tells me the Reds haven't even made a peep about it. They're keeping the whole thing hushed up. The disarmament meeting is going ahead again, and we might get a complete agreement on banning bombs in orbit. Guess we showed them they can't put anything over on us. We called their bluff, all right!"

"I committed a murder."

"Now listen son . . . I know how you feel. But it had to be done."

"No it didn't," Kinsman insisted quietly. "I could've gotten back inside the capsule and de-orbited."

"You killed an enemy soldier. You protected your nation's frontier. Sure, you feel like hell now, but you'll get over it."

"You didn't see the face I saw inside that helmet."

Murdock shuffled some papers on his desk. "Well . . . O.K., it was rough. But it's over. Now you're going to Florida and be a civilian astronaut and get to the Moon. That's what you've wanted all along."

"I don't know . . . I've got to take some time and think everything over."

"What?" Murdock stared at him. "What're you talking about?"

"Read the debriefing report," Kinsman said tiredly.

"It hasn't come down to my level and it probably won't. Too sensitive. But I don't understand what's got you spoofed. You killed an enemy soldier. You ought to be proud . . ."

"Enemy," Kinsman echoed bleakly. "She couldn't have been more than twenty years old."

Murdock's face went slack. "She?"

Kinsman nodded. "Your honest-to-God hero murdered a terrified girl. That's something to be proud of, isn't it?" ■

PSI FOR SALE

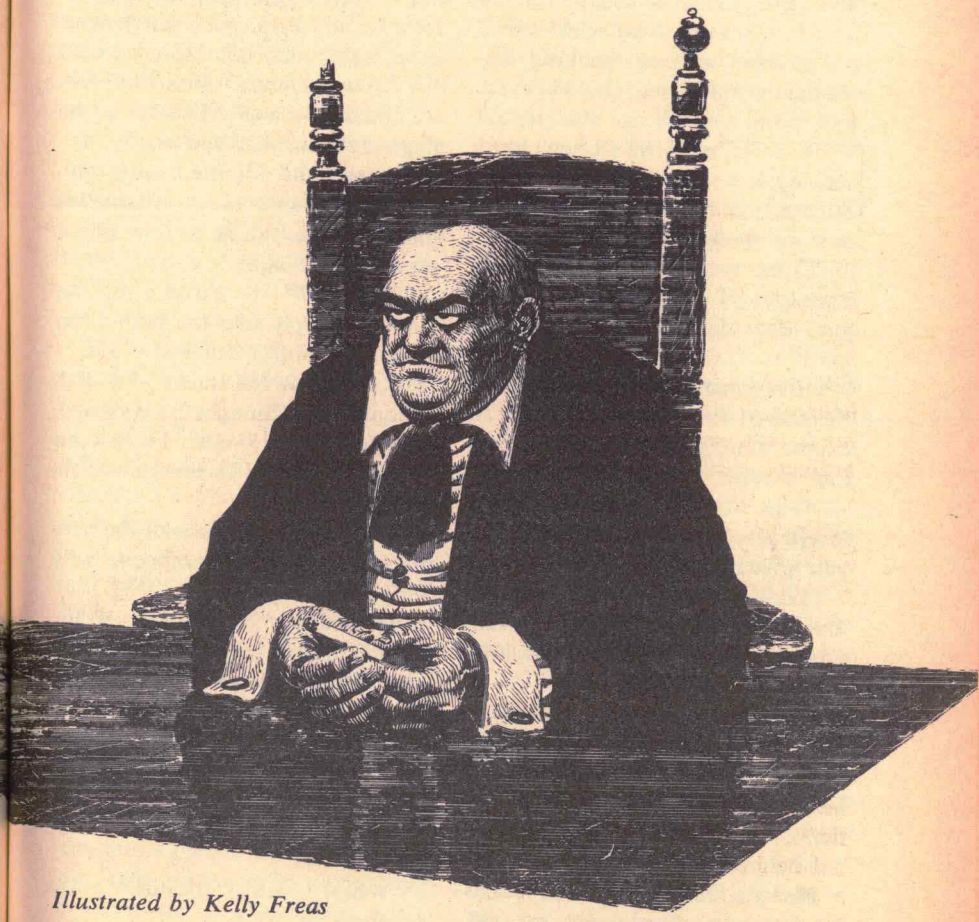
The only real and abiding difference between the crackpot and the genius is that what the genius does is profitable—and not just to himself!

BY WALTER BUPP

The first time I met Jacobine was at an after-the-theater cocktail party. Somebody was dragging me by the elbow and saying to him, above the excited alcoholic clatter: "And I want you to meet Peter Maragon, the well-known telekinetic."

I held out my hand to Jacobine, a stocky, pompous man of about my build and height. He was too busy holding the stem of a cocktail glass to reach for my hand. "Telekinetic!" he snorted. "If you can move objects at a distance, I'm a leprechaun!"

Ordinarily I would have grinned and agreed that my TK wouldn't budge a fly. But this Jacobine was so cocksure and pompous that my less-lovely self came to the surface. I fired a lift at his Martini glass. The cocktail tilted and spilled gin down the front of his suit.



Illustrated by Kelly Freas

"The Devil!" Jacobine exclaimed, twitching the glass upright and jumping a little. *"You* did that!"

He might be pompous, but he wasn't slow.

With the egoist's complete disregard for anybody else's plans, he seized my arm and dragged me off to a corner of the room where the laughter and conversation of the party was less noisy. "I've never

seen that done before, Maragon," he said, in what I suppose was an apology. "See here, can you tell if somebody else is using telekinesis?"

I nodded without speaking, immediately interested. I didn't see any point in telling him that I spent a major portion of my time seeking out people who had the Stigma, looking for Psis who had not yet joined the Lodge.

"Come on, then!" Jacobine said intensely. "I want you to meet a guy! Boy, do I want you to meet him!"

He seemed to seethe with a remembered fury. I wasn't about to expose some poor telekinetic to that kind of rage.

"Wait," I said. "Aren't you going to get a replacement for that drink you spilled?"

"I don't drink, Maragon," he said. "Just carry them around at parties. Can't afford liquor in my occupation."

I held back as he led me to the door, stalling while I fumbled around in the cloak closet for my hat. "What *is* your occupation?" I temporized, not sure whether I should go with him.

He was insulted. Didn't *everybody know?* "Jacobine," he said, conceding that possibly I hadn't heard his name correctly. "I'm a heart surgeon," he added stiffly. He could be pretty stiff, if you let him.

"I guess you *can't* afford any vices."

"Just one, Maragon," he said, as we got into the elevator and started down for the street. "I gamble."

I began to get the picture. Perhaps I could work out a safe way to have him point out his suspected Psi. "You gamble," I told him, as we climbed into the skim-copter he flagged down. "And you lose."

"Lately," he admitted, after giving the pilot an address. "I hope we find the game. I think I know where it's running tonight."

"Roulette?" I asked, as we climbed steeply into the slow lane. It almost had to be that or craps.

"Roulette is for snobs," he said. I would have thought he was one. "Too effete, by a mile. I'm a crap shooter." He was an inverted snob, that's all.

"And you suspect one of the people in the game, eh, someone who wins all the time?"

He nodded, peering out of the bubble of the 'copter toward the spot where we were descending. "Lately he's been getting *too* lucky, if you know what I mean. If he's been tipping those dice . . . !" he finished, seething again.

"In a sense, it's hard to blame them," I said.

"What? It's cheating!" he snapped.

"Oh, I just mean that cheating at crap or roulette is one of the few ways Psis have ever figured out to make the Stigma pay," I said. "Here they have this special ability, and there doesn't seem any way to make a dime with it."

"I think I know one guy who's figured out a way," Jacobine said grimly.

That meant I had better go all the way with Jacobine tonight. If some maverick Psi was tipping dice, and got too ambitious, he'd get his throat cut. Well that's what the Lodge is for, to prevent that sort of thing and give Psis a chance to make an adjustment to Normal society. I got the old tingle. Perhaps I'd find a recruit tonight!

"What's his name, Jacobine?" I asked as we grounded and he stuck his credit card in the meter.

"Lefty," he said, taking me by the arm again. He was always hurrying me somewhere. If he didn't slow down, his own heart would be in need of his services. "They call him Lefty," he added, leading me down a dark cobbled alley between two tall buildings. "He's got something the matter with his right arm —looks like neurasthenia—and he can't use it."

In the feeble gleam from a lone light on a post I could see they were making an addition or alteration to the rear of one of the buildings. The contractor's construction shack made a good place for a floating crap game to come to momentary rest.

Jacobine breathed Lefty's name to the watchman, apparently serving as the lookout, and we were let into the plywood shack. There were stand-up tables for spreading out construction drawings on two sides of the square building, piled with rolls of blueprints. A desk and chair were in a corner. On the desk was a visiphone, a calculator and the lamp that was casting what light there was in the open space in the center of the shack. A small ring of gamblers were on their knees or hunkered down, and bills were stacked in front of them, including some in a loose pile in the center of the circle.

There were a few nods as we elbowed our way into the game, but no comments. Directly across the ring of gamblers from me was a slight, slender young man, with a pointed chin and a welter of freckles. His face had a sharp acidity about it, and his limp right arm hung down at his side. The fingers of that hand curled lankly, with the knuckles in the dust of the plank floor. This was Lefty.

It took me no longer than his first roll, which came up directly, to know that he had the Stigma. He tried for a seven and hashed it badly, letting one die roll a turn too far, so that he got a one-three for a four instead of a one-six for a natural.

Four's a hard point, and I made it harder for him by tipping the dice away, carefully enough so that he didn't make his point, but not so energetically that he rolled a seven and lost the dice.

Most of these untrained TK's don't amount to a Tinker's Dam.

And Lefty was pathetic in his inconsistency. He blew on the dice, cursed them, rattled them in his left hand, rolled them and with my interference failed to make his four, time after time. With some of the rolls I could feel that he had a pretty good grip on the ivories. Other times I couldn't feel him tip them at all.

Finally I put the blocks on him, snagged up tight on the ivories and skidded them in a two-five seven that lost Lefty the point. Outside of showing his disappointment with a hissed oath, Lefty gave no sign that he had felt my stronger grip on the dice.

That got me to thinking. I kept the dice moving from gambler to gambler, with one eye on Jacobine's bets, and the other on Lefty. Making sure that the surgeon and I won wasn't hard, but making sure that Lefty knew what I was doing was something else. Reluctantly I came to the conclusion Lefty could not feel my grip on the dice, and that he didn't realize he was tipping them himself. He didn't know he had the Stigma.

Jacobine was several hundred dollars to the good when I straightened up, brushing dust from my trousers, and went back to the door of the shack. The heart surgeon rose and followed me, brushing at his knees.

"Well?" he whispered. "Does he. . . ?"

"Outside," I said, and led him far enough down the darkness of the cobbled alley to keep the lookout from hearing what I had to say.

"You want to get his throat cut?" I said angrily.

"He's got the Stigma, eh?"

"Yes," I agreed. "Lefty is a telekinetic, and he's tipping dice with it."

"He must have recognized you," Jacobine said. "He played it cute tonight, letting me win."

I shook my head. "He tried. He just wasn't good enough," I told him.

"Oh! *You* were. . . !"

"I was. Now what?"

"I'm going back in there!" Jacobine said with a resumption of his fury. "He still owes me about three thousand bucks!"

He was a dear. "You *like* the sight of blood," I said. "No wonder you're a surgeon."

He didn't get it.

"The minute you expose that sour looking TK, one of those gamblers will go for him with a knife and he'll have his throat cut. Is that what you want?"

"I couldn't care less " he snapped. "He cheated me out of . . ."

"Add it to your next fee," I sneered. "You'd never miss three thousand. Not the way he'd miss his life."

"Nuts," he said. "Come on."

"And get *my* throat cut, too?" I said.

All of a sudden he grew quite still. It hadn't hit him. Ah, yes, old Pete Maragon was a TK, and he, Jacobine had brought a TK to the game! And look what happened, Jacobine and his tame Psi won the money!

"My sainted aunt!" he said. "They might go after me, too!"

"Yeah," I said. "Shall we go back?"

He spun on his heel and made for the street. He'd keep his mouth shut about Lefty.

I walked slowly back to the shack, nodded to the lookout, and rejoined the game. A couple gamblers rose as I came in, and the game began to break up.

Finally Lefty and I were alone, rolling head to head, and I cleaned him thoroughly, using TK without any let-up.

"How much did you lose?" I asked him, when he indicated he was through.

"A couple thousand," he said sourly. "And never to hotter dice than yours!"

"Don't blame the dice," I said, pointing to where they lay on the boards between us. They jumped a couple inches into the air in response to my lift and came down Snake Eyes, the old sign.

"That's how you lost," I said.

He had the knife out, left-handed, before I could wink. I suppose, when you've had a gutter upbringing, that you react in gutter fashion.

"There's no need for the knife," I said. "I won from you fairly."

"Fairly!" he said viciously. "Using TK on me is fair?"

"Why, of course, it is," I protested. "You were using TK on *me*."

That time I had to lunge away from the blade, and seize his wrist. If he had had the use of both arms, he would have knifed me, and as it was I had the Devil's own time making him drop the pig sticker.

We froze, scraping in the grit of the floor, our faces almost touching. I had his left arm locked tight in my two hands. He strained against me, but I had him in chancery, and he couldn't move.

"You fool!" I snapped. "I did you a favor tonight! I beat you at your own game and kept you from being found out. Why do you think Jacobine brought me into the game? He's suspicious of you already!"

"He knew that *you* had the Stigma?" Lefty demanded. "And still brought you into the game?"

"Only to catch you at it," I said. "And I *caught* you. Oh, you're not much, but with some training you could make the dice behave the way I do."

It's almost unfair to dangle that temptation in front of a crap shooter. Lefty couldn't resist the bait, either.

"You're serious?" he demanded. "You really think I have the Stigma?"

"You have it," I assured him. "And I think you are sincere in

protesting that you didn't know. Don't let it upset you—you can hide it if you want, just so you listen to me."

"I'll listen!" he said, almost feverishly. "I've got it coming after the deal I got."

"What do you mean?"

He reached across his body with his left hand and raised his limp right arm. "Do you know what I always wanted to do?" he demanded. "Be a surgeon! And when I went to medical school and tried to specialize my studies in surgery, I found out there can't *be* any one-handed surgeons! I've got something coming for this dead wing of mine! A Psi!" he breathed. "I'll make a million!"

I smiled at him, getting to my feet in the shack. "You might," I said. "But that would come after the Lodge has given you some training.

"Lodge?" he asked, getting up, too. "What Lodge?"

"A group of Psis in New York," I said, brushing off the dirt. "We've banded together to keep alive. And we want you to join us."

"To get training in how to do tricks with dice?"

"More than that. That would be part of it."

He shrugged. "Why not?"

