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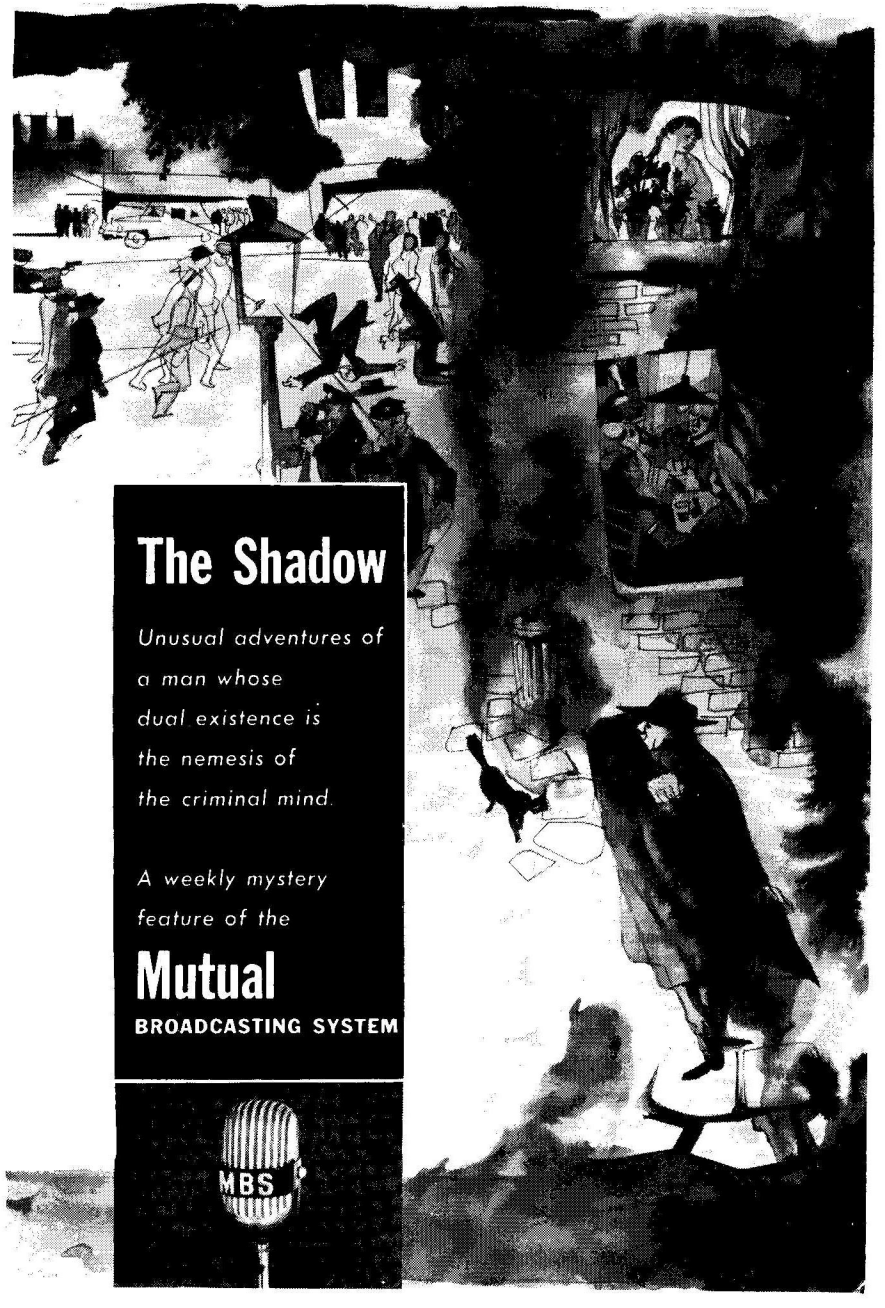
Astounding SCIENCE FICTION

The End of Summer BY ALGIS BUDRYS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EDITORIAL

PREDICTION

I am willing to bet that the next major advance in human understanding — the really big advance — will be initiated by working with something that is detected by organic entities, and cannot be detected by mechanical devices, until *after* considerable work has been done with organic — probably human — detection systems.

We've got a fine, fancy science today that is based on the use of inorganic sensing devices, and the modern attitude linked to that is that the observer must do nothing but read meters. That's fine — if you know how to build suitable meters. But the observer is going to have to do a lot more than that before metering becomes possible.

This attitude — it will probably be considered positively mystical, anti-scientific, and highly improper — is based on a somewhat longer-term consideration of what science has actually done. Most of us have a lot of trouble remembering our own childhood attitudes and beliefs; science, being a human institution, after all, shows the same tendency. It forgets how it got where it is, in its acute interest in achieving what it hasn't yet reached.

The earliest experiments in science involved light and sound. Modern science, dedicated to instrumentation as it is, wouldn't approve of purely organic detectors such as the eye and the ear. But remarkably able work was done with the eye and so simple a thing as a bit of paper with a dot of grease. They didn't have photocells and electronic amplifiers as yet, so they obviously couldn't do any really scientific work without proper metering techniques — or did they?

You can't make original discoveries with metering equipment for the simple reason that you don't yet have meters in the field involved. If you did, it

wouldn't be original work.

Electrical metering is *the* standard these days — electrical, electronic, or the like. But the first galvanometer consisted of a pair of frog's legs — an organic detector. It was nearly half a century before a moderately good galvanometer of the electromagnetic type was developed.

There's a strong feeling that Dr. Rhine's work with the psi phenomenon is bordering all too close to the mystical; the only meter he can make it show up on is a computing machine running a statistical analysis.

The trouble with metering devices is precisely the thing that makes them so valuable; they do precisely and only what they are designed to do. A voltmeter reading is not affected by the nasty disposition of its boss; a human being is. A voltmeter will, also, read steady and true while a radio-frequency field of some tens of thousands of kilowatts operates in its immediate neighborhood. The meter says "there's nothing there," of course, just as it was designed to.

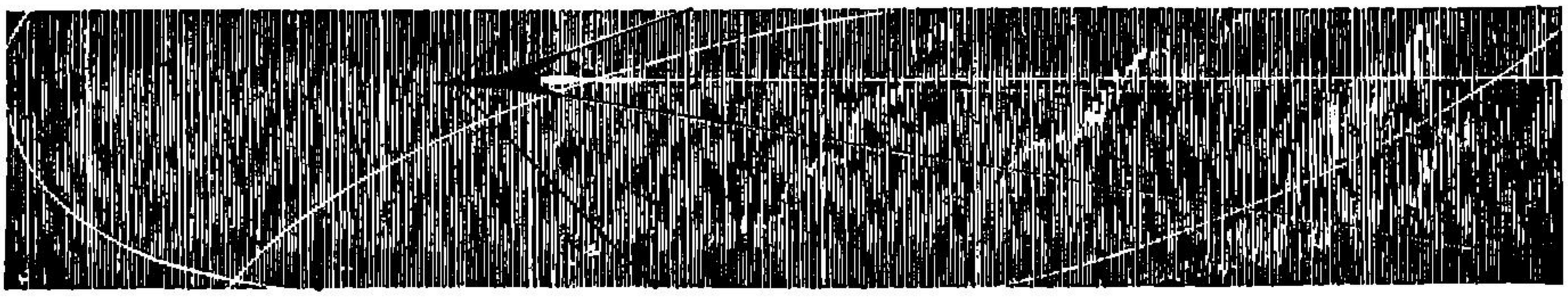
There might also be a psionic field present, one having great intensity, and the voltmeter, having been very carefully designed to react strictly and solely to voltage, wouldn't budge.

Induction heating by high-frequency radio-fields was first worked out because men working near high-power transmitters developed fevers. Unlike voltmeters, they reacted to all sorts of odd effects, thereby discovering things they weren't designed to. Early experimenters with electricity found that the human tongue made a quite sensitive detector for small currents. Exceedingly minute quantities of complex chemicals are, today, determined by "biological assay" — which simply means "we use organic detectors, because no metering device yet cooked up will do the job."

Science, like the human beings that develop it, has a marked tendency to forget its childhood, and the processes and methods of its childhood. Organic detectors come first — because, being protein, they are protean in their sensitivities. The human organism is sensitive to, or applies, every known level of science — and gives demonstration after demonstration that it is also applying levels of science that haven't yet been discovered.

Anybody want to bet that organic detectors will *not* be used in opening the next major field of advance?

THE EDITOR.



THE END OF SUMMER

They had immortality—the good life everlasting. Or . . . is it, if you don't know it . . . ?

BY ALGIS BUDRYS

Illustrated by Freas

I.

Americaport hadn't changed since he'd last seen it, two hundred years before. It was set as far away from any other civilized area as possible, so that no plane, no matter how badly strayed, could possibly miss its landing and crash into a dwelling. Except for the straight-edge swath of the highway leading south, it was completely isolated if you forgot the almost deserted tube station. Its edge was dotted by hangars and a few offices, but the terminal building itself was small, and severely functional.

Massive with bare concrete, aseptic with steel and aluminum, it was a gray, bleak place in the wilderness.

Kester Fay was so glad to see it that he jumped impatiently from the big jet's passenger lift. He knew he was getting curious looks from the ground crew clustered around the stainless-steel ship, but he would have been stared at in any case, and he had seen the sports car parked and waiting for him beside the Administration Building. He hurried across the field at a pace that attracted still more attention, eager to get his clearance and be off.

He swung his memory vault impatiently by the chain from his wristlet while the Landing Clearance officer checked his passport, but the man was obviously too glad to see someone outside the small circle of airlines personnel. He stalled interminably, and while Fay had no doubt that his life out here bored him to tears, it was becoming harder and harder to submit patiently.

"Christopher Jordan Fay," the man read off, searching for a fresh conversational opening. "Well, Mr. Fay, we haven't seen you here since '753. Enjoy your stay?"

"Yes," he answered as shortly as possible. Enjoyed it? Well, yes, he supposed he had, but it was hard to feel that way since he'd played his old American memories at augmented volume all through the flight across the Atlantic. Lord, but he was tired of Europe at this moment; weary of winding grassy lanes that meandered with classic patience among brooks and along creeks, under old stately trees! "It's good to be back where a man can stretch his legs, though."

The official chuckled politely, stamping forms. "I'll bet it is at that. Planning to stay long?"

Forever, if I can help it, Fay thought first. But then he smiled ruefully. His life had already been an overdone demonstration that forever was a long time. "For a while, at any rate," he answered, his impatience growing as he thought of the car again. He shuffled his feet on the case-hardened flooring.

"Shall I arrange for transportation to New York?"

Fay shook his head. "Not for me. But the man who drove my car up might be a customer."

The official's eyebrows rose, and Fay suddenly remembered that America, with its more liberal social attitudes, might tolerate him more than Europe had, but that there were still plenty of conservatives sheltered under the same banner.

As a matter of fact, he should have realized that the official was a Homebody; a Civil Service man, no doubt. Even with a dozen safe places to put it down within easy reach, he still kept his memory vault chained to his wrist. Fay's own eyebrows lifted, and

amusement glittered in his eyes.

"Driving down?" The official looked at Fay with a mixture of respect, envy, and disapproval.

"It's only fifteen hundred miles," Fay said with careful nonchalance. Actually, he felt quite sure that he was going to throttle the man if he wasn't let out of here and behind the wheel soon. But it would never do to be anything but bored in front of a Homebody. "I expect to make it in about three days," he added, almost yawning.

"Yes, sir," the man said, instantly wrapping himself in a mantle of aloof politeness, but muttering "Dilly!" almost audibly.

He'd hit home with that one, all right! Probably, the man had never set foot in an automobile. Certainly, he considered it a barefaced lie that anyone would undertake to average fifty mph during a driving day. Safe, cushiony pneumocars were his speed — and he an airlines employee!

Fay caught himself hastily. Everybody had a right to live any way he wanted to, he reminded himself.

But he could not restrain an effervescent grin at the man's sudden injured shift to aloofness.

"All right, sir," the official said crisply, returning Fay's passport. "Here you are. No baggage, of course?"

"Of course," Fay said agreeably, and if that had been intended as a slur at people who traveled light and fast, it had fallen exceedingly flat. He waved his hand cheerfully as he turned away, while the official stared at him sourly. "I'll be seeing you again, I imagine."

"I'm afraid not, sir," the man answered with a trace of malevolence. "United States Lines is shutting down passenger service the first of next dekayear."

Momentarily nonplussed, Fay hesitated. "Oh? Too bad. No point to continuing, though, is there?"

"No, sir. I believe you were our first in a hectoyear and a half." Quite obviously, he considered that as much of a mark of Cain as necessary.

"Well . . . must be dull out here, eh?"

He cocked a satiric eye at the man and was gone, chuckling at that telling blow while the massive exit door swung ponderously shut behind him.

The car's driver was obviously a Worker who'd taken on the job because he needed money for some obscure, Worker-ish purpose. Fay settled the business in the shortest possible time, counting out hundred-dollar bills with a rapid shuffle. He threw in another for good measure, and waved the man aside, punching the starter vibrantly. He was back, he was home! He inhaled deeply, breathing the untrammeled air.

Curled around mountains and

trailed gently through valleys, the road down through New York State was a joy. Fay drove it with a light, appreciative smile, guiding his car exuberantly, his muscles locked into communion with the automobile's grace and power as his body responded to each banked turn, each surge of acceleration below the downward crest of a hill. There was nothing like this in Europe—nothing. Over there, they left no room for his kind among their stately people.

He had almost forgotten what it was like to sit low behind the windscreen of a two-seater and listen to the dancing explosions of the unmuffled engine. It was good to be back, here on this open, magnificent road, with nothing before or behind but satin-smooth ferroconcrete, and heaped green mountains to either side.

He was alone on the road, but thought nothing of it. There were very few who lived his kind of life. Now that his first impatience had passed, he was sorry he hadn't been able to talk to the jet's pilot. But that, of course, had been out of the question. Even with all the safety interlocks, there was the chance that one moment's attention lost would allow an accident to happen.

So, Fay had spent the trip playing his memory on the plane's excellent equipment, alone in the comfortable but small compartment forward of the ship's big cargo cabin.

He shrugged as he nudged the car around a curve in the valley. It couldn't be helped. It was a lonely life, and that was all there was to it. He wished there were more people who understood that it was the *only* life—the only solution to the problem which had fragmented them into so many social patterns. But there were not. And, he supposed, they were all equally lonely. The Homebodies, the Workers, the Students, and the Teachers. Even, he conceded, the Hoppers. He'd Hopped once himself, as an experiment. It had been a hollow, hysteric experience.

The road straightened, and, some distance ahead, he saw the white surface change to the dark macadam of an urban district. He slowed in response, considering the advisability of switching his safeties in, and decided it was unnecessary as yet. He disliked being no more than a pea in a safetied car's basket, powerless to do anything but sit with his hands and feet off the controls. No; for another moment, he wanted to be free to turn the car nearer the shoulder and drive through the shade of the thick shrubbery and overhanging trees. He breathed deeply of the faint fragrance in the air and once more told himself that *this* was the only way to live, the only way to find some measure of vitality. A Dilly? Only in the jealous vocabularies of the Homebodies, so long tied to their hutches and routines that the scope

of mind and emotion had narrowed to fit their microcosm.

Then, without warning, still well on the white surface of open road, the brown shadow darted out of the bushes and flung itself at his wheels, barking shrilly.

He tried to snap the car out of the way, his face suddenly white, but the dog moved unpredictably, its abrupt yell of pain louder than the scream of Fay's brakes. He felt the soft bump, and then his foot jerked away from the clutch and the car stalled convulsively. Even with his engine dead and the car still, he heard no further sound from the dog.

Then he saw the Homebody boy running toward him up the road, and the expression of his face changed from shocked unpleasantness to remorseful regret. He sighed and climbed out of the car clumsily, trying to think of something to say.

The boy came running up and stopped beside the car, looking up the road with his face drawn into tearful anger.

"You *ran* over Brownie!"

Fay stared helplessly down at the boy. "I'm sorry, son," he said as gently as he could. He could think of nothing really meaningful to tell him. It was a hopeless situation. "I . . . I shouldn't have been driving so fast."

The boy ran to the huddled bundle at the shoulder of the road and picked it up in his arms, sobbing. Fay followed him, thinking that ten thousand years of experience were not enough—that a hundred centuries of learning and acquiring superficial maturity were still insufficient to shield the emotions trapped in a young boy's body, at the mercy of his glandular system, under a shock like this.

"Couldn't you see him?" the boy pleaded.

Fay shook his head numbly. "He came out of the shrubs—"

"You shouldn't have been driving so fast. You should have—"

"I know." He looked uselessly back up the road, the trees bright green in the sunshine, the sky blue.

"I'm sorry," he told the boy again. He searched desperately for something, some way, to make recompense. "I wish it hadn't happened." He thought of something, finally. "I . . . I know it wouldn't be the same thing, but I've got a dog of my own—a basset hound. He's coming over from Europe on a cargo ship. When he gets here, would you like to have him?"

"Your *own* dog?" For a moment, the boy's eyes cleared, but then he shook his head hopelessly. "It wouldn't work out," he said simply, and then, as though conscious of guilt at even considering that any other dog could replace his, tightened his arms on the lifeless bundle.

No, it hadn't been such a good idea,

Fay realized. If he weren't so snarled up in remorse and confusion, he'd have seen that. Ugly had been his dog and couldn't be separated from him, or he from Ugly. He realized even more strongly just precisely what he had done to the boy.

"Something wrong? Oh—" The Homebody man who had come up the road stopped beside them, his face turning grave. Fay looked at him in relief.

"I had my automatics off," he explained to the man. "I wouldn't have, if I'd known there was a house around here, but I didn't see anything. I'm terribly sorry about the . . . about Brownie."

The man looked again at the dog in the boy's arms, and winced. Then he sighed and shrugged helplessly. "Guess it was bound to happen sometime. Should have been on a leash. There's still a law of averages."

Fay's fist clenched behind his back, out of sight. The well-worn words bit deep at the very foundation of his vitality, and his mind bridled, but in another moment the spasm of reflexive fear was gone, and he was glad he'd had this harmless outlet for his emotions. Besides, the man was right, and at this moment Fay was forced to be honest enough with himself to admit it. There was still a law of averages, whether Fay and his Dilly kind liked it or not.

"Go on back to the house, Son," the man said with another sigh. "There's nothing we can do for Brownie. We'll bury him later. Right now you ought to wash up. I'll be along in a minute."

It was the way he said it—the fatalistic acceptance that no matter what the honest folk did, some blundering, heedless dilettante was going to thwart them—that scored Fay's emotions.

The boy nodded wordlessly, still crying, and began to walk away without looking at Fay again.

But Fay couldn't let him go. Like a man who picks at a splinter, he could not let this pass so simply. "Wait!" he said urgently.

The boy stopped and looked at him woodenly.

"I . . . I know there's nothing—I mean," Fay stumbled, "Brownie was your dog, and there can't be another one like him. But I do a lot of traveling—" He stopped again, flushing at the Homebody man's knowing look, then pushed on regardless. "I see a lot of people," he went on. "I'll try to find you a dog that hasn't ever belonged to anybody. When I do, I'll bring him to you. I promise."

The boy's lip twitched, suddenly revealing what ten thousand years had taught him. "Thanks, mister," he said half-scornfully, and walked away, cradling his dog.

He hadn't believed him, of course. Fay suddenly realized that no one

ever believed a Dilly, whether he was telling the truth or not. He realized, too, that he had done the best he could, and nevertheless failed. He looked regretfully after the boy.

"You didn't have to do that," the man said softly, and Fay noted that some of his reserve and half-contemptuous politeness were gone. "I don't know whether to believe you or not, you didn't have to do that. Anyway, I'll edit the dog out of his memories tonight. My wife and I'll clean the place up, and he won't notice anything." He paused, reflecting, his eyes dark. "Guess Madge and I'll cut it out of our own minitapes, too."

Fay clenched his teeth in sudden annoyance. Nobody ever believed a Dilly. "No," he said. "I wish you wouldn't do that. I meant what I said." He shook his head again. "I don't like editing. There's always a slip somewhere, and then you know you've got a hole in your memory, but you can never remember what it was."

The man looked at him curiously. "Funny thing for one of you people to say. I always heard you went for editing in a big way."

Fay kept his face from showing his thoughts. There it was again—that basic lack of understanding and a complete unwillingness to check secondhand tales. The very essence of his kind of life was that no memory, no experience, not be lived and preserved. Besides, he'd always heard that it was the Homebodies who had to edit whole hectoyears to keep from going mad with boredom.

"No," he contented himself with saying. "You're confusing us with the Hoppers. *They'll* try anything."

The man curled his lip at the mention, and Fay reflected that the introduction of a common outsider seemed helpful in circumstances like this.

"Well . . . maybe you're right," the man said, still not completely trustful, but willing to take the chance. He gave Fay his name, Arnold Riker, and his address. Fay put the slip of paper carefully in his memory vault.

"Anytime I lose that, I'll have lost my memory, too," he commented.

The man grinned wryly. "More likely, you'll remember to forget it tonight," he said, some of his distrust returning at the sight of the spooled tapes.

Fay took that without protest. He supposed Riker had a right to feel that way. "Can I drive you down to your house?"

The man flicked an expressive glance along the car's length and shook his head. "Thanks. I'll walk. There's still a law of averages."

And you can take that phrase and carve it on Humanity's headstone, Fay thought bitterly, but did not reply.

He climbed into the car, flicked on the automatics, and froze, com-

pletely immobile from sharply ingrained habit that was the only way to avoid the careless move that just might open the safety switch. He did not even turn his head to look at the man he left behind as the car started itself slowly away, nor did he catch more than a passing glimpse of the house where the boy and his dog had lived together for ten kiloyears.

We guard our immortality so carefully, he thought. *So very, very carefully. But there's still a law of averages.*

II.

Perversely, he drove more rapidly than normal for the rest of the trip. Perhaps he was trying to reaffirm his vitality. Perhaps he was running away. Perhaps he was trying to cut down the elapsed time between towns, where his automatics threaded him through the light pedestrian traffic and sent him farther down the road, with each new danger spot safely behind him. At any rate, he arrived at his Manhattan apartment while it was still daylight, stepping off the continuous-impulse elevator with his eyes discontented.

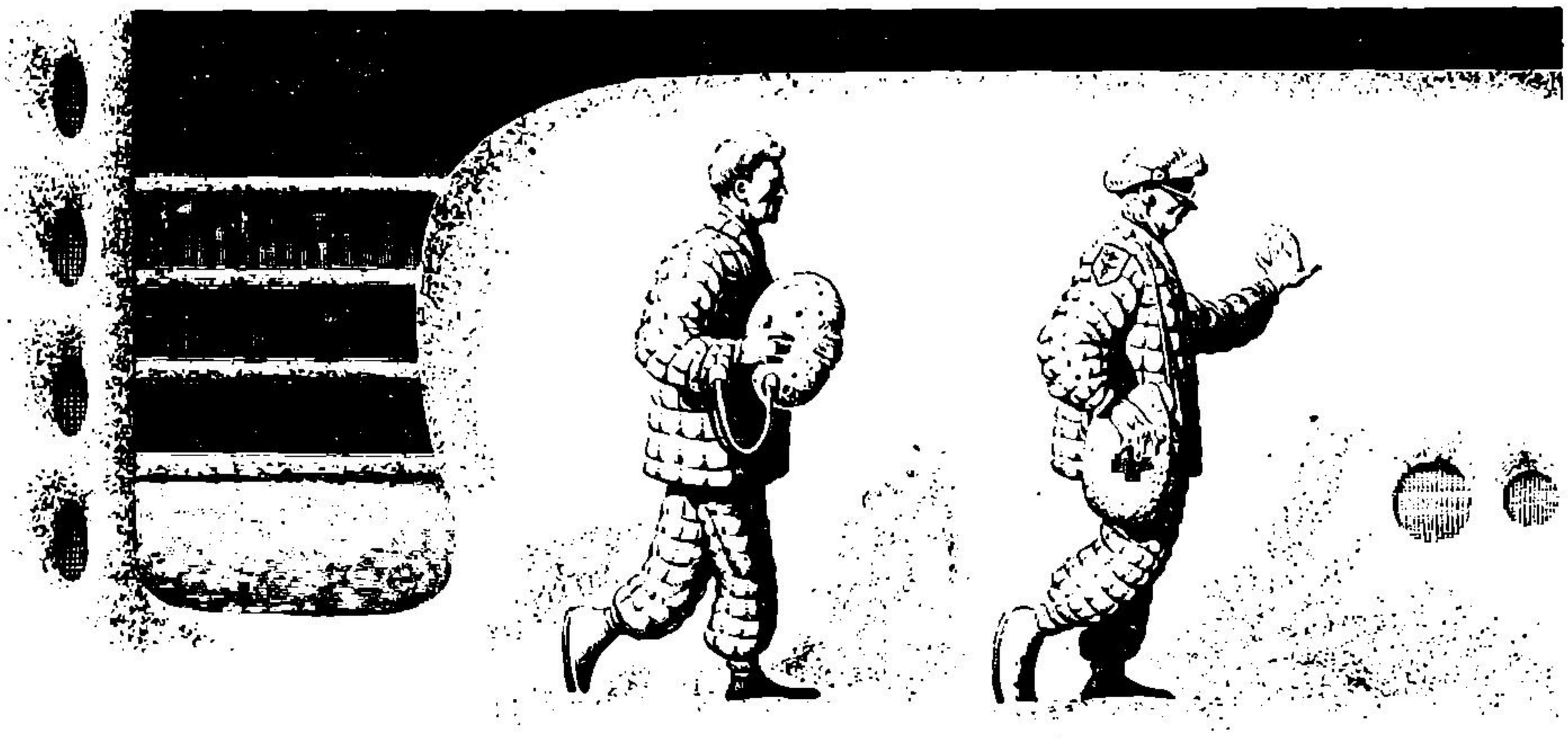
The apartment, of course, was just as he had left it two hectoyears ago. The semirobots had kept it sealed and germicidal until the arrival of his return message yesterday.

He could imagine the activity that had followed, as books and music tapes were broken out of their helium-flooded vaults, rugs and furnishings were stripped of their cocoons, aerated, and put in place. From somewhere, new plants had come and been set in the old containers, and fresh liquor put in the cabinet. There would be food in the kitchen, clothes in the wardrobes—the latest styles, of course, purchased with credits against the left-behind apparel of two hectoyears before—and there were the same, old, familiar paintings on the walls. Really old, not just By-Product stuff.

He smiled warmly as he looked around him, enjoying the swell of emotion at the apartment's comfortable familiarity. He smiled once more, briefly, at the thought that he must some day devise a means of staying in a sealed apartment—wearing something like a fishing lung, perhaps—and watch the semirobots at their refurbishing process. It must be a fascinating spectacle.

But his glance had fallen on the memory vault which he had unchained and put on a coffee table. It faced him with the ageless, silent injunction painted on each of its faces: PLAY ME, and underneath this the block of smaller lettering that he, like everyone else, knew by heart:

> If your surroundings seem unfamiliar, or you have any other reason to suspect that your environment and situation are not usual, request immediate assistance from any other individual. He is obligated by strict law to direct you to the nearest free public playback



booth, where you will find further instructions. Do not be alarmed, and follow these directions without anxiety, even if they seem strange to you. In extreme situations, stand still and do not move. Hold this box in front of you with both hands. This is a universally recognized signal of distress. Do not let anyone take this box away from you, no matter what the excuse offered.

He wondered momentarily what had made him notice it; he knew it so well that the pattern of type had long ago become no more than a half-seen design with a recognition value so high that it had lost all verbal significance.

Was it some sort of subconscious warning? He checked his memory hastily, but relaxed when he found none of the telltale vagueness of detail that meant it was time to let everything else wait and get to a playback as fast as possible. He had refreshed his memory early this morning, before starting the last leg of his trip, and it seemed to be good for several more hours, at least.

What was it, then?

He frowned and went to the liquor cabinet, wondering if some train of thought had been triggered off by the accident and was trying to call attention to himself. And when he dropped into an easy-chair a few minutes later, a drink in his hand and his eyes still brooding over the vault's legend, he realized that his second guess had been the right one. As usual, one level of his mind had been busy digesting while the surface churned in seeming confusion.

He smiled ruefully. Maybe he wasn't quite as much of a Dilly as he looked and would have liked to believe. Still, a man couldn't live ten thousand years and not put a few things together in his head. He took a sip of his drink and stared out

over the city in the gathering twilight. Somewhere in the graceful furniture behind him, a photoelectric relay clicked, and his high-fidelity set began to play the Karinius *Missa*. The apartment had not forgotten his moods.

No, he thought, the machines never forgot. Only men forgot, and depended on machines to help them remember. He stared at the vault, and a familiar sophistry occurred to him. "Well," he asked the box labeled PLAY ME, "which *is* my brain—you or the gray lump in my head?"

The answer depended on his moods, and on his various audiences. Tonight, alone, in an uncertain mood, he had no answer.

He took another drink and sat back, frowning.

At best, he'd offered the boy a shoddy substitute. Even presuming that the passage of ten kiloyears had somehow still left room for a dog without a master, the animal would have to be re-familiarized with the boy at least once or twice a day.

Why? Why did dogs who had always had the same master remember him without any difficulty, even though they seemed to have to reinvestigate their surroundings periodically? Why would Ugly, for instance, remember him joyfully when his ship came? And why would Ugly have to be re-familiarized with this apartment, in which he'd lived with Fay, off and on, for all this time?

The Kinnard dog, whose master insisted on building each new house in a carbon-copy of the previous, didn't have anywhere near as much trouble. Why?