"Good," I said. "Tomorrow night is Chapter Meeting," I added. "The Chapter House is on Eighty-seventh Street." I gave him the address.

The sky was paling over Brooklyn when I got back to the Lodge and wearily heaved myself into bed. I slept late and found the Chapter House pretty well deserted when, shortly after noon, I went downstairs for some breakfast. Cookie made me some ham and eggs while I looked over some bills, handled a little correspondence and otherwise behaved like the Grand Master of the Manhattan Chapter.

I usually have dinner with Keys Crescas and Millie Pugh on the evening of a Chapter Meeting. Keys is our treasurer, and Millie serves as my right hand. Keys is a mild TK and makes a fair living as a locksmith, with an occasional big fee from opening a safe that is misbehaving, where his telekinesis comes to the fore in moving a sticky tumbler.

Millie is something else. Close to middle age, her dumpy shape and lumpy features would make you think she was on the dull side. It's protective coloration. She is a clairvoyant, short in range, to be true, but quite accurate. The pressures of Normal society on anybody with the Stigma seems to develop in Psis a kind of shiftiness and sly disregard for the truth that makes Millie important to me in handling Lodge affairs.

"How do we stand for tonight, Keys?" I asked our treasurer. He nodded his curly black head and smiled.

"I struck it rich today, Pete," he said, taking out his wallet. He counted a thousand dollars in bills onto the tablecloth. "Stockbroker couldn't get that period-piece Mosler of his to open. I wish there were more of them in town. They all stick, sooner or later."

"We're in clover, then," I grinned at him, laying the money I had won from Lefty on the linen.

"Where did you get that?" Millie said.

"Not in court," I said. I am an attorney, but since it's been public knowledge that I have the Stigma, my cases are rare—not much more than defending Psis who get caught up in the toils of the law. "Won it shooting crap."

Millie sniffed. "I thought we weren't to use our powers to the detriment of a Normal," she reminded me. "I'm all for pooling our incomes, but I don't think you should go out and get money for the Lodge that way, Pete."

I nodded. "You're right. But this wasn't a Normal. I won it from a TK who was trying to win the same way. He just didn't have enough TK is all."

"A Lodge member?" Keys demanded.

"No. And, frankly, quite unaware that he had the Stigma. I've invited him over tonight. I think he'll join the Lodge."

"We can use him," Keyes said. "Your recruiting drive certainly has been in low gear!"

I didn't need to be reminded that our affairs were progressing poorly. But you have to start somewhere. Leaving the money with Keys, I got up and made my way around the tables, greeting members I hadn't seen for a week or so, and finally went out to stand on the steps to wait for Lefty.

The Lodge has its headquarters in an old brownstone, the most we can afford, with steps that lead up from the sidewalk to the first floor. The street was crowded with skimcopter traffic, blowing grit around, and it paid to stay a few feet above the pavement to keep the stuff from cutting your ankles and blowing into your eyes.

Lefty was late, and the members were up in the meeting room when I made my last trip down to the steps to see if he were coming. Just as I reached the front door and started down for the street, I saw him stepping from the bubble of a 'copter and pay the man in cash. Typical Psi—he had no permanent address and couldn't get a credit card.

He saw me at once and came running up the steps to me. "I can do it, too, Maragon!" he said quickly, sticking out his pointed chin. "You ought to see it!"

"Do what?"

"Make the dice jump up, you know, and come down Snake Eyes!"

I gasped. "You learned to do that in just one day?" I demanded.

"Sure. You ought to see the way those ivories behave *now!*"

"This changes things a little, Lefty," I said, taking him by the arm. "I hadn't figured you were ready for admission yet, but perhaps you are. Say, I've never learned your name."

He grinned crookedly over at me. "Bupp," he said. "Walter Bupp." He looked at the front of the brownstone as we walked up the steps. "You guys sure picked a rundown neighborhood," he said. "Who you trying to kid?"

"Nobody, Lefty," I said, taking him in. "New York real estate comes high."

"You own this place?" he said, looking at the flaking front door.

"The Lodge does, with some help from the bank."

"Agh," he said as we went inside. "No air conditioning." Well, it was hot inside, but no hotter than it had been out on the street.

"It's an old place," I said. "We'll grow out of it."

The meeting room is on the second floor, and I showed him up the narrow, creaky staircase. The carpeting is worn and bare in spots, and the light in the hall is poor.

"How many members you got?" Lefty demanded as we got to the head of the stairs.

"About fifty."

"Fifty?" He stopped and turned to look at me. "I thought there were thousands of Psis!"

"Out in the midwest, where the N-bomb went off," I said. "Sure. But not many here in New York. We have to dig them out of the woodwork. Not many Psis feel as you do, glad to learn they have the Stigma. There's too much social pressure here. And further west it's a good way to get lynched."

"Yeah," he said. "Where to?"

I showed him into the second-floor parlor where we had a couple dozen folding camp chairs lined up in auditorium style for our meeting, pretty well filled with Lodge members waiting for the meeting to start. I went around to the other side of the table I use for a rostrum.

"This Lodge is now in session," I said, cutting in on the hum of conversation. "First order of business is the plea for admission from Walter Bupp, TK."

"I protest this admission," somebody said. "There is no proof."

Lefty started to get to his feet, his freckles prominent as he paled angrily, but I motioned him to relax. "The Keeper will bring the weights," I said. Keys was serving as Keeper, and brought the little case to my table.

"Come forward, Walter Bupp," I said. We try for a little formality at meetings. "I appoint Fred Feeney and Miles White examiners."

The two I named came up to my table. I took the cover off the weights, a set of brass metrics from a laboratory scale.

"You have been challenged, Walter Bupp," I said. "The examiners demand that you demonstrate your powers."

I motioned for Lefty to join us, which he did. "Lift the two-gram weight," I directed.

He glared sourly at the brass cylinders. "I can't do that," he protested. From his left pocket he drew two dice and threw them down on the table. "Only these."

I shook my head. "Lift the two-gram weight. You may touch it first, if you desire."

He looked around him at the faces of the members, solemn at this important moment. Hesitantly, then quickly, he touched the bob of the weight with the forefinger of his left hand, and withdrew it.

"Up!" he said between his teeth. The weight came out of its rack, lifted an inch or two and tumbled back to the table.

There was a rustle and creaking of chairs as everyone relaxed. I kidded and coaxed Lefty until he had lifted the ten-gram weight, but his freckled face was running sweat, and when that lift broke, he fell back, exhausted.

"How say you, examiners?" I asked.

Fred Feeney spoke: "We find Walter Bupp qualified for the first degree," he declared, and turning, he held out his right hand. "Welcome, Brother," he said.

"Up a rope!" Lefty gasped, but then, thinking better of it, he held out his left hand. Fred was only a moment catching on, and shook hands with him left-handedly.

The examiners took their seats and I gave instruction to the new member.

"Walter Bupp," I said to Lefty. "You are now a member of the Manhattan Chapter of the Lodge, and entitled to its benefits. You are also subject to its orders and discipline.

"First, be it known to you that you may no longer make use of your Psi powers to the detriment of any Normal.

"Second, be it known to you that all your essential needs will be met by the Lodge, to the extent that you call on it for help, and that you are expected to contribute to the Lodge your earnings.

"Finally, be it known to you that you are expected to attend our meetings, and to subject yourself to our course of instruction and training.

"Speak now if you have any question."

It wasn't a question. He barked a laugh at me. "Next you'll have regalia! Sure, sure, Pete. I'll go along with you guys. Just show me how to handle dice the way you do, and I'm your pigeon."

He reached into his coat for a billfold and took a thick sheaf of currency out of it. Peeling off a couple bills, he tossed the balance to my table.

"I'm holding out a thousand to operate with," he said. "There's about twelve thousand there. O.K.?"

It was Keys Crescas who bustled up to count the money. I suppose he should have. He is our treasurer.

"Eleven thousand eight hundred bucks!" he said. "Now, that's more like it! Welcome, Brother."

"There's more where that came from," Lefty said smugly. "For Pete's sake, how about painting up the joint, and getting some air conditioning in the trap "

The meeting broke into laughter. I cut him short.

"Thank you, Brother," I said, and proceeded to the next order of business.

When we adjourned, there was the usual back-slapping of a new member, with congratulations that he had qualified on his first attempt. The turnout had been disappointing. For the past several meetings attendance had been dropping. It was a danger signal that I could not afford to misinterpret.

Lefty was shifting uncomfortably from one foot to the other, wondering, I guess, how to break up the knot of people around him.

"My turn," I said to them. "Lefty and I have a little business. Want to come with me?" I said to him.

He was glad enough to get away and climbed stairs with me to the third floor, where I have one of the bedrooms of the old brownstone house fixed up as an office.

He looked around at the old metal desk I had there, and slid with a grunt into the worn chair I had for visitors. My swivel creaked and complained as I settled my weight into it. It's not that I'm fat. I just come from solid stock and weigh a lot for my size.

"You sure don't put on much front, Maragon," Lefty said.

I shook my head. "We can't afford to. Face a couple of facts, Lefty," I said, knowing that he was far too intelligent to be fooled by me. "This thing is new. We don't have many members. There are hundreds of other Psis here in New York, but they are mighty cautious about revealing themselves. We hunt for them, but it is more or less luck when we scent one. Millie Pugh helps a lot."

"Is that the bag with the iron corset?" he said. Lefty had a big streak of irreverence.

"Don't underrate her," I scowled. "Millie has enough sense to come in out of the rain. She is a powerful clairvoyant, the best we have, although her technique gives her only a limited scope. But she is quite accurate within her limits. She has qualified for the tenth degree, which is more than you can say and she is able to peep thoughts of a good many people. Unfortunately, most Psis try, with considerable success, to hide their thoughts.

All except the telepaths, who are unable to. As a result we pick up more than our share of telepaths. TK's like you, and CV's, like Millie, are harder to come by."

"So why are we up here?" he said, impatient as usual.

I handed him one of our mimeographed manuals. "Read this," I suggested. "It's an outline of how we are organized, our bylaws and such. And read this," I added, handing him another.

He read the title: " 'Elementary Exercises in Telekinesis.' " He looked up. "What the devil!" he said. "A textbook?"

"Why not? It's a field of human knowledge and ability. You'll want this, later." I gave him a copy of "Extended Exercises in Telekinesis."

He looked over the second Manual. "Who wrote these, Maragon?"

"I did."

"You the expert? You got the most TK of anybody in the Lodge?"

"I'm the teacher," I said. "Whether I have the greatest powers is beside the point. I understand what makes a Psi tick, and I can explain it to another Psi and help him elaborate on his powers. Just remember this: There is, so far as we know, no limit to the power of the human brain. Our horizons continue to expand as we find Psis with powers that we did not know existed. Our hopes grow as we see these powers daily extended to new heights. You have shown a great deal of raw TK. For all I know, you may be the most powerful TK of them all. But it calls for your complete acceptance of a new way of looking at the cosmos, and a dedication and devotion of your time and energies that you have not experienced before. When you hear a concert musician perform, it sounds wonderful. But behind that performance of some classic piece of music lie years of practice in the elementary exercises on the piano or violin. The same is true of you. I have outlined a course of exercises in the Manuals, and I urge you to follow them as they are specified. No shortcuts, please. Take the exercises in sequence, and learn each one solidly in its turn. When you get to the end of the book, if you do, then the time will come for you to write your own extension of the powers of TK."

He grinned at me. "I'm the kid who can do it," he said. "I'll show you tricks with dice that will turn you green."

"Perhaps," I said. "But that will be rather academic, won't it? You have already agreed not to make use of your powers to the detriment of a Normal."

"Oh, sure," he said, getting up. "Well, I'll give these some study in the sack tonight."

We walked down the two flights of stairs together and I saw him flag down a cruising skimcopter. Millie was on the brownstone steps, stolidly watching the lights of traf-

fic overhead, as it streaked, red and green, in its carefully oriented lanes.

"I peeped him, Pete," she said.

"So?" I growled. One thing about Psi. It leaves you darned little privacy.

"He has some big reservations. He can't wait to get into another crap game."

"I'll fix his wagon," I said: "You know our discipline is formidable."

Lefty made it back for dinner each evening. This was certainly his right. As a member of the Lodge, he could have asked for a room, and all his meals, for that matter. He also made a point of coming up to my office each night to show me his progress with the exercises.

He worked his way through "Elementary Exercises" in less than a week. This was unprecedented, and I made the mistake of telling him so.

"What did you think, Pete?" he said. "That it would take me all summer to learn these simple lifts?"

"Frankly," I said. "Yes."

"Care to see what I can do with 'Extended Exercises'?"

"Show me," I said, scowling, and handing him my copy of the Manual.

He turned about midway in the book, to some of the really tough ones. That's where the split lifts are described. There are only two of us in the Lodge who can split a lift. I would have bet my eyeteeth that Lefty wasn't up to it. He took two of the standard weights from my rack, the ten-gram, and to my astonishment, the twenty-gram.

"Let me see you do exercise number ninety-one," he said.

He had picked a tough one. It calls for suspending a weight over the substrate and making another equal weight describe a figure eight about the suspended weight.

I was not too proud to get a touch, and tapped the knob atop each weight with my forefinger. When the weights are of unequal size, the problem is to pick the one you will suspend. It may sound easier to suspend the heavier weight and move the lighter, but a little experimenting with them will quickly convince you that the reverse is true.

My lift was good and the ten-gram weight hopped off the table and hung between us. *"Now!"* I said to myself and brought the twenty-gram weight up and moved it carefully in the figure-eight prescribed in the exercise.

The lift nearly broke, and I had trouble getting both weights back to the top of my desk without a clatter. But I got them down, and that's what counts.

"Like that," I said, smugly.

He grinned at me, sticking out his sharp chin. Not even bothering to get another touch, he snapped the twenty-gram weight up between us and started maneuvering the lighter weight. I smiled to myself, knowing that he had picked the far harder lift. But he spun the ten-gram weight around in a couple precise eights and then flung it sharply at the ceiling, while lowering the twenty-gram piece to the desk.

The lighter weight made a sharp crack as it hit the plaster. I looked up, startled to see that it had actually dented the ceiling. This was an example of acceleration that was completely beyond anything I had ever seen. I kept my composure.

"You are supposed to lower both weights to the substrate," I said.

"Yeah," he grinned. "I must have slipped."

"Coffee?" I suggested, before he could show off any more.

Millie was sitting out on the steps, enjoying the cool of the night, when Lefty came out with me to grab a 'copter.

"He is absolutely fantastic," I said to her.

"I know," she said, giving me the picture of a CV peeper sitting stolidly on the brownstone steps, carefully keeping track of what was going on in my office. "He's going to make trouble. You heard about the money?"

"Money? No. What about it?"

She looked across at me, her round and lumpy features solemn. "He gave Keys twenty thousand dollars tonight. That's over fifty thousand that he's tossed in the pot since he became a member."