He'd heard rumors that some people were recording canine memories on minitape, but that sort of story was generally classified along with the jokes about the old virgin who switched vaults with her nubile young niece.

Still and all, there might be something in that. He'd have to ask Monkreeve. Monkreeve was the Grand Old Man of the crowd. He had memories the rest of them hadn't even thought of yet.

Fay emptied his glass and got up to mix another drink. He was thinking harder than he had for a long time—and he could not help feeling that he was making a fool of himself. Nobody else had ever asked questions like this. Not where others could hear them, at any rate.

He sat back down in his chair, fingers laced around the glass while the *Missa* ended and the *Lieutenant Kije* suite caught up the tempo of the city as it quickened beneath showers of neon.

PLAY ME. Like a music tape, the memory vault held his life tightly knit in the nested spindles of bright, imperishable minitape.

What, he suddenly asked himself,

would happen if he didn't play it tonight?

"If your surroundings seem unfamiliar, or you have any other reason to suspect your environment and situation are not usual . . .

"Obligated by strict law to direct you . . .

"Do not be alarmed . . ."

What? What was behind the whispered stories, the jokes:

"What did the girl in the playback booth say to the young man who walked in by mistake?

"Man, this has been the *busiest* Twenty-seventh of July!" (Laughter)

The thought struck him that there might be all sorts of information concealed in his fund of party conversation.

"If you wish to get to heaven,
Stay away from twenty-seven."

And there it was again. Twenty-seven. July Twenty-seventh, this time conglomerated with a hangover reference to religion. And that was interesting, too. Man had religions, of course—schismatic trace sects that offered no universally appealing reward to make them really popular. But they must have been really big once, judging by the stamp they'd left on oaths and idiomatic expressions. Why? What did they have? Why had two billion people integrated words like "Heaven," "Lord God," and "Christ" into the language so thoroughly that they had endured ten kiloyears?

July Twenty-seventh when? Year?

What would happen to him if he ignored PLAY ME just this once?

He had the feeling that he knew all this; that he had learned it at the same time that he had learned to comb his hair and cut his fingernails, take showers and brush his teeth. But he did all that more or less automatically now.

Maybe it was time he thought about it.

But nobody else did. Not even Monkreeve.

So what? Who was Monkreeve, really? Didn't the very fact that he had thought of it make it all right? That *was* the basis on which they judged everything else, wasn't it?

That boy and his dog had really started something.

He realized several things simultaneously, and set his glass down with a quick *thump*. He couldn't remember the dog's name. And he was definitely letting the simple problem of following his conscience—and his wounded pride—lead him into far deeper intellectual waters than any boy and his dog had a right.

His cheeks went cold as he tried to remember the name of this morning's hotel, and he shivered violently. He looked at the box labeled PLAY ME.

"Yes," he told it. "Yes, definitely."

III.

Fay awoke to a bright, sunny morning. The date on his calendar

clock was April 16, 11958, and he grinned at it while he removed the vault's playback contacts from the bare places on his scalp. He noted that all the memories he had brought back from Europe had been re-recorded for the apartment's spare vault, and that the current minitape had advanced the shining notch necessary to record yesterday.

He looked at that notch and frowned. It looked like an editing scratch, and was. It was always there, every morning, but he knew it covered nothing more than the normal Traumatic pause between recording and playback. He'd been told that it was the one memory nobody wanted to keep, and certainly he'd never missed editing it—or, of course, remembered doing it. It was a normal part of the hypnotic action pattern set by the recorder to guide him when he switched over from record to playback, his mind practically blank by that time.

He'd never seen a tape, no matter whose, that did not bear that one scratch to mark each day. He took pride in the fact that a good many tapes were so hashed out and romanticized as to be almost pure fiction. He hadn't been lying to the boy's father—and he noted the presence of that memory with the utmost satisfaction—he had a driving basic need to see everything, hear everything, sense each day and its events to their fullest, and to remember them with sharp perfect clarity.

He laughed at the vault as he kicked it shut on his way to the bathroom. "Not until tonight," he said to PLAY ME, and then teetered for a breathless moment as he struggled to regain his balance. He set his foot down with a laugh, his eyes sparkling.

"Who needs a car to live dangerously?" he asked himself. But that brought back the memory of the boy, and his lips straightened. Nevertheless, it was a beautiful day, and the basic depression of yesterday was gone. He thought of all the people he knew in the city, one of whom, at least, would be sure to have a contact somewhere or the other that would solve his problem for him.

He ate his breakfast heartily, soaking for an hour in the sensual grip of his bathtub's safety slinging while he spooned the vitalizing porridge, then shrugged into a violent bathrobe and began calling people on the telephone.

He hadn't realized how long he'd been gone, he reflected, after Vera, his welcome to her apartment finished, had left him with a drink while she changed. It was, of course, only natural that some of the old crowd had changed their habits or themselves gone traveling in his absence. Nevertheless, he still felt a little taken aback at the old phone numbers that were no longer valid, or the really astonishing amount of people who seemed to

have edited him out of their memories. Kinnard, of all people! And Lorraine.

Somehow, he'd never thought Lorraine would go editor.

"Ready, Kes?"

Vera was wearing a really amazing dress. Apparently, America had gone back toward conservatism, as he might have guessed from his own wardrobe.

Vera, too, had changed somehow—too subtly for him to detect, here in surroundings where he had never seen her before. Hadn't she always been resistant to the fad of completely doing apartments over every seventy years? He seemed to remember it that way, but even with minitapes, the evidence of the eye always took precedence over the nudge of memory. Still, she at least knew where Monkreeve was, which was something he hadn't been able to find out for himself.

"Uh-huh. Where're we going?"

She smiled and kissed the tip of his nose. "Relax, Kes. Let it happen."

Um.

"Grasshoppers as distinct from ants, people given to dancing and similar gay pursuits, or devotees to stimulants," Monkreeve babbled, gesturing extravagantly. "Take your pick of derivations." He washed down a pill of some sort and braced himself theatrically. "I've given up on the entymology. What'd you say your name was?"

Fay grimaced. He disliked Hoppers and Hopper parties—particularly in this instance. He wished heartily that Vera had told him what had happened to Monkreeve before she brought him here.

He caught a glimpse of her in the center of an hysterical knot of people, dancing with her seven petticoats held high.

"Whoee!" Monkreeve burst out, detecting the effects of the pill among the other explosions in his system. Fay gave him a searching look, and decided, from the size of his pupils, that he could probably convince himself into an identical state on bread pills, and more than likely was.

"Got a problem, hey, Lad?" Monkreeve asked wildly. "Got a dog problem." He put his finger in his mouth and burlesqued Thought. "Got a dog, got a problem, got a problem, got a dog," he chanted. "Hell!" he exploded, "go see old Williamson. Old Williamson knows everything. Ask him anything. Sure," he snickered, "ask him anything."

"Thanks, Monk," Fay said. "Glad to've met you," he added in the accepted polite form with editors, and moved toward Vera.

"Sure, sure, Kid. Ditto and check. Whatcha say your name was?"

Fay pretended to be out of earshot, brushed by a couple who were dancing in a tight circle to no music at all, and delved into the crowd around Vera.

"Hi, Kes!" Vera exclaimed, looking up and laughing. "Did Monk give you any leads?"

"Monk has a monkey on his back, he thinks," Fay said shortly, a queasy feeling in his throat.

"Well, why not try that on the kid? He might like a change." Vera broke into fresh laughter. Suddenly an inspiration came to her, and she began to sing.

"Oh where, oh where, has my little dog gone? Oh where, oh where can he be?"

The rest of the crowd picked it up. Vera must have told them about his search, for they sang it with uproarious gusto.

Fay turned on his heel and walked out.

The halls of the University library were dim gray, padded with plastic sponge, curving gently with no sharp corners. Doorways slid into walls, the sponge muffled sound, and he wore issued clothes into which he had been allowed to transfer only those personal items which could not possibly cut or pry. Even his vault had been encased in a ball of cellular sponge plastic, and his guide stayed carefully away from him, in case he should fall or stumble. The guide carried a first-aid kit, and like all the library staff, was a certified Doctor of Theoretical Medicine.

"This is Dr. Williamson's interview chamber," the guide told him softly, and pressed a button concealed under the sponge. The door slid back, and Fay stepped into the padded interior of the chamber, divided down the middle by a sheet of clear, thick plastic. There was no furniture to bump into, of course. The guide made sure he was safely in, out of the door's track, and closed it carefully after he had stepped out.

Fay sat down on the soft floor and waited. He started wondering what had happened to the old crowd, but he had barely found time to begin when the door on the other side of the partition opened and Dr. Williamson came in. Oddly enough, his physiological age was less than Fay's, but he carried himself like an old man, and his entire manner radiated the same feeling.

He looked at Fay distastefully. "Hopper, isn't it? What're you doing here?"

Fay got to his feet. "No, sir. Dilly, if you will, but not a Hopper." coming so soon after the party, Williamson's remark bit deep.

"Six of one, half a dozen of the other, in time," Williamson said curtly. "Sit down." He lowered himself slowly, testing each new adjustment of his muscles and bones before he made the next. He winced faintly when Fay dropped to the floor with defiant overcarelessness. "Well—go on. You wouldn't be here if the front desk didn't think your research was at least interesting."

Fay surveyed him carefully before he answered. Then he sighed, shrugged mentally, and began. "I want to find a dog for a little boy," he said, feeling more than foolish.

Williamson snorted: "What leads you to believe this is the ASPCA?"

"ASPCA, sir?"

Williamson threw his hands carefully up to heaven and snorted again. Apparently, everything Fay said served to confirm some judgment of mankind on his part.

He did not explain, and Fay finally decided he was waiting. There was a minute's pause, and then Fay said awkwardly: "I assume that's some kind of animal shelter. But that wouldn't serve my purpose. I need a dog that . . . that *remembers*."

Williamson put the tips of his fingers together and pursed his lips. "So. A dog that remembers, eh?" He looked at Fay with considerably more interest, the look in his eyes sharpening.

"You look like any other brainless jackanapes," he mused, "but apparently there's some gray matter left in your artfully coiffed skull after all." Williamson was partially bald.

"What would you say," Williamson continued, "if I offered to let you enroll here as an Apprentice Liberor?"

"Would I find out how to get that kind of dog?"

A flicker of impatience crossed Williamson's face. "In time, in time. But that's beside the point."

"I . . . I haven't got much time, sir," Fay said haltingly. Obviously, Williamson had the answer to his question. But would he part with it, and if he was going to, why this rigmarole?"

Williamson gestured with careful impatience. "Time is unimportant. And especially here, where we avoid the law of averages almost entirely. But there are various uses for time, and I have better ones than this. Will you enroll? Quick, man!"

"I—Dr. Williamson, I'm grateful for your offer, but right now all I'd like to know is how to get a dog." Fay was conscious of a mounting impatience of his own.

Williamson got carefully to his feet and looked at Fay with barely suppressed anger.

"Young man, you're living proof that our basic policy is right. I wouldn't trust an ignoramus like you with the information required to cut his throat.

"Do you realize where you are?" He gestured at the walls. "In this building is the world's greatest repository of knowledge. For ten thousand years we have been accumulating opinion and further theoretical data on every known scientific and artistic theory extant in 1973. We have data that will enable Man to go to the stars, travel ocean bottoms, and explore Jupiter. We have here the raw material of symphonies and sonatas

that make your current addictions sound like a tincup beggar's fiddle. We have the seed of paintings that would make you spatter whitewash over the daubs you treasure, and verse that would drive you mad. And you want me to find you a dog!"

Fay had gotten to his own feet. Williamson's anger washed over him in battering waves, but one thing remained clear, and he kept to it stubbornly.

"Then you won't tell me."

"No, I will *not* tell you! I thought for a moment that you had actually managed to perceive something of your environment, but you have demonstrated my error. You are dismissed." Williamson turned and stamped carefully out of his half of the interview chamber, and the door slid open behind Fay.

Still and all, he had learned something. He had learned that there was something important about dogs not remembering, and he had a date: 1973.

He sat in his apartment, his eyes once more fixed on PLAY ME, and tried a thought on for size: July 27, 1973.

It made more sense that way than it did when the two parts were separated—which could mean nothing, of course. Dates were like the jigsaw puzzles that were manufactured for physiological four-year-olds: they fit together no matter how the pieces were matched.

When had the human race stopped having children?

The thought smashed him bolt upright in his chair, spilling his drink.

He had never thought of that. Never once had he questioned the fact that everyone was frozen at some apparently arbitrary physiological age. He had learned that such-and-such combined anatomical and psychological configuration was indicative of one physiological age, that a different configuration indicated another. Or had he? Couldn't he tell instinctively—or, rather, couldn't he tell as though the word "age" were applicable to humans as well as inanimate objects?

A lesser thought followed close on the heels of the first: exactly the same thing could be said of dogs, or canaries or parakeets, as well as the occasional cat that hadn't gone wild.

"Gone" wild? Hadn't most cats always been wild?

Just exactly what memories were buried in his mind, in hiding—or rather, since he was basically honest with himself, what memories had he taught himself to ignore? And why?

His skin crawled. Suddenly, his careful, flower-to-flower world was tinged with frost around him, and brown, bare and sharply ragged stumps were left standing. The boy and his dog had been deep water indeed—for his tentative toe had baited a monster of continuous and expanding questions to fang him with rows of

dangerous answers.

He shook himself and took another drink. He looked at PLAY ME, and knew where the worst answers must be.

IV.

He awoke, and there were things stuck to his temples. He pulled them loose and sat up, staring at the furnishings and the machine that sat beside his bed, trailing wires.

The lights were on, but the illumination was so throughly diffused that he could not find its source. The furniture was just short of the radical in design, and he had certainly never worn pajamas to bed. He looked down at them and grunted.

He looked at the machine again, and felt his temples where the contacts had rested. His fingers came away sticky, and he frowned. Was it some sort of encephalograph? Why?

He looked around again. There was a faint possibility that he was recovering from psychiatric treatment, but this was certainly no sanatorium room.

There was a white placard across the room, with some sort of printing on it. Since it offered the only possible source of information, he got off the bed cautiously and, when he encountered no dizziness or weakness, crossed over to it. He stood looking at it, lips pursed and brow furrowed, while he picked his way through the rather simplified orthography.

Christopher Jordan Fay:

If your surroundings seem unfamiliar, or you have any other reason to suspect that your environment and situation are unusual, do not be alarmed, and follow these directions without anxiety, even if they seem strange to you. If you find yourself unable to do so, for any reason whatsoever, please return to the bed and read the instructions printed on the machine beside it. In this case, the nearest "free public playback booth" is the supplementary cabinet you see built into the head of the bed. Open the doors and read the supplementary instructions printed inside. In any case, do not be alarmed, and if you are unable or unwilling to perform any of the actions requested above, simply dial "O" on the telephone you see across the room.

Fay looked around once more, identified the various objects, and read on.

The operator, like all citizens, is required by strict law to furnish you with assistance.

If, on the other hand, you feel sufficiently calm or are commensurately curious, please follow these directions:

Return to the bed and restore the contacts to the places where they were attached. Switch the dial marked "Record-Playback-Auxilliary Record" to the "Auxilliary Record" position. You will then have three minutes to place your right forearm on the grooved portion atop the machine. Make certain your arm fits snugly—the groove is custom-molded to accept your arm perfectly in one position only.

Finally, lie back and relax. All other actions are automatic.

For your information, you have suffered from loss of memory, and this device will restore it to you.

Should you be willing to follow the above directions, please accept our thanks.

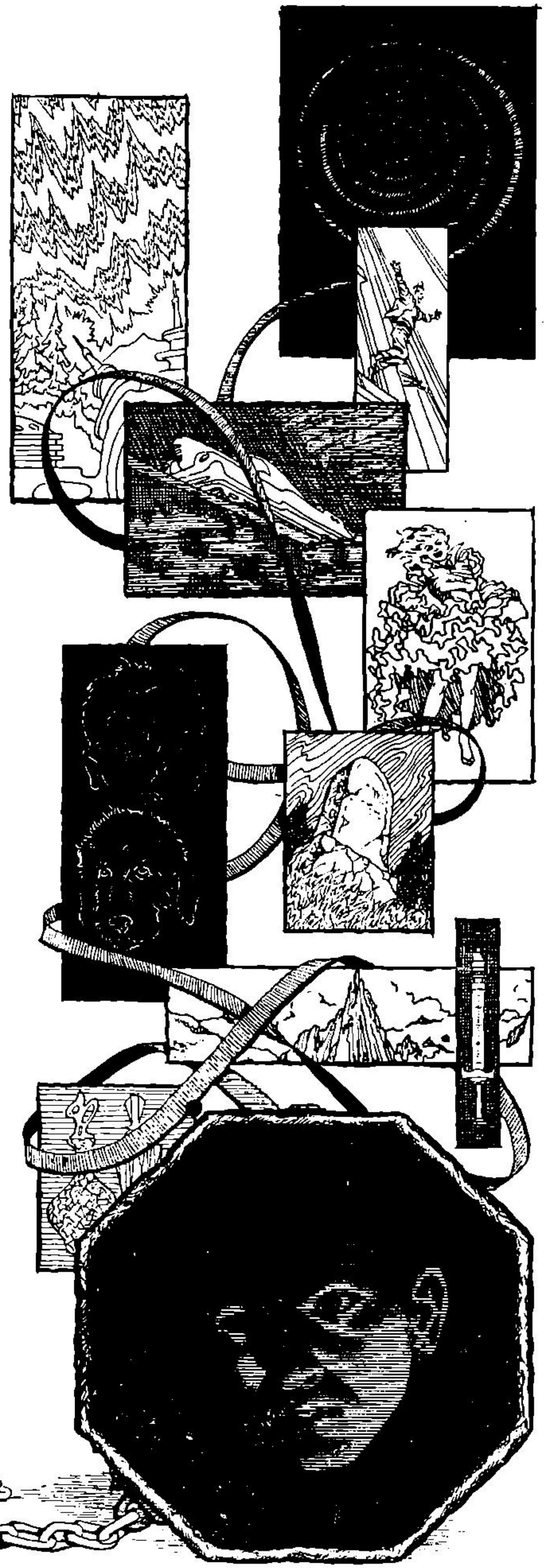
Fay's tongue bulged his left cheek, and he restrained a grin. Apparently,

his generator had been an unqualified success. He looked at the printing again, just to be certain, and confirmed the suspicion that it had been done by his own hand. Then, as a conclusive check, he prowled the apartment in search of a calendar. He finally located the calendar-clock, inexpertly concealed in a bureau drawer, and looked at the date.

That was his only true surprise. He whistled shrilly at the date, but finally shrugged and put the clock back. He sat down in a convenient chair, and pondered.

The generator was working just as he'd expected, the signal bouncing off the heaviside layer without perceptible loss of strength, covering the Earth. As to what would happen when it exhausted its radioactive fuel in another five thousand years, he had no idea, but he suspected that he would simply refuel it. Apparently, he still had plenty of money, or whatever medium of exchange existed in the future—or, rather, existed now. Well, he'd provided for it.

Interesting, how his mind kept insisting it was July 27, 1973. This tendency to think of the actual date as "the future" could be confusing if he didn't allow for it.



Actually, he was some ten-thousand-and-thirty-eight years old, rather than the thirty-seven his mind insisted on. But his memories carried him only to 1973, while, he strongly suspected, the Kester Fay who had written that naïve message had memories that *began* shortly thereafter.

The generator broadcast a signal which enabled body cells to repair themselves with one hundred per cent perfection, rather than the usual less-than-perfect of living organisms. The result was that none of the higher organisms aged, in any respect. Just the higher ones, fortunately, or there wouldn't even be yeast derivatives to eat.

But, of course, that included brain cells, too. Memory was a process of damaging brain cells much as a phonograph recording head damaged a blank record disk. In order to relive the memory, the organism had only to play it back, as a record is played. Except that, so long as the generator continued to put out the signal, brain cells, too, repaired themselves completely. Not immediately, of course, for the body took a little time to act. But no one could possibly sleep through a night and remember anything about the day before. Amnesia was the price of immortality.

He stood up, went to the liquor cabinet he'd located in his search, and mixed himself a drink, noticing again how little, actually, the world had progressed in ten thousand years. Cultural paralysis, more than likely, under the impact of two and a half billion individuals each trying to make his compromise with the essential boredom of eternal life.

The drink was very good, the whiskey better than any he was used to. He envied himself.

They'd finally beaten amnesia, as he suspected the human race would. Probably by writing notes to themselves at first, while panic and hysteria cloaked the world and July 27th marched down through the seasons and astronomers went mad.

The stimulated cells, of course, did not repair the damage done to them before the generator went into operation. They took what they already had as a model, and clung to it fiercely.

He grimaced. Their improved encephalograph probably rammed in so much information so fast that their artificial memories blanketed the comparatively small amount of information which they had acquired up to the 27th. Or, somewhat more likely, the period of panic had been so bad that they refused to probe beyond it. If that was a tape-recording encephalograph, editing should be easily possible.

"I suspect," he said aloud, "that what I am remembering now is part of a large suppressed area in my own memory." He chuckled at the thought that his entire life had been a blank

to himself, and finished the drink.

And what he was experiencing now was an attempt on his own part to get that blank period on tape, circumventing the censors that kept him from doing it when he had his entire memory.

And that took courage. He mixed another drink and toasted himself. "Here's to you, Kester Fay +. I'm glad to learn I've got guts."

The whiskey was extremely good.

And the fact that Kester Fay had survived the traumatic hiatus between the Twenty-seventh and the time when he had his artificial memory was proof that They hadn't gotten to him before the smash-up.

Paranoid, was he?

He'd stopped the accelerating race toward Tee-Total War, hadn't he?

They hadn't been able to stop him, that was certain. He'd preserved the race of Man, hadn't he?

Psychotic? He finished the drink and chuckled. Intellectually, he had to admit that anyone who imposed immortality on all his fellow beings without asking their permission was begging for the label.

But, of course, he knew he wasn't psychotic. If he were, he wouldn't be so insistent on the English "Kester" for a nickname rather than the American "Chris."

He put the glass down regretfully. Ah, well—time to give himself *all* his memories back. Why was his right arm so strong?

He lay down on the bed, replaced the contacts, and felt the needle slip out of its recess in the forearm trough and slide into a vein.

Scopolamine derivative of some sort, he decided. Machinery hummed and clicked in the cabinets at the head of the bed, and a blank tape spindle popped into position in the vault, which rested on a specially-built stand beside the bed.

Complicated, he thought dimly as he felt the drug pumping into his system. I could probably streamline it down considerably.

He found time to think once more of his basic courage. Kester Fay must still be a rampant individual, even in his stagnant, conservative, ten-thousand-year-weighty civilization.

Apparently, nothing could change his fundamental character.

He sank into a coma with a faint smile.

The vault's volume control in the playback cycle was set to "Emergency Overload." Memories hammered at him ruthlessly, ravaging brain tissue, carving new channels through the packed silt of repair, foaming, bubbling, hissing with voracious energy and shattering impetus.

His face ran through agonized changes in his sleep. He pawed uncertainly and feebly at the contacts on his scalp, but the vital conditioning held. He never reached them, though he tried, and, failing, tried, and tried

through the long night, while sweat poured down his face and soaked into his pillow, and he moaned, while the minitapes clicked and spun, one after the other, and gave him back the past.

It was July 27, 1973, and he shivered with cold, uncomprehendingly staring at the frost on the windows, with the note dated 7/27/73 in his hand.

It was July 27, 1973, and he was faint with hunger as he tried to get the lights to work. Apparently, the power was off. He struck a match and stared down at the series of notes, some of them smudged with much unremembered handling, all dated July 27, 1973.

It was July 27, 1973, and the men who tried to tell him it was really Fall in 1989, clustered around his bed in the crowded hospital ward, were lying. But they told him his basic patents on controlled artificial radioactivity had made it possible to power the complicated machinery they were teaching him to use. And though, for some reason, money as an interest-gathering medium was no longer valid, they told him that in his special case, in gratitude, they'd arranged things so there'd be a series of royalties and licensing fees, which would be paid into his accounts automatically. He wouldn't even have to check on them, or know specifically where they came from. But the important part came when they assured him that the machinery—the "vault," and the "minitapes," whatever they were, would cure his trouble.

He was grateful for that, because he'd been afraid for a long time that he was going insane. Now he could forget his troubles.

Kester Fay pulled the vault contacts off his forehead and sat up to see if there was an editing scratch on the tape.

But, of course, there wasn't. He knew it before he'd raised his head an inch, and he almost collapsed, sitting on the edge of the bed with his head in his hands.

He was his own monster. He had no idea of what most of the words he'd used in those memories had meant, but even as he sat there, he could feel his mind hesitatingly making the linkages and assigning tags to the jumbled concepts and frightening rationalizations he'd already remembered.

He got up gingerly, and wandered about the apartment, straightening out the drawers he'd upset during his amnesiac period. He came to the empty glass, frowned at it, shrugged, and mixed a drink.

He felt better afterwards, the glow of 100 Proof working itself into his system. The effects wouldn't last, of course—intoxication was a result of damage to the brain cells—but the first kick was real enough. Moreover, it was all he'd gotten accustomed to,

during the past ten kiloyears, just as the Hoppers could drug themselves eternally.

Moreover, ten thousand years of having a new personality seemed to have cured the psychosis he'd had with his old one. He felt absolutely no desire to change the world singlehanded.

Had it, now? Had it? Wasn't being a dilettante the result of an inner conviction that you were too good for routine living?

And didn't he want to turn the generator off, now that he knew what it did and where it was?

He finished the drink and bounced the glass in his palm. There was nothing that said he had to reach a decision right this minute. He'd had ten kiloyears. It could wait a little longer.

He bathed to the accompaniment of thoughts he'd always ignored before—thoughts about things that weren't his problem, then. Like incubators full of babies ten kiloyears old, and pregnant women, and paralytics.

He balanced that against hydrogen bombs, and still the scales did not tip.

Then he added something he had never known before, but that he had now, and understood why no one ever ventured to cross Twenty-seven, or to remember it if he had. For one instant, he, too, stopped still at his bath and considered ripping the memory out of his minitapes.

He added Death.

But he knew he was lost, now. For better or worse, the water had closed over his head, and if he edited the memory now, he would seek it out again some day. For a moment, he wondered if that was precisely what he had done, countless times before.

He gave it up. It could wait if he stayed sane. At any rate, he knew how to get the little boy his dog, now.

He built a signal generator to cancel out the effect of the big one, purring implacably in its mountain shaft, sending out its eternal, unshieldable signal. He blanketed one room of his apartment with the canceling wave, and added six months to his age by staying in it for hours during the eighteen months it took to mate Ugly and raise the best pup, for the stimulating wave was the answer to sterility, too. Fetuses could not develop.

He cut himself from the Dilly crowd, what was left of it, and raised the pup. And it was more than six months he added to his age, for all that time he debated and weighed, and remembered.

And by the time he was ready, he still did not know what he was going to do about the greater problem. Still and all, he had a new dog for the boy.

He packed the canceling generator and the dog in his car, and drove back

up the road he had come.

Finally, he knocked on Riker's door, the dog under one arm, the generator under the other.

Riker answered his knock and looked at him curiously.

"I'm . . . I'm Kester Fay, Mr. Riker," he said hesitatingly. "I've bought your boy that dog I promised."

Riker looked at the dog and the bulky generator under his arm, and Fay shifted his load awkwardly, the dangling vault interfering with his movements. Light as it was, the vault was a bulky thing. "Don't you remember me?"

Riker blinked thoughtfully, his forehead knotting. The he shook his head. "No . . . no, I guess not, Mr. Fay." He looked suspiciously at Fay's clothes, which hadn't been changed in three days. Then he nodded.

"Uh . . . I'm sorry, mister, but I guess I must have edited it." He smiled in embarrassment. "Come to think of it, I've wondered if we didn't have a dog sometime. I hope it wasn't too important to you."

Fay looked at him. He found it impossible to think of anything to say. Finally, he shrugged.

"Well," he said, "your boy doesn't have a dog now, does he?"

Riker shook his head. "Nope. You know—it's a funny thing, what with the editing and everything, but he knows a kid with a dog, and sometimes he pesters the life out of me to get him one." Riker shrugged. "You know how kids are."

"Will you take this one?" He held out the squirming animal.

"Sure. Mighty grateful. But I guess we both know this won't work out too well." He reached out and took the dog.

"This one sure will," Fay said. He gave Riker the generator. "Just turn this on for a while in the same room with your son and the dog. It won't hurt anything, but the dog'll remember."

Riker looked at him skeptically.

"Try it," Fay said, but Riker's eyes were narrowing, and he gave Fay both the dog and the generator back.

"No, thanks," he said. "I'm not trying anything like that from a guy that comes out of nowhere in the middle of the night."

"Please, Mr. Riker. I promise—"

"Buddy, you're trespassing. I won't draw more than half a hectoyear if I slug you."

Fay's shoulders slumped. "All right," he sighed, and turned around. He heard Riker slam the heavy door behind him.

But as he trudged down the walk, his shoulders lifted, and his lips set in a line.

There has to be an end somewhere, he thought. Each thing has to end, or there will never be any room for beginnings. He turned around to be sure no one in the house was watching,

and released the dog. He'd be found in the morning, and things might be different by then.

He climbed into the car and drove quickly away, leaving the dog behind. Somewhere outside of town, he threw the canceling generator outside, onto the concrete highway, and heard it smash. He unchained his memory vault, and threw it out, too.

There had to be an end. Even an end to starlit nights and the sound of a powerful motor. An end to the memory of sunset in the Piazza San Marco, and the sight of snow on Chamonix. An end to good whiskey. For him, there had to be an end—so that others could come after. He pointed the car toward the generator's location, and reflected that he had twenty or thirty years left, anyway.

He flexed his curiously light arm.

THE END

IN TIMES TO COME

Next month brings up a new Raymond F. Jones yarn, "The School." It's a sequel, in a way, to "Trade Secret," in that the two inventors of that yarn start a school—but *not* any ordinary school, of course—and not one that would be very popular with orthodox thinkers. Which, naturally, means a most peculiar type of very-hot-water situation, again!

Also coming up is a science-fiction story by a new author, Rex Jatko, with the least science-fiction-like title in a long time: "The Care and Breeding of Pigs." So far, it has caused five red-hot arguments among the members of Astounding's staff; I suspect it may cause some interesting explosions in Brass Tacks.

Incidentally, if your wife doesn't read science fiction, you might get her to try this one. I won't guarantee she'll like it—but I can practically guarantee she won't ignore the subject.

On a longer-term prediction—there's a new two-part serial of the Paratime series by H. Beam Piper coming up. How would you trace down a criminal gang happily hiding out in one of several billion alternative possible time lines?

THE EDITOR.

THE DIP STICK

BY WILLIAM E. BENTLEY

What could be more attractive to a highly intelligent race than a chance to study the interstellar ships of another race? What could be more effective as a lure . . .

Illustrated by Freas

The patrol ship *Boreas* was a month out on a three-month patrol, and signs of boredom were beginning to show. For the *Boreas* was of the deep-space class, atomic powered, and, therefore, unable to land on any planet. Her flight path had been fixed on a master control screen, and she was capable of following it unaided.

All of which explains Captain Agar's delight when a ship's trail was detected.

The clamorous alarm bell in his cabin brought his stocky figure striding into the circular control room. He spoke to the radio operator.

"Well, Jennings, what about it?"

"She's a big one, sir, and coming in fast. Atomic powered, but the fuel they're using is new to me."

Captain Agar leaned over his shoulder and stared at the speck of light on the long-range screen. "Greenway," he called. "Have you plotted it yet?"

"I'd like a few more minutes, sir," replied the navigator. "I think she's heading straight for us. If she keeps to her present course, she'll pass within two hundred miles of us. That puts her definitely inside Earth's outgoing corridor, doesn't it, sir?"

"It does," said Agar grimly. He went to the master control screen in the center of the room, and looked down at it.

Burgess, his second-in-command—tall, lean, hard-faced—moved silently to his side. "Turn it off," he urged softly.

"Get thee behind me," Agar grunted. "She may only be a freighter off course." He raised his voice. "Jennings, send out the challenge signal, and an order for a person-to-person channel."

"Let's hope she's a pirate," said Burgess. "We could use a little excitement."

Agar looked at him thoughtfully. "Let's hope she's a freighter," he said. "Think of the forms I shall have to fill in if she's a pirate."

"There's no reply, sir," called the radio operator. "Shall I repeat the signals?"

"Yes."

"I've got her plotted," broke in the navigator. "She's twenty minutes away, constant thrust, but there's something funny about her. Her speed is exactly the same as ours."

"What!" Captain Agar swung round. "Are you sure?"

"That's what the instruments say."

Agar ignored the calculations he was holding out, and stared at the spot of light on the screen. And as he stared at it, it was suddenly obliterated by a white cross which completely filled the screen. It faded, and was replaced by a circle enclosing two squares. The patrol challenge signal—and it could only have come from the other ship!

Agar straightened up. "Mr. Burgess," he said quietly, "does that look like impertinence to you?"

Burgess grinned wolfishly. "Yes, sir, it does."

"Very well then. Action stations."

Burgess was at the intercommunication panel in two swift strides. As he slid into the seat he pressed the Action Stations' button, and almost before the siren had begun to sound he had strapped himself.

The *Boreas* began to echo the clatter of running feet on metal floors, and the slam of bulkhead doors closing. Agar turned to the master control screen and turned it off. "She's all yours," he said to Burgess. "Keep her constant till we come into TV range."

There was a moment then for thought. Jennings was intent on his radar equipment, listening, watching, probing. Greenway, leaned back in his chair, was trying to hold a pencil between his nose and upper lip. Burgess, in smooth, swift action, was testing controls, checking connections, gathering the reins into his long, tapering hands.

Agar began to pace about the room. The factor of the identical speeds bothered him. Identical thrust could be a coincidence, but not identical speeds. He went and sat on the edge of Greenway's desk.

"How did you calculate her speed?" he asked softly.

"The usual way," Greenway was a little startled. "Bounced a few radiations off her, got the overall speed, deducted our own."

"I've got her," called Jennings excitedly. "Dead on. But that ain't a spaceship. It can't be!"

In the center of the tele-screen there floated a shape something like a flattened pear-drop. The jagged flame of her drive sped from the pointed end, and the sides shaped down to a knife edge. Her hull was smooth, and black, and featureless.

Agar let out a deep breath. "She's a spaceship, all right, but she's built to fly in an atmosphere. Which means she doesn't operate from a space station, which means she's from no known planet."

He moved quickly then to his seat at the intercommunication panel. and strapped himself in. "Cut off motors," he ordered.

"Yes, sir," and Burgess repeated the order into the intercom. Twenty seconds after he reported, "Motors off."

Jennings called, "She's cut her drive, sir."

"I don't get it," said Greenway. "Everything we do—"

"Greenway! barked Agar. "You're at action stations. Keep your thoughts to yourself." To Burgess. "Put the Cloud in her path."

The Cloud was a rapid diffusion of radioactive particles; quite harmless, and invisible to the naked eye. But on a detector screen it had all the outward appearances of an atomic explosion. It was the shot across the bows. It was standard practice. And, as Agar knew, in this case it was quite futile.

He leaned back in his chair and stared up at the domed and padded ceiling. You meet an alien life form, he thought, so you bite your navigator's head off. You don't know what to do and it's beginning to show.

Jennings reported, "The Cloud's opened out, sir."

Agar looked at the desk chronometer and watched the seconds-hand creep round. At fifteen seconds every indicator needle in the room began flicking wildly backwards and forwards. The viewing screens went a blank, glaring white; and flames danced

on every metal corner and projection. Jennings began to swear in a low, passionate voice. The display lasted about a minute.

"Not bad," said Agar, looking about him. "In fact, pretty good, for an extemporaneous display. In fifteen seconds they've observed the Cloud, assessed its total effect, calculated its purpose, and replied with their equivalent."

"So what do we do?" asked Burgess. "Blast 'em?"

"No, you bloodthirsty hound." An idea had occurred to him, was only half-formed as he went on. "Don't you see what they're saying to us? We're alien to them, remember. Turn the ship on line of flight and decelerate at one G. Have the men stand down and congregate in the common room. Greenway, how long have we got before we pass?"

"Two and half minutes . . . sir."

There was high insubordination in the pause before the "Sir." Agar smiled thinly.

"Well, I've got a job for you. Can you plot a course that will bring us out side by side?"

"I've already figured it out. I thought you'd need it." Greenway became suddenly enthusiastic. "A right-hand spiral curve at five degrees based on the square of our distance apart when we pass. We flatten into a closed orbit at the top of the cone. That will bring us up out of the corridor, and about four-five miles apart. Just one thing, can we depend on the other navigator?"

"Don't bother about that," replied Agar. "You'll find that she'll stick to us like a shadow."

As if in confirmation, Jennings said: "She's decelerating on line of flight, sir."

Weight had returned now so Agar left the control room and climbed up into the common room. This room, for the first two weeks of flight, was a fuel tank. Now it was crowded by about twenty young men, sprawled about in the attitudes that the young are wont to assume when they relax. There were two main groups in the room. There was the crew of eight, and the marine detachment under Sergeant Valestrino. The loud chatter subsided, and several pairs of feet thudded to the floor as Captain Agar entered. He waited till every eye was on him before he spoke.

"As you know we've met an alien ship," he said. "Now this is something that's never happened before, and was thought so highly an improbable contingency that only fifteen regulations were laid down for it. The important ones are these: First, we must sever all connections with Earth. Second, if necessary, destroy this patrol ship—though to be sure we are allowed to engage the alien in combat and attempt to destroy her first. Third, we are not to try to communicate with them unless they are peaceably in-

clined, and are obviously trying to communicate with us. Finally, I am instructed to tell you what I am going to do, why I am going to do it, and then take notice of your opinions, presumably because you are the sole representatives of the human race. This last piece of tommyrot we'll dispense with, but the rest, because it is designed to protect the makers of regulations, we will follow—in principle."

The men grinned. The Old Man was in great form. Agar went on:

"Now the alien has religiously followed a purely negative pattern of behavior; and this I decided to recognize as a form of communication. They're not obviously peaceably inclined. They're not obviously anything. They are a reflection of ourselves. They are saying, 'I can do anything you can do, and probably more besides.' I'm telling you this because I've decided to board her, and I want no trigger-happy hooligans in the party. I want volunteers, but only men who are interested in her scientifically and culturally. I'll take two men from each group."

As he expected the room was full of volunteers. The crew, with a great deal of laughter and argument and coin-flipping elected a fitter, and a maintenance man. With no fuss at all Sergeant Valestrino picked a mining expert, and a gunner.

"Right," said Captain Agar. "Stand to, you men. Number Two landing equipment, and remember, that means spacesuit and *no* side arms."

Later, Captain Agar cursed Greenway and his curves as he struggled into his spacesuit. For, since the *Boreas* had entered the spiral curve, the left-hand wall of his cabin had shown a decided tendency to become the floor.

Burgess stood in the doorway, and watched him with flat, incurious eyes. Then Agar slipped three small cylinders into the arms belt, and his interest quickened.

"So you think it may be a trap?" he asked softly.

Captain Agar asked: "What is a trap? Why should they try to trap us? What have we got that they must travel light-years to find, and cannot obtain by peaceful means?"

"Then why the A. B. C. bomb?"

"Perhaps I just want to blow a big hole in space. Alternatively I may be bothered by an aspect of this action and reaction business that is completely illogical." He flipped a switch on his desk, spoke into the intercom. "Rogers. Have number four transit rocket made ready."

Burgess spoke suddenly and urgently behind him. "Take me with you. You know me. I'm expendable. Greenway can take the ship home. And anyway you're supposed to have a second pilot on a rocket."

Agar thought for a moment, drumming his fingers on the desk top. Yes,

he knew Burgess, and he knew that no matter how subtly a man may contrive, or how discreetly he comports himself, some day he will find himself in an emergency that can only be solved by the employment of brute force. And then he needs a man like Burgess at his side.

"All right," he said. "Get into your suit, and come down to number two lock. You can carry arms."

Burgess left, and Agar sent an order for the others to meet him in the lock, and went down there. He passed into the lock, and when the air had been drained from around him he pressed the button that opened the outer door. Then for a few moments he was alone with his enigma. The alien was a jagged candle flame hanging directly opposite in a silent void. He saw the two ships in his mind, a slim, pencil shape and a flattened pear drop warily circling a common axis. Tiny motes dancing a strange, precise gavotte in a vast amphitheater.

A red light began to flash on and off over the doorway. It meant that someone was trying to enter the lock. Agar closed the outer door and was joined by the others. They checked the radio, then walked outside and along the catwalk to number four transit rocket. She was anchored by grapples and lay spreadeagled on the side of the ship like a starfish on a whale. Agar took the pilot's chair, and the others took their choice of the remaining eight seats. Burgess released the grapples and Agar pressed the firing stud. He eased the throttle open with feather-light touch so that the rocket drifted away from the parent ship with the minimum of thrust. Then he took her round and pointed her nose at the flame of the alien's drive.

The journey took only a few minutes. Once clear of the *Boreas* Agar cut the drive and applied the forward braking jets. Even so the black bulk ahead grew with alarming speed.

"Hey, she's big!" somebody said in awe.

Agar searched the shape ahead with anxious gaze. There had to be a lock, and it had to be open. He tightened the flight curve a little and then he saw it. A square of black velvet on smooth metal, and the rocket seemed to be heading straight for it. Which was very good for discipline. He landed the rocket on the back of the ship near the lock, and Burgess applied the grapples. Agar radioed Greenway on the *Boreas* to shut off the deceleration and continue the orbit in free fall.

While they waited for the alien to cut off, Agar told them: "Now this is the order of things: When we travel in single file, or enter any rooms, Lieutenant Burgess goes first; myself second; you others behind. If anything is going to happen to us, it will happen to Lieutenant Burgess

first, at his own request. Then we must see that it doesn't go any farther." He tapped his belt. "This is an Alpha-Beta-Gamma bomb. You've heard about them, of course. It's fused now. Take Alpha away and there's a small explosion. Place Gamma between Alpha and Beta, and the explosion is atomic."

The purple glare of the alien's drive flooding the cabin altered to red suddenly, faded, and died. They were left in the dusk of space. Agar said: "Right, let's go."

They climbed out, and walked, with the plunging movement of magnetized boots towards the lock. It was a square opening, and on one side of it the hull was continued over the edge and into it to form the floor. Burgess led the way in, and Agar followed him. It was dark inside, and several hand-torches sprang to life lighting a square, cavernous room. It was obvious at once that it was not an air lock.

There were three openings from the room, one from each wall. On the left-hand wall the opening was about two feet high, the next one four feet, the third one eight.

Somebody said: "What do you make of these rails on the floor, sir?" And Agar looked down.

There was one rail from each opening, and they met in the center of the room. They were all about a quarter of an inch high, but varied in width. The widest, from the largest corridor, was about four inches wide, the next two inches, the narrowest, one inch.

Agar said, "Like everything else about this ship they're probably highly significant. But we won't solve the problem by standing here. Mr. Burgess, will you take the right-hand corridor?"

"Is there an alternative?" asked Burgess, as he stepped into it.

The corridor was about four feet wide, smooth-walled and curved overhead. Burgess strode along, his torch held level in his left hand, the gun in his right dangling negligently by his side. Twenty yards in he stopped. He said, "There's a curtain ahead."

Agar moved up to his side and shone his torch ahead. The curtain hung straight down from ceiling to floor, and seemed to be made of small beads threaded on wire. The rail continued under it. Agar stood still and said nothing, and Burgess walked forward until he could touch the curtain. He parted it with his torch.

"It could be a curtain," he said laconically, and pushed through it. His voice came back, oddly distorted, thin and high-pitched. "Ugh, it's like walking through treacle. It's a field of some sort. But come on in, the water's fine."

Agar grinned and walked forward. As he pushed through he experienced a moment of near panic. The curtain seemed to cling, to cover him completely. He was drowning in a vast

ocean. Then he was through, and looking back at a bead curtain.

"All right, come on through," he ordered. "It's pretty bad, but don't let it bother you. It's only taking your picture."

Burgess looked at him. "That's what you think?"

"Yes. Somewhere on this ship somebody is now studying a miniature replica of alien life forms." He turned his attention to the corridor ahead. Twenty feet farther on it divided, and there seemed no reason why one should be chosen rather than the other. Agar flicked his torch from one to the other, and then dropped it to the floor. The rail divided and continued on in the center of each, but in the left-hand corrider it was colored green.

"That's it," he said. "That's for us."

Burgess led the way again, and soon the domed ceiling began to glow with a blue light and they were able to turn their torches off.

And so they came to the first of the rooms. It was a square room, hardly wider than the corridor. There was machinery of some kind on the floor, and the men pounced on it with whoops of excitement. The room had the appearance of an anteroom. On the left-hand wall there was another doorway, and, through it, a glimpse of a bigger room. Burgess went to the doorway and leaned against it. He looked expressionlessly across the room at Agar who had stayed outside. Conversation was impossible because of the excited chatter of the others.

"Hell, I didn't bring a screwdriver."

"How would you get this casing off?"

"Betcha something will jump out and bite you."

Agar leaned against the wall and switched off his radio. He closed his eyes and thought. He thought about the corridors that seemed to have no object but the distance, the rail that became colored, and the fact that there were no air locks—and he came to a logical conclusion.

He switched on his radio, and opened his eyes and mind on a scene of disappointment.

". . . Just a dressed-up dynamo."

"Thing can't even work."

"What is this? Kindergarten?"

Burgess was still looking at him. He said, "Quiet, everybody. Mr. Burgess, will you go into the other room? Tell us what you see."

Burgess smiled thinly, and went into the other room. Everyone stood still, looking towards the door. There was a gigantic pause before his voice sounded.

"Just another room, a bit bigger. More machinery, a little more complicated looking."

They give a bit, they take a bit, thought Agar. He said aloud: "All right, everybody out. Quickly now! Mr. Burgess, bring up the rear."

He turned his back on their startled

faces, and led the retreat. Along the lighted corridor, through the curtain, and into the entrance hall. He stood there while the men hurried past him. "In the rocket," he said. "Jump to it!" Burgess came backing out of the corridor, his gun held level.

"Anything at all?"

"Nothing. No change anywhere."

"Right. We'll get away from here."

He blasted away from the alien with full thrust, out of the orbit of both ships. When they were some distance away he cut the engine, and they hung silently in space, the ships like toys beneath them. Agar stared thoughtfully down.

"Do you know what that thing is, Mr. Burgess?" he asked. "Think about it.

"Suppose you wanted to find a civilization with certain characteristics, on a world with mineral resources comparable to your own. The symbol of such a civilization would be space-flight. And its motivating urge, the thing that would give it space-flight, and a society based on its mineral wealth, the common denominator of all intelligence throughout the galaxy—curiosity.

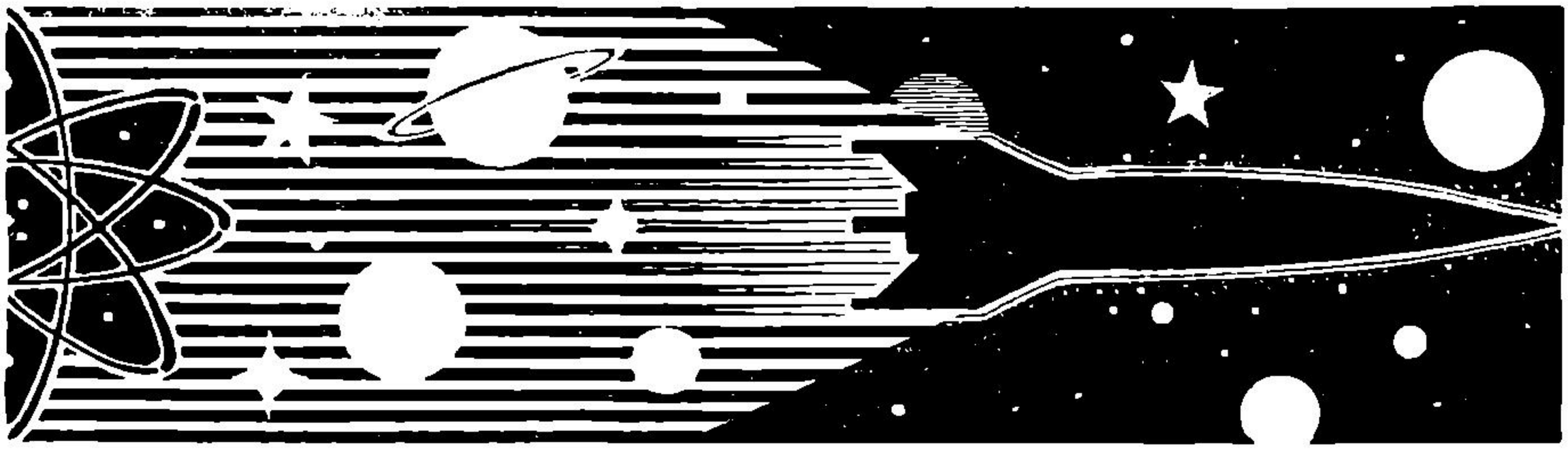
"So you'd build that thing down there. A ship that would attract the curious, then examine, select and classify them. And, no doubt, have ample accommodation for live specimens. It's a dip stick. It's a mousetrap on a piece of string. But suppose somebody cut the string—"

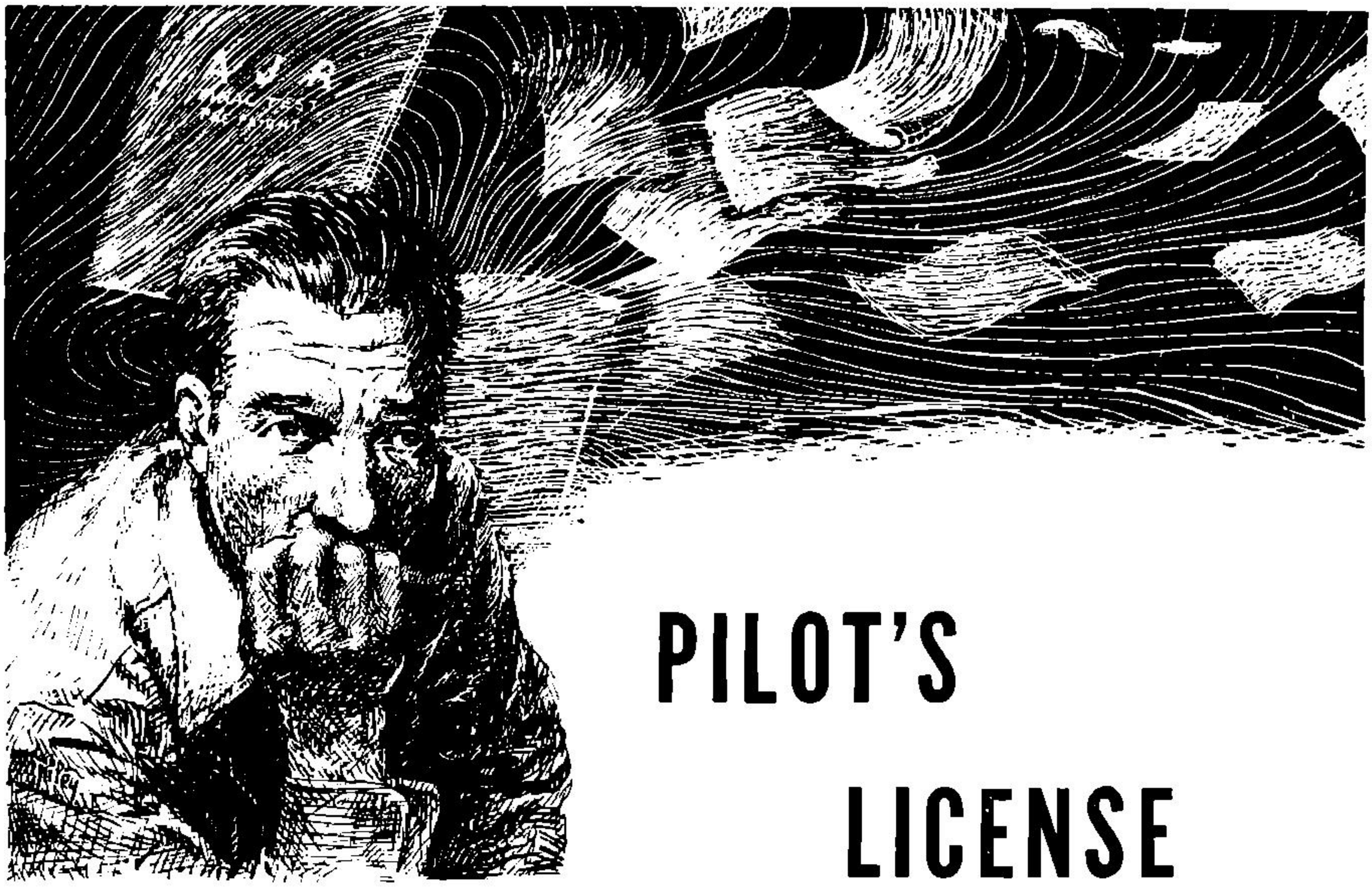
He switched on the intership radio. "Hello, Greenway. Listen carefully. Break out of the orbit away from the alien, but first, hit her with everything you've got!" He switched off. "It wasn't logical," he mused. "It wasn't reasonable. Their reaction to our action. If our action had been an atomic torpedo, what could their reaction have been? So the ship had to be expendable. It came an immense distance, so it had to be completely automatic. And there she goes."

Below them the alien was enveloped in a purple cloud, and the cloud was blown to fragments as a slower, heavier torpedo hit.

The *Boreas* was drifting in behind them, coming to pick them up.

THE END





PILOT'S LICENSE

The only man you can be sure won't get polio is one who's had it —and won the battle. And it isn't the man who "can't be broken" that's safest—but the man who can put himself back together!

BY WILLIAM T. POWERS

Illustrated by Riley

"Lysle Cruthers," the thin little man said, leaning over the counter and watching the girl's hand fill in his name. "L-y-s-l-e. It's spelled L-y-s-l-e."

"Address?"

"11610 West Austin, city."

"Occupation?"

Lysle held his voice steady. "Accountant."

The girl raised her eyebrows and stopped writing long enough to give him a closer look. "Aren't you stepping outside your field a little?"

"A little. What's next?" Lysle fervently hoped that she would keep the news to herself, but he knew she wouldn't.

"Credit references?"

"I'm paying cash. I've saved up for this since I was seventeen."

The girl looked at him again, sympathy in her eyes. Cocker-spaniel eyes, built for giving or demanding sympathy. "I sincerely hope you make it,

Mr. Cruthers. That's fourteen years."

"Almost fifteen. I shall make it." He had said it that way fourteen years ago, when he started his special savings account, the one he hadn't touched for anything, vacations nor sickness nor hunger. There was a wall against thoughts of failure.

"Why do you want to pilot a rocket?" She leaned across the counter toward him.

"I have my reasons." He couldn't possibly tell her. Not her, a stranger. Not, as a matter of fact, anybody.

"I understand."

"Do you? I don't see how you could," he said rather coldly. "Where do I go next?"

"Through that door. Medical examination. Did you know that was required?"

"I knew. Thank you."

"Good luck."

"Thank you."

He fidgeted for a moment, and then she handed him the form she had just filled out and a stack of others, and pointed silently to a double door across the anteroom.

Lysle pushed through the crowd milling between him and the door, slipping among the green and pink and black "civilians" and the navy-blue pilots, and went through the doors. Just before they swung shut, he thought he heard someone snicker.

There was a male nurse sitting at a desk, and Lysle saw gratefully that no one else was waiting. He put his papers before the man and waited.

"Hm-m-m. Application for instruction leading to private pilot's license. Looks O.K. When will Cruthers be in?"

"I'm Cruthers," Lysle said, steeling himself. He knew it was going to be this way, and worse. He would just have to put up with it.

"*You?*" The man looked again at the sheets and burst out: "An accountant! You're really thirty-two?"

"I am in excellent physical condition," Lysle said. "I have kept in training."

"O.K., bud. You're either a fool or a suicide, but we'll go through with you as far as you can make it. Through that door—I'll buzz Doc for you."

The doctor was doubtful. "Well, Cruthers, you seem to be in good physical condition, but external appearances can fool one. A man of thirty-two is *old* to be—"

"I know of pilots who are forty and forty-five," Lysle snapped.

"Yes, of course, but they've been flying since they were teen-agers. They don't have to *learn*, Cruthers. You'll have to pick up at your age what is sometimes hard for even an eighteen-year-old to master. And remember, cardiograms are only an indication. I've seen perfectly healthy hearts give out without any warning from the EKG, and the older the person, the more pessimistically we have to interpret our results. I'm afraid that AJR just won't want to risk your life like

this. I wouldn't feel too badly about it—"

"Doctor, I cannot stress too strongly that *I am going to learn to fly a rocket!*" Cruthers was on his feet, looking thin and ridiculous in his nudity. His eyes glared at the doctor's. "Nobody is going to stop me. If I have to steal a rocket and learn illegally, I shall do it that way. I have waited too long, worked too hard, even to consider being rejected."

The doctor, taken aback, was silent. He looked his patient up and down with the withdrawn attitude of a horsetrader, pursing his pudgy lips. He hm-m-m'd. He tapped his short fingers, stacatto, on the desk. He scanned the papers and the entries he had made.

"Right on the edge," he muttered. "Heart's good, reaction-time fair, co-ordination excellent. Limbs somewhat inflexible. You know what you're asking me to do, my good man? You're asking me to risk my job here. You're asking me to take the poorer of two alternatives."

Lysle was silent. He wanted to put his clothes on and run back to his hole-in-the-wall basement apartment and never come out again. He wanted to do something violent, but he knew that there was precisely nothing he could do that would make his position any better.

The doctor sighed, picked up a rubber stamp, and in rapid succession stamped the six sheets of the medical report: "SATISFACTORY PHYSICAL CONDITION."

Lysle let out a long shuddering breath. "Thank you, doctor."

"Incidentally, I knew your father quite well," the doctor said.

Lysle's heart and breathing stopped.

"I've heard it said that he was a coward and a disgrace to his country," the doctor went on.

Lysle's face went white, his body went numb.

"However," the doctor said, rising and coming out from behind his desk, "I do not believe in that myth which says courage runs in the blood. I have taken several hundred gallons of blood-samples in my life, and I never ran across one cc of courage there."

When the numbness had resided, Lysle said shakily, "There are some things that one must prove to himself, doctor."

"I don't think you will do it this way. But, if you think you must, you must. I haven't any illusions of being able to change your mind. That's up to you."

"You will not mention this to anyone?"

"Of course not. I won't even bring it up again to you, if you wish."

"I'd prefer it that way."

"Very well. You report in to the Training Office, now, to matriculate. Good luck."