It could only mean one thing. He was gambling. Keys and I had been the big producers for the Lodge up to that point. As an attorney, I made my rare cases pay, and once in a while I could throw two or three thousand in the pot. Keys rarely earned as much as a thousand for a job. Yes, Lefty would be a problem.

I got a good idea of the dimensions of the problem when I went back to the Lodge. Keys was waiting for me.

"I've got a contractor coming tomorrow," he said.

"What for?"

"Time we air conditioned this place," he said. "This is an uncomfortable building to begin with, and soaking up heat all day makes it worse."

"New carpets next?" I grumped.

"No," he said, completely serious. "New equipment in the kitchen."

That decided me. The next night was Chapter Meeting. Our sudden prosperity certainly increased the turnout. We didn't have enough chairs, and a dozen or so Psis were standing around the edges of the room when I called the meeting to order. Of course, with so many telepaths in the Lodge, our improved financial standing could not be kept a secret. Keys and I can keep our thoughts to ourselves, when we think about it, but Millie can't.

A pathetic TK made an attempt for admission, but he was so wrought up that whatever powers he had shown to his sponsor before the meeting were sadly lacking when he was faced with the weights. I tried to be as kind to him as possible, and suggested that he come up to my office after adjournment.

The treasurer's report was read, and our fat balance got finger-snapping applause out of the membership. This was my signal.

"Our bank balance has improved a great deal in the last week," I said, when Keys had sat down. "We can thank Brother Bupp for this, and of course, we all do."

There was another snapping of fingers, our peculiar substitute for applause. It may not be as loud as the clapping of palms, but it had the same effect on Lefty. He blushed, but I could see he was pleased.

"Would Brother Bupp please come forward," I said.

He hadn't expected that, but he walked up to face me across the table where I was seated.

"The membership appreciates the contribution of your earnings, Lefty," I said. "As you know, though, our rules require that you not make use of your Psi powers to the detriment of a Normal. These funds are quite sizable and I would like you to tell us in what endeavor you have earned them."

"Nuts," he said.

I tried not to bristle. It never pays to show anger. "Millie," I said.

"He won that money shooting crap, Grand Master," she said quietly.

He turned on her savagely. "Keep out of my mind, you old bag!" he stormed at her.

"This is part of the price of living in a Psi community, Lefty," I explained patiently. "All of us are subject to peeping, and we just have to get used to it."

"Not me!" he said. "Tell her to cut that out!"

"Too late for that," I said. "The Lodge cannot tolerate your acquiring money in defiance of its rules. More than that, you are subject to discipline for having willfully violated our rules."

Keys Crescas was on his feet. "Just a minute, Maragon," he said hotly. "We have uses for that money!"

"No," I said. "Not gained by cheating in a crap game."

The membership began to buzz, and several conversations started in the seats. I banged my gavel on the table for order, and stood up to make sure I got it.

"We'll leave the question of spending this money to a later time," I said. "For the moment, Brother Treasurer, you are not to disburse it. But even more important, I want an immediate agreement out of you, Brother Bupp, that this business of using TK to tip dice will stop. Do you agree?"

"No!"

Fingers snapped all over the room. I had a revolt on my hands.

This was the moment. I could not afford to let it go a step farther. I rammed my most potent lift in under Lefty's diaphragm, and he dropped to the floor in front of me, his face contorted in pain.

He shook his head, clearing his senses, and looked up at me, fear and surprise etching his sharp features.

"I told you that our discipline is formidable," I growled at him. "Do you want another dose of that?"

"No!"

"Do you agree to stop tipping dice?"

He nodded. "Yes."

"Rise, Brother Bupp, and take your seat," I snapped. I glared out at the membership. "No Psi can make it tough for all other Psis by taking advantage of Normals. So Lefty got away clean in a few crap games. He can't continue to win like this without the suspicion becoming a conviction. And when the losers spot him for a TK, he'll get his throat cut, and all of us will bleed a little!"

A dead silence, sullen, but acquiescent, greeted my words.

It was significant that Lefty did not leave as soon as the meeting was over. I had already committed myself to a private talk with the applicant who had failed so badly in the meeting, and that took nearly half an hour. With a little gentle coaxing, he could show some TK. Not much, but enough to show that he had the Stigma and was worthy of some training.

Lefty and Keys were talking in the front room when I came down. Their talk came to a dead stop when I walked up to them.

I took Lefty to the door, both because I wanted him out of the building, and because it was opportune to say the required words.

"I am sorry . . . really regret —" I began.

"Can it," he said, sourly.

"Hear me," I said. "I regret that my duty forced me to take the action that was so painful to you. You are new in the Lodge. We take our obligations seriously. It is better that you know this now. But I count you a big enough man to accept that I did what I did as Grand Master and not as Pete Maragon."

"I'll make my own interpretation," he said, walking slowly down the steps. A dog trotted away from us as we came out. Suddenly the animal howled dismally and twisted sharply to bite at its flank. Then it ran wildly up the street.

"See you tomorrow night," I said.

"Sure," Lefty said. "You'll see me."

I was walking the sidewalk in front of the Lodge before dinner the next night, trying to duck the flying grit as skimcopter traffic went

by. Lefty got out of one in front of our brownstone steps and waited for me to walk up to him.

"There's another dog," he said, pointing to a cur that was sniffing its way along the gutter. He whistled sharply at the animal, and it raised its head to look at him.

Then it yelped sharply and broke into a frantic run, tearing up the street away from us.

"Dogs don't like you," I said.

"Not any more than people," Lefty told me acidly.

We went up the steps into the Lodge. He sat with me, Millie and Keys at dinner. I could not help but notice that we were served excellent steaks, something that had been outside our budget a week before. Perhaps I would regret it, but I can't keep silent on a matter like that. I had told Keys not to spend the money that Lefty had put in the pot.

"Since when can we afford steaks, Keys?" I demanded.

Lefty answered the question by throwing a sheaf of bills on the tablecloth. "This will buy all the steak we need for the year," he sneered.

Keys reached forward to pick up the money, but I was quicker. "This doesn't go into the bank," I said grimly. "I thought I gave you instructions on this matter last night!"

"We decided not to follow them," Lefty said.

I turned to face him across the table. "Who is 'we'?" I demanded.

He jerked his head at the man beside him. "Keys and me," he said.

I pointed a finger at him. "I'm sorry," I said, and hit him as hard as I could manage in the pit of the stomach with a lift. It knocked him back against the chair. But that was the last thing I saw.

The next thing I knew they were helping me up off the floor. I could feel my heart thumping in a wild fashion and there was a monstrous pain across my chest and down my left arm. I have enough general education to know the symptoms of a heart attack when I feel one. The pain was dwindling, and for a moment I had a surge of hope that I would not die.

"How do you like them apples?" Lefty demanded. "You lay another lift on me, and next time I'll pinch down tight and you'll never get up off the deck!"

"You!" I breathed. "You can't!"

"I practiced on dogs," he sneered. "But it's just as easy to do to people. You had better get used to the idea that you can't push Lefty Bupp around!"

They had me back in my chair. The dining room was still as death. There was no hiding from the Psis at the other tables what Lefty had done to me. As far as I could make out, he had so precise a power that he had clamped shut my coronary artery or stopped off my mitral valve. Either one would have starved my heart and brain for

blood in short order. Well, he had extended the dimensions of TK, that I would say for him. He had also completely shattered the foundations of my control over the Lodge.

He pointed a finger at me, about to speak, the freckles on his face prominent against the paleness of his own surprise and shock at what he had done to me.

"Wait," I said, finding it an effort to speak. I took a tremulous breath. "You have made enough trouble for one night, Bupp. I suggest anything you might say right now would only compound the injury you have done the Lodge. Unless," I added with bitterness. "Unless you intend to take over as Grand Master, too "

He dropped his hand. "No," he said in a choked voice. "Not that."

I turned to Millie. "Help me to my room," I said. "I'm shaky."

Millie got to her feet with that curious unbending action of her torso that Lefty had laid to a firm foundation garment. There was a dead silence in the dining room as she helped me out between the tables and to the stairs. We climbed them together.

"My office," I said. "I was grandstanding a little."

"How *do* you feel, Pete?" Millie asked me, as she closed the office door behind us.

"Like a busted leg. But I'll live. He's a bruiser."

"He's pure poison," she answered hotly, telling me that I still had her loyalty.

"Pure gold," I answered, to her surprise. "He has TK such as this Lodge has never seen before. Raw, brute strength of mind. What will it be when it has its training?"

That shook her up. "You're not thinking of actually training that monster?" she demanded.

"Of course," I said, easing down into my complaining swivel chair. "Sit down for a moment. I need to think out loud."

I took some more deep breaths. They seemed to help the continuing pounding of my heart. The pain in my arm had subsided to a dull throb, but it was receding.

"I have to know something," I said to Millie. "Where do I stand with the membership on this thing? Take the members in the dining room as typical."

Millie Pugh shook her head. "There was a welter of thoughts," she said. "A lot of alarm and concern, but the undercurrent is that Lefty is taking charge."

"They are in favor of that?"

"The money looks good," she said. "This is the first time a lot of them have seen how the Lodge might find a way to stand on its own feet."

"In a weird sense, they're right," I said, to her surprise. "The way things have been going, the Lodge hasn't been worth its salt. In theory we pool our incomes. That would

be all right if the average publicly exposed Psi could make a decent income. But Normals don't think that way. The result is that Psi powers, far from giving Psis a better grip on the economic system, have a negative economic bias. If an institution doesn't have a function, it doesn't persist. The Lodge certainly hasn't shown any economic function so far. That's a sure way for it to fall apart on economic grounds alone."

Millie came around the desk to put her hand on my shoulder. "But we must stick together, Pete," she told me. "Without some control over them, half our members will run wild, and all of us will pay the penalty."

I nodded, putting my hands on hers. "Yes, but it's the same with the Stigma as with the Lodge, Millie," I told her. "We think Psi powers are an important mutation, even if they were induced by an atomic accident. But Psi powers have to show survival powers in the economic system, too, for that is our environment. If they don't, Psis won't survive as a class. The gene will be squeezed out of existence."

She shook her head, looking more solemn and dowdy than usual. "There must be a way," she said.

"There is," I smiled. "Run along and let me work on it."

When she had gone, I got out the directory and looked for the name Jacobine among the Physicians. There was only one, a Vincent Jacobine. I dialed his home number, feeling that he was not the kind of doctor that went out on house calls.

He answered the call himself, without the usual privacy fuss of keeping his screen blank. He recognized me at once.

"Hello, Maragon," he said. Then: "What the devil do you want!"

It had only taken him a moment to remember that I had the Stigma and that I had nearly gotten him into a pack of trouble a week before.

"Your professional help," I said.

He brought his brows down in a frown and stayed the hand that was about to cut the image. "For yourself?" he demanded.

"Yes. I've had some kind of a seizure."

I'll say one thing for him, he didn't put me off till morning. "Name it," he said. "My office, or the emergency room of Memorial Hospital, whichever you think the better."

"I'm recovering and largely out of pain, Jacobine," I said. "Let's try it in your office."

"Ten minutes," he said, and as I nodded, he cut the image.

Not a soul spoke to me as I walked carefully down the two flights of stairs and signaled a 'copter. Eyes had avoided me all the way. Things were in a complete mess.

I wasn't any more than ten minutes flying uptown to the stylish location of Jacobine's office, but he was at his office door, already in a gown, waiting for me.

"When did this happen?" he asked me.

"Twenty minutes ago, Doctor," I said, thinking of him now in his professional capacity. I blacked out for a moment, but recovered rather quickly. Still a leaden pain in my chest and somewhat in my arm."

You know what it's like, if you've ever had an electrocardiogram. He had me stripped to shorts in a minute or so and was rubbing the conductive salve on the six points while asking me my age and a little of my medical history. Then all was quiet while he hitched up the leads and made the various readings.

He pulled a chair up beside the leather cushioned table where I lay, and drew the strips from the EKG recorder. "This is odd," he said.

Not really knowing what the scribbles meant on the tape, I looked at them anyway.

"You have had some kind of a shock," he said to me. "This looks like the EKG of a man who's been subject to an intense electric shock. There's been no permanent damage to the heart muscle, and your heart seems to be operating normally in the mechanical sense that it's pumping in rhythm and at full force. But see here," he said, pointing to a squiggle. "That's trauma. You've had a jolt—a powerful one."

He looked over at me. "What happened, Maragon? Surely you know."

"Oh, of course," I said. "May I get dressed?"

He nodded, taking the leads from my chest, wrists and ankles, and swabbing at the grease with a tissue. I put my clothes back on. "It was TK," I said.

"Stop right there!" he snapped. "I'll treat you as a human being, Maragon. Or as one almost human, but I want no part of your Stigma troubles!"

"This isn't what you think," I said. "Please hear me out." He subsided a little, but anger still clouded his features. For a man of science, he had a very low boiling point.

"You remember Lefty?" I began.

"Yes."

"We've recruited him as a member of our Lodge. A group of Psis here in New York."

"I've been hearing about it," Jacobine said, admitting that he had done some checking on me. "You're the big cheese or something."

"Grand Master," I corrected him loftily. "Or was until half an hour ago. Looks like Lefty might be taking over."

He shook his head. "I told you I wanted no part of your Stigma troubles, Maragon."

"The way he did it will interest you," I said. "What would you say

if I told you that in just a week of training and practice he has extended his telekinetic ability to the point where he could cause this trauma to my heart?"

"Nonsense," he said. "How could he do that?"

"I think . . . I really don't know enough about medicine to be sure . . . but I think he closed down on my mitral valve and cut the flow of blood off from my brain. If he had, would that account for what the EKG shows?"

He shrugged. "It's one possible explanation," he conceded. "But I don't believe it's possible."

"Oh, it's possible," I said with a grin. "I can do it to you, if I want to. But it took me years of study and practice to become that proficient, and I'm not even certain what I do. I know that a certain lift, fired a certain way, can make people drop. I think Lefty had a much clearer image of the insides of my heart than I have. He started out to study medicine—I don't really know how far he got with it. But he didn't fumble around feeling for parts of my anatomy. He dropped me first crack out of the box."

"Hypnotism, or something like that," he scoffed. "I just don't believe that . . ."

"Did he do any permanent damage to me?" I demanded.

"No," Jacobine said "Nothing permanent. You'll have some symptoms for a fews days, like a muscle that was seriously fatigued."

"Then it wouldn't harm you if I were to do it to you, right now?" I said, leaning back against the operating table.

He stood up, sticking out his chest. "Don't try to bluff me, Maragon!" he snapped.

I wasn't bluffing. I did my best, and held the lift firm. He staggered. It wasn't as if Lefty were doing it and had the valve locked tight. But I was seriously interfering with the flow of blood through Jacobine's heart, and his brain was beginning to reel from lack of oxygen. He fell into the chair with a thump and I let up.

"Bluff?" I said quietly.