Lysle left in a turmoil. He hadn't really thought of his father for years,

but the doctor had reminded him sharply of his fundamental reason for having to master space. His father, supposedly a steady-nerved veteran had in Lysle's eighth year taken a job as pilot for an interplanetary line. Not the kind of pilot they trained at AJR, but one who scoots out to the big ships and maneuvers them through instrument-twisting electrical and magnetic storms to a safe landing. He had had a deep-seated neurosis which he kept carefully hidden, and he had been overwhelmed by it while landing a giant vessel belonging to another government. Lysle could still see the videocast, the cameras weaving in and out around the great falling hulk, covering the disaster from every angle from beginning to end. He could still see, when he chose to, the awful fountain of wreckage splashing high into the sky as the incandescent liner hurtled into the ground in the space between scanning-frames. One moment, a peaceful suburb, being watched by a local camera. The next instant, a gigantic crater flashing into being, erupting destruction and debris.

"You can't go in there, bud."

Lysle started, and nodded his apologies to the uniformed policeman barring his way. His face reddening, he asked, "Where do I go to matriculate?"

"Wha-at?"

"Where do I sign up for flying school?"

"Whyncha say so?" the guard asked, also turning a bit red. "Out that door, then in the first door t'yer right."

As the door closed behind him, Lysle heard belly-laughs. In misery, he recalled that a goodly portion of the crowd had been in Navy blue.

He wrote out a check for sixteen thousand dollars in his neat accountant's hand, and signed his name in plain legible letters, handing over thus approximately nine-tenths of his life's savings. He signed the matriculation papers and was informed that he was to report to his class the following Monday at eight A.M. He was given a plastic-coated ID card, a seating assignment, a tool-room checkout number, and a list of the books he would have to buy, all of which had been in his own library since they were published. His heart in his mouth, he then made his request.

"I have heard," he said, "that it is possible for a student to be excused from ground-school if he can pass the necessary examinations satisfactorily. Do I apply here?"

The girls on either side of him stopped taking data from their applicants and turned to listen. The girl taking Lysle's application frowned.

"As far as I know, only a dozen or so people have ever done that," she said. "How much college training have you had?"

"Just two years, studying accounting," Lysle said. "But I have taken eleven years of work in night schools, and I would like a chance to take the tests."

"Well, I don't know," said the girl. "We hardly ever make exceptions, and then only to those who have obviously already received the proper training—"

"It's absolutely essential that I be excused from the classes," Lysle interrupted desperately. "I have only one month's leave of absence, and I cannot, obviously, spend a year in study if I am to fly by then."

"Good heavens, you don't expect to get your certificate in one month, do you?"

Lysle wanted to bite off his tongue. "No, no, of course not," he said hastily. "But since I am going to overstay my leave of absence, I naturally want to limit the overstay as much as possible. Now, what must I do in order to take the tests?"

"I'll have to ask the Training Chairman about that," the girl said. "What is your address?"

"I'll wait while you consult with him."

"Oh, I can't see him now, he's much too busy. Perhaps in a week—"

"A week will be too long!" Lysle protested. "I must see the chairman today!"

"About what?" a deep voice asked, and the girls all turned around.

"Oh, Mr. Shednoe, this gentleman wants to confer with you about something, and I was just telling him how busy you were—"

"What's the difficulty?"

Lysle saw a heavy-set man with black hair and thick eyebrows, and a set of horizontal furrows in his forehead. Deep-set black eyes looked at him noncommittally.

"I . . . I wanted to take the necessary examinations to . . . to excuse me from ground school," Lysle stammered, feeling suddenly how ridiculous his request was.

"All right, Julie, why don't you sign him up for the tests Saturday? You're Cruthers, aren't you? Thought so. Sure, let him try."

Lysle suddenly understood. They were sure he'd never make it, and were counting on his failing the tests. An easy way of getting him out of their hair. Discouragement mounted up in him as he saw the pressure against him, and he thanked Shednoe without feeling anything.

He ate a meager supper that night, and just before he fell into an exhausted sleep, he reflected that he hadn't even been out to the field yet, after spending a whole day at Athos, Jets and Rockets. His dreams were full of endless falling.

He spent the next day boning up on all the books he had ever been through, forcing himself to review and re-integrate all the details of the subjects he had been over and over for eleven years: Partial Differential (Tensor) Equations; Theory and Design of Combustion and Expansion Chambers; Nozzle Hydrodynamics; Fuels, Lubricants and Coolants in

Rocket Engineering Design; Servomechanisms; the Thermodynamics of Liquid-Fueled and Nuclear Rockets; Rocket Instrumentation; Navigation by Doppler-Fitzgerald Plot; Astrogation, Theory and Practice; the Homeostatic Autopilot; Rocks and Shoals, and more.

He ate only twice that day, and when study finally palled early in the evening, he simply went to bed, setting the alarm for six.

He gave himself the luxury of taking a taxi to AJR, after a breakfast of steaming egg-and-pancake and good hot coffee made by Mrs. Morelli at the corner restaurant. He allowed himself to feel good, which was wise.

He found that he was taking the test along with a class that was taking its finals, and he was glad, somehow, that he was not going to be alone in a large room. He needed the feeling of human companionship and human endeavor around him.

He took his test from the young instructor, who kept his expression neutral. Back at his seat he scanned quickly through the test, making a neat check-mark before the questions he was absolutely sure of. There were eight-five questions and he made eighty check-marks.

Three hours later, at the halfway-point break, he had completed the eighty questions and had derived the equation he had forgotten for the first doubtful problem. He turned his test over and joined the group of students outside for the ten-minute smoke. Nobody was monitoring them, but the subject of the test was not brought up. A couple of students came over to Lysle and stuck out their hands.

"I'm Red Agnew," said the red-headed one, "and this is Dory Abenathy. We're at the top of the class, alphabetically."

"Lysle Cruthers," said Lysle, shaking hands. "I suppose I will be with your class from now on."

"Think you'll make it through this test all right?" Dory asked frankly.

"I think so. What is the minimum passing grade?"

The two looked at each other doubtfully. Then Red said, "Didn't you know? Didn't anyone tell you?"

"What?" Lysle's heart sank. What now?

"There isn't any passing grade," Dory said quietly. "Passing is perfect."

"One hundred per cent," Red said.

"No," Lysle whispered. "No, they didn't tell me. Thank you."

You'd think they'd at least give me a chance! One day to study they gave me, without any warning. One day! He crushed out the stub of his cigarette and lit another from the pack. A kid of no more than nineteen hollered at him.

"Hey, Grandfather, what you trying to prove?" A few of the others made protesting noises. Lysle ignored the youngster.

"Hey, Cruthers," the kid went on. "Hey, *Cruthers!*"

"What?" Lysle said finally, withdrawing inside himself. The kid knew his name—how?

"What you going to be when you grow up, Grandfather? A pilot like your old man?"

"I don't know what you're talking about," Lysle said weakly, nausea in his stomach.

The kid's nasal taunt went on. "I bet he just wants to get on television. You know who his old man was, fellows? Who do you know by the name of Cruthers? I'll give you a hint. Think of something yellow—"

The kid quit then, because Red Agnew was suddenly standing very close in front of him, saying something in a low voice. Red was a head shorter and ten pounds lighter, but the kid shut up, and even whined something apologetic, but not to Cruthers.

There were some looks of amusement and some looks of righteous indignation directed at Lysle, and fewer looks of compassion and apology. But among all the twenty blurring faces, there was not one look of surprise. *They all knew.*

The instructor appeared at the door and took in the situation, and said quietly, "Time, fellows. Back to the rack." Red started toward Lysle, looked at his watch, and changed his mind.

Lysle went in last and sat down quietly in his seat, sick. The paper in front of him was covered with meaningless symbols, and he felt lost and defeated. Gradually, as the minutes ticked by and the fear and desperation numbed his mind, he began to hate.

It was easy. All he had to do was to remember the look on his mother's face as she turned away from the video screen, or when she came very early from her bridge club meeting never to go out of the house again. Or remember the kids ganging up on him and snubbing him, shutting him out of their dreams of space. The weary hours of hopeless crying, the scholarship he was never nominated for, the way his mother looked at twenty-nine, worn and beaten, in a cheap coffin.

He clamped a steel control on his mind, and bent to the paper. One hundred per cent. All right—

At precisely four o'clock, when the test was officially over and the others were still scribbling through checks, he dropped his paper in front of the instructor and walked out. He went to a bar near his room and for the first time in his life got drunk.

After he passed out the bartender picked him up in his arms and started toward the door. "Wonder if the little guy made it today?" he mused to no one in particular, and then went on out and carried Lysle up to his room, put him to bed, and got coffee ready for brewing in the morning. When he left, Lysle was crying in his sleep.

Lysle had a beauty of a hangover the next morning. His head expanded

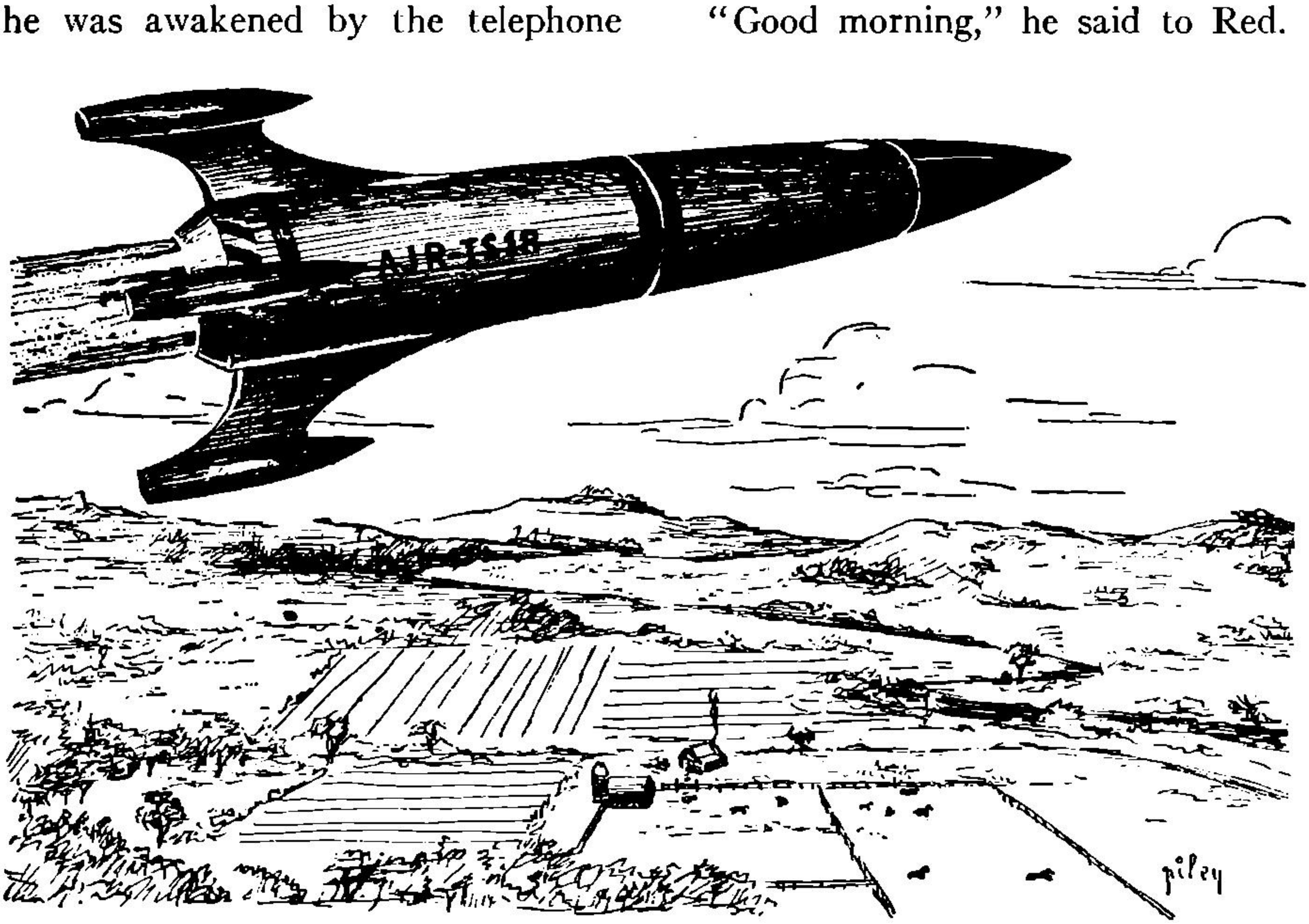
and contracted like a bullfrog's throat, or at least it felt that way, and his mouth was lined with some sort of soundproofing. It took all his B_1 tablets and all his coffee before he could even face the idea of breakfast, and even after forcing two eggs down he felt like the aftermath of twenty-five Gs. And then he had to sit through a long, dreary, rainy Sunday, half-vomiting most of the day, and wonder if he had done all the problems correctly. He tried to remember what they were, but he couldn't make his mind function properly, and he wasn't sure he was remembering correctly the ones his reluctant memory served up. Eventually, in the afternoon, he gave up and went to sleep, sleeping quietly until he was awakened by the telephone at eight o'clock the next morning.

It was the switchboard girl at AJR. The girl said, "Test results will be posted at nine o'clock this morning—I thought you'd like to know."

He shook the sleep from his head, noting that it no longer hurt, and said, "Thank you." He was irritated—it seemed that everyone was trying to mother him. The irritation gathered and became anger again. He gulped down some breakfast and took a streetcar and a bus out to AJR.

He arrived about nine-thirty, and Red was there to greet him, holding a slip of paper in his hand. When Lysle saw the slip, he knew instantly what it was, and he tried unsuccessfully to read the figures on Red's face.

"Good morning," he said to Red.



"Is that my grade? Let me see it—"

Red handed the slip over, and instantly all Lysle could see were the hastily scrawled numbers in red on the slip: Point nine eight three.

"I want to apologize for yesterday . . . I mean Saturday—" Red began, but Lysle muttered "Skip it," and crammed the slip into his pocket, pushed on past the young student.

He went through the building, through the miles of corridors, to the entrance to the field. He brushed past the guard, who did not try to stop him, and was greeted instantly by a blast of sound. Automatically he stepped back, until he saw that the source of the sound was a good mile across the field.

Then, caught in a sort of trance, he watched. A great cruiser was getting ready to take off, and the cradle in which she stood was warming up its tubes. Straight down they pointed, blasting away the water that covered the field five feet deep. In the mid-distance, a smallboat was heading toward the dock where Lysle stood.

The sound rolled across the water, visibly rippling it, and grew and grew in intensity. Lysle marveled that he had never heard the take-offs from inside the building. Clouds of steam boiled up around the base of the cradle, being instantly whipped to shreds by the torrent of heated air. Then, like a giant rising to his feet, the cradle and the cruiser stirred.

Though he had seen it a thousand times, Lysle was gripped anew by the scene. There were no words to tell how it felt to watch a thousand *tons* of mass rise evenly and gently into the air on a screaming column of racing gases. It was just there, a part of a whole world that now vibrated to the bellowing of energy released. The earth itself seemed thrust away by the blast, as though the cruiser and the cradle were standing still and the whole world were being pushed away by them. Then in an ever-new moment of splendor, earth and cradle and cruiser all thrust away from each other and there was no fixed point in the universe, only the mounting motion of great masses interacting. Then the cradle dropped farther behind the cruiser, and once again the earth was the foothold, and the cruiser was an insignificant dot fleeing into the sky while the echoes and the rumbles of its departure followed each other around the horizon to extinction.

Lysle felt his way to a bench and sat down, then suddenly collapsed inside himself and buried his face in his hands. So close, so close—

"Cruthers—" It was Red. "It was a dirty trick, and I could kill myself for it. I didn't know how much it meant to you. Did you know that you got the highest mark in the class?"

The words didn't penetrate immediately. An incredible hope rose in Lysle, died, and rose again. He snatched the slip of paper from his pocket and read it all.

"Test grade: 0.983. Class Rank: 1." And in the lower right-hand corner was penciled lightly in feminine handwriting, "Goody!!"

"Goody!" Lysle burst out, joy beyond containing bubbling in him. "Goody! Perfect!" And he collapsed into hysterical laughter, which Red watched, first doubtfully, then with growing amusement, and finally with matching hilarity.

"You're not mad?" Red asked, finally, wiping the tears from his eyes. "Man, I wanted to tell you before we went back in, after that jerk Danley was riding you, but I had the test on my mind, and—"

"Forget it, Red," Lysle chortled expansively. "I would have felt just as good even if I'd been sure of passing. By the way, just what *was* passing score?"

"Sixty," Red said, and they were both off again.

"Look!" Lysle said suddenly, breaking his laughter short. Red turned, and with glowing eyes they watched the cradle returning alone, as it roared jerkily into position and settled squatly into the hollow made for it in the bottom of the artificial lake.

Then, in unison, their eyes lifted to follow the long, long trail of light-blue haze that ran raggedly up through the air and on out into space.

Thirty men in fifteen smallboats shivered in the dawn light, poised at the docks. Engines thrummed quietly with a liquid sound where the exhausts bubbled beneath the water.

A row of loud-speakers made a throat-clearing sound, and then rasped loudly, "Coxswains make ready to shove off. Instructors will carry out their maneuvers at the following altitudes: Training Ship Nine, one hundred miles; Training Ship Twelve, two hundred miles; Ship Thirteen, three hundred; Ship Eighteen, four hundred miles. All remaining ships will wait for orders before crossing the commercial zone from five hundred miles to eight hundred miles. Ship Twenty, nine hundred miles—"

The voice finished the long list, and gave a crisp order to execute. The loud-speakers thumped in unison and quit hissing.

The smallboat engines thrummed louder and the fifteen shuttles made parallel wakes out across the landing-lake. Lysle turned to his instructor, the only other person in the passenger-space, and shouted above the rumble of the Diesels.

"Mr. Wade!"

"It's 'Bob.' What is it?"

"How do they keep track of the count on the water?"

"What?"

"*The count—how?*" Lysle pointed over the gunwale.

Wade lifted a finger for "watch" and reached into a small locker under the coxswain's poopdeck. He pulled out a small black waterproof model of a beta counter and tossed the ear-

phones to Lysle, holding onto the end of the cord and plugging it in. He pointed conspicuously to a knob at the bottom of the case and gestured to his ears. Lysle fitted the earphones on and heard a sporadic *click!* over the muffled groan of the engines.

Wade went to the gunwale and held the counter out over the water, then pulled the knob at the bottom of the case. A U-shaped drawer slid away from the counter's base, and the click in the earphones jumped three- or four-fold. Lysle nodded.

Wade came over and shouted in Lysle's ear. "Automatic monitoring—count level automatically adjusts the gates up at the dam! Changes the water fast enough to keep the activity down. No danger."

Lysle knew about the control for keeping fresh water coming in and radioactive water draining out, but he smiled his thanks anyhow. He had asked just to make conversation in the first place.

The training-ship drifted closer to them, and the coxswain let the engine idle. Lysle knew these ships backward and forward, as well as pictures and diagrams could teach, but the actual ship showed that the pictures missed a certain feel of mass and solidity. His mouth began to get dry, and when the smallboat began making the peculiar ululating whine that meant reversed propeller, and bumped up against the ship, Lysle began to get shaky—he grabbed for the open hatch and missed. Wade got him by the collar, thus saving him from a dunking and a rush trip to the decontamination showers. Lysle grunted his thanks, regained his footing, and held the smallboat fast while Wade swung aboard and stretched a hand down to him.

The smallboat heeled over as the coxswain leaned on the tiller and gunned the engine, and swept away in an unwinding spiral toward the docks. The silence was almost embarrassing.

"You first," Wade said. "Know what the insides of these things look like?"

"Pretty well," Lysle said cautiously.

"Take the right-hand seat—you have to go first to get into it."

Lysle squeezed through the air lock's two doors and found himself crouching in a low, dark space with nothing in it but a few meters on a small panel. Storage space, Lysle knew, where food and spare oxygen was kept for long trips. Coming up through the deck around the edges of the room were six enormous bolts with massive nuts on them—any part of this ship associated with living beings had to be stored separately from the reactor-section, to keep cumulative radioactivity from reaching too high a level in the metal.

Lysle realized that Wade was waiting patiently behind him, so he reached up and began to climb the narrow tube leading "up forward." He passed a hatch which he knew opened into the air-reconditioning and oxygen-

storage plant, and finally stuck his head up into the blackness of the control room. Grinning to himself, he reached up and flipped on the light, finding the switch right where he expected to. The result was a roar from Wade, who swarmed up behind Lysle as fast as he could.

"Listen, mister, there'll be no more of that or you can get out of this school!"

Lysle grew hot and his palms got damp.

"The first thing you're going to have to learn," Wade went on breathlessly, "is that a student never touches a control, even if it's only a light-switch, until he's been checked out on it. What would have happened if you'd decided to open the canopy? Look!"

Lysle looked at the place where the canopy switch was supposed to be, and read the plate: START COMBUSTION. The design had been modified.

"That's for delicate maneuvering," Wade said. "We burn a gasoline-oxygen mixture in the expansion-chamber to make minute corrections in orbits. Right now, there's an explosive mixture of hydrogen and oxygen in that chamber; stray activity in the reactor decomposes the lake-water. Strap in."

"What . . . what happens if it's touched off?" Lysle gulped.

"Oh . . . maybe nothing serious. But then again, maybe we crack the ceramic lining on the tubes, or maybe we start a fault in the ceramic filters where the working-fluid comes through. We'd find out for sure after about ten minutes in the air, the hard way. Now watch what I do, and if you have any questions, ask 'em on the spot. And excuse my temper—it's been short since we lost Ship Six because some student dumped the fuel just fiddling around with the panel. He and his instructor were riding about 500 KMJ—kilomegajoules—of energy at the time, and the only way to lose energy in a rocket is with your jets or by hitting something. They weren't in an orbit and they didn't have any jets. O.K. Here's the procedure for take-off."

He pulled out a checklist, and after hesitating a moment, handed it to Lysle. Then he waited. Lysle paused too, then caught on and read off the first challenge, pencil poised.

"Air lock Outer."

"Shut." A motor whined briefly.

"Air lock Inner."

"Open."

"Batteries."

"Full Charge on 1 through 13."

"Canopy . . . where is the switch, now?"

"Right there. Canopy closed."

"Fluid, working, main tank."

"Full."

"Fluid, working, auxiliary tank."

"Half full. Write one-slant-two, not one-over-two."

"Valve, fuel supply."

"Auxiliary on, main off. We drop the auxiliary as soon as we can."

"I know. Combustible fuel."

"One hundred aaaaaand—thirty. Gallons."

"Oxygen pressure."

"Fifty-five hundred pounds—write 'psi'."

"Evacuation pump . . . what's that?"

"On." A switch clicked. "Cuts air-pressure in here down to about four psi. We're on pure oxygen, and all we need is normal oxygen partial-pressure. How are your ears?"

"O.K.—just popped."

The list went on and on—Lysle began to wonder if they would have to swim around the ship in the lake, counting nuts and bolts. The full check-out took about thirty minutes. When they were through, Wade scanned the sheets rapidly, then signed them at the bottom. At Wade's gesture, Lysle signed them, too. Wade picked up the mike, the radio having been turned on during the checkout.

"Control T from TS-18. Checkout complete, over."

"TS—18, roger. Stand by."

They didn't have long to wait. Wade was in the middle of a short tale about a student who took his girl out in one of the training ships, and he had them just entering an orbit and going on autopilot, when the UHF set came to life again.

"TS—18 from Control T, over."

"TS—18, over."

"Synch your timepiece, old man."

"Roger, old bean." Wade grinned and flipped a switch under the clock set into the instrument panel. In a few seconds the hands of the clock took a sudden jump, and went on from their new position. Wade flipped the switch back and fastened a metal strap across it.

"TS—18 is sinking, old fellow." Wade said.

"Good-oh. I'll throw you a lifebuoy. Five, four, three, two, one, bye-bye."

Lysle was crushed back into his seat by the totally unexpected acceleration.

And he discovered that he was mortally afraid!

The three-g acceleration lasted an interminable time—all of two minutes. All the while Lysle, his head mashing into the pads, his body caught under a terrifying weight, thought over and over: *I didn't know it was going to be like this. I didn't know it was going to be like this. I didn't know it was going to be like this. I didn't*—

Then there was another long, gasping period of no weight at all, and Lysle froze to his seat, his legs thrusting him up against the straps and his fingers clawed rigidly around the armrests—and weight returned.

"Hovering now," Wade said. "Three hundred and ninety-eight miles up. How did you make out?"

"O.K." Lysle struggled to make his voice calm, to relax his muscles. "Kind of—surprised me." He could not convince himself that Wade hadn't been

watching. "I . . . I was a little scared."

"Don't let that confuse you," Wade said. "You're likely to interpret the body's normal adjustive activities as fear at first—and turn on the rest of the stuff that goes with fear. Lots of adrenalin floating around, and so on. And sinking feelings in the diaphragm, and maybe some disorientation. We won't hover long—the first few trips we do to let you get squared away. The surprise, by the way, was on purpose. Some guys get so tense waiting for that first acceleration that when it hits they pull tendons. In two or three trips we'll just head directly for an orbit."

The speaker said quietly, "TS—18, all clear in your orbit-shell."

"Roger," Wade replied. "Commencing maneuvers in thirty seconds." He said to Lysle, "Light up if you want to—no restrictions today."

Lysle fished a cigarette out from his jacket pocket and held it in his mouth while Wade waved his lighter underneath it. He puffed at it almost obediently, but the fear remained. In his mind was the image of a ship falling, and the soles of his feet crawled with the awareness that nothing but sheer *balance* kept the ship from toppling over into the incredible depths below. Wade chose that moment to open the canopy.

In front of Lysle's eyes appeared a black vertical stripe that widened until it was suddenly flecked with stars. The blackness opened up, right and left, wrapped itself back on each side around Lysle. Harsh yellow sunlight splashed in through the filter-glass, and Lysle closed his eyes.

"Yeah, it's bright," Wade said, sounding uncomfortable. "Listen, have you had enough for today? We could go back down, and nothing said."

Only by completely preventing himself from moving and breathing did Lysle manage to avoid hysterical, grateful agreement. He said, through jaws he could scarcely move, "I'll be all right. Let's get on with the maneuvers."

Wade looked long at him, then shrugged. "O.K., mister, if that's the way you want it."

"That's the way I want it."

Wade flipped the autopilot off with his left hand and took the control-stick delicately between thumb and forefinger of the right. Lysle saw the stick move slightly, and the rim of the earth swung abruptly into view to Lysle's right. It hung there at a steady angle for a few moments, then began tilting farther and farther.

"Watch the velocity integrator and the altimeter," Wade said, as though from far away. "Getting into an orbit from a hovering attitude is simple. You keep the altitude constant tilting the ship and building up velocity. Notice that I've increased the thrust to about ten per cent over hovering thrust: we keep that constant increment of thrust, which is why this is

called the constant-increment method. As we build up velocity in the orbit we want, centrifugal force neutralizes some of the gravitational field, so we can tilt farther, putting more of our thrust into the horizontal component. If you're in a hurry, you increase thrust two or three hundred per cent, and tilt more rapidly. Now watch—when we hit orbital velocity, we'll have to be tipped exactly horizontal to the ground below—if I've managed to maintain altitude, we will automatically be exactly horizontal when we hit orbital velocity. And the instant we hit parallelism, we cut the jets to avoid increasing altitude. All you have to remember is to maintain constant altitude. Here comes parallel—watch the attitude indicator."

Lysle, who had been watching the earth begin visibly rotating beneath him and tipping up until it made a gigantic wall on his right, grabbed the arms of the seat again, then deliberately let go. The apparent gravity, which had stayed "straight down" with respect to the ship, suddenly cut off as Wade cut the jets, and instantly Lysle was falling. The earth seemed again to be "down," although there was no gravity apparent, and the long, final fall had begun.

Lysle's eyes glazed under the glare of earthlight, and he was once more with his father in the great falling liner, terror and helplessness bursting his heart and closing his throat, every muscle straining up—UP!

"Daddy, *don't!*" Lysle cried out, veins purple on his forehead, eyes staring wildly at Wade. For a moment there was a frantic kaleidoscope of images—his father grinning up at him while he tossed him into the air; his father's face contorted with fear as oncoming headlights glared through the windshield; his father dropping kittens into the river. His father's twisted face watching the earth rise to annihilate him—sweet darkness, full of murmurs and gentle swaying.

They made him go up again, just like in the books, the same day. Just before he climbed into the smallboat beside the silent Wade, he asked himself if this was the fear of dying, and said "yes" to himself. And then he asked himself if it was, after all, so terrible to cease to live, and the answer was "no."

And he sat, stony-faced, during the second flight, and watched the earth below and regretted his wasted life, and waited and longed for the jets to fail.

"Incidentally," Wade said the next morning, as they were waiting for the cue to blast, "I think we can keep yesterday our own business."

"It doesn't matter," Lysle said. "It won't happen again."

"Feel like trying out the controls today?"

"Surely," Lysle said shortly.

The orders to synch the chronometer came, and the count-down, and then

once again they were off the earth.

Fifteen minutes later, they were in an orbit nine hundred miles up. Wade swept the instrument panel with his eyes, and apparently satisfied, leaned "back" in his seat, letting the straps center him. Lysle waited, impassive.

"Best to start from an orbit," Wade said. "Sort of a zero-point. O.K., here are the controls and the instruments you will use today: Altimeter. Attitude Indicator. Control Stick. Velocity Integrator, resettable to zero. Actually a vector-force integrator, but it shows velocity, accurate to within about five-thousandths of a per cent, and its vernier dial, which indicates accurate to about a fifty-thousandths of a per cent, you connect by flipping this switch. Angles are supposed to be accurate to within ten seconds of arc, but you can only read the pointers to within about thirty seconds. We need the accuracy, though, because we're integrating a directly-measured quantity to get these readings, and the errors mount up with time. With normal maneuvering taking off and landing, and a little dodging in between, you can hit a spot on the Moon a hundred miles across, flying blind. Get the idea?"

"Yes," Lysle said. "The instrument measures the forces—or the accelerations—acting on the ship, and totals them, converting the total to velocity continuously. Of course, you couldn't actually go to the Moon using this."

"Good! But why couldn't we?"

"Because it won't detect the effects of a gravitational field."

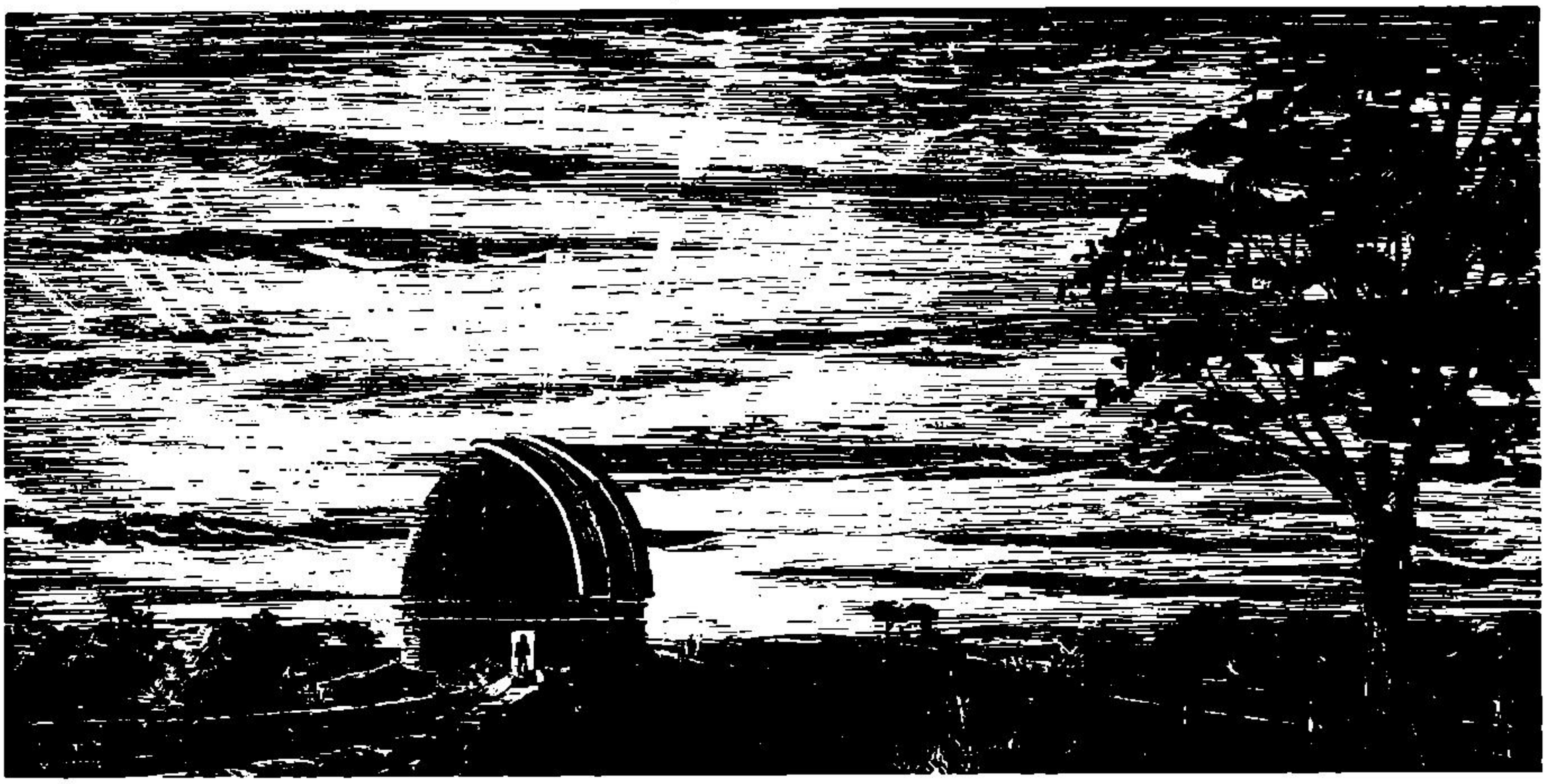
"Absolutely right. That is, as far as you could possibly know. We have another unit now which corrects for the gravitational field."

"But that's impossible!" Lysle showed his first real sign of life. "You can't detect the effects of a gravitational field in free-fall! All the measuring elements are affected the same way, so they can't measure any differences."

"Not *quite* the same way," Wade said. "That statement holds only for point-masses. You *can* detect the difference between the accelerations of two point-masses, or two real masses, if they're at different distances from the origin of the field. That's how the Holman Gravitic Field Detector works. Simply put two small masses into free-fall for an instant, and use electron diffraction patterns to measure the difference in their accelerations. Throw in a system for finding the orientation that gives maximum difference, and you can measure the magnitude and direction of the field."

"But the difference would be almost zero, wouldn't it?"

"Figure it out. It's small, but it's measurable by Holman's gadget. The period of integration is pretty long—about thirty seconds, I think—but we get nearly all the accuracy we need that way. It was Holman's design for this gadget, long before he knew how



to build it, that was responsible for dropping the principle of equivalence."

"I remember, now. Was that the same Holman?"

"Same one. Seems hard to believe, now, that a famous physicist once said that no physical experiment in a closed system could distinguish between gravitational attraction and spatial acceleration. Or between motion in and out of gravitational fields."

Wade paused.

"We might as well go ahead," Lysle said. "You don't need to stall any more. I'm not going to blow up."

Wade looked embarrassed, then finally grinned. "Not very subtle, was I? O.K. First maneuver: Turn Ship. End-for-end 180-degree turn in a horizontal plane, not correcting for orbit, maintaining altitude and free-fall condition. That means we end up pointed back-end-to,traveling backwards. Take the stick in your right hand—very lightly, that's it. Don't overcontrol—all the muscles you need are in the servo-motors."

Lysle did as directed.

"Good. Now keep your eyes on the altimeter and the attitude indicator. Keep the ship parallel to the ground and at the same altitude, and turn it to the left until your heading is—one eighty plus nineteen—one-nine-nine. Go ahead."

Lysle knew that he was being given far too little in the way of instructions, but he knew how every control worked, and after thinking a moment he twisted the stick its full range to the left, keeping it exactly vertical between his knees. He reached out and put his hand on the throttle, pausing until Wade said: "Go ahead, but take it easy."

He cracked the throttle and the ship pushed gently and obliquely against his back. The altimeter hung

steady,the vernier indicator oscillating randomly, perhaps dropping a bit. Two of the attitude-indicator needles hung steady at zero, and the third swept steadily around, accelerating. When that needle hit one-eighty and the gyrocompass said one-nine-nine, Lysle cut the throttle and released his grip on the stick, which spun to center by itself. Then he noticed that the attitude-needle was still revolving steadily, quite a bit faster than he had intended. Centrifugal force was mildly uncomfortable, and altitude was increasing.

"Pretty fair," Wade said. "Of course, you forgot a few things. First of all, when you impart an angular velocity to the ship, you can only lose it by imparting exactly the opposite angular velocity. Also, since you didn't neutralize angular velocity, you didn't provide the thrust which would have slowed us down to our original velocity —linear—at the same time. We'll drift out of our assigned shell very shortly. Got it?"

"Yes," Lysle said. "Will you get us back where we were so I can try again?"

Wade raised his eyebrows slightly at Lysle's flat request, then took the stick. Watching the attitude-indicator, he waited with his hand on the throttle until it hit the one-eighty mark, and then applied the same thrust Lysle had, but in the opposite direction. A few corrections, and all the needles were steady. "There's a better way of doing it—" he began, but Lysle interrupted.

"I think I know what it is." He cranked the stick to the left as before, but this time applied a short burst from the jets and cut them immediately. The ship swung smoothly around the vertical axis, centrifugal force barely detectable, and when the needle hit about one-seventy-five, Lysle cranked the stick in the opposite direction all the way and applied an equal burst. Then with the stick at neutral, he applied one short burst, and another, and the altimeter stopped its lazy climb.

"Good," Wade said somewhat coolly. "Now put us back on our original heading and in the same orbit as before."

"All right," Lysle said. He showed no signs of triumph—only preoccupation with the task. His forehead creased a bit, and he went through the same maneuver as before, except that he stopped the slow fall of the altitude vernier with a single, longer burst.

"That was very good," Wade said, sounding somewhat strange. "Have you ever done this before? Ever go up with a friend?"

"No," Lysle said. "It's merely a question of working out the mechanics. All momenta must cancel, angular and linear. I just applied what I knew. My first attempt was rather stupid." He paused. "When one wants to turn faster, he has to apply a longer burst or a harder one. That shoves him out

of his orbit, and so does the oblique stopping-thrust, so much that one can't correct the orbital velocity with a simple burst straight back. How does one determine the direction in which to apply the final thrust?"

Wade looked at him agog. "*What?*"

"I believe what I said makes sense," Lysle said patiently. "When one has to turn faster—"

"I heard what you said," Wade said shortly. "I'm just not used to talking textbooks. Well, if I'm figuring out correctly what you said, the answer is that you can't correct in any simple way. A straight-back thrust is usually good enough for orbit-work, unless you're on a geographical survey. Then you just jockey around until you have what you want."

"I see," Lysle said. "What is the next maneuver?"

Wade pressed his lips tightly together. Finally he appeared to think better of what he had been going to say, and replied, "That was all for today."

"Shall I go through it again?"

"No," Wade said. "Just land the ship."

"All right," Lysle said, and reached for the stick.

"Let it alone!" Wade snapped. "Are you playing stupid?"

"No. If you don't want me to try something, don't suggest it."

"If you don't want to walk home from here," Wade grated ominously, "quit needling me."

Lysle shrugged and remained silent. Wade's face went through a pink crescendo, and finally returned to normal.

"The next maneuver," he said quietly, at length, "is the same as the previous one, except it is to be carried out in a vertical plane."

Lysle carried out the previous maneuver, except in a vertical plane.

"The next maneuver," Wade said, "is the same as the previous one, except in a plane inclined thirty degrees to the horizontal."

Lysle thought a moment, then rolled the ship on its long axis, reset the needles to zero, and carried out the maneuver in a plane inclined thirty degrees to the horizontal.

Wade took the controls abruptly and spun the ship one hundred eighty degrees, muttering in exasperation when he had to correct an overshoot. He began blasting, turning ship in the vertical plane, until they were poised in hovering position, motionless relative to the ground nine hundred miles below.

"The next maneuver is to attain an orbit from hovering attitude by the constant-increment, constant-altitude method."

"The way you did yesterday?" Lysle asked.

"Yes." Wade stared straight ahead at the control panel.

He continued to stare as Lysle carefully performed the ordered maneuver with mechanical precision, not manag-

ing, however, to maintain altitude.

"Would you mind if I tried that again?"

Wordlessly, Wade brought the ship to hovering attitude, somewhere over Asia.

Lysle performed the maneuver again, this time keeping the altitude vernier from so much as quivering. That should have struck Wade, because error-detection requires an error to be detected, but Wade was dangerously far from reality.

And, of course, so was Lysle.

"That's enough," Wade said eventually in a brittle voice. "You have gone through all the exercises for the next five weeks, and we're running low on working fluid. Do you think you can remember all of this?".

"What is there to forget?" Lysle asked calmly. "All that maneuvering amounts to is application of simple laws of mechanics, and application of the proper controls. I memorized all of this years ago."

Wade's eyes slitted. "So you can perform any of the thirty-odd maneuvers you went through today on demand?"

"I think so," Lysle said. "Yes, I'm certain I could."

"And probably any others that could be described to you?"

"I presume so, unless they involve the use of controls or instruments I have not heard of yet."

"You know what you're saying?" Wade hissed, twisting around in his straps, glaring at the impassive profile of his student. "You're saying that all there is to piloting a spaceship is knowing the rules, the physical laws involved. You're trying to tell me that there's no purpose in all this training, that any professor out of college could make this ship do anything he wanted it to."

"Am I?" Lysle did not change expression. "I suppose I am."

Wade paled. "I've been flying over fifteen years, Cruthers." He paused a long moment, his breath beginning to shudder. "O.K. This time I'm not kidding, Cruthers. *Land the ship.*"

"I should mention," Lysle said, almost crooning, "that one of the prerequisites to trusting the laws and the controls is that one doesn't care about errors, except as indications of necessary corrections of methods."

"Land the ship. I'll grab the controls when you crack. Go nuts, Cruthers, go nuts."

Lysle trembled slightly, then took the control-stick delicately in his hand. He tilted ship so that he could see the earth, and peered at the patterns on the distant terrain. Twenty minutes of silence passed before North America came into view, and another five before Lysle blasted, tail-first, into a hovering position. Then, for another thirty seconds, Lysle sat hunched over the controls.

"How—" He finally spoke, and cut himself off short.

"Can't see the ground, can you?"

Wade said. "But you'll figure it out. Just remember how I did it yesterday."

Lysle merely said, "I was unconscious until the landing was completed."

Wade answered, "You have seven minutes-worth of working fluid left."

Lysle's hand on the control-stick shook, and a tremor ran through the ship in sympathy with the vibration of the control-stick. Then the hand became still again, quite still.

Abruptly, Lysle gunned the throttle and twisted the stick, gunned and twisted, and gunned and twisted again. The ship rose briefly, flipped over, and began to fall nose-first toward the ground.

"*You fool!*" Wade gasped, then said no more, only watched the earth gradually expand, gradually attain features, and clutched his arm-rests with angry claw-hands.

Lysle kept peering at the ground. At four hundred miles he said, "Would you mind pointing out—" and clamped his jaws shut again, and squinted more intently at the onrushing earth. Suddenly he moved both his hands, and the ship came to life on silent jets. It swung its tail around underneath it and with stomach-sucking deceleration came to rest at one hundred thirty miles in hovering attitude. Immediately Lysle went through the series of manipulations that sent them diving nose-first again. The earth below slowly began expanding again, and Lysle cracked the throttle, driving them downward faster. A choked cry came from Wade, but the brief acceleration ceased immediately, and directly below them was a tiny round dot with fine white lines radiating from it across a desert. The field.

Carefully, Lysle aimed at the field, discovering the sight and squinting through it. Just as carefully, he checked the needles against each other, then reset them all to zero, and swiftly turned the ship for the last time. His hands were getting slippery, and his face was flushed and running with sweat. The sound of the reset relays was echoed immediately by the slap of Lysle's hand on the throttle, and the ship swung to point for the last time at the stars. Air began whistling outside.

The attitude indicators quivered, wavering for a moment before returning to their settings; the altimeter clicked, changed ranges, changed ranges again, paused a while, then changed ranges once more, to the lowest range. Lysle's hand shoved, and the air outside howled with the shriek of wide-open jets. The radio began blatting, and the two men flattened grotesquely into their seats. The acceleration let up to one G, and Lysle said, "We're almost out of fluid. How do you locate the correct landing position?"

"The autopilot—switch it on!" Wade gasped. "QUICK! QUICK!"

Lysle looked at the instrument-board, blinked, finally slapped at a switch. The ship immediately leaned,

straightened, leaned the other way, straightened, and diminished its thrust. Then the jets coughed once and quit, and they were falling.

And instantly they stopped, with a jar that was barely noticeable.

For a long moment Lysle sat with both hands clenched around the control stick. Then he fell back in his seat and whispered, "That was difficult."

Wade was trembling uncontrollably, and tears were coursing down his cheeks. He kept pounding one fist against the arm-rest.

"What was I thinking about, what was I thinking about?" he moaned. "My *wife*, what was I thinking about?"

Eventually he was calm enough to hit the air lock-switch in response to the pounding from outside. There was scrambling below, and two men crowded into the small compartment. Lysle looked at the doctor with eyes full of misery.

"*What happened?*" the other man—Shednoe, Lysle saw—barked. "Half the crash-boats on the field are heading back toward the docks!"

"He landed the ship," Wade said weakly.

"Him?" Shednoe raised his eyebrows, then his eyes popped wide open. "You mean *he landed it? Manually?*" His voice kept getting louder.

"It was a fool, unforgiveable stunt," Wade moaned. "I let him needle me into it. I lost my head."

"I want to talk to you alone," the doctor said to Lysle, and turned and climbed back down.

All the way to the docks, while Shednoe poured questions at the two silent men, the doctor stared at the water and frowned, his fingers going *ta-ta-ta-ta-tap* on the gunwale.

As they disembarked, the doctor looked Lysle up and down. "You're soaked with sweat. Go change your clothes, and then come and see me in my quarters." He turned and left.

Wade came up to Lysle and said in a low voice, "I was an idiot for letting you do it, and you are an unsufferable egotist for even trying. But it was good. Ha! It was perfect." He turned his mouth down bitterly. "I spent three years learning to do a Cruthers landing-approach. Or didn't you know your old man invented it?"

"He told me all about it," Lysle said, and walked away.

Shednoe and Wade looked at each other.

In the doctor's quarters, Lysle leaned back in the easy-chair and closed his eyes. "What did you want to tell me?"

"I don't exactly know, Cruthers. Of course, you were only doing what you were told to do, I have no doubt, so your instructor gets a severe reprimand and a fine, and you get off scot-free. But you knew you could bait him long enough to make him take any sort of challenge. You aren't, by any chance, under the illusion that

you can pilot a spacecraft, are you?"

"No, of course not," Lysle said. "I had no idea of where the ship was or what it was going to do. I just watched the instruments and made them read what they ought to, and trusted that they were accurate. I wasn't flying the ship—I was flying the instrument panel. I might as well have been on the ground."

"Then how could you have taken a chance like that? You must have wanted to die."

"I suppose I did," Lysle slumped a little farther into his chair. "I haven't been myself—or anyone—for the last few days. I think I prefer it that way."

"Rather than being afraid?"

"No." Lysle opened his eyes and looked at the doctor. "That's a funny thing. Last night I got over it. Being afraid, and everything else, too. I remembered what you said about not being able to make up for what another person has done, and all of a sudden I knew what that meant. I even knew why I was afraid. I'd been trying to relive my father's life so long that I *was* him, as much as I could be. You've no idea how completely a person can do a thing like that. When I went up the first time, I *knew* I was going to die. Only it wasn't me that was supposed to die. My father died. A ship got him, a ship gets me. Simple. So, that's that."

"That's not that. Last night you turned into a machine. Why?"

"Why not? Don't you see, I have nothing to live for now? I have seen the basic fallacy in the main efforts of my life. What does it matter now if I die? What will I be losing?"

The doctor was silent for a long time. He went to the window, peered out. He lit a cigarette. Finally, he said, "Why keep on flying?"

"Why not?" Lysle replied wryly. "I abhor accounting, and flying and accounting are the only things I have prepared for. I shall continue to fly, until the time comes when the instrument panel is not enough."

"And then?"

Lysle shrugged.

"Do you want to die?" the doctor persisted.

"No—I wouldn't say that. I have no reason either to seek death or to avoid it."

"Did you know that I washed out, a long time ago?"

"No, sir."

Abruptly, the doctor ground out his cigarette, and went to the closet. "Come along, Lysle," he said, getting his coat. "I'm going to show you that you're lying to yourself—if you want to be shown. Do you?"

Lysle shrugged once more and stood, following the doctor outside into the night. When he saw where they were going, a perverse Something in him fought the instant knowledge that the doctor was right, that he was hiding something from himself. He even knew that the something was a goal he had had all his life, a reason

for living that transcended all others, a vision of glory and freedom. Adroitly, he remained apathetic. *Even that means nothing—was just something else my father instilled into me—not mine—not mine—*

They mounted the winding steps and the doctor threw open the metal doors, closed them again when they were inside. He was whistling to himself under his breath as he heaved at the crank that opened the dome-slit.

"When I washed out," the doctor said, unlocking the right ascension and declination clamps, "I left an instructor behind me in the wreck with a broken back. So I went off to medical school to be a back specialist. By the time I got through medical school, I'd sort of forgotten that instructor—he got well without me. Didn't go on into a specialty."

He squinted through the eyepiece. "Nope. Too far down. Let's try M-13." He swung the twelve-inch refractor slowly around, while Lysle stood near the door, his apprehension troubling him more and more as he tried to understand what the doctor was saying. It seemed that he *should* try. The doctor went on in his quiet, conversational tone.

"Then I got tired of the whole thing. No goal. Just another GP, swabbing throats and giving pills to people whose minds were killing them. So I got drunk and started chasing women. Stayed drunk for ten years and had so many women I lost count. Ended up broke and sick. Then one day I got to thinking about how I got where I was, trying to find out what I had wanted that had ruined me. I remember—I was sitting on the back steps of a skid-row flophouse in Chicago, waiting for them to throw out the garbage. Trying to remember what I had wanted, so long ago. Aaah!"

He twisted the clamps and let the sidereal drive take the telescope, a smile on his dim face as he held his eye to the eyepiece, the other one open after the manner of the experienced amateur astronomer.

"Here—look." He backed off and pushed the observing-stool closer, and beckoned Lysle. Lysle went with slow steps, straddled the stool wearily, and looked into—*grandeur*.

"I was lucky," the doctor said quietly. "I remembered.

"I remembered a single scene from my childhood. My poor and unhappy childhood." He chuckled.

"It was one evening in Chumley, Missouri, and I was. . . oh, say seven. About. Nice evening. I'd been quarreling all day, it seems, and couldn't make peace with anybody. Sitting out there with Ma and Pa and my kid sister. The stars came out.

"I sort of opened up, let go. Looked at Ma and Pa, and Betty, and felt the stars all around, and smelt the hay smell from the barn. I told myself right then, as if I knew it all along, that what I wanted was for everyone

to love everyone else, like I loved Ma and Pa and Betty right then, and for everybody to love everything the way I loved the whole world and the whole universe right then.

"And after I remembered that, I got up and went away from there and got a job."

In the black of the field of view glowed a hundred thousand suns, an incredible spectacle set in the incredible deep of space. The Great Cluster in Hercules, on a clear, cool, summer evening.

The doctor paused on his way out and stuck his head back through the doorway. "By the way, Lysle, your father and I used to come up here—before he forgot."

Then he closed the door quietly and left, reflecting that a man who has just remembered his reason for living has a right to weep in private.

Cruthers, he thought, is going to be the most prodigal spaceman ever to hit space, when he gets over the idea that he used the instruments to fly that ship.

For of course, the doctor mused happily, watching the last traces of twilight fade from friendly Arcturus, no man with that degree of presbyopia could have read his instruments accurately enough to fly on them.

THE END

THE ANALYTICAL LABORATORY

"The Cold Equations" was not received coldly; it was warmly appreciated and it was hotly denounced . . . but obviously it wasn't simply ignored! A lot of readers irately insisted on doing *something* to get the girl out of the jam. But evidently the general net reaction was that, whether you liked the way it worked out or not, you felt it was a good, and a strong, story! It's seldom that a novelette—and a short novelette at that—succeeds in clawing a serial out of first place!

The score came out this way:

Place	*Story*	*Author*	*Points*
1.	The Cold Equations	Tom Godwin	2.10
2.	They'd Rather Be Right (Pt. II)	Mark Clifton & Frank Riley	2.11
3.	Superstition	Lester del Rey	2.89
4.	Welcome, Strangers	H. B. Fyfe	3.42
5.	This Is The Way The World Ends	H. W. Johnson	4.00

The fact that "Equations" and "Rather Be Right" came in with a difference of only 0.01 points shows it was a real battle for first place, too! THE EDITOR.

A MATTER OF MONSTERS

Maybe it's not quite so easy to define what a "monster" is as you thought. Of course, anyone who's stared at, gawped at, and made to feel violently different anywhere he goes is made uncomfortable . . .

By MANLY BANISTER

Illustrated by van Dongen

He was the most wretched looking being I ever saw. It was a cold, rainy night, and he slouched down the street five paces ahead of me. He had hunched his shoulders under his thread-bare jacket, thrust hands deep into the pockets of his baggy pants. He had turned his coat collar up as an ineffective shield against the drizzle, and the brim of his hat was pulled

down so that everything under it, down to his shoulders, was in deep shadow. The battered crown of his hat and his shoulders glistened wetly with rain and neon light.

He stopped just ahead of me and looked into the steaming glass of Dan's Chili Parlor. His head was lifted, and the profile toward me. That was what stopped me. I've seen hungry tramps before—but I had to get a better look at this one. At first, I thought it could have been a chromatic trick of the colored neon lights in Dan's window, but then I knew what it was—the guy's head was purple. More than that, it wasn't a head such as you are accustomed to. It was a great blotchy thing, puffed and rift-ridden. It wasn't recognizable as a human head, and it was purple—brilliant purple. I knew what I had to do.

I stepped up to him.

"Hungry, fella?"

He recoiled. He turned his face toward me. I almost vomited. The eyes were spongy yellow puffs in that hideously purple visage. He looked me over.

He saw a rather tall guy, thirtyish, with a floppy brown hat drenched with rain and pulled down low. I had on a tightly belted trench coat, and the light glinted off my rain-spattered specs. I'm not much to look at, but at least my head doesn't look like a rotten purple cabbage!

He nodded. His thin tongue—it was purple, too—licked tentatively from a slit in the purple horror of his face.

"Yeah," he said dully, and if I ever heard a purple syllable, that one was it.

I jerked my head.

"Come on. Let's put on the feed bag."

There was nothing bashful about him, purple head or not. While we were waiting for our chili, I deliberately avoided looking at the guy. He was a monster, and the sight of him made me want to jump up and run. But there was another reason for not looking at him. He would be sensitive about that purple toadstool that masqueraded as his head. Under the pretext of wiping my specs with a handkerchief, I adjusted them just so, and I could see him fairly well without looking directly at him.

He wasn't over twenty—a hell of an age to be afflicted with a knob like that on his shoulders! I knew that if he had any folks, they didn't know he looked like this; he would never have let them know. They probably thought he was dead. And if he had ever had a girl, he didn't have one now. He would know she couldn't look at him, with his head all purple and puffed—and she wouldn't know who he was, even if she saw him. That was the only merciful part of it. If he ever saw her on the street, he could walk right on by, and she would never know. But he would—

I knew what the purple knob was—and I knew who this boy was, too. That's why I hadn't walked on by. He wasn't a tramp—far from it. He was what was left of a man who had been to the Venusian swamps, in the name of humanity—trying to clear the place for settlers from the over-populated Earth. He had been a spaceman and a member of the Planetary Frontier Corps, until he contracted the purple stuff that was a Venusian fungus disease—noncommunicable but incurable.

He ate like a stranger to food—fast and gobbling. It seemed to me that the chili turned purple, too, as fast as he shoveled it into his mouth. I felt a queasy pitch and roll in the region of my stomach.

Sure the guy was hungry—he'd been out of the service at least two years. And it doesn't take long to eat up the lousy three hundred bucks severance pay that goes with a medical discharge. He'd probably been eating out of garbage cans. What housewife could even look at him long enough to hand a sandwich out the kitchen door? What kind of a job could he take, with a head like that?

If he didn't starve first, he could look forward to living maybe ten years—on the shots the medicos handed out at the spaceport sick bay. It took guts to report regularly for those—knowing that if you didn't report, you'd die and be out of this rotten mess!

I felt a sudden warm thankfulness that *I* wasn't like this poor kid. It helped to feel that way, with what I had to say to him.

He finished the last of his chili, gulped down a cup of steaming coffee and looked around like he was still hungry. I held up a finger to Dan.

"Pie!" I looked back at the purple-headed kid. "With ice cream—and bring some more coffee."

When the kid finally wiped pie crust off his purple phiz on the back of his hand and leaned back in his chair, I offered him a cigarette. He took it with fingers that shook. Moisture oozed out of the yellow fungoid blobs of his eyes.

"Been having it tough, haven't you?" I remarked lighting up for him.

"Tough enough." He froze on those syllables and turned his head away.

"Can't get a job, can you?" I continued callously.

He didn't answer.

"Can you?"

He still didn't answer. I said, "Where you been getting your shots?"

"I've been getting them."

"Not at the sick bay. You haven't showed there for six months."

"I got a friend—a doctor. He gives me the shots. I don't need no space navy medico—"

I saw how he felt, and my heart bled.

I said, "Don't blame the Navy doctors for that knot of yours. It

don't make no difference where you get your shots—you've just been holding me up, is all."

He jerked up from the table, knocking his chair backward.

"Look—thanks for the meal. I'm going now."

"You haven't anywhere to go," I said. "Sit down."

The kid was in awful trouble with that head of his. I treated him rough, because he wouldn't even have heard me if I'd used any other approach. He'd had that ugly purple head just long enough to realize the full depth of degradation it could bring him to, the full limit of utter aloneness to which he was subject—an outcast, unwanted by an uncaring world.

He scared you to look at him. Not scared as if you were afraid he might attack you—you knew he wouldn't. It was a deeper fright than that you felt—a fright that rocked the underpinnings of your psychological makeup; that made your very mind want to curl up and go back to the womb for a fresh start.

I looked straight into his swollen, purple visage.

"You think you can't share a table with me, because you're prettier than I?" I asked. "You got to jump and run as soon as you've eaten? Sit down!"