"No!" he said. "Please, no more!"

"That's a tenth of what Lefty can do," I said. "I want you to meet him. Here, in your office."

"What for! Another dose of that? Get out of here!" he stormed, beginning to feel his old self again.

"I have a medical reason," I told him. "Let's make it this same time tomorrow." He looked at me, furious, but nodded.

Things were very quiet back at the Lodge. I was weary in a way I could not remember, and bed felt wonderful. I should have been shaken up at the way I was avoided when I returned, but there were high hopes in my heart, and I could not get upset.

I slept late again. A session with Lefty seemed to keep me in the sack. But, as I had done a week before, I was ready and waiting for his arrival at dinner.

He came, of course. It would be beyond human nature for him not to make an appearance after what he had done to me. I stopped him as he got out of his 'copter.

"Lefty," I said, as he was about to walk past me and run up the brownstone steps.

"We've got nothing to say to each other, Maragon," he said, sticking his pointed chin out at me.

I urged him up a few steps, away from the flying grit of skimming traffic. "Yes, we do." I corrected him. "You did some damage to my heart last night. The doctor wants to know just what you did. We've got a date with him, right after dinner."

"I didn't hurt you!" he said hotly. "All I did . . ."

"Yes?" I said. "Do you *know* what you did?"

He paused for several breaths. "I think so," he said. "I clamped down on your mitral valve. Not too long, though."

"The doctor doesn't quite agree," I said. "He wants to talk with you about it. And how can you be so sure what you did? What do you know about my heart?"

"I told you I had gone to medical school," Lefty said.

"How far did you get?"

He shrugged. "Finished the class work," he told me. "I have the degree. I've just never interned."

"That's something," I decided. "And you'll have dinner with Millie, Keys and me. The less talk the better." I wasn't above playing a little politics, if I had the chance.

"All right," he agreed sourly, and we went in together.

Vincent Jacobine was waiting for us when Lefty and I reached his office, but he was in a business suit. "I think you should put on your gown, Doctor," I said.

"This isn't a medical problem, is it?" he demanded. "You've got me tangled up in your rotten Stigma troubles."

"Hey!" Lefty exclaimed. "I know you!"

"Three thousand dollars worth!" Jacobine said tartly.

"Yeah," Lefty said, chastened.

"I found out a little more about Lefty," I told Jacobine. "He finished medical school, and he's ready to do intern work. I think I can interest you in seeing that he does that work in one of the hospitals to which you are accredited."

"What for, in Heaven's name?" Jacobine demanded.

"Put me back on your table, with the EKG hooked up to me," I suggested. "I think Lefty can open your eyes."

Lefty was as ready to protest as the doctor, but I got them both to shut up by starting to peel off my shirt. Lefty showed that medical school hadn't been completely wasted on him by helping with his one good hand to get me ready for the EKG machine.

When I was on my back, at last, and hooked up, I turned my head to Lefty. "Do it again," I said. "But not as hard as last night."

He shook his head. "I thought you said it had done you some damage," he protested. "I don't want to harm you."

"Nothing permanent," I said. "Just touch the valve." I swung back to Jacobine. "Are you hooked up to read what happens to my mitral valve?"

"I will be," he said, turning the switches on the console. "Go ahead!"

The pain flickered briefly and went away. It was distinctly unpleasant.

"I'll be switched!" Jacobine said. "Look there."

Lefty crowded over his shoulder, able by his training to interpret the squiggles on the tape. "I did that?" he said with quiet wonder. "Yes, I did!"

"Make him explore my whole heart, doctor," I suggested. "I think he can put pressure wherever he wants. Can't you tell which of the major arteries or valves he's lifting?"

Jacobine got the point, and gave terse directions to Lefty. The lifts were brief, and not all of them hurt, but the whole performance left me with a horrible hollow feeling, a feeling of dying right there on the table.

From time to time Jacobine went over me carefully with his stethoscope. "You're all right," he said finally. "He has a delicate touch. But what does it mean? It's a medical curioisity, Maragon. What's the point?"

"You can let me up now," I said, and they worked together to remove the leads and clean me up.

"You are a surgeon, aren't you, Jacobine?" I said, putting on my shirt.

"Of the heart," he agreed.

"And you must have the devil of a time, cutting into a pump that's running. How much of the time are you working in a dry field?"

He shrugged. "Always. There are a number of procedures that are impossible because we can't clamp arteries shut."

"Here's your clamp," I said, pointing to Lefty. "With the right kind of practice, I think Lefty can help you extend the practice of heart surgery by many operations. At least it is worth a try. And if not the heart, think of other operations where a clamp *before* the cutting began would simplify affairs."

"I don't want any part of it," Lefty said sullenly. "I tossed medicine over!"

"Not so quick," I said. "Jacobine makes money faster slicing up sick people than you can ever make it tipping dice. Why not cut yourself in for a part of his fees? You have as much right as the anesthesiologist, don't you? Wouldn't you?"

"That's right," Jacobine said, warming to it. "This is a new frontier in medicine. Where did you get your degree, Doctor?"

Oh, that was a telling blow!

"Doctor?" Lefty said.

"You said you had the degree," Jacobine said quietly. "Now all we have to do is get you admitted to practice. Where did you say you got it?"

"Right here," Dr. Bupp said. "Columbia. But I can't . . ."

"Oh, yes you can," Jacobine said. "And I can *force* you to!"

That got a rise out of both Lefty and me.

"Force?" I said. "That's a real twist!"

"What does he want me to do?" Jacobine said. "Take some time on the TV to advertise the fact that he is a TK? Just let me show his face on the screen, and he's rolled in his last crap game! I think he'll work with me!"

He turned back to Lefty. "I could offer you a partnership, Doctor," he said. "Would that be sufficiently dignifying?"

Lefty looked at me. "Is this what you figured on?" he asked me.

I nodded. "Psi has to be worth *something,*" I said. "So far we haven't seen enough of it to be worth anything in the marketplace. Well, you have *more,* and *better.* It's something you can sell, the way Keys sells his ability to open locks. It's time you joined the Normal community."

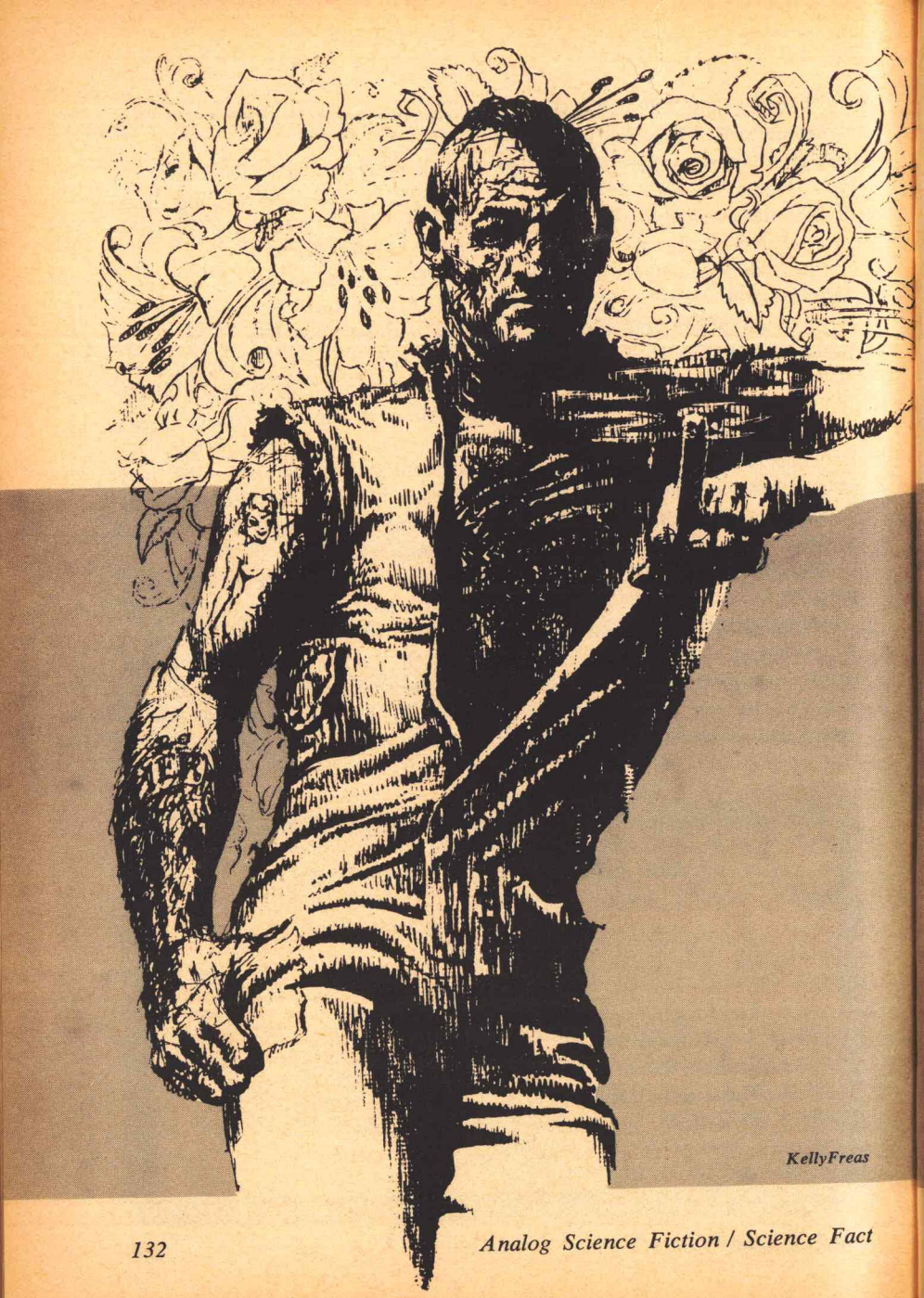
Lefty looked back at Jacobine. "If this is as good as you think," he began. "If it's really something I can sell, I don't think I want to cut you in on it. I'll work for you by the case. I think I can sell this to half the surgeons in town!" ■

THE ANALYTICAL LABORATORY

MAY 1965

PLACE	STORY	AUTHOR	POINTS
1.	The Prophet of Dune .... (Conclusion)	*Frank Herbert*	1.82
2.	Trouble Tide	*James H. Schmitz*	2.2
3.	The Captive Djinn	*Christopher Anvil* ...	2.41
4.	Planetfall	*John Brunner*	3.45

THE EDITOR



KellyFreas

Say it with Flowers

WINSTON P. SANDERS

Flowers was not one to be classified as "sweet"—but he was tough and responsible. Asterites had to be to stay alive anyway. And he did make an excellent courier!

Whiskey Johnny was eighteen hours out of Sam's when her radar registered another ship. There was no doubt about that. A natural object, a meteorite or asteroid tumbling through the Belt, even a comet falling inward from near-infinity, could never have had such a vector as the computer printed out. And the vessel could hardly be anything but North American: hostile.

The pilot uttered expert obscenities. They bounced around his ears, in the tiny, thrumming cockpit where he sat. He punched for distance and velocity at closest approach, as if the keys under his fingers were noses in a barroom battle. The answer was unpleasantly small. However, that assumed he himself continued acceleration. If he went free . . . yes, better. The enemy craft— a big one, the radar said—was itself under power, so it would gain speed with respect to him. . . .

To reduce his detectability, he cut the Emetts and throttled his nuclear generator down to a minimum. The scoopship yielded to the pull of the

sun, shrunken and brilliant to starboard. Her path did not curve much. She had already built up enough velocity to swing in a flat hyperbola that would take her out of the Solar System were it not modified. But she was, now, in free fall.

So was her pilot, since he had shut off the internal field generators. He floated in his seat harness, in a quiet so deep and sudden that he heard the blood beat through his own veins. A fan came on automatically, to keep fresh air moving past him, but that whirr only emphasized the silence. He peered out the inertrans canopy as if to see the patrolling warship from Earth. Of course he couldn't, at those distances. Stars crowded the blackness, unwinking and winter-cold; the Milky Way girdled the universe with diamond dust; Jupiter blazed enormous, not many astronomical units to port.

No asteroids were visible to the naked eye. Those clutstered in the vicinity of Sam's lay far behind. Pallas, where *Whiskey Johnny* was bound, lay hours ahead, even at the high acceleration of which a scoopship was capable. As for the rest of the Belt—well, there are thousands of worldlets, millions of meteorites, but space is huge and they spread thinly.

The pilot fished a cigar from his breast pocket. Presently the cockpit air was as thick as that of Venus, and nearly as poisonous. He didn't mind. He had spent half of his forty Earth-years digging and building on raw rocks where only the tough could hope to survive. His face was so craggy that the assorted scars looked natural. Half open, his frayed old Long John revealed a chest like a barrel; through the hair showed an enormous tattoo in enormously bad taste, a comet which was also a flag. The naked woman who danced on his right biceps was probably in worse taste yet. His left forearm was shaven, which indicated that the design of roses and lilies inked into its skin was very recent. Some people never grow up.

He puffed hard. It was a strain, waiting. He tried to think of matters more pleasant than the war. Like, say, that bender he went on back at Sam's, shortly before he started on this mission. Trouble was, the wingding had been too good. Several girls . . . yeah . . . and then afterward Billy Kirk showed up with a bottle in either fist . . . and then everything was blank, until he woke with volcanoes in his head and those silly posies on his arm. *Why* had he elected that design?

Well, there'd be a doctor at Pallas who could take it off for him. And plenty of booze and wild, wild women. The colonists had fleet enough to defend their capital and its supply lines. Otherwise they could only hold strong points like Sam's. But they were scattered through millions of kilometers, on hundreds of asteroids; their ships were manned with deadly skill; little by little, they wore down their one-time masters. Meanwhile, on Earth, their diplomats intrigued in various capitals. Other nations would bring pressure to bear on North America. Eventually the Republic would be free to shape its own destiny.

The pilot didn't think in any such high-flown terms. He'd just gotten sick and tired of being taxed to support a bureaucracy which seemed interested only in regulating his life for him.

The radio buzzed. A call on the universal band.

"Huh!" he growled. "I'm on to that stunt, buster. You broadcast, and I turn up my receiver, and you detect that." He went on to suggest, in some detail, what the American could do with his 'caster.

Although—wait! The signal was coming in much too strong. Either the warship had gotten close, or it was sending a maser beam. Sweat prickled forth on his skin. He got busy with his instruments.

Both cases were true. The ship had locked a beam onto his vessel and it was coming about to make rendezvous.

So its sky-sweeping radars had picked him up after all, and never lost him again.

No choice, after that, but to answer. He flipped a switch. "Scoopship *Whiskey Johnny* receiving call," he said in a flat basso.

"NASS *Chicago* transmittin'. Prepare to match velocities."

"What the double blue hell is this? I'm minding my own business."

"I doubt that," drawled the Texan voice. "You're from Sam's for Pallas. Don't bother denyin' it. We got plenty good data on your path. So you're a courier."

"You're out of your ever-loving mind," said the asterite, in rather more pungent language.

"What else would you be, son, in a small fast boat like that? Listen, don't try to get rid of your dispatches. We're near enough to register anything you pitch out the air lock. As of this minute, you're a prisoner of war and subject to discipline."

Kirk warned me about narcoquizzes. And if I keep on claiming to be a civilian, I could be shot as a spy.

"Identify yourself," said the voice.

"Lieutenant Robert Flowers, Space Force of the Asteroid Republic," the pilot snapped.

Briefly, furiously, he considered making a run for it. He could outaccelerate a capital ship by several gees. Probably he could evade a missile. But no. The warhead needn't burst very close for radiation to kill him. Or a laser gun might track him and gnaw through to his engine. Flowers cursed some more and donned the battered officer's cap which put him legally in uniform.

"Well, you rebels call it a republic," said the Texan. "O.K., punch these here instructions into your autopilot. And then you might as well relax. You'll be locked away for quite a spell, I reckon."

The cruiser was a great ovoid, dully agleam in the harsh spatial sunlight. Rifles poked dinosaurian from their turrets, missile launchers gaped like moths. The scoopship edged inward, dwarfed.

"Cease drive," came the order. They weren't taking chances on a suicide plunge.

"Smelly" Flowers obeyed. He stuck a fresh cigar between his teeth and got up a good head of steam.

A geegee beam reeled him in. A boat hatch opened. He felt the slight shock and heard the clang as *Whiskey Johnny* entered a cradle. Now steel enclosed him. Air whistled back to the compartment. Four bluejackets appeared, and motioned him out. He slid back the canopy, which he had already unsealed, and jumped down. Smoke gushed from his mouth, into the nearest face. The man gasped and staggered.

"All right, funny boy," said the ensign in charge. "Give me that."

"Huh?" cried Flowers. "Can't a joe even have a smoke?"

"Not if I say he can't." The ensign yanked the cigar from the prisoner's lips, threw it to the deck and ground it under his heel. "Frisk him, Justus. Iwasaki, get his dispatches.

Flowers submitted. *I could take all these pups in a rough-and-tumble, and Judas, I'd love to,* he thought. *But their sidearms are a bit much.*

Iwasaki, in the cockpit, lifted a small steel tube. "Would this be it, sir?"

"I suppose so. Toss." The ensign caught it. "Commander Ulstad will know. But search the whole craft and report anything unusual. You others come with me."

They went unspeaking down long bleak corridors. The crewmen they passed stared at Flowers—for the most part, without the ensign's hostility. This had been a gentlemen's war, on the whole, and the asterite cause had its sympathizers in North America. After all, the colonists were American, too, and the rebellion was for the sake of that individual freedom to which lip service was still paid at home.

Probably the ensign was impatient to get back to his girl.

A murmur went through the metal, a slight shiver was added to the steady one gee of the interior field. The ship was under weigh again, returning to its patrol orbit.

At the end of the walk, Flowers was urged through a door. He found himself in a small office. It was furnished with proper naval austerity, but a few scenic views of Earth were pasted on the bulkheads, and the desk bore pictures of wife and children. The man behind was lean, erect, gray at the temples, his long face reasonably kind.

However, onto this cabin there opened an interrogation lab.

The ensign saluted. "Reporting with prisoner, sir. He had this aboard his boat."

"Let me see." Commander Ulstad —must be him, and he must be Intelligence—reached for the tube. He unscrewed the cap and shook out a scroll of shiny plastic. Spreading it on his desk, he looked for a moment at the blank surface.

"Yes, evidently his dispatches," he murmured. "Magnetic, what else?" He rose and went into his laboratory. Flowers saw him thread the scroll into a scanner. The machine clicked to itself. A screen flickered with shifting dots, lines, curves.

Flowers knew, in a general way, how the system worked: analogously to an old-fashioned tape recording. The visual pattern of the message was encoded in a series of magnetic pulses which imposed a corresponding pattern on iron particles embedded in the plastic. Of course, for military purposes you first enciphered the message and then put a scrambler in the recording circuit. The result couldn't even be seen, let alone cleared, without a descrambler in the playback.

Ulstad frowned and made adjustments. Realization jarred through Flowers: *He expects to project the thing. Blast, and befoul! Somehow they've learned our scrambler patterns.*

The officer tried several other settings. Nonsensical images gibed at him. Flowers sank into a chair. A slow, happy grin spread across his mouth. So the Republic had gotten wise and adopted a new code, huh? Gr-r-reat!

"Well." Ulstad returned. Excitement barely tinged his voice. "We seem to have caught a rather big fish." He punched the intercom. "Commander Ulstad here. Get me Captain Thomas."

He sat down and held forth a pack of cigarettes. "Would you like a smoke, Lieutenant Flowers?" he invited.

The asterite leered at the ensign, who stood in the doorway with his guards. "How about that, chum?" he said, and accepted. "Thanks."

Ulstad turned on a recorder. "You understand I have to ask you some questions," he said. "Please state your correct name, rank, and serial number."

"Robert Henry Flowers, Space Force lieutenant, number . . . uh, I never can remember the mucking thing." He read it off his ID bracelet. That was one more bit of junk he meant to throw into a sunbound orbit, when the war was over and he could be his own man again.

Ulstad smiled. "You don't look like anyone named Flowers," he remarked.

"Yeah, I know. That's how come I've got this busted nose and such. You should'a seen those other bums, though. I don't take being razzed."

"You won't be. I have every intention of treating you with the respect due a commissioned officer." The intercom buzzed. "Excuse me."

The cruiser's captain spoke out of it. "Yes, Commander, what do you want?"

"About this courier we just captured, sir," Ulstad told him. "I can't read his dispatches. That means the enemy has changed the scrambler code again, and no doubt the ciphers as well."

"So?"

"So in the first place, sir, the enemy probably realizes that we have cracked his last set of codes. He doesn't change them often or lightly, when word about new arrangements has to be sent over lines of communication as long as his. Therefore, our own GHQ has to know. Then second, this particular message must be delivered for analysis as fast as possible. I respectfully suggest that we shoot a speedster off to Luna Base at once."

"Um-m-m," grunted the captain. "Don't like that. Too many asterite frigates skulking around."

"Well, then, we'd better make rendezvous with a ship able to defend herself, and send the message by her."

"We've mighty few ships to spare, Commander." The captain paused. "But this is important. I'll contact CINCOBELT when our position allows, and they'll see what can be done."

"Thank you, sir. Over and out." Ulstad turned off the intercom.

His gaze went to Flowers, who had gone rigid, and he nodded. "Yes," he said, "we have computers at Luna Base which can discover any scrambler pattern and then go on to break any cipher. Not too easily, I confess. You have some fiendishly clever people in your code section. But the machines can always grind out the answer, by sheer electronic patience."

Flowers recollected some remarks overhead when he reported for briefing. He hadn't paid much attention. But . . . yeah, asterite Intelligence must suspect the truth. There had been comings and goings of late, couriers bringing secret word from Pallas to Sam's as well as to other Republican centers. Only the higher-ups knew what that word amounted to. A warning?

His bemusement vanished in a puff of indignation. Space was too vast for the North Americans to blockade very effectively those places too well-armed to capture. Most boats got through. Why did *his* have to be among the unlucky ones?

"I suppose you have no idea what message you were conveying," said Ulstad conversationally.

"Think I'd tell you if I did?" bristled Flowers.

"Yes, under drugs and brain stimulation," said Ulstad.

"Well, I don't know!"

"We'll find out."

"You rust-eaten mutant—"

"Please." Ulstad waved back one of the guards, who had taken a forward step with anger on his face. His own tone stayed mild. "The process doesn't hurt or do any damage. We're fighting this war by the Geneva convention, the same as you people are. But still, we consider it the suppression of an insurrection: which gives us the right to use police procedures. Your interrogators do likewise to our boys, without that legality."

Flowers finished his cigarette and flipped the butt into a disposal. "You can stuff those quibbles," he said. "Get on with your dirty work so I can get out of here."

"What's your hurry, Lieutenant? You'll be aboard the *Chicago* for a number of hours, till we can arrange your transfer to a supply ship. And it will only be going to Vesta, where you'll sit out the war in a prison camp. Dull place. We'll do our best to make you happy, on this ship. Cool your motors. Enjoy our hospitality. Would you like some coffee?"

Flowers swallowed his rage. Doubtless Ulstad was trying to disarm him, but the fellow seemed decent at heart. "Druther have booze," he said.

"Sorry. Me, too, but regulations." Ulstad crossed his legs and leaned back in his chair. "Let's get acquainted. I'm always interested to meet a colonist. You weren't born out here, were you?"

Flowers had no wish to spill military information; not that he had much. But by gabbing a little while, he postponed the humiliation of narco. Besides—"Brooklyn," he said. "Moved to space at eighteen. Uh, my parents are still alive. You wouldn't know about them, would you?"

"'Fraid not. I'm from Wisconsin myself. Your folks must be all right, though. The government doesn't discriminate against anyone who happens to have rebel kinfolk, as long as they keep their own noses clean." Ulstad kindled another cigarette. "Really, we're not the monsters your more overheated propagandists claim. In fact, our society is a good deal more benevolent than yours."

"Yeah. So benevolent that I felt smothered, every visit I made back home."

"*De gustibus non disputandum est*, which personally I translate as 'There is no disputing that Gus is in the east.' You weren't a Jupiter diver in civilian life, I am sure of that."

"No, a rockjack. Construction gang superintendent, if you must know. We only use scoopships for messenger boats because they're fast. Their regular pilots are too good for that kind of job. Do better at captaining warcraft."

"How well I realize that," Ulstad sighed. "I wonder, though, why you don't send more stuff directly by maser."

Flowers clammed up.

Ulstad grinned. "All right, I'll tell you," he said. "First, our side has too good a chance of intercepting a beam; and evidently your Intelligence suspects we can break your cryptograms. A courier flits away from the ecliptic plane and probably makes a safe trip. Second, if we really can use your own ciphers, and you relied too much on radio, we could send misleading messages to your commanders." He shrugged. "Of course, the courier system ties up boats that might be put to better use elsewhere. But then, it ties up a lot of our fleet on patrol duty, so honors are even."

"Not quite," Flowers snapped. "Especially after the last battle."

"The engagement near Sam's you mean? I take it you were there?"

"I sure was, chum."

"In what capacity?" drawled Ulstad.

Flowers crammed on a deceleration vector. "Never mind. It's enough that you took a licking."

"We'd at least like to know what happened to those of our ships which never reported back. Were all of them utterly destroyed?"

"I suppose so."

Ulstad leaned across the desk. "Even if you weren't told officially, you may have heard something." His smile was wistful. "I'm interested for private reasons. A nephew on the *Vega*."

"Sorry. I can't help you, though."

"We'll find out about that."

"Go ahead!"

"Very well, Lieutenant." Ulstad rose. "If you please?"

Flowers tensed himself. His entire being rebelled. But he stole a glance behind, and saw that the ensign would be only too glad to use force. Like, say a pistol barrel against the prisoner's head.

Flowers got to his feet. "Look me up after the war," he invited. "I know some back alleys where the cops won't interfere."

"I might at that," said the ensign.

"Control yourself, young man," said Ulstad. He led the way into the lab. "If you will lie down on this couch, Lieutenant—"

The anesthetic shot took rapid hold and Flowers spiraled into a darkness full of voices.

Afterward he lay with closed eyes, letting will and strength creep back. He must be recovering faster than was usual, because he heard Ulstad say, as if across a black gulf:

"Nothing to speak of. He's what he claims to be, a big dumb rockjack who ordinarily commands an engineer group. I suppose they dispatched him precisely because he doesn't have any worthwhile information. And I hope the poor devil doesn't go stir crazy in prison camp, with so few inner resources."

"What'll we do with him now, sir?"

"Oh, lock him in a spare cabin. How long will he be on your hands?"

"I checked that, sir. We'll make contact with the transport in five hours."

"He'll only need one meal from us, then. Inform the cook. Regular mess time is O.K., three hours hence." Ulstad chuckled. "Maybe I do him an injustice, calling him an ignorant boor. His cussing under dope was sheer poetry!"

Save for a bunk, the cabin was bare. Tiny, comfortless, atremble with the energies of the ship, it surrounded Flowers like a robot womb. That was his first thought as he struggled back to consciousness.

Then, through the racking stutter of a pulse run wild, he knew that hands lifted his head off the deck. He gasped for breath. Sweat drenched his coverall, chill and stinking. Fear reflexes turned the universe into horror. Through blurred vision, he looked up at the bluejacket who squatted to cradle his head.

"Flip that intercom, Pete!" the North American was saying. "Get hold of the doc. Fast!"

Flowers tried to speak, but could only rattle past the soreness in his throat.

The other guard, invisible to him, reported: "The prisoner, sir. We heard him call out and then fall. He was unconscious when we opened the door. Come to in a couple of minutes, but he's cold to touch and got a heartbeat like to bust his ribs."

"Possibly cardiac," said the intercom. "Carry him to sickbay. I'll be there."

Flowers tried to relax in the arms of the young men and bring his too rapid breathing under control. That wasn't easy. When they laid him on an examination bench, amidst goblin-eyed instruments, he must force his spine to unarch.

The medical officer was a chubby man who poked him with deft fingers while reeling off, "Chest pains? Shortness of breath? Ever had any seizures before?" He signaled an orderly to attach electrodes.

"No. No. I ache all over, but—"

"Cardiogram normal, aside from the tachycardia," the doctor read off the printouts. "Encephalogram . . . hm-m-m, hard to tell, not epileptiform, probably just extreme agitation. Neurogram shows low-level pain activity. Take a blood sample, Collins." He ran his palms more thoroughly over abdomen, chest, and throat. "My God," he muttered, "where did you get those tattoos?" His gaze sharpened. "Redness here, under the chin. Sore?"

"Uh-huh," whispered Flowers.

"What happened to you?"

"I dunno. Started feeling bad. Blacked out."

A chemical analyzer burped and extruded a strip of paper. The orderly ripped it off. "Blood pH quite high, sir," he read. "Everything else negative."

"Well—" The doctor rubbed his chin. "We can't do more except take an X ray. A warcraft isn't equipped like a clinic." He nodded at Flowers. "Don't worry. You'll transfer to the

other ship in half an hour or so, and I understand she's going almost directly to Vesta. The camp there has adequate facilities. Though you look a little better already."

"What . . . might this . . . 'a been?" Flowers managed to ask.

"My guess," said the doctor, "is an allergic reaction to something you ate. That can overstimulate the vagus nerve and produce these other symptoms. You asterites never see a good many Terrestrial foods, and this navy prides itself on its menus. I'll find out what went into your dinner, including seasonings, and give you a list. Avoid those things, till the culprit has been identified, and you may have no more trouble."