He sat down. I was going to bust him wide open and he knew it, and somehow he was eager for it to happen. He didn't know exactly how I'd do it, but I'd gotten that much across to him anyhow—that I would. I'd bust him wide open— and when I did, it would mean a lot to him. And he felt it coming.

I don't mean I was going to hit him. What do you think I am? I was going to bust him wide open from that prison—that damnable purple prison—he'd locked himself into, and he was almost neighing with hope and anticipation.

"You got something for me!" he croaked.

"A job."

He shrank inside his sodden, worn-out clothes. He dropped his purple head into his hands and sobbed. I waited until his shoulders stopped shaking.

"You won't like this job," I said.

He threw his head back, peered at me out of those frightful eyes of his.

"If it's crooked—keep it!"

I grinned. I took a small notebook out from under my trench coat. I thumbed over a few pages.

"Huysman, George," I read slowly. "Engine Cadet First Class. Is that you?"

The purple scab twitched and fluctuated. He nodded.

"Serial Number S778—that's a mighty low number, George!"

He gripped the table until his knuckles glowed white. He relaxed slowly.

"That was three years ago—when

the Frontier Corps was just getting started."

I said, "There's almost a million in the Corps now. You were one of the first, George. That ought to mean something to you."

The yellowish fungus of his eyes scrunched up into pulpy masses and oozed, so help me, purple tears—or maybe it was just because they were transparent they looked purple.

I added, "How long you been . . . purple, George?"

His voice was a low mumble. "Two years—three. Since my first trip." He stared blindly at me from inside that disgusting purple fungoid growth. "One trip . . . that's all I got out of it—one trip!"

His voice began to rise and I shushed him.

"Would you like to make another trip, George—*one* more trip?"

He was quiet a long moment. "So that's the job. But why just *one* more trip?"

"Because this is a trip you can't come back from, George."

The purple fungus of his face writhed hideously. I tensed with anxiety, then relaxed. That frightful expression was the kid's version of a smile!

He said, "Where and when do I sign on?"

"You're on, George," I grinned. "You can go with me now. But first, I want you to do me a favor—"

I carefully manipulated the locks and disengaged the tri-dimensional anastigmat lenses of my specs from their seat in the front half of my solid silver cranium—the "seeing" part of my electronic eyes, without which I was blind as a bat. I passed them to him with my handkerchief.

"Before we go out, I'd appreciate your cleaning these up for me so I can see, George."

My boys welcomed George into our select little group. But from the first introduction, he was George Huysman no longer. He was Purple Top, and he liked that better—none of us wanted to be reminded of our names. Names meant we could have kinfolks, but *our* kinfolks didn't have us. We were living dead— dead to the world that didn't want us, or wouldn't want us if it knew.

There were five of us—five broken jugs that had gone to the well too often. Iron Head—that's what they call me, in spite of the fact my head's made of silver, not iron. Iron rusts and the water on my brain would raise merry hell with an iron skull. I stuck my head into the flareback of an atomic converter. After that, I suffered what seemed like years of agony until I woke up with a brand-new, silver skull. It don't hurt to have a silver head—after you get used to the idea you can't grow hair on it.

I was to be pilot of our ship on this one-way trip.

Then there was Pat Rourke, the Plastic Man. He'd cracked up a scout

on one of the unnamed asteroids. He came out of it alive—but the medicos gave him a face, a right arm, a right leg, and a large part of his back muscles of plastic. Sure, he can use the plastic parts, after a fashion. They do marvelous things with the new bioplastics—but it isn't flesh, and that says a lot.

The Plastic Man was our engineer. He was now training to operate the new DC-3 Converter—a top military secret.

After Pat, there was Jimmy Sidel. The medicos had saved his life, too, but not much else. From the moment Jimmy came off the operating bench, he was known as Bottle Bottom—Bottle for short. That's what Jimmy was—a living bottle, just like a regular Coca Cola bottle, except for size. Bottle was man-size, and transparent—not made of glass. That would be too fragile. He was transparent plastic, and you could see the amazing innards working inside of him. Up at the top, where you'd expect a crinkly-edged cap to be, Bottle just rounded off in a frosted plastic dome. Under that dome lay Bottle's brain—all that was left of Space Pilot Jimmy Sidel after the heater in his spacesuit went out of whack and he went into quick-freeze in the hard vacuum of space.

Bottle had electronic eyes, but no hands, no legs. He could see. He could talk. And hook him up to the right kind of machinery, he could operate it like it was his own body. Machinery like that was being developed for us to take along on our trip. Bottle was transparent to make it easy to study him—that's what the docs had been doing. But now, nobody studied Bottle any more. He had been the best navigator who ever took a ship into the sky—and he got to be one of *my* boys. I had use for him. And priority counts.

The last of our group, Henry Jones, was the only one of us who still looked remotely human. All Henry's changes were inside and you couldn't tell it, unless you saw him in the shower. Then you saw the up and down and side to side scars the surgeon's knife had left in his breast and belly.

Hank was Gutsy to us—he hadn't a vital organ left inside him. The medicos had cured him of cancer, but they left him with insides that were a dream of Rube Goldberg mechanics—a nightmare, that is. But Gutsy was still alive, and he still had plenty of what it takes to be my co-pilot on this last, lone flight we were about to take together.

Purple Top, of course, was our jetman. To judge from his record, he had been a good one. That's why I had chosen him.

If collecting bric-a-brac had been my aim, I could have had a thousand monsters. But I just went after the best. One by one, I had tracked them down, found where they hid out, and I dragged them back into the service.

Bottle had been easiest to find. He couldn't have gone anywhere had he tried. Purple Top had been the toughest, and he was the last. I had them all now.

And I didn't tell any of them why I had brought them together. Mainly, because I didn't know myself. One last trip—that's all any of us knew. I didn't even know when we would blast off. That had to be decided by the brass. All we could do was wait.

Oh, we lived like kings during that waiting. Our quarters were the best in the service. Each of us had a private suite of his own. If there's one thing a monster can't stand, it's looking at four other monsters twenty-four hours out of every day.

That's why, I told them, the ship was designed the way it was—each man at a separate station in a different part of the ship. Each man had private quarters at his station. There was an intercom hook-up to keep us in touch.

None of us had seen the ship yet, of course, though the Plastic Man and Bottle were undergoing daily training in their specialties; but that's the way it was designed, so I told them.

I had seen the plans of our ship-to-be, and in a lot of ways it wasn't like any ordinary ship. Once I had seen a mock-up of it, and it looked even more unusual. The colonel showed it to me in his office one day, when I had gone over to attend a meeting of high brass. I was supposed to be not only pilot but commander of the expedition. I went to the meetings so I'd know what it was all about. All I heard was a lot of gum-beating, and nothing ever came out of it that made sense to me. I figured that was the way they wanted it, so it was O.K. I'd find out soon enough, anyway.

All summer the five of us lived the life of Riley, except for the time we had to spend in class on ship operations. We got together when we felt like it in our communal recreation room. When we didn't, we retired to our private quarters.

We could read, watch TV, pursue hobbies—anything we wanted to do. But we couldn't leave our quarters unless to go to school or when summoned by higher authority. Not only were we not allowed off the base, we couldn't even wander around on it. That suited us—we didn't like people staring at us.

They fed us on the fat of the land—real "condemned man ate a hearty meal" stuff. The food was sent over from the commissary cafeteria, three times a day without a miss, and it was the best to be had anywhere. Each of us was served separately in his quarters—except Bottle.

Bottle never ate. They had "fed" him when they made him, on a tiny speck of radioactive material that kept his artificial innards going. That bottle-shaped body of his would live

on a thousand years after his brain died and dissolved into gray slime.

We lifted ship in the cheerless dawn of a chill, drizzly October day. I still hadn't told my boys anything, though I had finally been briefed the night before. Only the Plastic Man knew. He had to know. It was a part of the training he had put in on the DC-3 Converter. Not even *I* knew what that was at the time.

The colonel had discussed the advisability of briefing the crew as a unit when he told me when we were going, and what we were going to do when we got there. I advised against it. The men, I told him, had been having a lot of fun guessing. Each had built an elaborate thesis in defense of his own guesswork. None of us were anywhere near with our guesses, of course—the engineers who had made this last flight of ours possible were farther ahead in the field of spatial science than we could have known.

So we blasted out into space and no one but I and the Plastic Man knew where we were going or how we intended to get there.

We had transferred Bottle to the ship in a covered van and had wheeled him on a dolly to his station. A pair of metal straps held Bottle rigid between two stanchions. He'd stay there until we got to where we were going.

After he was securely in place, a couple of engineer-medicos came in to fix him up. They worked for hours.

When they left, Bottle was equipped with a special plug-in switchboard with outlets for all the instruments he would use on the voyage, plus a few more for the different machines we carried in the hold, and others that would let him take advantage of our recorded entertainment facilities.

We drove straight out into space after cutting orbit, straight out and away from the sun. There wasn't any moon to flag us on as we went by—it was on the other side of old Earth. There weren't any planets in this direction, either. I knew my boys were burning with curiosity. They had to know. I'd better tell them.

I flipped the toggle on the Attention All Stations buzzer. The boys reported in—"Gutsy!" "Bottle!" "Plastic!" "Purple Top!"

"O.K.," I said. "So nobody got left behind. This is Iron Head. Everybody comfy?"

There was a moment of silence, as if each waited for another to speak first.

Bottle said, "I'm laughing."

That was a standard phrase with Bottle. He couldn't laugh, of course. That mechanical yakker of his didn't know what it was to laugh. Whenever Bottle felt amusement, ironic, sardonic, perhaps bitter—one never knew what it was with Bottle—Bottle said, "I'm laughing."

Gutsy spoke up. "I'm not laughing. I'm sad, and I'm up in the air. All of us are, including Bottle. Give us the scoop, Iron Head."

"You've been waiting," I said. "You deserve it. Here it is. You all guessed—I did, too—that we were going somewhere among the outer planets. We aren't."

Again that moment of silence. Purple Top groaned:

"Why keep us in suspense?"

I laughed, but there was no humor in it. It hurt to tear my thoughts away from Earth—the world we were leaving forever.

"I said, "You fellows know this is a one-way trip. I've been able to tell you that much. Now I can tell you why." I paused. My mouth felt suddenly dry. I went on, "Maybe all of you know what the astronomy professors have been doing the past few years with their big telescopes. Maybe you don't. But the fact is, they've been locating more planets. Not in the neighborhood of Sol, but out in space, circling our nearest neighbors among the stars."

"We are going to the stars," Bottle said flatly. "I really guessed that, but I hadn't guts enough to say it. That's a joke. I'm laughing."

Nobody else laughed.

"Correct," I said.

"Which one?" Purple Top wanted to know.

They took it calmly, those boys.

I said, "Alpha Centauri. That's

a binary, and there are planets circling both those stars. Maybe, among the half dozen the astronomers have located, there is one we can land on."

"If there isn't?" That was Plastic, who knew all about where we were going.

"We've had it," I said succinctly. I drew in my breath. "On the other hand, the chance is equally good that there is. The probability is that there are even more planets there than the professors have been able to discover. Isn't anyone even interested in how we're going to get there?"

"I figure that's been taken care of," said my co-pilot.

"O.K., Gutsy, it has," I replied.

"Not on jets," Purple Top averred. "We wouldn't get there in a million years!"

"It's the new engine," Bottle put in. "A sub-spatial energy warp."

"You've been talking to Plastic," I accused.

"The hell I have." That was Bottle again, toneless, flat. "What have I got to do but think. I haven't any fingers to twiddle. I figure it has to be something like that. I can just figure it, vaguely."

"How about that, Plastic?" I asked.

The Plastic Man's nasal tones took over.

"Bottle's got it—backwards. It's a space warp on the sub-energy level." He launched into a discussion of the DC-3 Converter. I heard his words, if you get what I mean, but I didn't know what he was saying. He wound up, "The source of power for our converter is a very special alloy, you might call it, of radioactive materials. Our converter contains just one charge—enough to get us where we're going. That is why we can't count on coming back."

Gutsy exploded. "Why couldn't we carry an extra charge to come back on?"

I could visualize the Plastic Man's stiff, unsmiling face.

"Our journey will last for twelve years—and so will the charge that is in the machine. The charge lasts twelve years, whether it is inside or outside the machine. We could carry an extra charge, but it would exhaust itself in the course of the trip. And we'd all be dead in three weeks from radiation disease."

"Twelve year!" yelped Purple Top. "*I'll* be dead in less than that!"

"It's up to you to stay alive," I snapped at him. "We got plenty of shots aboard for you. You can die after we get there."

"Thanks," Purple Top acknowledged.

I went on brusquely. "So we'll spend twelve years in space. What's the difference, how long it takes? That's only part of it. As soon as we land, we're going to set up a radio beacon that will contact Earth. We'll use it to report on the conditions we find. It will take four years for our carrier wave to reach Earth. That

will add up to sixteen years. Four years later—twenty years from now—we'll hear the first broadcast sent back to us from Earth. Meantime, we'll have plenty to do, mapping the planet and getting a space cleared out and built up for future settlers. A lot of that Bottle can handle by himself with the special machines he's been training on—"

I went on, told them a lot of things. I reminded them of the acutely critical population congestion on Earth. The governments knew that something had to be done about it within the next century. Mars had turned out to be a lousy place to colonize, and Venus was even worse. What had been tried there, on both planets, wasn't going over so well.

The plan was, if our converter did not fail and we safely made a planetfall, other expeditions would be sent out, to other stars. Somewhere, habitable planets must be found to relieve Earth's growing congestion.

"It's a toss-up whether we get there," I told them flatly, "or, having got there, whether we'll find a planet fit to land on. Hadn't you wondered why a bunch of monsters like us were assembled to make this trip? Who else could stand twelve years in this can without going off his rocker? The fact that we are still sane, after what happened to us, shows we can take it—take it better than all the thousands of A-1, physically fit young bucks who would have gladly volunteered for this job. Are you beginning to get it? I'll repeat it—frankly, the chances of our ever getting a radio message back to Earth are remotely small. And who would miss *us* if we failed? And who else would be as glad to get away from Earth?"

I told them a lot more to whip up their morale—in case it needed whipping up. I wound up speaking directly to Bottle.

"It's yours from here on. You plot the course for me and Gutsy to steer her by. When you've got it, Plastic will give her the gun. Check it out."

Twelve years is a long time to live with four other monsters. In less than a twelfth of that time, you don't think of them as monsters any more. You don't hate to look at them. You even crave their company. Underneath, these so-called monsters are like people you've known all your life—like you think you are yourself. It gets so you look at them and you don't see monsters—you see people . . . friends . . . buddies. That's how it was with us.

We got together in our rec room more and more often for games, for bull sessions, for any purpose at all to avoid being alone. You got so you felt the vastness and emptiness of space right down to the middle of your guts, and the loneliness of being alone scared hell out of you.

How do you keep your sanity

throughout twelve years in a metal vacuum bottle? Bottle, maybe, can answer that better than I can. He's been in a bottle even longer.

We had plenty to do, just running the ship. There was the hydroponics garden that had to have regular care—it furnished part of our food and kept our air oxygenated. No kind of machinery will run for twelve years without a breakdown, either—except the DC-3 Converter, and it functioned beautifully. But the other stuff kept going to pieces, especially after a few years. If we weren't tinkering with the refrigerator, it was the air purifier, or the laundry machines. Or maybe the tape projector would take on a case of electronic gastritis. Twelve years is a long time, but it goes fast when you've adopted it as a way of life.

We celebrated all the holidays, like the Fourth of July, Thanksgiving, Christmas and New Year's. We even made a holiday of our own and called it D.D.—Date of Departure.

We didn't miss the things you might think we missed. We didn't miss crowds, or the neon lights of Earth. What we did miss was new things to see and new things to hear about. I would have given my silver skull to know what was going on, back on Earth.

After about eight years in space, Purple Top began to change. He had to take his shots regularly, of course, to stay alive. But he got so that he'd miss a shot for a long time, he felt so good. And that purple knot of his seemed to be shriveling and turning a pale lavender.

Within two years, Purple Top wasn't Purple Top any more. And he deliberately smashed his hypo on the deck. He wouldn't be needing it. He was cured of the Venusian fungus disease. Incredible, isn't it? He was cured of an incurable disease.

We discussed the phenomenon with great interest among ourselves. Was it the steady storm of cosmic rays hurtling through our ship that had effected the cure? Or was it some other unguessable radiation that abounded in the deeps of space? We couldn't tell, and I wished to hell there was a radiation that would change a silver skull back into flesh and bone. What wouldn't I give to be able to weep decent tears again!

It was a bitter thing to contemplate—bitter for the slowly dying victims of the Venusian fungus disease back on Earth. They were kicked out of the space service for it—given a lingering death-sentence on Earth, when a few years in space might cure them completely. Well, you live, you know—and while you live, you learn things.

Anyway, we couldn't rightly call him Purple Top any more, so we called him George. And for a while, George was the same as the old Purple Top we had known.

The change in George was subtle

at first, but one thing about being a monster, it makes you sensitive to people's reactions. We all sensed the change in George from the beginning. He took to shunning us, like we made him sick, or something. We saw less and less of George. He got moody.

I knew what was going on inside George's mind. Wouldn't any of us know? He was beginning to miss those things I said monsters couldn't miss. He knew that if he were back on Earth right now, he'd have opportunities again—opportunities to work for a living among other human beings, to marry and have kids. That's what was eating the heart out of George.

But nothing could be done about it now.

He had to take the situation or go over the line. He didn't go over, but I think he came very close to it.

What saved us all about then was the fact that we were nearing the end of our journey. That was the one focus strong enough to bring us together and outweigh any psychological factors of hurt feelings or under-the-surface frictions.

Even Bottle was excited. He kept saying he was. You couldn't tell it from the sound of his voice.

We decelerated on the Alpha Centauri system, looking for a likely planetfall. It didn't take us more than a week to find it, and it was good—too good, almost, to be true.

We checked the planet out with our instruments, and she was Earth-type, within the tolerance allowed. That dazed us all—made us quiet and filled us with renewed purpose. Really, we hadn't expected it.

So the planet checked out good. We couldn't set our ship down fast enough.

The blue air looked good around us, and the fleecy clouds when we got down low enough to pass through them. We could see the map of the new world spread out below us, all green and wrinkled up with mountains, and flat stretches that could only be plains, and seas and rivers.

Except for the shape of the continents, it was as much like Earth as any planet we could ever hope to see again. And it was ours—all ours.

We landed on a plateau that ended in a vertical precipice falling off into the sea. The sky was blue. Twin suns swam overhead in it, and it was spring in that hemisphere. White birds fluttered over the cliff and the singing sea, and there were trees and shrubs growing right up to the edge of the cliff. Our observations had shown us no signs of civilized life whatever.

We set our ship down in a clearing a half mile from the sea, where a small stream burbled through a field of grass—the ideal spot for our Earth-ranging radio beacon.

Suddenly a warning whistle cut across the tense bustle of our landing.

"What the hell—?" I said.

We had never thought we'd use our radio apparatus—ship's radio, that is—except for local contact with our own exploring parties. Now it was sounding the warning that it had picked up a carrier wave. The light on the control panel blinked the code signal for the carrier's kilocycle range.

Dread froze my hand for an instant, then I moved and tuned the set.

A voice filled our ship with sound—was carried by intercom to every station on our ship.

I can't remember what the voice said. Does it matter now? More important, I think, is the effect the voice had on us. It wasn't the fact that the voice spoke English that stunned us, nor the knowledge that a spaceship from Earth rode the sky a mile above us.

What killed our souls, was the knowledge that we had been beaten—we had failed.

Of course, it wasn't our fault. Twelve years is a long time. Science can advance a lot in twelve years—when it has a good start like the DC-3 Converter. You see what I mean? Our whole spaceship—crew included—had been obsolete from the moment we left Earth. New techniques had created a better machine—and better men were available to man it.

We learned about it from Commander Halloran as we gathered that evening around the first campfire that had ever been lit on this new world—and we named it then and there New Earth, in memory of the old Earth.

The other vessel had landed a short distance away, and Commander Halloran came over with a few of his officers. He had a crew of five hundred men on that ship of his.

We were all at the campfire, save Bottle. We hadn't had time to unship him yet. And Commander Halloran knew how we felt. He was very delicate about the situation. But I only half heard his words, I was so taken up with my own thoughts. But I noticed George. He was changed from the surly, uncommunicative fellow he had become on the latter part of the voyage. He was leaning with interest on the commander's words, and his eyes shone in the light of the campfire.

". . . Made the trip in less than thirty days," the commander was saying. "We can go anywhere in the galaxy in less than a year. We calculated to get here just before you arrived—we wanted you boys to be first to make a planetfall here. It was your right. You had it coming to you. We waited and picked you up with our detectors as you came in on the system. We followed you in to your landing." He smiled. "I understand how you feel. You feel like we've taken your triumph and your glory away from you. We can't help that—even though it isn't so. What you did was plenty more than what

we had to go through. Your names will go down in history as the first Earthmen to set foot on New Earth.

It was small consolation to me.

George said, excitement tingeing his voice, "Less than thirty days!" He looked at me. "In a month, I could be back on Earth, if I went back with them. Couldn't I, Iron Head?"

My thoughts focused again. I thought of George, his restored manhood—the hope that was offered him after years of hopelessness.

Why was I griping?

"I think it would be a great thing for you to go back with us," Commander Halloran said, taking the words out of my mouth. "Think what a sensation you'll make among sufferers of the Venusian fungus dis-case!"

I knew that wasn't what George was thinking. He was picturing to himself the sensation he'd make among the girls of Earth.

There isn't much of my face left to show feelings, but what little there is must have shown something. Plastic, of course, was expressionless all the time, and Gutsy kept his thoughts to himself.

Later, after the commander and his group had gone back to their ship, we went back inside our own. But not until I had stopped a moment and searched the star-blazing sky for old Sol. I saw my native sun —a pale flicker of yellow light, and abruptly followed the others inside.

The others had gone to their quarters, and as I came in, I ran into George coming out of his. He had a packed duffle bag on his shoulder.

"Thought I'd take my stuff over to the other ship—"

"Sure," I said. "Go ahead, George, and say—"

He turned at the air lock door.

". . . Good luck," I finished.

I heard his hard shoe soles ring on the air lock floor, then the sound fell away to a *chink, chink, chink* as he descended the landing ramp.

Gutsy came out into the alleyway.

"George gone?"

I nodded.

"Guess he couldn't stand us monsters any more."

There was bitterness in his tone.

"No . . . you're wrong, Gutsy. George couldn't stand himself any more."

The Plastic Man ducked out of Bottle's quarters.

"So what if he's gone?

"I wonder if that's the best thing?" I returned.

Bottle's mechanical voice floated eerily out of his little chamber.

"You wouldn't stop him, would you, Iron Head?"

I went in to get closer to Bottle. The others crowded after.

I said, "The matter with George is he thinks he's useless. He thinks we all are. I saw it in his face. out there by the campfire, when Halloran

was spouting about the wonderful new ship they've developed. He figures none of us is needed any more, so he's going back to Earth, because he'll be needed there. Well, all right —let him go. But there's plenty of work to be done here. We may be a bunch of monsters, but humanity still needs us. We've got to get this place ready to receive people when they start arriving. We've got to clear land, put up houses—"

I heard the *chink, chink, chink* on the ramp, but somehow it didn't penetrate. I kept on talking.

"We've got the equipment and the guts to do the job. That's why I think it's a mistake to let George go back. He just *thinks* he's needed back on Earth—"

The ring of hard shoe soles had sounded the length of the alleyway and stopped outside the door. I felt the tension in the air. I babbled aimlessly a moment more, then turned with a sick grin. George stood in the doorway.

"Go on, Iron Head," he said softly, face pale. "Say the rest of it."

"Look, George—" I protested.

"If you don't, I will," he went on, just as quietly. "I thought I could find a place where I was needed back on Earth. We'll start from there. I admit it. That's what I thought. I thought about the guys with the purple heads and I thought I was the hope they were looking for. But it came to me, all of a sudden, when I was about halfway to the other ship. They don't need me either. Just knowing they can be cured will be enough for them.

"You know what I'm thinking," he went on after a moment. "We were all monsters, until we lived together long enough none of us was a monster any more. And we had a job to do. That made life worth living and looking forward to. But suppose I did go back? Everybody would come for miles to look at me. Newsmen would chase me around with cameras. I could be turning video offers down left and right. Why all the excitement? Because the world needed me?" He grinned suddenly, wryly. "Hell, no! Because I was a monster—which just means somebody different."

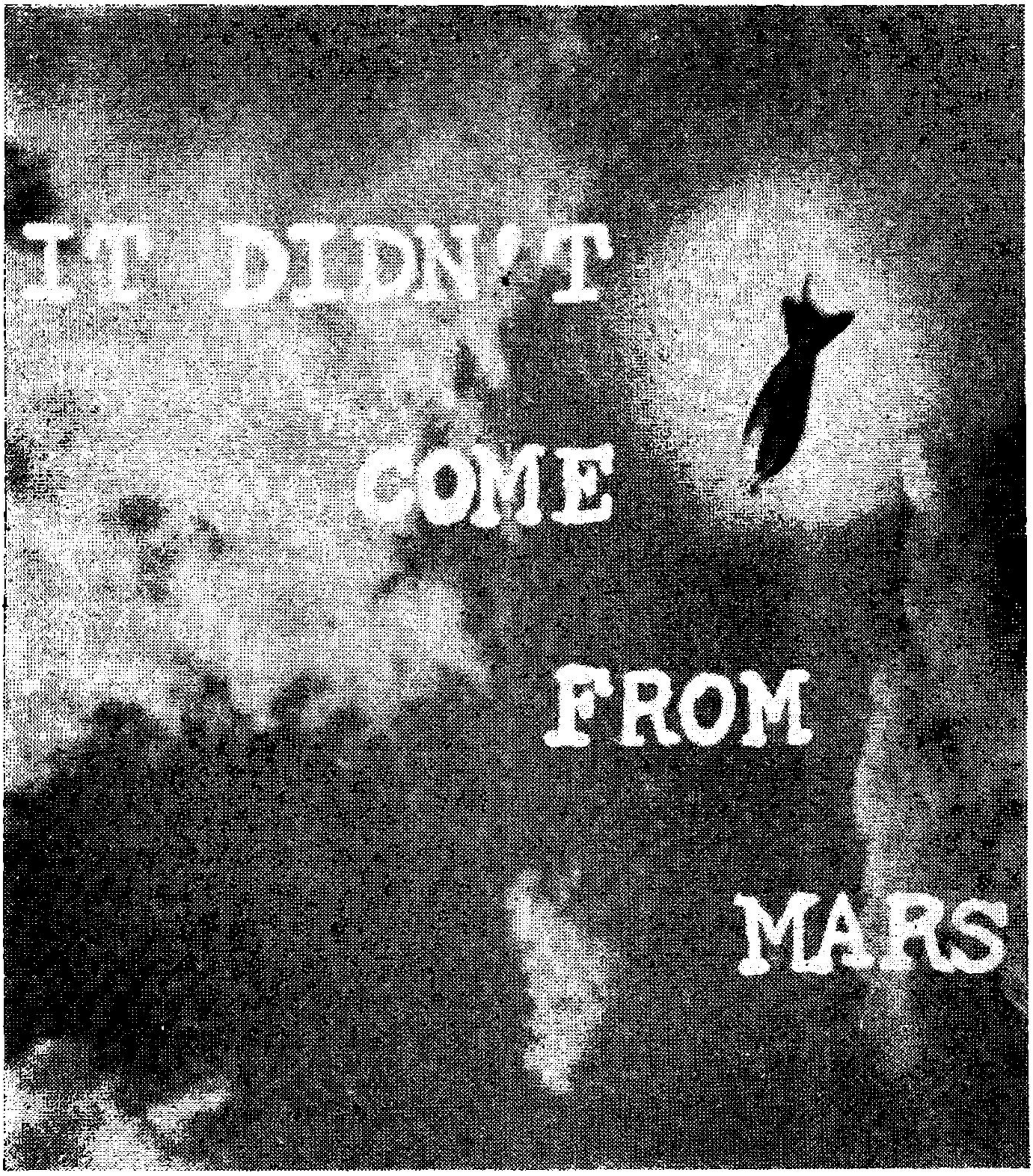
He stepped completely into Bottle's little room.

George said, "I've come back, fellows, to help you do the job that I suddenly realize needs to be done." He stopped and then went on doubtfully, peering at each of us in turn, "If you'll have me back."

Nobody said anything. I took George's hand and shook it. The Plastic Man grabbed him around the waist and hugged. Gutsy hammered him on the back.

We had been like a sick organism, with one of its members out of function. Now we were whole again and feeling it. We were ready to whip this world—*any* world—into shape.

THE END



Here's a man who built a ship that flies "without visible means of support"! No wings, no rockets—and flies through the air with the greatest of ease!

Photographs by Roy L. Clough, Jr.

BY ROY L. CLOUGH, JR.