Flowers lay back while they X-rayed him. That was negative, too. The doctor said he could stay where he was, under guard, till transfer time. He stared at the overhead and concentrated on getting well.

The *Chicago* slid into orbit and halted her Emetts. The doctor came back with his list. "You appear to be in much better shape," he said. "Got some color, and your breath and pulse are nearly normal. Think you can walk?"

"I'll try." Flowers sat up. Slowly he swung his legs off the bench, put feet to deck, and raised himself. He staggered. Leaning on the bench, head hung low, he mumbled, "I get dizzy."

"O.K., we'll take you on a stretcher," said one of his guards. "Captain's orders are to get you out fast so this ship can proceed to where she belongs."

Flowers would have enjoyed the ride had there not been such a tension gathering in him.

At the air lock where they went, two sidearmed men from the transport waited. "What the hell?" exclaimed the right-hand man.

A bearer related the situation. The newcomer made a spitting noise. "You're mighty tender with a rebel," he said.

"Oh, ease off, Joe," said his companion. "They're not bad fellows. Hell, after we've beaten some sense into their thick heads, I've half a mind to quit the service and come live in the Belt myself."

Joe spoke a bad word, but took his end of the stretcher. They passed through a jointube, into the boat. As Flowers had expected, this was merely a gig, with a single cabin where the pilot sat in the forward end. You don't bring full-size ships together if you can avoid it: too ticklish an operation. The freighter lay several kilometers off; he glimpsed its bulky shape through a port, among the constellations.

His new guards put his stretcher down in the aisle between the seats, dogged the air lock, and retracted the jointube. The pilot tickled his controls and the boat slid smoothly away from the *Chicago*. The bluejackets returned to sit on either side of their prisoner.

"How you feel?" asked the man who had sympathized.

"Like a court-martialed kitten," Flowers whispered.

The man laughed. His companion still looked sour.

"I'd like to try sitting, though, if you'll help me," Flowers went on.

"Sure you ought to?"

"Well, I might be able to board your ship under my own power, but I'd better practice first."

"O.K. Gimme a hand, Joe."

Both guards bent close to the lying man. Flowers laid an arm across either pair of shoulders. They raised him.

His hands slid to the backs of their necks. His gorilla arms cracked the two skulls together.

They lurched, stunned, blood running from their scalps. Flowers snatched the nearest pistol from its holster and sprang into the aisle.

"Hands up or I shoot," he rapped. To the pilot: "Cut the drive. Now. Get out o' that chair."

Oaths ionized the atmosphere. He grinned. "I'm a desperate man," he said. "As soon kill you as look at you. Maybe rather. Git!"

The pilot got. Flowers approached him in the aisle. His hands were aloft, his belly exposed. Flowers' unoccupied fist rocketed forward to the solar plexus. As the pilot doubled, Flowers hooked him in the jaw. He fell.

The man called Joe reached for his gun. He was slow about it, and Flowers clopped him. With some regret, the asterite gave the same treatment to the other man, who had been nice to him. Before consciousness could return, he trussed all three with their belts and shirts and harnessed them in chairs.

The radio buzzer sounded hysterical. Flowers vaulted to the pilot board and clicked the receiver switch. "What's going on there?" bawled a voice.

"Listen," Flowers said. "This is the asterite. I've got your men prisoners. They're not hurt to speak of. But I'm bound home. You can stop me, sure—by destroying this boat. That'll cost you three North American lives, because I'm not issuing any spacesuits. It don't seem like much of a bargain. Better just say good riddance to me."

Words squawked. Flowers used the time to swing the gig around and apply a vector in the general direction of Pallas. Later he would calculate an exact path; right now he wanted nothing more intensely than distance between himself and the guns of the *Chicago*.

His victims awoke. He made them speak, to prove to their buddies they were alive. Cruiser and freighter dwindled beyond naked-eye vision. Stars blazed everywhere about.

Ulstad's tones leaped over the kilometers, cool and almost amused. "I'm not sure we ought to let a man of your capabilities escape, Lieutenant. My fault. I took you for a stupid laborer. I should have re-

membered, stupid people don't survive in space."

Flowers gulped. "I'm no prize, Commander. But you got three good men here. I'm sorry I had to be rough with them, and I'll treat them as decent as I can."

"How did you manage this caper?"

"Tell you after the war."

Ulstad actually laughed. "Very well," he said. "Seeing that we have no alternative except to fire on our own men, Captain Thomas has decided to let you go. After all, we have your dispatch, which is the important thing. I'm unmilitary to say this, but . . . good luck."

"Same to you," Flowers husked.

He broke the beam and concentrated on driving the boat.

The revolutionaries were so short of manpower that quite a few women held high rank. Colonel Adler of Intelligence was among them. In uniform, her hair cut short, she didn't much suggest the opera star who had once dazzled the capitals of Earth. But her tunic couldn't flatten out every curve, and Flowers was in some respects a very suggestible man.

He leaned back in the swivel chair, flourished his cigar, and tried to be modest. "Faking sickness was easy," he said. "I counted time till I knew the transfer boat 'ud be along pretty soon."

"How did you count?" she asked.

"Oh, I sang songs in my head. I'd timed that years ago. Often useful to know how long, say 'The Ballad of Eskimo Nell' takes—Well, never mind that, ma'm. Anyhow, then I started hyperventilating. Do that a while and you get the doggonedest symptoms. When my body chemistry was way off kilter, I let out a yell, then pressed my carotid arteries till I passed out."

"That took courage," she murmured, "when fear is part of the syndrome."

"You said it, I didn't. Of course, I couldn't be sure I'd get away with anything. The doc could've spotted the cause. However, since they took me for an ignorant nank, he never thought I could be faking it. Naturally, I recovered my strength fast, and didn't let on. I kind of hoped I'd have a chance to do something, because they'd be off guard with a sick man. But, sure, I had luck with me."

Colonel Adler drummed fingers on her desk and glanced out the viewplate. Pallas Town bustled under a dark, starry sky. The geegee fields gave Earth weight and held atmosphere, but it was a thin atmosphere and space glittered through, cold and huge. She turned back to Flowers. "Why did you proceed here?" she asked. "Sam's was closer."

"Uh, well, I figured GHQ should know as soon as possible about those code-busting machines of the enemy's."

"GHQ already did, as your interrogator believed. In any event, the information could have been sent from Sam's, along with a duplicate of your original dispatch."

Flowers reddened. He had expected to be treated like a hero. "So I made a mistake. I'm no professional."

She smiled. "Perhaps you did not err after all, Lieutenant. But come, let's get the quizzing over with. Then I'll authorize some furlough time for you. You've earned it."

Flowers nearly swallowed his cigar. "Quiz? You mean narco?"

She nodded. "An examination in depth."

"Whatever *for?*"

"SOP in cases like this. If nothing else, we have to be sure the enemy hasn't begun on that dirty trick of implanting posthypnotic suggestions. I'll handle the job myself, and anything personal which might come out will never get past me."

"You? Huh? I mean . . . look, I'll go along with this if I've got to, but not with a lady!"

The colonel chuckled. "I'm older and I've seen more of the universe than you might think. You won't outrage any propriety of mine. Now come with me. That's an order."

When he woke, he found her regarding him most thoughtfully. Her cheeks were a bit flushed.

"Whuzzamattuh? he mumbled.

"I made a discovery," she said. "I can be shocked."

Anger whipped him to full consciousness. He sat up and growled, "My private life's my own. Isn't that one of the ideas we're supposed to be fighting for? Now with your permission, ma'm, I'll get out of here."

"Please." She fluttered hands at him. Also eyelashes. "I didn't think I could be shocked any more. It was a delightful surprise. You mentioned some fascinating—Well, Smelly, I mean to say, I get off at 1800 hours and I do have some civilian clothes and if you'd like to meet me somewhere . . ."

Trade boomed after independence was won, and Pallas boomed loudest. Each time he visited the place—which was often, since his construction business required him to see people there—Flowers thought it had doubled in population and noisiness. But one little bar near the space docks remained unchanged. You could sit in a booth, under a stereo mural of Saturn, and have an honest beer and an uninterrupted talk.

"I see you changed tattoos," Ulstad remarked.

Flowers glanced at his left forearm, bare in an incadescent sports shirt, and grunted. "Yeah. That one. Very soon after I escaped from you, in fact. A dame I was going with for a while said she didnt' like the design. I didn't either, so I had it removed. I, uh, this is a kind of sentimental thing to say, but I had reasons for substituting this eagle. Symbol of friendship with the moth-

er country and all that sort of engine spew, huh?"

"Yes. I'm glad you feel that way." Ulstad took a swallow of Tuborg. "Glad I could finally get hold of you, too, and learn how you did get away from us. What a yarn!"

Flowers grinned. "I didn't know the whole story till after the war."

Ulstad pricked up his ears. "Go on."

"This is no secret any longer, or I wouldn't've been told yet. But the message I was carrying—you never did decipher it, did you?"

"No. We finally decided it was a blind, wasting much too much valuable computer time."

"Kee-rect. A pure random pattern. Quite a few of our couriers carried similar ones for a while. It was a safe bet that at least one man would get captured and so confuse you. I happened to be the man."

Ulstad frowned. "Seems like poor strategy. You couldn't spare that many ships for a single trick."

"Oh, no. 'Course not. But you see, messages were being sent anyway."

"What? How in the name of—"

Flowers drained his beer and bellowed for another. While he waited, he produced a cigar. "That tattoo on my arm," he said. "I only knew I'd gotten blind drunk. Figured I must've ordered the damn thing put on and never remembered afterward. Actually, my booze had been mickeyed.

"The message was important. They did capture the *Vega* in the battle off Sam's, you know. And maybe by now you also know they locked onto her code books. Pallas had to be told what your ciphers were, but we couldn't risk a maser beam being intercepted."

"Certainly not." Ulstad grimaced. "It took several disasters before we realized what must have happened."

"That code was in my tattoo," Flowers said. "There're thousands of punctures in any such picture. For some of 'em you can use a needle with a special dye—standard color, nothing different except for a few iron atoms—to write anything you please. Put the arm under a scanner while I'm anesthetized and can't blab, and there you are."

The beer arrived and he drained half the tankard. "I really needn't have bothered escaping, I suppose," he mused. "Our high command would've gotten me included in the next prisoner exchange. Still, I did get the information to HQ faster, and saved myself a bad time."

Ulstad whistled. After a while, with a touch of malice, he said: "Remember I told you I had a nephew on the *Vega?* Not true. I was only trying to soften you up a bit."

Flowers started. Then he guffawed and raising his draught. "You know," he said, "I could use a man like you in my business."

"Might be fun at that," said Ulstad. The tankards touched. ■

SECOND WORLDS

The "I-wish-I'd-said-that" syndrome is something that every reader of Analog must have experienced. At the moment a variant is giving me some acute pangs: I wish I'd read that.

At the 21st World Science Fiction Convention in Washington, Labor Day weekend 1963, I attempted rather unvaliantly to debate the master of "hard" science fiction, Hal Clement, on the essentials of good science fiction. (How unvaliantly is evident in the recently published *Proceedings* of the convention.) I most devoutly wish that I had read, and had at hand then, an essay by J. R. R. Tolkien, "On Fairy-stories," which comprises the greater part of his little book, "Tree and Leaf." (The American edition is published by Houghton Mifflin Co. for $4.00, but you can get the British edition from specialist booksellers like F and SF Book Co., P.O. Box 415, Staten Island, N.Y. 10302 for only $2.25—paperbound, only $1.00—so why don't you?)

Although fairy stories are not our subject here, Tolkien says a number of things about the genre that apply to all fantasy and to science fiction as well. Here is part of the paragraph I wish I'd had to make things a little harder for Hal Clement:

> ". . . The story-maker . . . makes a Secondary World which your mind can enter. Inside it, what he relates is 'true': it accords with the laws of that world. You therefore believe it, while you are, as it were, inside. The moment disbelief arises, the spell is broken; the magic, or rather art, has failed. You are then out in the Primary World again, looking at the little abortive Second-

ary World from outside. If you are obliged, by kindness or circumstance, to stay, then disbelief must be suspended (or stifled); otherwise listening and looking would become intolerable. But this suspension of disbelief is a substitute for the genuine thing, a subterfuge we use when . . . trying . . . to find what virtue we can in the work of an art that has for us failed."

The best science-fiction writers create such Secondary Worlds and take us inside. They may do it, as Hal Clement has done in his best stories, Robert Heinlein in most of his, and Arthur C. Clarke and Frank Herbert with notable success, by building their worlds as carefully as an architect-builder would do his work. In such stories the structure may get in the way of the plot to the extent that you find yourself wondering "Why is that happening?" or "How could that possibly be so?", but you stay *inside* the story—inside the second world. Once you step outside, back in your own Primary World, to look at the fictional world, Tolkien says that the story and the storyteller have failed.

The point I tried to make in Washington is that even in "real" science fiction, the storyteller can create a second world that will not stand up to scrutiny from outside, with disbelief suspended, but is yet wholly believable while you are inside. I called this a "snow job," and I think it's quite as legitimate a way of writing good science fiction as good fantasy. If the second world of the story is real enough, you'll be able to predict what can happen and may happen. And that, I submit, is one of the tests of science.

THE OTHER HUMAN RACE
By H. Beam Piper • Avon Books, New York • No. G-1220 • 1964 • 190 pp. • 50¢

This is a sequel to "Little Fuzzy," but by no means the pure delight that book was, and is. The reason is probably Beam Piper's integrity as a writer interested in the forces that shape and shake human societies.

"Little Fuzzy" was the story of the struggle of some stubborn and well-meaning folk to make the Terran Federation admit that the little golden-furred prawn-hunters of Zarathustra are people, "humans," in the legal meaning of the term. The Fuzzies were—and are—charming, the plot line was straightforward, and I sincerely hope that some day some smart publisher will convert the book into a juvenile classic that will live as long as some other adult novels that have dug roots into that profitable soil.

As "The Other Human Race" begins, the Good Guys have had their triumph, the Fuzzies are acknowledged humans, the fairly stable economy and social order of Zarathustra is shot all to hell, and the skies are about to fall. It is, in short, a rather realistic yarn about the pains of revolution, the gray scale of human character, the undamped oscillations of a teased society. It's far more realistic than "Little Fuzzy," and probably a better book, but it's far less fun. Too bad.

DESTINATION: AMALTHEA
Foreign Languages Publishing House, Moscow, USSR. • 420 pp. • $1.00

This is the third in a series of paperback collections of short Soviet science fiction that the Russians are publishing in English translations. The first two were reprinted, without credit to the source, as Collier paperbacks titled "Soviet Science Fiction" and "More Soviet Science Fiction." This one I had been unable to locate until an archeologist friend found it in a Connecticut paperback store. If you're interested, hunt in the stores that sell highbrow and foreign paperbacks.