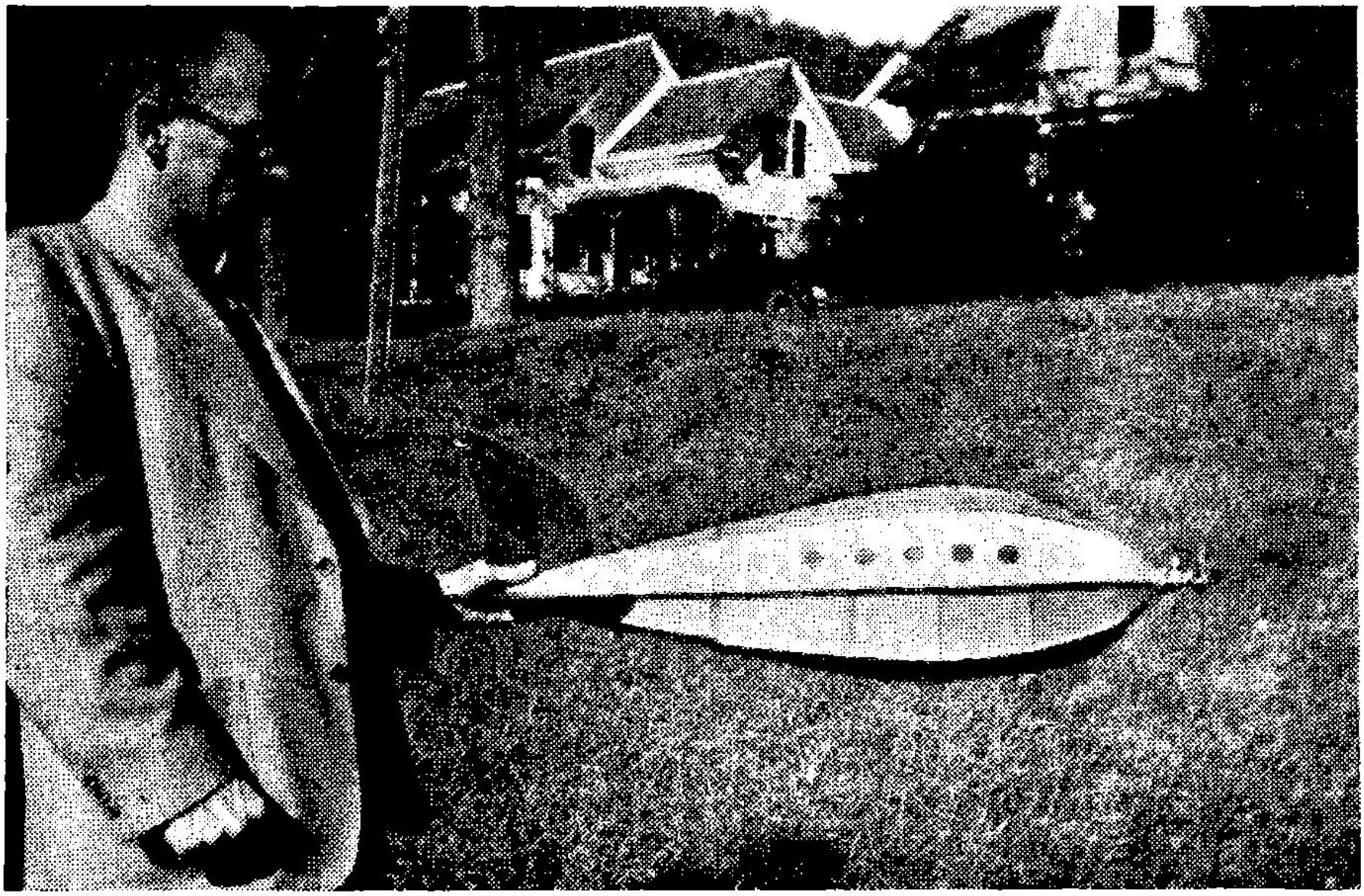
One of the more intriguing aspects of the flying-saucer plague is a number of fairly well substantiated reports of a coexistent torpedo-shaped machine which zooms winglessly through the sky without visible means of support.

While disk-shaped saucers, either of the stationary or rotating surface type are quite understandable in terms of aerodynamics, the appearance of the wingless torpedoes has created considerable speculation that somebody—or something, has a method of countering gravity; producing an antigravity force. And, since scientists still have only the dimmest idea of what gravity may be, let alone nullifying it, this line of reasoning has led to an assumption that these ships, if they are not mirages, must indeed come from some advanced super-race from beyond our atmosphere.

That this isn't necessarily so is illustrated by the little flying model in the photos. It has no wings, yet it takes off normally, climbs rapidly, and even has a fair "glide" when the power goes off. It can also be adjusted to perform a near-hover and hang weirdly "unsupported" at a very low forward speed.

Of particular interest to flying-saucer addicts are the unique flight characteristics of this machine, which appear to throw some light on a pecu-

Terrific climb out of hand-launch with a slightly more powerful engine. Model does not stall under power, it just assumes whatever climbing angle thrust output dictates.



Power plant is a miniscule model plane unit which burns alky, nitro-methane and castor oil. Narrow longitudinal ribs, or stall fences channel the airflow evenly over hull surface.

liar maneuver frequently performed by the big mystery ships: The model has proven to be extraordinarily stable, so stable in fact that it cannot be maneuvered like a conventional aircraft. In order to make it turn in a small radius it must be nosed up sharply, rolled about its longitudinal axis so that it "comes down" headed in a new direction. Seen from the ground this odd maneuver looks remarkably like a right-angle turn, and while it is difficult to judge simply by watching the model, it would appear possible that the physiological effects of such a maneuver might not be nearly as violent as supposed.

The model is generally flown with a small power plant which holds its speed down to 20–25 mph, and fuel is limited to prevent its climbing more than 200–300 feet high. However, experiments with various engines of somewhat greater power output have produced speeds estimated at over 50 mph and altitudes above 600 feet. A small increase in power above the minimum required for flight seems to produce a great increase in lift, or speed. It also would appear that the lift-to-drag ratio becomes very favorable at higher speeds.

The model is of historical interest because it is the first man-made flying machine to be heavier-than-air and not have a direct counterpart in nature.

THE END

THOSE HAIRY ANCESTORS

Maybe those old boys weren't so thick-witted, thumble-fumbed and generally dopey as we've been taught! They didn't have automobiles, of course—but Homo Neanderthalensis was doing some high-grade inventing and research a long, long while back!

BY POUL ANDERSON

Illustrated by Freas

We've all read about them. As children we had the adventures of Ab and the discoveries of Strongarm; grown up, we may have encountered "*The Long Journey*," or Vardis Fisher's series of novels. Caveman stories have filled a good many magazine pages—as literature they have ranged from excellent to poor, but few of them are particularly believable. This is the more unfortunate because the subject of pre-history is fascinating in its own right and should not be smoke-screened by the endless clichés which have become a part of modern folklore.

You know them, of course. Man descends from the trees, and before long Europe is overrun with grunting, brutish Neanderthals, who squat in their caves chomping bones: dark, hairy, dim-witted gnomes. Along come the Cro-Magnons. Their leader, Ung son of Oof, is tall, blond, and generally godlike; he wears a bearskin loincloth and pays due obeisance to the Sun. In a series of bitter battles, his people wipe out Neanderthal and settle down to being Nordic supermen. Between bouts with saber-toothed tigers, Ung invents the bow and weds fair Woo-Woo, sacred virgin of the Sun.

In an alternate version of the legend, Neanderthal man is not killed off but, being too stupid to compete with the magnificent invaders, dies of heartbreak. This was the theme of a rather good story, "The Day Is Done," by Lester del Rey, which came out of a number of years ago.

I'm afraid that none of these clichés happen to be true. Facts and logic show most of them up as quite false, and cast serious doubt on the rest. The most probable reconstruction of what really happened is more complex and far more interesting. Let's work up to it gradually.

I.

The time and place at which man originated is still unknown. It was probably in Central Asia, but that region has been little explored by paleontologists. What evidence there is, suggests that the Hominidae, the family embracing man, his subhuman but manlike ancestors, and certain extinct offshoots, developed from the main primate stock rather long ago; the apes are more distant cousins of ours than used to be thought. (We are certainly not "descended from monkeys," rather we have a lemurlike many-greats grandpa in common.) Most likely there was not a single evolution of a type which became our sole ancestors, but several concurrent developments. Genus Homo once had several species, though today only one survives.

One thing is certain: pre-man was *not* a tree-dweller. He could climb trees, of course, and may at times have nested there for safety, but he was not an arboreal animal like the modern chimpanzee; his arms and hands were not specialized for grasping and swinging through branches as an orangutan's are. (The opposable thumb, far from being a human "invention," is a very old, primitive feature. Some lizards, for instance, have it.)

Nor does man have an instinctive dread of snakes as some people think: that particular phobia is merely characteristic of Western civilization, and by no means universal there, either. Nor was pre-man a weakling, utterly dependent on his fire and his weapons for survival.

To this day, man is one of the largest

and strongest mammals alive; a man in good condition can run down a horse, and indeed many savage hunters used to get their deer by the very simple process of chasing it till it dropped.

Indeed, judging from the teeth which are all the remains we have of him, the Asian sub-man Gigantopithecus would have been some eight feet tall if he stood erect. Weidenreich has suggested that modern man is descended from such a giant form, but most anthropologists disagree.

You have doubtless heard of Australopithecus, the mysterious South African "fire ape"—an extremely primitive, small-brained being which nevertheless did use fire. It seems not to be ancestral to man, indeed a late comer, contemporary with true humans and probably wiped out by them. It may well have learned the use of fire by watching human camps. So . . . quite probably, the favorite science-fiction theme of a new, mutant race developing among other animals to rival man, has already happened! And the sad fate of this challenger gives us reason not to worry about possible super-rats or super-bears appearing to contest our rule of Earth. They wouldn't last long.

Australopithecus does, however, indicate that the domestication of fire is very old, of remote pre-human origin. Java man, perhaps the most ancient known species, of low cranial capacity, had fire, as proven by charred bones found in his dwelling places. (The bones also prove he was a cannibal.) Where and when fire was first tamed will never be known; it may have been done independently, several times. The Near East is a possibility, since in some regions there, outpourings of natural gas will burn for centuries; pre-men living nearby would thus have become familiar with flame and had a handy source of it for experiments.

Even apes weave nests, so clothing may also be an old idea; pre-man may have woven grass capes as protection from insects, if nothing else. Thus we get the picture of man evolving as a creature already in possession of fire, tools, and clothes of some sort.

Our basic bodily features must also be of high antiquity. It has been suggested that the human female has longer and stronger hair than the male because her young clung to it as she carried them around. The male beard is probably both display and protection: the latter is suggested because even today the beard is usually heaviest on the neck and under the jaws, as if it were meant to be a protective ruff for the throat. Body hair is probably pure display related to sexual selection, like the peacock's tail; it may have served to concentrate odors which aroused desire, for the taboo on "B.O." is very recent.

II.

These days, the subject of race is so touchy that intelligent discussion is almost impossible. On the one hand, we have the gibberin of the Hitlers, Malans, and Bilbos; on the other hand, liberals tend to regard the suggestion that the different branches of the human species really *are* different as proof of fascist ambitions. I don't want to enter this argument except to point out that man is a continuum, and the point where one "race" leaves off and another begins is arbitary; that physical differences do exist, but are—or should be—only of scientific interest; and that while it is conceivable that mental differences also exist, (a) it has not been proven, (b) it would only be a statistical matter telling nothing about any given individual, and (c) in no case would it be a logical or ethical ground for discrimination. With that out of the way, let's consider the origin of the three main racial groups.

The "white" branch shows the largest number of primitive features: hairiness, vestigal eyebrow ridges in the male, thin lips, et cetera. Argument still rages over whether this is due to its being an old, original stock from which the others developed, or to its being a hybrid. From the facts presented later in this article, it is probable that the truth lies somewhere in between these extreme views.

The Mongoloids separated early from the Caucasoids, even before Homo sapiens had evolved. Though Chinese palentology is still a little-known field, the evidence indicates that Central Asian pre-man, perhaps even as far back as the Peking type, had already developed some of the distinguishing characteristics which mark his descendants. (The grounds for this belief involve details of skeletal and tooth structure.) Incidentally, the Mongoloids seem to have progressed farthest along the general path of human evolution, being more "fetalized" than the other races. (The trend of man's development has been to make him look more like an immature or even unborn ape than a mature one: relative lack of hair, unspecialized body form, large head, et cetera. The Mongoloid has these characteristics in high degree, as well as other fetal traits like the well-known eye-fold. It might be added that in some IQ tests given to school children in Hawaii, those of Japanese ancestory scored highest—which proves nothing, but does give pause for thought.)

Far from being "like apes," as our more idiotic Southern whites so drearily repeat, the Negroids seem to be the youngest race, such characteristics as dark color and woolly hair a recent specialization to tropical conditions. It should be added that not all Negroes are black—they range from light-brown to ebony in Africa;

too—and that not all black-skinned peoples are Negroid—e.g., the Papuans are Caucasoid, closer related to the European than the African.

These considerations lead to the probability that the earliest true Homo sapiens was of dark-white complexion—like a modern Arab, perhaps. Coming as he did from the southeast, Cro-Magnon was hardly blond; his appearance must have been more Arabic or Spanish, with dark hair and eyes and swarthy skin.

But where, then, did blondness come from? It is rather a freak in the human species: confined to a small area of the world, to a few subdivisions of the Caucasoid race. The fact that blond children often turn dark-haired as they grow up suggests that fairness is an ancestral trait, like the spots which lion cubs lose as they mature. It could not have been necessary in the cold, rainy climate of subglacial Europe, for Lapps and Eskimos are dark. On the other hand, it does not do any harm in the North, and may have some value: in greater ability to utilize sunlight for making Vitamin D and in conserving the iodine that goes into pigmentation and is notoriously deficient in central Europe today.

Kenneth Gray has proposed what to me seems the most plausible answer. When we note that the concentrations of blondness in Europe in early times are almost the same as the greatest concentrations of Neanderthal remains, and that Neanderthal is partly ancestral to European man —we'll prove this later on—it begins to look very much as if blondness is of Neanderthal origin.

It makes pretty good sense. As a small, scattered, isolated population in subglacial Europe, living there for untold thousands of years, Neanderthal man would be subject to genetic drift: new traits would appear through random mutation and build up in the whole race. Blondness would not have been harmful to him in that environment, and may have been helpful—

a familiar evolutionary mechanism.

So . . . already one feature of the dark, stupid gnome has disappeared!

III.

In many ways the term "Neanderthal" is misleading. The name was given because the first remains of this type were found in the Neander Valley of Germany; but actually the basic stock was extremely widespread, its bones and tools having also been found in the Near East. The physical remnants are so few that we cannot reconstruct details of anthropology, but it is probable that there was as much racial variation as in Homo sapiens. (For example, Heidelberg man, though different in some respects, is now regarded as being of this general type, and the early development of Mongoloid traits has already been mentioned.) For this reason, it has become customary to speak of a "Neanderthaloid" stock.

The special characteristics of modern Homo sapiens must have arisen through genetic drift in small, lonely enclaves; as the new races spread outward, these features would be extended, intensified, and varied through interbreeding with other branches. Eventually a fully human race—or, rather, set of races—was developed, and some of them wandered into Europe, where they encountered Neanderthaloids who had not followed this particular evolutionary path. Since this essay is concerned mainly with Europe, we shall speak of Neanderthals and let the above reservations be understood.

We might as well be clear about the ways in which Neanderthal *was* different from us. Though anatomists can go into considerable detail, the most striking involve legs, arms, spine, and head. Neanderthal must have walked with a shambling, bow-legged gait, hunched over and unable to turn his head as freely as we can, his hands dangling low. His forehead was narrow, with enormous supra-orbital ridges, and he had no chin to speak of. The cranial capacity was large, greater even than that of the average modern European; however, the skull shows that the brain itself must have been of different shape from ours, that the forebrain in particular seems flattened out and constricted. It is this which led to the long-standing assumption that Neanderthal man was a brutish dimbulb.

Peculiar as all this sounds, we might as well recognize that even physically he wasn't so very strange. Those who have read L. Sprague de Camp's "The Gnarly Man" will know already that, given a shave and haircut and dressed in modern clothes, Neanderthal would not attract much attention in the tough part of town. We've all seen men who looked at least as odd.

There's still that matter of the shape of his brain. To gauge his intelligence,

we must look at the record. First, then, we see that he survived for tens of thousands of years, often under difficult conditions—no mean achievement. Moreover, he did not practice his arts by rote, but made progress: a whole series of cultures exists, a gradual improvement of tools. He was, therefore, capable of innovation. Finally, some of his burials have been unearthed, and show that his dead were not merely left where they fell. Quite elaborate rites were in force: well-made graves often lined with stones, funeral offerings, special positions for the corpse, in one case even decapitation as if to prevent the ghost from walking. This shows that Neanderthal had a religion of some sort, with pretty definite ideas about what comes after death. But he could not have had that without a power of abstract thought and a fairly well-developed language.

Many tribes have flattened the skulls of children without apparent injury to the reasoning abilities. And several first-rank geniuses, such as Descartes and Leibniz, have had startlingly small cranial capacities. In view of all this, aren't we being rather rash in concluding Neanderthal was imbecilic? He must have used that big brain for something, and the unconcious and involuntary functions would not have required more cells than they do in us. To my mind, the fact that his brain was of different shape merely suggest that our brain doesn't have the only possible contour for a reasoning animal. The best guess, I think, is that Neanderthal may have been a little slow-thinking by modern standards, but not really stupid.

On the basis of such evidence as this, Hrdlicka went so far as to propose that the modern European is descended directly from the Neanderthaloid. Most anthropologists would agree only in part: it's more probable that our ancestors arose as a variation of this type, which then interbred with the less changed branches of the race.

We come now to the so-called Cro-Magnon, the early European Homo sapiens. As remarked before, he was almost certainly of proto-Caucasoid type, but probably dark white rather than blond. He also had a larger average cranial capacity than the modern, though this does not make him a genius. (In fact, the brain may later have shrunk slightly for reasons of efficiency; Norbert Wiener of cybernetics fame has suggested that our brain is still too large, the interneural paths too long, for really foolproof operation, and that this may be the cause of many nervous disorders.) Cro-Magnon was quite tall, six feet or more, and slender; on the other hand, his women were smaller than the modern average, which hints that obstetrical difficulties may have had something to do with his eventual disappearance.

He did *not* come in as an invading

wave. An economy based on hunting, fishing, and gathering simply will not support armies. His arrival must have been a slow trickle of family groups and small tribes, going on through a long period of time. This would also accord with what is known about near-contemporary savages and, for that matter, animals: far from being footloose wanderers, they have strictly defined territories and only move out of them under the pressure of necessity.

What was the necessity in this case? As the glaciers receded, southern areas dried up, swamps and forests became grassland and, at last, desert —a process which is still going on. It was easier for hunters to drift north and west into subglacial Europe, which was still a wet land of enormous woods teeming with game, than to change their whole mode of living. Those who did stay behind were ultimately forced to invent civilization.

Remember that the cliché makes Cro-Magnon a godlike being, immeasurably superior to poor old Neanderthal. I'm afraid the facts won't bear this out either. The first known cultures associated with true European Homo sapiens—the complex known roughly as Aurignacian—were hardly superior to the last Neanderthal Mousterian—the stone-working techniques are different, but not noticeably better. The newcomers do seem to have had considerable artistic ability which was lacking in the older race; but again, the cave paintings and statuettes and the rest were probably made well after the first generations to arrive.

It's tempting to sketch out Cro-Magnon society, drawing analogies from known tribes of more modern times, but the practice is apt to go through pitfalls. Not only do contemporary savages live under different conditions, but they are just as far removed in time from paleolithic Europe as we. My personal guess would make Cro-Magnon rather like our more primitive Indians, with an elaborate set of taboos, social regulations, and ceremonies, which naturally varied from group to group; but it's only a guess.

Now the matter of the bearskin kilts: The same people who so admire Cro-Magnon's intelligence never give him brains enough to think of clothing which would do him some good. The fact that he had needles, together with certain of the cave paintings and statuettes, shows that he wore tailored clothes: trousers and jacket not unlike the Eskimo's, doubtless footgear of some kind. The best theory is that he went naked or nearly naked in the short warm summer and bundled up to the ears in the long cold winter. He may well have painted himself, Indian fashion. All this is probably true of Neanderthal, too.

It's also unlikely that he lived

in caves all the time. Caves aren't that easy to find; even if you have one, there are better places to inhabit in summer. Chances are that Neanderthal and Cro-Magnon both made tents or lean-tos in warm weather; if there was a cave handy, they would have moved into it for winter, otherwise built themselves a sod hut.

About their languages, of course, we know nothing. But monosyllabic names like Ung, son of Oof, are not very credible. All known primitive speech is far more complex than that of civilized man; usually it is agglutinative. In spite of the danger of reasoning from present savages to those of the past, I'm inclined to think that Ung really had five or six syllables in his name.

Now what did happen when these two races, Homo Neanderthalensis and Homo sapiens, met? There may well have been some fighting, but I can't see a long, bitter struggle of extermination. It was too much work just staying alive, the groups were too small and thinly scattered for organized war, none of them owned a great deal worth robbing. On the other hand, intermediate types did exist in a pretty complete gamut of variations: strongly Neanderthaloid in Palestine and some European areas, more modern in Brünn, Steinheim, Galley Hill, and Swanscombe, still more modern at Combe Capelle. (Some authorities believe Brünn and Combe Capelle man to be identical.) The question is whether these represent intermediate stages of development, or are hybrids.

Convergent evolution does happen, but I find it hard to imagine such close parallelism taking place in areas so far apart. More and more anthropologists are coming to the opinion that hybridization went on almost continuously. In that case, the Neanderthaloid could not have been so very alien to us, or interbreeding would have been impossible.

True, the extreme types of Neanderthal and Cro-Magnon must have looked quite different; but the large numbers of half-breeds existing today prove that this is no barrier. Anyway, race prejudice probably hadn't been invented yet. And surely hybridization would explain much about which we are otherwise in the dark.

It should be mentioned that the picture of a "pure" Cro-Magnon type intermingling with a "pure" Neanderthal is grossly oversimplified. We've already seen that the Neanderthaloid stock had its own varieties. So did Homo sapiens, even at this early date. To name only the most conspicuous examples, Grimaldi (Italy) man is definitely Negroid, and the Chancelade (France) skull looks Mongoloid.

What we get, then, is a complicated interaction lasting for a very long time. The different types of Neanderthal and Homo sapiens meet; sometimes they fight, sometime they in-

terbreed, in varying degrees throughout Europe and hither Asia, possibly throughout the entire Old World. The moderns win out because of certain advantages—perhaps slightly higher IQ, perhaps slightly greater fleetness of foot, perhaps superior social organization. Their competition with Neanderthal need not be a matter of tooth and club; for instance, if they are somewhat more effective hunters, they can increase their numbers till they are in the majority and their traits predominate when the two stocks melt together.

My picture of European Neanderthal is that of a hard-bitten, practical little man with great physical strength; his skin was fair, his hair yellow and brown and red, his eyes light. He survived for a long time and contributed much to human culture. As Hrdlicka remarked, no one need be ashamed to have him for an ancestor. The tall dark invader did not exterminate him, nor did he die of a heartbroken inferiority complex; the man who stood up to the cave lion, the mammoth, and the glacial winter wasn't that sort. He was assimilated, he became part of that vast complex of races which is European and American mankind.

Cro-Magnon is also among our ancestors, but not alone there. His own type and culture were lost among later incursions, some of which seem to have been of Mongoloids from central Asia. It ill becomes the "white" man to boast of his own racial purity; his descent is perhaps the most scrambled on this planet.

Some people think that the Basques

may be the last survivors of the Cro-Magnons. It's true that their long-boned, long-headed build and their fantastically complicated language—the verbs have different forms for the different genders!—give some background to the guess; but it seems unlikely that any enclave could have lasted so long, what with all the migration that went back and forth across the Pyrenees. All we can be sure of is that they antedate the arrival of the Aryans—or, rather, the Aryan languages—in Europe, but this took place at a much later date, when history was already being written farther south and east.

If we assume that such Cro-Magnons as reached the Spanish littoral could build seaworthy canoes, then the Guanches, the Canary Island aborogines, may have been their direct descendants: tall, slender sheep-herders, living in sod huts under exceedingly primitive conditions. Unfortunately, we have few accounts of them; the Spaniards wiped them out to the last man, and little if any of their blood survives.

IV.

I cannot resist winding up with a few remarks about Neolithic man, because he has also been much misunderstood. "Neolithic" has become a synonym for "barbarous" in popular usage, which is as great a calumny as to say that all Germans are beasts or that all Americans practiced atrocities on the Indian. The term simply refers to the period of highly polished stone implements, and the cliché has it that these suddenly went out of use when copper and bronze came in. That is another untruth.

The Neolithic Near East was one of the most enterprising and progressive milieus the world has yet seen. More really basic inventions were made then than have ever been made since or are ever likely to be. Atomic energy may change our lives, but unless it destroys us altogether the change cannot be as profound or important as that wrought by the introduction of agriculture. Man ceased being a hunter and berry-picker; he became settled not only in one territory but on one plot of land, the immense expansion of human population started—

Contrary to general belief, a pastoral stage of nomadic herders did not precede one of sedentary farmers. Both logic and material evidence show that you can't develop cattle, sheep, horses, and camels tame enough to control in large flocks until you have had a place to keep them and land to feed them for some generations. Nomadism seems to have been an invention of weaker tribes forced into arid steppes and deserts; to a high degree, nomads have always been a fringe people of civilization, in contact with it and dependent on it for much of what they use; most of them plant

certain areas and return to harvest the crop later. Ironically for the Marxist, whose sacred writings postulate a pre-agricultural nomad stage, much of the archeological evidence against this belief has come from Russia.

A bare list of the innovations made in the Neolithic will do: agriculture, the domestication of animals—except possibly the dog, which may have been tamed earlier—village and town life, the nation, highly organized religion, the wheel, the seagoing ship, the loom, metallurgy, writing—to name only a few. And some archeologists think all this may have come about within a few centuries!

There was an extensive industry with, for instance, large flint mines. There was trade and exploration on a grand scale, for example, the regular amber route between southern Europe and the Baltic. Some of the work done was incredibly beautiful: I have seen flint axes in Copenhagen so highly polished that they look metallic. (Some stone daggers were made in direct imitation of bronze weapons trickling in from the south.) Without going into ultra-diffusionism, it is certainly true that the new techniques spread far and rapidly.

The introduction of copper and bronze did not end stone tools. The metals required were relatively scarce, hard to get from their ores, therefore expensive; the Homeric warriors were aristocrats whose power depended on their being able to afford large, effective arsenals of bronze weapons and armor. Ordinary wooden plows lasted almost to the present day throughout much of the world; the early Bronze Age peasants must have kept right on using wood and stone.

Nor is a flint tool to be despised. Danish experimenters have built whole houses with surprising speed and ease, using copies of Neolithic axes. Our own Pueblo Indians made good-sized dwellings with similar implements. The main trouble is that a flint edge will only work green wood, so that lumber has to be cut to shape immediately.

For the sake of precision, many archeologists therefore prefer to speak of a "Chalcolithic" period rather than a Bronze Age.

The last and one of the greatest innovations of this era was writing, and some authorities believe that it may have brought about the end of the progressive time. It led to a class of priestly literati in whom power concentrated and who, like all dominant classes, were immensely conservative. Whether or not Western civilization's special contribution to human advance, the scientific method, may cause a similar freezing of the *status quo* by a similar concentration of power, is best left to the speculative imagination.

A practical method of extracting and working iron seems to have been first discovered in Armenia; the Hit-

tites tried to keep it secret, but inevitably the secret leaked out. Unlike bronze, iron was cheap and plentiful; the barbarian was again on an equal footing with his more cultured neighbors, and his incursions wrecked chalcolithic civilization in many areas. There seems to be a certain analogy here to our own uneasy time.

But we have now left the prehistoric period and are well into the age of written history.

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THE END

THEY'D RATHER BE RIGHT

BY MARK CLIFTON AND FRANK RILEY

***Last of Four Parts.** Bossy had Dreams For Sale. The Dreams of the ages could be realized! If . . . you'd give up one half, and alter the other half beyond recognition!*

Illustrated by Freas

Synopsis

Bossy, a cybernetics machine storing all of man's knowledge but none of his prejudices, was moved secretly from a hideout in San Francisco's skid row district to a luxurious private wing of the Margaret Kennedy Clinic near Berkeley.

With Bossy went:

Joe Carter, a telepath by mutation of birth, now in his early twenties.

Professor Jonathan Billings, formerly dean of psychosomatic medicine at Hoxworth University, who had trained Bossy in psychosomatic therapy.

Professor Duane Hoskins, formerly professor of cybernetics at the same university, whose skill had been largely responsible for Bossy's actuality.

Mabel, now a lovely young girl, who had been rejuvenated by Bossy's psychosomatic therapy. She had been an old woman, with a long criminal record in woman's oldest profession, who had furnished a hiding place for Joe and the professors when they were being hunted, and who had become their first experiment in the therapy. They had sought only to cure her arthritis, but through unsuspected powers of the machine, they had restored her youth, cleared her of all repressions, and the result had been the awakening of her psionic abilities.

Carney, an old skid-row character, friend of Mabel, and the outside contact man for Joe and the professors when they were in hiding.