Only two of the seven stories in the collection—the title story by Arkady and Boris Strugatsky, and "The Maxwell Equations," by Anatoly Dnieprov—are worth much attention. The latter, with Valentina Zhuravleva's "The Astronaut" and Mikhail Vasilyev's "Flying Flowers," was reprinted in New York University Press' rather dismal "Russian Science Fiction" last year. Dismal is also the word for this lot. Perhaps the translation is partly to blame, but the level of writing and thinking seems to be on that of the 1920s and 1930s in American SF, if not earlier.

In "Destination: Amalthea" the brothers Strugatsky have an action plot and some mild satire. A station on Jupiter's fifth moon has lost most of its food, and the photon rocket *Tahmasib* is coming to the rescue when it gets into trouble and comes down in the deep Jovian atmosphere. The authors use the device of parallel glimpses to show the crew of the ship working out the problem of escape, while their planetologist passengers are totally and single-mindedly immersed in their own scientific concerns and never understand the crisis at all. It's the kind of story George O. Smith might have written for Astounding in its very early days.

"The Maxwell Equations" also has an authentic ring to it: its author is a Soviety physicist, and his picture of cybernetic ized human computers isn't bad at all. "The Astronaut" is a sentimental tale of the heroic skipper of a starship, quite artificial, and "Flying Flowers" might have been done by A. Hyatt Verrill in the early 1920s. In "Over the Abyss," Alexander Belayev is also writing on an early-Gernsback level in a story of antigravity wrecking the world—or seeming to, for in a sense it's a "dream" story. Igor Zabelin, in "The Valley of the Four Crosses," brings in a kind of optical time machine, the chronoscope, to visualize the friction that broke up an exploring expedition years be-

fore. Finally, "The Golub-Yavan," by Kirill Stanyokovich is a short, remarkably flat and uneventful story of an attempt to catch an Abominable Snowman.

All these stories, except the Strugatskys' and Dnieprov's, are in the old, early mold of sugar-coated information: mainly authentic pictures of strange places in the Soviet domains of High Asia and the Arctic. Gimmicks are mild and the story-telling is milder. The stories may have been intended for children. The exceptions—scientists and younger men—like Ivan Yefremov, do have a more modern concept of what science fiction is and what can be done with it, but it is pretty elementarily developed in the samples we have been allowed to see.

OUTSIDE THE UNIVERSE

By Edmond Hamilton • Ace Books, New York • No. F-271 • 1964 • 173 pp. • 40¢

At the Washington SF convention, John Campbell credited Dr. E. E. Smith, in his "The Skylark of Space," with being the first to utilize the still-controversial idea that certain of the nebulae were in fact island universes, as large as our own galaxy but immeasurably distant. Since the story was written in 1918—though not published until 1928—he is technically correct. But the author who did most to put across the immensity of the universe and the probable diversity of intelligent species in these early years was Edmond Hamilton.

"Outside the Universe" was a four-part serial published in *Weird Tales* late in 1929. From his second or third story, three years earlier, Hamilton had established the concept of the Interstellar Patrol—the police force of an entire galaxy, made up of men-of-good-will from dozens of monstrous but intelligent races, in addition to the men who ordinarily tell the stories. This is also, of course, the unifying concept of "Doc" Smith's great "Lensman" series. In this story, our Galaxy is invaded by a serpent race from a dying universe, and after striving vainly to beat them off, members of the Patrol go to the Andromeda galaxy for help.

After remembering this yarn with affection for thirty-five years, it is a disappointment to find it more dated than I supposed. The narrative is pitched in a continual shout of superlatives and excessives. (So were my own first stories: we relished words in those days—but it is wearing on today's readers.) The physics is of the Nineteenth Century, pre-Relativity variety in which just about anything can be done by manipulating the "ether". There is no limiting velocity, so that starships can go racing about among the stars and galaxies at millions of times the velocity of light, and the trip to Andromeda, with a detour to the serpent galaxy, can be accomplished in a few days or weeks.

Nevertheless, it is interesting to note that Ed Hamilton, in this and even earlier stories, was anticipating the Hoyle-Bondi "steady state" cosmos, in which matter and energy are continually being created: today, out of "space," in 1929 out of "ether". It seemed necessary, so Ed Hamilton did it; I'm sure he doesn't claim any patents for the invention.

THE STAR KING

By Jack Vance • Berkley Books • New York • No. F-905 • 1964 • 158 pp. • 50¢

THE KILLING MACHINE

By Jack Vance • Berkley Books • N.Y. • No. F-1003 • 1964 • 158 pp. • 50¢

With these two paperback yarns Jack Vance is launching a long saga of vengeance in the galaxy of some sixteen hundred years from now, when mankind has scattered among the stars and begun to differentiate into varied and peculiar strains and races. As a child, his hero, Keith Gerson, watched the five star-roving freebooters known as the "Demon Princes" as they destroyed his town and family. As a man, trained for vengeance, he begins to hunt them down. It may take five books to finish the job.

"The Star King," first and better of the two episodes published to date, was serialized in part in *Galaxy* in 1963. In it the author begins to rough in the structure and details of a galactic society second in complexity only to Cordwainer Smith's. He shows the power of institutions—the Interworld Police Coordination Company, the intellectually and ritually oriented Institute, and others—to cut across race and nationality. Gerson uses those powers intelligently in his feud with Attel Malagate, the inhuman "Star King" who masquerades as a man. It's a fine, sweeping, fast-moving adventure yarn that throws up the repeated flashes of color and movement that you expect of Jack Vance in his fantastic vein.

In "The Killing Machine," Gerson is after Kokor Hekkus, the crime lord who delights in grimly fatal mechanisms, and tracks him to the lost world of Thamber, at the rim of the Galaxy. His adversary's fascination with mechanisms might have been built up to better effect; actually, only one great machine plays a part in the plot—a crawling fortress built like a gigantic centipede. The best facet added to Vance's universe in this book is Interchange, a successful business serving the kidnapping industry. Victims are comfortably housed here until their ransoms are paid and a commission taken, but if the ransom is not forthcoming, Interchange will sell to the highest bidder. (Slavery is one of the institutions that has regained its place in the Galaxy of the future.)

Like Talbot Mundy of fond memory, the author introduces his chapters with interpolated commentaries on the universe, mankind and

other pertinent matters, in which he can have his say about the forces and institutions of the world he is creating. It's an old custom, of course, and less skill may be involved in "forging" your own quotations from nonexistent books instead of quoting the authentic classics, but you can hew much closer to the mark when you write both words and music.

FALCONS OF NARABEDLA
By Marion Zimmer Bradley

THE DARK INTRUDER
By Marion Zimmer Bradley • Ace Books, New York • No. F-273 • 1964 • 127 & 124 pp. • 40¢

This Ace "double" demonstrates that Marion Zimmer Bradley is in the top rank when it comes to writing sword-and-sorcery yarns but no great shakes at short stories.

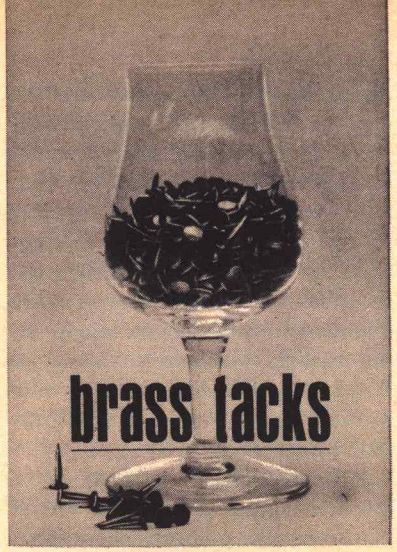
"Falcons of Narabedla" is jammed with action, color, mystery, and cryptic science masquerading as magic. Its hero is a man of our time whose personality is snatched into the far future, into the body of a conniving swordsman in a feudal world following the inevitable nuclear holocaust. There are rebellious commoners outside the walls of the Rainbow City, with whom Adric has cryptic relationships. There are the Dreamers in their remote keep, masters of vast psionic powers which can be tricked or bargained out of them for the benefit of Adric's kind. There are beautiful women and strong men and the terrible falcons . . . electronic and mechanical missiles into which a man can project his mind and will, and fly and fight like a bird.

Preposterous? Sure—but it swings. It may also be related to the author's "Sword of Aldones," published earlier by Ace. The psychic forces seem to be much the same, and someone swears by Aldones.

On the flip side, only the title story, an interesting yarn about the search for a Martian city which turns up the Martians themselves, is of much account. The others: "Jackie Sees a Star" contains a basic impossibility—a starship may travel far faster than light in hyperspace, but the light from the exploding star it is escaping will still take years, not seconds, to get to Earth. "Exiles of Tomorrow" is a twist on the usual time-travel paradoxes, with no real validity in the shock ending. "Death Between the Stars" is a little better: properly brought up girl treats an alien like a human being and is rewarded in a way she could not suspect.

"The Crime Therapist" is a macabre little bit, also mostly gimmick and twist. "The Stars Are Waiting" is very old hat: the Universe is waiting for Man. And "Black and White" is a pretty obvious translation of racial brutality into a future where it makes even less sense than it does here and now.

But "Falcons of Narabedla" is good fun from start to finish, unless you can't stand that kind of stuff.



Dear Mr. Campbell:

While being extremely sorry for the reasons for it, I am delighted with the change-back to the digest-size Analog. The large ones were more difficult to store and refer to, and took up far more space when carrying them to read on a journey, which I always do. I also felt that the stories weren't as good since the change, but this is probably just an example of the innate conservatism of the human mind, which is apparent in even so unlikely a field as the readership of Analog!

Beam Piper's death is a tragedy; of all your authors he gave me the most pleasure. All his work had a characteristic "believability," in that his stories, of which the best was "Space Viking"—surely the finest serial you have ever published—read like histories of something that had actually happened. I usually dip into my twenty-year file of Astoundings and Analogs each evening, and frequently decide to re-read some story or other which I last looked at months or even years before, and it is astonishing how often I find the line "H. Beam Piper" under the title of the story I select.

One suggestion I should like to make is that you publish each month a brief biography of one of your authors—it would be extremely interesting to know a bit more about those to whose efforts Analog readers look forward each month. I was going to nominate Beam Piper for the No. 1 spot, but since this is no longer possible, how about Poul Anderson or Christopher Anvil?

Anyway, keep up the good work: I always look forward to the day each month on which I receive my Analog—not much work gets done that day till it's been devoured from cover to cover.

W. R. Matthews
2, Quebec Mews,
London, W.1, England

How many old-timers can name Beam Piper's first story in ASF—and date it!

Dear Sir:

On page 16 of your February issue, in the article titled "Program for Lunar Landings," by Joe Poyer, the author states ". . . Mid-course

correction will be made with the S-4B 21,000 pound thrust restartable engine . . ."; this is an error. The S-4B is propelled by a Racketdyne J-2 engine that is rated at 200,000 pounds thrust at altitude. The mid-course corrections will be made, according to the NASA Saturn V mission plan, using the Service Module engine. And, as was pointed out in the paragraph preceding the one I am discussing, the S-4B was jettisoned after injection into the trans-lunar trajectory, before mid-course corrections are made.

Robert A Duke
Service Publications Writer
Douglas Aircraft Co.
(S-4B Prime)
Space Systems Center
Huntington Beach, California

Correction noted—and if he slipped only once in compiling that much assorted data, Poyer is not only good, but lucky!

Dear Mr. Campbell:

I do not recall ever before writing to an editor—either magazine or newspaper—and I suppose my motivation for doing so now is a common one . . . fear. In this case it is a fear that a well-loved companion of twenty years or more, Astounding-Analog, may be about to leave me.

The source of that fear is, of course, your editorial announcement in the March issue that Analog is reverting to the digest size. Your article was quite reassuring on the reasons for the change except for a pair of unmentioned facts. One, that among other advantages, offset lithography is a more economical printing process for relatively short-run publications than is letterpress. Secondly, the fact that the Condé Nast plant in Greenwich, Connecticut, is now on the market. (I should perhaps state that I am a Development Engineer in the Graphic Arts field for Eastman Kodak.)

Astounding and Analog have given me great pleasure for years . . . from the pulp magazine state, through the digest format to the present size. In this time I have always been a newsstand buyer. With the emphasis once more on reader support, I am sending in a subscription to add my mite to the support of your magazine.

I hope that you have reader reaction that will assure the existence of Analog for as many years in the future as Astounding has years in the past. I would also like to say "thank you" to you and to the members of the staff for the years of enjoyment Astounding-Analog has given me.

Robert D. Nelson
249-A Ridgeway Avenue
Rochester, New York 14615

1. Analog has long been successfully self-supporting as a reader-based magazine; we have every reason to believe it will continue to be self-supporting.

2. Offset printing is competitive with letterpress at our level of print-orders—circa 150,000 copies not markedly cheaper—but very much crisper on the paper we're using, as the example now in your hands shows. Letterpress can't print high-resolution photographs on anything but high-cost, slick-surface paper; offset can, as you, as a Graphic Arts man know.

3. Astounding-Analog was never printed by Condé Nast; it was a Street & Smith magazine, with outside printing contracts, up to the time Condé Nast began closing out its printing—as distinct from publishing—activities.

From the viewpoint of a publisher, printing is, was, and will continue to be a necessary nuisance. An author has to type his manuscripts; that doesn't mean he wants to be a typist. Condé Nast is now happily out of the business it didn't want to be in.

Dear John:

After reading your editorial on lack of support for Analog by advertisers, and after reading Dr. Robert G. Hoffman's frustrated letter on medical statistics, (Analog, March '65, p. 90), and after reviewing my article on our troubles with space power—to be forwarded February 15—I have evolved a new theory which I shall modestly call "Coneybear's theory of erroneous choices".

This theory deals with situations in which a person is in a position to choose a course of action for himself, or some other entity, from among two or more possible alternatives. It assumes the existence of a mental operator on information which is commonly called "the subconscious."

My theory states that whenever the subconscious concludes that: 1) a particular choice would bring success—whether technological, or financial, or whatnot—and 2) the same choice would bring "significant" change in—what the subconscious conceives to be—the individual's normal, steady-state environment, the subconscious will always push the individual towards making an erroneous choice.*

This theory has the interesting corollary that, in general, the more successful the correct choice, the less apt it is to be made, since the more it would change the environment. It also fits the three cases mentioned at the beginning of this letter. Decisions, for example, by the advertising managers of large "serious" technical companies to advertise in a whole new class of magazines—exemplified, they feel, by Analog—might cause all sorts of rejuggling of advertising budgets and bring many other requirements for new thought, and action. This would seriously change their environment.

If we assume that Dr. Hoffman's

*Reasons for the choice are rationalized afterwards. Such rationalizations are well known in connection with actions resulting from post-hypnotic suggestions.

ideas on medical statistics *are* important then, by their very nature, they would, if pursued, upset the environment in which the organizations and individuals of NIH are embedded. Therefore, such studies should be resisted. If it was concluded—subconsciously—that his studies would fail, or not change the existing environment, they would be worthwhile research and a thing to be supported. The continuing support of research for research sake—*not* for changing the environment—must be part of the normal NIH managerial structure.

In ASTRA's case, the same situation prevails. If we—or anyone else—should succeed in designing an inexpensive practical space power system, it might wipe out much of the government and industrial subculture which is geared up to a *continuing* R&D effort, aimed at possibly producing, eventually, a space power system. (*Quelle horreur!*)

This phenomenon need not bother you, nor Dr. Hoffman, nor Henry Kroeger, *in your specialties.* Your subconscious conceives your environment to be the successful editing of a magazine. Dr. Hoffman's conceives his to be the successful evolution of medical statistics. Henry Kroeger's conceives his to be the successful solution of practical problems in engineering. I am willing to bet, however, that all of us have areas in which we make erroneous choices in order to avoid change.

This theory also fits some classical cases of erroneous choices, for example, Edison's bitter fight against A.C. power distribution systems. The potential adoption of such systems threatened to make violent changes in what Edison's subconscious conceived as his environment, i.e., the successful innovation of D.C. systems.

Well, there you are. Where are the holes in my line of reasoning? If you were to conclude that I am correct, would this change your subconscious concept of your environment (and therefore, in fact, the environment of that subconscious)? If so, you must conclude that I am wrong!

J. Frank Coneybear

To be known henceforth as Coneybear's First Law—the psychological equivalent of Finagle's First Law, undoubtedly!

Dear Mr. Campbell:

I have just finished reading the March issue. I find that the article pointing out that the transistor was patented in 1925 and again in 1930 dovetails very well with the article on the "paradoxical invention" by Richard P. McKenna. What happened with the early transistor is obvious enough. People could see no reason why it should work, so they did not bother to build one and see if it would work. Even if they had been shown a working model, there would have been much suspicion and difficulty in selling it until a satisfactory theory was developed to show how it worked.

Mr. McKenna's charged particle motor looks as if it would work, according to present theory, until another aspect of present theory is considered, when it appears that it won't work. The scientific method at this point urgently cries out for an experiment. Build it if you can and see if it *does* work. If you can't build it, you may learn from the difficulties in building it the right theoretical basis.

On a different level, it seems to me that if the stream of particles induces rotation in the rotor, it would be a rotating magnetic field and would tend to induce a current in the axis contrary to the flow of current which the particles would constitute and would thus slow down the particles. In fact, from the description, the device seems to me to be a simple electric motor not unlike the starter motor of my car, but in which charged particles traveling through space are substituted for electrons moving through a conductor. (This may be because I simply do not grasp the basic idea, however.) The reason why the cyclotron and cathode-ray tube do not change the speed of the particles when they go through a stationary magnetic field is that a stationary magnetic field does not induce a current. (The author uses the term "velocity" incorrectly for speed, it seems to me.) But enough of such middle-ages reliance upon theory and deduction from authorities. Build it and see.

Dr. Semmelweiss developed a workable means of preventing "puerperal fever" in maternity wards or hospitals. Largely because the theory by which he explained his method was not logically convincing, men ignored the clear proof that his method worked and women continued to die by the thousands of "puerperal fever" until basically the same method was worked out on a more logically sound or intuitively obvious theory. Men concluded that Semmelweiss' method could not work because they didn't see how it worked. They ought to have seen that it did work and used it and figured out why it worked whenever they could. Similarly, it will be time enough to explain why the charged particle motor does not work when you know that it does not or why it does work when you know that it does. If it does work and slows down the particles, you can then solve any theoretical problem arising from that fact. If it works and doesn't slow down the particles, you can start worrying about the conservation of energy then. The theory is a lesser matter than the fact. Change the theory, if necessary, to fit the fact.

Dennis R. Scott

Some men live by making things work. Some live by explaining why things work. Usually the latter group has more influence!

HOW LITTLE WE KNOW
continued from page 7

cury's a blackened cinder, which doesn't show up very well even against the clearest of blue skies.

Observers, even those working with the finest telescopes under the best seeing conditions, had enormous difficulty observing Mercury. However, they *knew* that Mercury had to be locked to the Sun's gravitational tides, so they *knew* what they would see, in one sense, at least. They'd always seen the same features, year after year, as in observing the Moon.

Given very bad seeing conditions, and a positive assurance of what one *ought* to see . . . it's very difficult indeed to identify anything contrary to that "ought to"!

The optical astronomers didn't. Radar didn't have the same type of difficulties; the radio astronomers observed something they "ought not to"—and now the astrophysicists are having fun explaining why their mathematical proof that Mercury *couldn't* have day and night failed.

Well, it seems that the Solar Wind has been interfering with the real-world-Mercury, but wasn't affecting their calculations. When the first analyses were made, of course, there was no idea that a Solar Wind existed; since then they've sort of been too busy to cross check.

Mercury has an atmosphere composed largely of—of all things—hydrogen and helium. At Mercury's temperature, those extremely light gases can't be held by Mercury's small mass, of course; it loses its atmosphere fairly rapidly.

But Mercury's somewhat like a small lake in a stream. The constant drainage will, obviously, empty the lake completely in just a few years . . . if the stream flowing into the lake from above ceases to flow.

Mercury's gravity-well isn't deep enough to *hold* light gases, but it is deep enough to *pool* them. It acts as a trap for the gases composing the Solar Wind, and accumulates a high concentration of them, just as a lake can pool the water of a stream, and accumulate a huge tonnage of water, yet can't hold water.

The trapping phenomena involved are of several types. First and simplest, is the obvious mechanism that when Solar Wind hits the rocky mass of the planet, the stuff stops right there. Being driven with immense velocities, the ions of the Wind penetrate many meters into the rocks—but get baked out again, slowly, by the heat of Mercury's days. Second, once some atmosphere pools around the planet, it acts as a highly efficient trap for more Solar Wind. Third, atoms that miss both the planet itself and its pool of gases are gravitationally focused behind the planet. Gases coming around the planet from opposite sides can collide at this gravitational focus, and kill each other's velocity sufficiently to allow some of the gas to be trapped and pulled back to Mercury.

The astrophysicists calculated that tidal forces would stop Mercury's rotation in about 400,000,000 years; it should, therefore, have stopped day-and-night rotating along about the time Earth cooled off enough to start building up organic molecules in its still-steaming seas. Say four and a half billion years ago.

Why didn't it?

Perhaps the Solar Wind explains that, too.

The explanation will, however, involve some highly complex balances of interactions, and is going to take some extremely complex mathematical analysis, plus some Grade A inspired guesswork.

First, consider that the Sun does not rotate. Then the emission of gases that constitutes the Solar Wind would stream out radially from the Sun, but would, on the average, have zero net angular momentum. No orbital motion.

These gases being trapped and pooled by Mercury's gravity well, would be accelerated by Mercury to its own orbital velocity; angular momentum would be added.

But the gases that escaped from Mercury by the normal diffusion into space would carry with them Mercury's orbital velocity—they'd carry off angular momentum.

Now if Mercury had been braked to a relative halt—no day-and-night rotation, but only one revolution per year—this loss of orbital momentum would tend to slow Mercury in its orbit, causing it to fall inward toward the Sun as it lost momentum.

This in turn would mean a decrease in the length of the year. And then the day and year would no longer be equal; day and night cycles would return.

Of course, then the tidal forces would go to work slowing down this day-and-night cycle, tending to brake it to a halt again.

Under those conditions, Mercury would be constantly spiraling inward, very slowly, and would always have a little residual day-night rotation, since the tidal braking effect can only approach zero diurnal rotation asymptomatically.

However, the real situation is more complex than that; the Sun does rotate—in about 28-30 days, depending on latitude. The streams of Solar Wind thrown out presumably share that rotation. Mercury is, in effect, in the outermost fringes of the Sun's corona, which we presume rotates with the Sun.

But Mercury's year is eighty-eight Earth-days, so the Sun's corona, Solar Wind, et cetera, rotate faster than Mercury. So maybe the Solar Wind tends to make Mercury speed up in its orbit, and spiral outward instead of inward. . . . ?

Here's where the inspired guesswork comes in.

The Solar Corona does not rotate in 28-30 days, as the Earth's atmosphere rotates with the Earth. Fire a projectile vertically from Earth's equator—just straight up—with energy sufficient to take it to the 23,000 mile altitude of the 24-hour synchronous orbit. Will that put the missile in orbit? No, it will not. The missile will be carried along with the Earth's surface, but at Earth's surface that 24-hour circuit involves only 1,000 miles an hour. At 23,000 miles, one circuit in twenty-four hours involves a great deal more kinetic energy, and a great deal more angular momentum. Our missile will simply loop back down again. (Think about it, and you'll see that it won't hit where it took off from!)

In a generally similar manner, Solar Wind particles leaving the Sun with a 28-day-period movement won't be pushing Mercury to a 28-day period, if they're simple missiles-into-space.

But they're *not!* They're caught in immense magnetic fields, the violent and turbulent magnetic fields of the Sun. The Sun being a totally ionized plasma, it's a perfect electrical conductor; its magnetic field *has* to turn with it. That magnetic field extends for *x* million miles out into space. It sweeps the Solar Wind around with it, to some extent, which gives the Solar Wind particles more angular momentum than they started with.

Result: The Solar Wind *could* have angular momentum enough to be causing a slow, continuous acceleration of Mercury's orbit. Which would change the annual-diurnal ratio, and produce diurnal cycles on Mercury in exactly the opposite sense!

We are missing a few small items of data for our calculations on this, at the moment. We don't know the intensity of the Solar Wind at Mercury's orbit, the strength of the Solar magnetic fields, the angular momentum of the Solar Wind resulting, the mass of Mercury's pooled Solar Wind gases—or the direction of rotation of Mercury!

In other words, as of mid-1965 we don't know anything about the dynamics of Mercury's rotation and its orbit.

Also, incidentally, we don't know anything about the nature of Venus, and why it's so different from Earth.

Man is not stupid—except when he arrogantly decides he isn't ignorant.

No theory Man has ever invented but has, in the long run, proven to be inaccurate, mistaken, or downright wrong. But the earliest engineering techniques Man ever discovered are just as workable today, without exception. A stick will still pry up a rock; a chipped flint will still cut meat or, tied to a stick, chop wood. But the Gods and Ghosts and Spirits and Demons that controlled the behavior of winds, earthquakes, streams and individual trees and animals—they've proven wrong theories.

If we'd be a bit more humble, and refer to Newton's *Guesses* of Motion, and Einstein's *Guess* of Relativity, we might better appreciate our actual degree of understanding.

Now we know that Mercury's dynamics are considerably different than we believed—and that astronomers have been seeing what they thought they ought to see, rather than what was there—what about that famous forty seconds of arc per century? The famous forty seconds by which Mercury's nodes advanced beyond what Newtonian physics required. If Einstein's Relativity Guess stands or falls on that first, famous test—it's got pretty shaky foundations! *Something's* interfering with Mercury enough that the impossible diurnal rotation exists; any effect massive enough to change the orbit and/or the rotation of the planet that seriously might also be implicated in that forty seconds of arc!

There are very few things that we can truly say we know for certain. An "inert gas" turned out to be quite reactive. (Incidentally, it shouldn't have taken so long to find that; it had been known for a dozen years that xenon is an anesthetic—except for its high price, it would be the ideal, perfect anesthetic. Nontoxic, nonexplosive, noncorrosive, nonallergenic, produces deep relaxation—wonderful. But the screaming clue was ignored. *How could a totally inert material affect a biochemical system so drastically as to produce anesthesia?*)

Some stars, it turns out, produce technicium in quantity; in our Solar System it's a long-since-vanished element, because it has no stable isotopes, and our Sun does not seem to produce it.

Our knowledge of the cosmic abundance of elements is rudimentary, and exceedingly inaccurate. When the nucleogenesis experts are working up their new guesses, they pick the cosmic-abundance estimates that best fit their theories, and ignore all the other estimates as inaccurate. Sure; they are inaccurate. So's the one they choose to use as The Best Estimate. Rubidium, long considered one of the rarer elements, turns out to be one of the most abundant. Not because astrophysicists had such trouble analyzing the spectra of some remote star, but because geologists studying minerals right here on Earth had sort of neglected to distinguish adequately between potassium, which was known to be abundant, and its chemical twin, rubidium! Turn out it's sixteenth in the list of elements in Earth's crust.

The nuclear experts keep saying that iron-56 has the lowest energy per nucleon, that it is at the bottom of the packing-fraction curve, and that's why iron is so abundant in the cosmos.

Hm-m-m . . . well how come,

then, that manganese, cobalt, nickel and copper, which are in the same lowest-dip portion of the packing-fraction curve, are so rare, by comparison? How come, in particular, that iron's extremely plentiful, cobalt a million times less, nickel quite plentiful, then copper's almost as rare as cobalt?

If science had, somehow, originated and developed on Ascension Island, and the scientists of the area had analyzed the substances of their world-island, their ideas of cosmic abundance might be somewhat peculiar.

If I take a shovelful of earth, and analyze that and base cosmic abundance on the results . . . well, I might have grabbed a shovelful from the Michigan iron mines region, or grabbed some loose rock from the Climax, Colorado area, where the rock is the world's best source of molybdenum. The materials of this Earth aren't very well mixed; the statistics vary somewhat wildly with locale.

Yet those sampling techniques I suggest above would be a better statistical representation of Earth-as-a-whole than Earth is of this stupendous galaxy of ours. What right have we to assume that there is thorough statistically-uniform mixing of matter in the cosmos? Particularly when we know that hydrogen and helium together constitute something like ninety-eight per cent of the total mass of the galaxy? We're trying to determine the distribution of extremely minor impurities—impurities that present guesses suggest they got there by the explosion of super-nova stars. And such events are bound to be highly individual; there's no equilibrium effects in such appalling and sudden violence. The gases blasted out into space from three or four supernovas, mixing to some undeterminable degree with the background hydrogen-helium mixture recondense to form a star. Is that star typical of "cosmic abundance?"

No more than a random handful of Earth's rock is typical of "terrestrial abundance."

We don't know the composition of the water of our own seas accurately; only recently we learned that our standard technique for measuring oxygen content of the deep seas was completely incompetent. (The sampling gadget used turned out to react with oxygen under the pressure conditions of the deep waters, and the chemical analytical reagents turned out not to be stable enough for calibration.)

There is one thing, however, of which we can be one hundred per cent certain. We're ignorant. And all our theories are guesses, which will all turn out to be mistaken.

But—every engineering technique which actually works, will, throughout all time to come, work. It may, later, be as impractical to apply as the use of stone axes today—but it will always work.

THE EDITOR.

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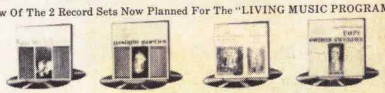

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