After Mabel's rejuvenation, Joe had accepted the protection of Howard Kennedy for himself, Bossy, and his associates. Kennedy had wanted rejuvenation for himself in order to carry on his dream of providing sanctuary for freedom of scientific thought, which had all

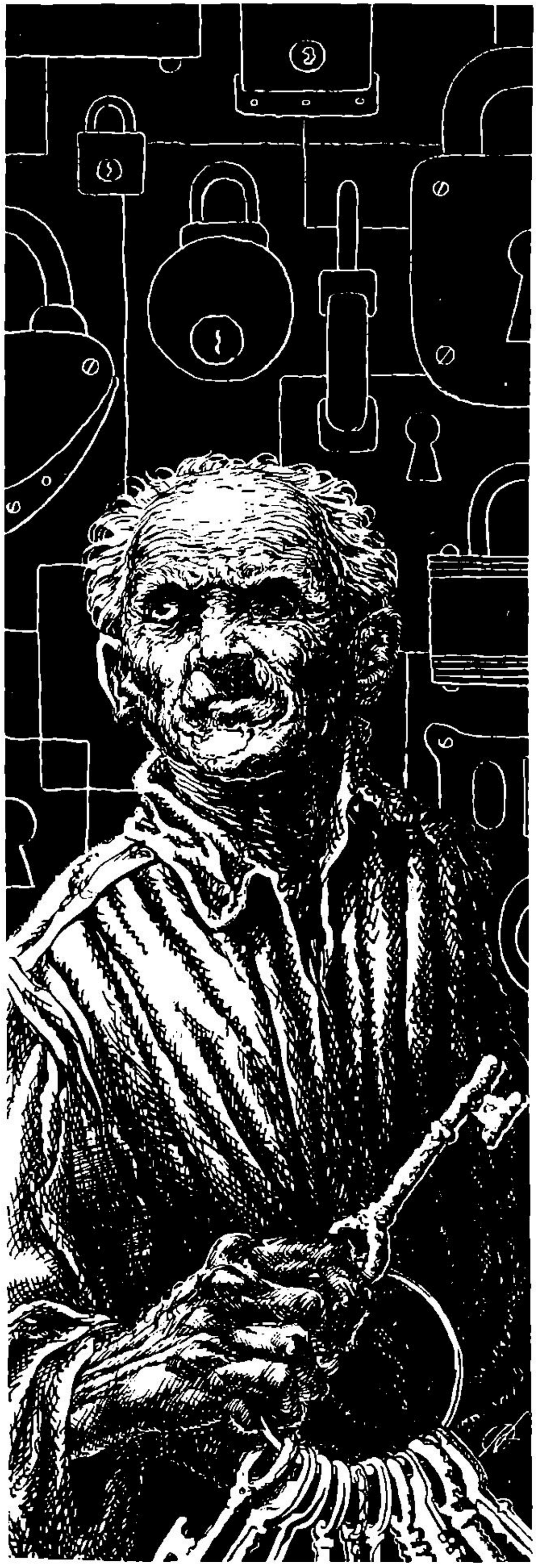
but been destroyed by political opinion control. He came to realize that any fixed opinion, good or bad, might prevent his rejuvenation, but he also realized that his protection of Bossy would be worth while.

To the head of his public relations department, Steve Flynn, Kennedy gave the task of creating favorable public sentiment for Bossy and her creators. Flynn breaks the true story of Mabel and Bossy, while Joe and his associates in further experiments learn from Bossy that only through an appreciation of multivalued physics can a satisfactory explanation of cellular rejuvenation and telepathy be found.

Steve Flynn's story sends the world into a binge of wild excitement. Everybody wants Bossy. Everybody wants to be immortal. The various governmental forces see unlimited power through control of who shall be made immortal. But there is a morning-after reaction to the binge, and the gray suspicion is aroused by unbelieving scientists and the opinion controllers whose position is threatened that all this has been a hoax. Proof of the therapy is demanded.

Steve Flynn sets up a televised show in the clinic's operating room. Since Professor Billings has always been the publicly acknowledged head of the project, he is chosen for the world-viewed experiment.

Bossy fails to rejuvenate Billings. The failure is dramatic and total. The world is crushed. The opposing forces build on this in hopes of completely de-



stroying Bossy.

In a conversation with Kennedy and Flynn, Joe reveals that he had anticipated the failure, but that he had let the experiment proceed anyway. He develops his thesis that any fixed opinion bound to one framework was destructive to mankind's future development, and that if Bossy were able to give such single-valued minds perpetuity, she would be going against a prime law of the universe—change. He had feared that Bossy might be able to do this, and this would have made Bossy harmful to mankind. The experiment, a failure to others, represented success to him. Since Billings could not give up the single-valued concepts which had made him into a world success, Billings could not be perpetuated. It was a case of he would rather be right—and die.

In the midst of the furor, the military suddenly moves a squad into the clinic to take over Bossy.

Part 4

XXII.

Joe had just switched off his bed lamp and was settling back into his pillow when a warning came to him. The premonition was as clear and distinct as the ringing of a bell.

He swung his feet to the floor and in the darkness groped for his robe and slippers. Someone was stealing down the corridor in this wing of the Margaret Kennedy Clinic, and was making a great effort not to be heard. It was the intense concentration on avoiding attention which had telepathed the warning to Joe.

In the same instant that he focused his psionic sight, Joe perceived that the prowler was Doc Carney; that the old con man was intent on reaching Bossy.

Bossy! But that would be impossible for the old man. Bossy was under padlock and government seal; with a soldier posted before each door of the operating amphitheater. The guard had been there since early morning, changed at two-hour intervals.

The military had established its beachhead, the main forces had not yet moved up. The impounding of Bossy by a small contingent was a scouting mission. The strength of the opposing forces had not yet been determined.

The Pentagon had not been worried about Kennedy's forces. These were already clamoring in Washington for an injunction to estop the seizure of Bossy, but this was to be expected. The main opposition, the one which had not yet declared itself, was public reaction. There was also fear of Bossy, herself. The machine had not been fully tested. It might have unknown striking powers. If it were as close to the human mind as was claimed, it might turn vindictive, revengeful.

Through devious channels to baffle investigators and wear out the publicity value long before the truth came

to light, the Pentagon sent out its task force to draw the enemy's fire, and waited.

That was Joe's summation of the background, and now here was Carney tiptoeing down the corridor, a kit of burglar tools in one hand, intent on breaking in to Bossy. His motivation was clear to Joe, if not to himself.

Ever since Mabel had gone into therapy, Carney had been a lost man. For the first time in his life he knew what it was to be completely alone. There was no companionship left for him back on skid row, and Mabel, his pal, his only tie to the old mores of his existence, had become something else entirely. There had never been love between them, contrary to gossip; there had never even been physical attraction. They were simply two old people who had led the same kind of life, drawn together out of mutual respect, and held together in a close orbit because there was no pull from any other direction.

That was all changed now. His whole world was changed. Even his contempt, his disgust, his fear of Brains had changed. They, too, were just guys who made the best of things, tried to get along according to their own lights. This had been the evolution of his thinking since the time Joe had insisted he leave skid row and come to the Margaret Kennedy Clinic. He didn't understand why Joe had insisted upon it, he didn't have to be told that there was no need for him there, that he was simply in the place, not of it. He wasn't even in the way; he wasn't even that important.

He was confused, he was lonely, he was no longer certain of anything. He, without knowing it, was ready for Bossy. And he was drawn to Bossy as though to a magnet. He was searching for Mabel, and the only way to find her was through Bossy. They talked about the immortality Bossy could give you, but that wasn't what he wanted. He simply wanted to know, to understand, to find comprehension because now he knew he had none.

The one remaining spark of his old life was his resentment at the padlock on Bossy's door. The lock was a symbol of his whole life. He had always either been locked out or locked in. There had always been a lock between him and the thing he wanted. A lock had become a challenge. It was a challenge he could not resist. He had wavered in indecision before, knowing very well that even if he again found Mabel through Bossy it would not be the same as it had been before, but as soon as the padlock was placed there his mind was made up. The symbol had been inserted again between him and what he wanted. He rose to the challenge.

His motives were quite clear to Joe; and Joe breathed a huge sigh of relief. He had wondered when Carney would come around to it.

When the old man was safely past his door, Joe slipped out into the corridor behind him. He set up a protecting wave field which would prevent the old man from hearing him, or seeing him if he turned around.

And he set up a wave field of illusion around old Carney himself.

At the next turn of the corridor, Carney paused to case the situation ahead. It was nearly midnight, and the young soldier on guard, feeling that by now the lieutenant would be safely in bed and asleep, had pulled a chair up in front of this main entrance to the operating amphitheater. He had tilted his chair back against the door and was dozing there comfortably with his rifle across his knees, dreaming of the next twenty-four-hour pass and the little brunette he had met on a Hyde Street cable car.

Alternative plans came into Carney's thoughts. He could rush the soldier, who seemed to be asleep, or he could make a noise and wake him, then stop to pass the time of night with the kid who was probably bored and lonesome and find an opportunity to clonk him on the head.

Joe decided to take a further hand. Either scheme seemed unlikely for success. Into the young soldier's dream, half reverie and half real on the edge of sleep, Joe injected the image of a frowning officer. It was not just the lieutenant, not even a captain. This was big brass, real brass. GHQ stuff. There was a guilt feeling in the young man's mind anyway because he had settled back and was resting his eyes; it was not difficult to materialize the symbol of retribution.

The soldier stirred uneasily and his movement decided Carney on the latter plan. He would just happen by and start talking. At the sound of a footstep, the symbol of retribution crystallized into reality. The soldier's eyes popped open in sheer horror. He pitched forward from his chair and somehow managed to get to attention without dropping his rifle.

The snapping to attention, the look of horrified awe shocked Carney into immobility also. For a long moment, the two of them stood there, each immobile. The guard's worst fears were confirmed. He saw before him a general, a two-star general. He had been caught sleeping at his post by a two-star general! He opened his mouth twice before he could get words to come out.

"S-sorry, s-sir," he stammered. The effort, feeble as it was, revived the pattern of self-preservation. "I . . . I was just resting my bad leg . . . twisted it on the range yesterday . . . sir—"

Carney stared at the soldier in stunned disbelief. The kid had gone nuts. They were all wacky.

Joe gave the soldier his first faint gleam of hope. This general wasn't

interested in him. He wasn't there to check up on the guard. He had important business. He had come by plane from Washington to make a personal inspection of this Bossy machine. But his visit was strictly hush-hush. Secret stuff. Classified! Restricted! Off limits! No enlisted men allowed. Officers only. The pattern was familiar, believable.

"I want in there, right now, at once," Carney heard his lips forming the words crisply, and wondered where they came from.

"Yes, sir," the soldier almost whispered. "Thank you, sir. But, sir, I don't have a key, sir. The lieutenant, sir—" He felt a little easier. If the general couldn't get in it was the lieutenant's fault. And he had used enough sirs to placate even a two-star general.

Carney opened his kit of burglar tools and fished out a ring of skeleton keys. That ring was the pride and joy, the lifetime collection of one of the boys who was now donating some time to the State.

"Try these," he said, and tossed them to the guard.

As key after key failed, the soldier grew more and more nervous until finally when one did work he was so relieved that he flung the door open, breaking the government seal, without a second thought.

"Right in here, sir," he said hurriedly. "I'll see that you're not disturbed, sir. Thank you, sir. Thank you, SIR . . . I mean."

Carney blinked at him owlishly. He didn't understand it, he didn't even understand himself, the way he'd acted. The kid soldier had apparently snapped his cap, but then what could you expect these days? He patted the boy on the shoulder.

"Take it easy, son," he said kindly. "You ain't no worse off than anybody else."

Tears of gratitude welled up in the soldier's eyes. Now, for the first time, he understood this feeling of loyalty they were always telling him he'd better have, or else. Here was a real officer, a regular guy. The kind of an officer you could go through hell for —He blinked the tears away and saluted, not trusting himself to speak.

Carney shook his bald head pityingly, and shuffled into the operating room.

When the door had closed behind Carney, Joe turned and ran back down the corridor to Hoskins' room. He shook the cyberneticist awake and dragged him, protesting, across the hall to the suite assigned to Billings. When both of them were sufficiently awake to understand him, he told them what had happened and briefly outlined his plan.

Billings looked uncertain, but Hoskins delightedly smashed his fist into the palm of his other hand.

"Good work, Joe," he exclaimed. "It's worth a try, anyway. Come on, Jonathan."

"Just walk right past the guard," Joe cautioned. "Don't say a word."

He hurried to his own room and phoned Steve Flynn. The phone rang a long time before he heard Steve growl an angry response.

At first Steve didn't get it. Joe repeated the essential facts of his plan. Steve got it then. He whooped joyfully into the phone, anger and sleep forgotten.

"Genius, kid! Pure, homogenized genius! You just keep control over there and watch Steve Flynn go into his super best!"

XXIII.

There was a time when scientists believed that when the water vapor in a cloud reached 32°F the fog froze, as respectable water should, and formed into snowflakes—all nice and tidy and dependable. Field tests, in the contrary way of reality, did not confirm them. Sometimes the temperature was as much as 60°F colder than freezing, and still the stubborn cloud refused to coagulate into snow. Then they found that a mere handful of dry ice could turn a whole roiling cloud into a sudden snowstorm.

The mass psychology of the public mind was like that. Potential would build up, higher and higher, and still there would be no mass reaction. A straw would be tossed to see which way the wind blew, and would fall to earth unnoticed. Many a politician, many a pollster, assumed from this that there was no reaction potential.

Then some insignificant little thing, some complete triviality, would seed the public mind, and a raging storm, over apparently nothing, would ensue. To those who had no conception of the forces of mass psychology, this made the public mind unpredictable.

Steve Flynn did not know the scientific terms to account for his mastery of public emotion; but he knew something better. He knew how to feel the mass psychology potential, and when and how to seed it to make it crystallize. He could not have held his own in the bright patter of devastating epigrams which rolled so easily off the tongues of the lunatic intellectual fringe which had moved over from art and into science; but he could do where they could only talk about.

He withheld breaking the news of Carney's therapy for hour after hour. The public mind had too high a potential of unbalance from Billings' failure in Bossy to risk another such fiasco.

Quietly, working completely behind the scenes, swearing each contact to secrecy, he set the stage for another world-wide television show. He even made the mistake, a part of his well calculated plan, of letting a notoriously unethical news commentator get word of what was happening just before that worthy went on the air.

The commentator scooped the world

with the rumor that Bossy was being tried again.

It was the handful of dry ice in a high potential of mass psychology. The tornado, the typhoon, the cyclone of public reaction was sudden and complete. Under normal circumstances, when the military had found its beachhead squad outmaneuvered, a larger contingent would have been sent in to take over and stop all this nonsense.

But, in view of the public clamor to be let in on what was happening, the mobs which gathered outside of newspaper offices and broadcasting studios all over the nation, the unaccountable mobs like those in an old-fashioned movie storming the palace gates, the Pentagon found it expedient to get all snarled up in orders and countermanded orders so that no action resulted.

The Chief of Staff was suddenly out of the city on urgent business. He could not be reached for a decision. Back down through the echelons, rank by rank, went the responsibility for decision. Back across the continent to San Francisco it traveled. Back to Area Headquarters. Back to Post. Back to the lieutenant, who took the only possible course—and turned the whole thing over to his sergeant.

"I know I can depend on you to take the appropriate action," he said crisply.

The sergeant nodded. He had been expecting it all the time. He would just keep changing the guard, the quite useless guard the way everybody and his dog kept running in and out of the room, until somebody, somewhere, made a decision.

The stage was set, and Bossy, bless her, was coöperating. To question after question, she answered instantly and simply:

"Progress satisfactory."

Assured by Joe, Billings and Hoskins, at noon Steve Flynn decided there was every chance the experiment on Carney would be a success. The scene in the amphitheater, set up again under the same conditions as the experiment on Billings, flashed on the television screens in millions of homes.

Slowly, the amphitheater filled again with the renowned scientists of the world.

By six o'clock the public began to get bored, restive. Carney's tired old body lay on the table under the glare of television lights, and its only movement was its rhythmic breathing, an occasional enigmatic twitch of the facial muscles, the tensing and relaxing of fingers and toes. There wasn't much to see. The entertainment value of watching an old man sleep is limited.

One by one the TV chains returned to more remunerative programs where the public would feel at home in the old familiar cliché situations and gags that had passed for entertainment from

time immemorial. Each chain promised to devote a half hour here and there, and anyone who really wished to hang upon Carney's every breath could do so by judiciously twirling his dial.

Steve Flynn's staff did a magnificent job of interest buildup; bringing in all the old phony hackneyed situations guaranteed to make the public love Carney. His dead-end childhood around the wharves of the Embarcadero read like a chapter from Lincoln's life. Carney became a towheaded little tot who studied by the light of street lamps, and lectured his playmates on the moral principles involved in stealing apples. His youthful years at juvenile delinquent institutions provided inspiration for a repetition of the sentimental prose of Dickens. The mature years developed into a search for comprehension, a misunderstood man buffeted by society, one of nature's noble martyers.

The public had its biggest cry since Camille. They stared at their TV screens with the fascination of the crowd who gathers at the scene of a murder and just looks.

In the days that passed Steve's office brought the public up to date on Carney's later life. The friendship between old Mabel and old Carney became a great and noble thing, touched with humor and bathos, unenlivened by any hint of turgid passion. Mabel had simply rescued an old childhood friend and had given him back his self-respect—in view of the whitewashing job done it was not quite clear how he had lost it—by making him manager of her picturesque little pawnshop down on Third Street.

Within an hour the pawnshop was completely cleaned out of all its merchandise by souvenir hunters who would pay any price for a slightly used jimmy or the hubcap of an out-of-date automobile.

The world took skid row to her motherly bosom and the winos hovering in cold doorways became the bewildered recipients of much good advice and some help. The shortline became both proud and resentful of their new status. The professional do-gooders had been at it long enough to have at least a little understanding of why a man was on the shortline in the first place. These new uplifters made the men uncomfortable. But they endured it, in the passive way they had endured all the other outrageous demands of a society with which they had never been able to cope.

And they knew that within a week or two the good-will jag would pass, and be as faded and tired as a forgotten Christmas wreath on the tenth of January.

In fact, the camellia of compassion was already starting to turn brown around the edges, showing that first sign of decay.

"Why?" some of the more respect-

able members of society were beginning to ask. "Why is Bossy successful only with the most disreputable creatures that could be found? What kind of warped minds had rigged the machine so that it would give immortality only to the worst dregs of society?"

Accustomed to rigging everything from slot machines to semantics in favor of some particular group, they could not conceive of a machine which had not been rigged and slanted deliberately.

Deep beneath the roar of the crowd who was delighted by it all, the voices of the people who really mattered began to coalesce into an opinion which began to be heard around Washington.

It was on the eighth day that some changes in Carney began to be evident. Step by step, and this time for the awed eyes of the world, Carney duplicated the pattern of renewal followed by Mabel.

The plasma supply suddenly became a very important item.

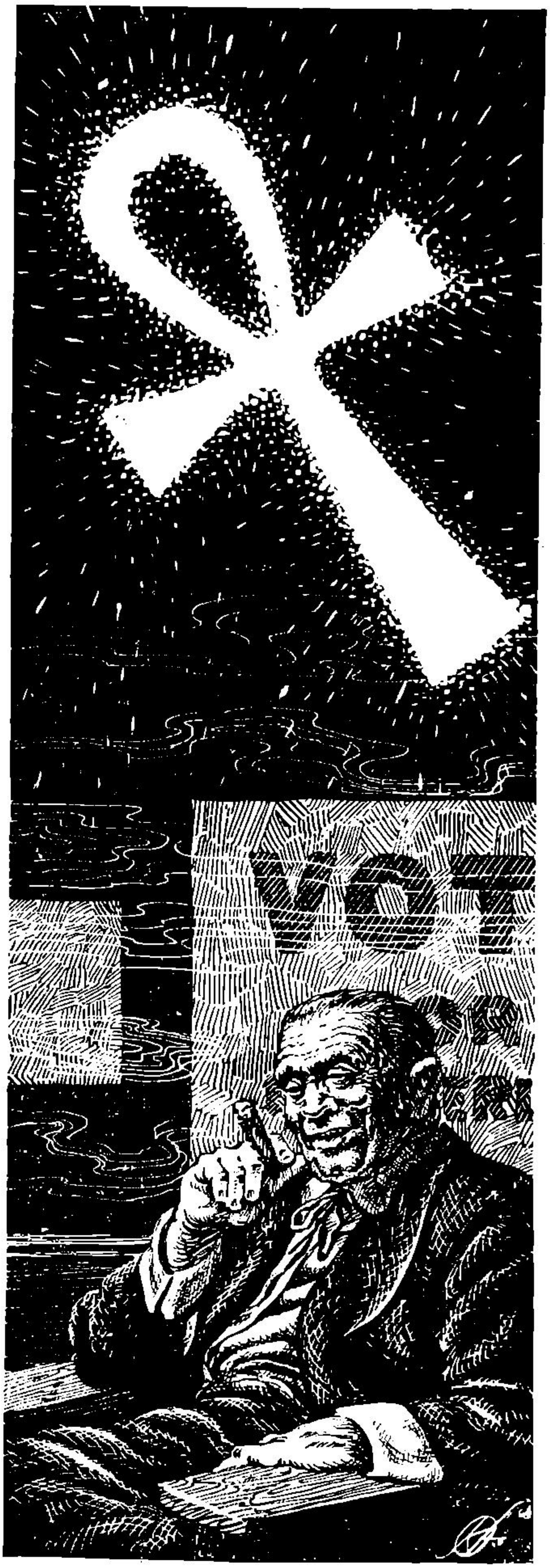
"More plasma," Bossy's screen would announce.

The TV commentator would murmur in his best bedside voice:

"More plasma."

Then, after the requisite two-second pause, the announcer would add:

"This plasma transfusion is by courtesy of Midvale Memorial Hospital, Oakland, fully equipped and



staffed for your every need. Luxurious service, modest prices. Pay-as-you-go-plan."

The figure on the operating table straightened its tired old bones, flaked off the outer epidermis of faded skin, shed the lank wisps of dirty gray hair. The figure of a vibrant young man began to emerge, strong and lithe and beautiful.

The tenth day passed. Now there was a renewed interest in watching the television screen. All the world knew that Mabel had emerged on the tenth day. But to repeated questions on when Doc Carney would emerge, Bossy simply answered:

"Progress satisfactory."

Perhaps it was the basic differences between the masculine and the feminine psyche which lengthened the therapy; perhaps there were just more cells to be re-educated. Or perhaps it was the additional facts which Joe had fed into Bossy. Facts about psionics, which he hoped would be fed into the patient's mind to condition him to the shock of unshielded normal minds.

Whatever the reason, it was the twelfth day before Bossy, without any buildup, fanfare, or pyrotechnics of any kind, made her announcement.

"Project completed." Bossy lacked showmanship.

But Steve Flynn did not. The release of every electrode from Carney's pulse points was played up as if it were world shaking. For that crucial moment necessary in catering to psychotically frustrated womanhood, the view of the cameras was obscured by the doctors hovering around; and when the public saw him again, the towel which had been draped across Carney's body had been replaced by a pair of conventional shorts.

The cameras were focused fully upon his face when he opened his eyes. There was no daze in them. Their first expression was one of amusement, a glinting flicker of mischief. Aided by Billings he sat up and looked about him. His eyes found Joe.

"Hi, fella," he said. They were his first words.

It was all close enough to stock plot number X672, Patient Regains Consciousness after Critical Illness, for the public to understand it. The public cried, it laughed, it shouted, it rang bells, blew whistles, got drunk, enjoyed itself in a national spontaneous Mardi gras.

With a flourish Steve Flynn provided slacks, an open-throated sports shirt, socks and shoes. To take away the last vestige of an unkempt look, a barber began to cut Carney's hair. The rust colored hair shaped into a bristling snappy style favored by the hot young bloods of the day.

Carney accepted it all, quietly and pliably. He was impassive except for a tiny crinkle of humor at the corners of his eyes.

In the days to follow twenty million

young men would be diligently practicing before their mirrors to get that same spontaneous crinkle of good humor.

"Are you able to talk to us?" Steve Flynn asked Carney.

Again there was that questioning flicker of his eyes toward Joe.

"Of course," Carney answered after the briefest of hesitations.

He endured the process of milking the situation for all the ham drama there was in it which TV considers so necessary to public enjoyment of its programs. Yes, he felt wonderful. Yes, he was very happy and grateful for his restored youth. No, it had not been unpleasant or painful. Yes, he remembered everything which had gone on. No, he didn't realize it had been twelve days; it seemed to be over in an instant, and yet it had seemed to go on for all eternity. No, he had never doubted it would be a success. Yes, there were times when it had been difficult to comprehend Bossy, it was all so different from what he had believed; but he had been willing to listen. Yes, he would say the willingness to listen was a vital factor. Yes, of course he expected to resume his friendship with Mabel.

"No," he answered to a more direct question. "There is no question of a romance between Mabel and me. Mabel has already found the one she loves, my best friend over there — Joe Carter."

Like Bossy, he seemed to lack showmanship. It was said so quietly, almost tossed away, that even Steve failed to grasp the import of it all at once. Then, frantically, Steve waved the camera to focus on Joe. Here was news as important as Carney's revival. Mabel was in love!

The cameras focused over where Joe sat. It was the first time that Joe Carter had come fully into the eye of the public.

Out of camera range for the moment, Carney allowed his lips to broaden into a delighted grin.

"Come on, Joe," he flashed psionically. "Take it like a man. That's what you told me to do, when I asked if I should answer those stupid questions."

Joe's face was controlled, but he flashed back an answer.

"Very well — Geoffery-Mortimonte."

Carney burst into a soundless chuckle.

"You are good," he conceded. "I thought the little secret of my fancy names was known only to Bossy and me."

"I'll make it Jeff", Joe promised, while he continued to nod and smile into the impertinent cameras. "And let's keep Carney as a last name. You're public property now, and there's no use confusing people."

The public, who had thought its cup was full, found the cup now running over. Here was stock situa-

tion K-482. Faithful Friend-Girl-Lover. Would there be a juicy triangle? Crime and tragedy of passion? Who knew what uncontrolled fires of terror this rejuvenation would unleash. Each of the old men had a pretty good idea of what he would spend his time doing if he got back his lost youth and vigor. Why not these?

The public licked its lips in anticipation.

XXIV.

The public's cup was not the only vessel full and overflowing.

For the first time, Joe had found both love and companionship. For the first time, in a lifetime of bottomless loneliness, there were those of his own species with whom he could communicate. Denied love before, because he could not reconci e himself to the normal mind, first he had been given Mabel.

But Mabel was wise. Even before she had gone into Bossy, she knew that no woman could fill all of a man's life, that her relationship to him was compartmentalized, that the avid woman who tries to monopolize both love and companionship usually winds up with neither. She did not pretend to fill more than a woman's place in Joe's life.

In the instant recognition when Carney came out of Bossy, an instantaneous bond of masculine companionship even while Jeff was still on the table attached to the lead controls into Bossy, the last ache of Joe's chronic loneliness was eased and stilled.

Jeff, too, would need love; but not yet. In time there would be other women who could surrender their values to Bossy's corrections. The three of them, Mabel and Jeff and Joe, knew with complete certainty that the public would be denied its anticipated scandal, and could somehow survive without it.

The days passed. The schedule of television appearances began to slacken. The three were allowed occasional moments to themselves. Mabel and Jeff were public property. Joe, whose place in the total scheme of Bossy was still known only to Billings and Hoskins, although suspected by Kennedy and Flynn, was a minor bit of public property by virtue of his love affair with Mabel.

The psionic communion the three of them shared was completely beyond the level of news releases. True, around the Clinic, there was considerable wonder at the way Mabel and Jeff had adopted Joe; some sly comment about the secret reasons for the inseparability of the three; some recalling of Mabel's past life and criticism of Bossy that such things were not cured; but no comprehension.

There was a healthier concern, too, over the fact that the three of them began to slip away from the Clinic.

Superintendent Jones admonished them with a shaking finger, and Steve Flynn portrayed the horrors of being mobbed by an admiring public; but to all questions and admonishments Joe made a simple reply:

"They need to get out and contact some of the world at first hand. We do not hold with the prevailing theory of psychology that the way to understand man is to shut one's self off from him in an ivory tower and build glorious structures of fallaciousness. We think the way to understand men is to look at them."

It was more than that, of course. Bossy, with the material given her by Joe, had done an excellent job of preparing Carney against the shock of raw and unshielded human motivations. His reactions were amused and healthy!

But Mabel, unprepared because Joe had not realized what a shock sudden esperance would bring, still needed further therapy. Her fortunate background helped, of course. Her knowledge had been wide and deep. But even in such a house, as under the questioning of the most skilled psychologist, mankind still conceals more than it reveals.

And there was still another reason for their occasional escape from the Clinic. It was a healing therapy for Joe, too, that he should now be able to walk the same streets in full companionship which he had walked in such complete loneliness; shut off from all others because there had been no others. A man likes and needs to take his new love and his new friend to see the places he has known; to see them again through fresh, delighted eyes, to show the beauty and to lessen the memory of ugliness.

They were young.

Most often they took the car which Kennedy had placed at Joe's disposal, and went down from the hills into Berkeley. They had no difficulty in blurring their features for anyone who looked closely, and easily passed as three students from the adjoining campus of the University of California. They were regarded by the townspeople as just three more specimens of the ten thousand examples of learned brainlessness.

All around them, wherever they walked, was the clamor of man's thoughts about immortality. In the fashion of a catch phrase which unaccountably sweeps the country, everyone knew that only five per cent of human beings were ever worth perpetuating. This posed a problem.

At a bus stop, two homeward bound businessmen were being practical about the whole thing.

"The things we've gotta watch," one of them said, "is to see that some biased bunch of subversives don't get control of this thing. What we need is a committee of sound thinking people in each community to decide on who should get immortal."

"Yeah," the other agreed instantly. "You know as well as I do that only about five per cent of any community take hold of their responsibilities. The rest are dead weight."

"Yeah, that's been proved by statistics. Now you take you and me, Henry. We're successful businessmen. How many people can make the grade? Only about five per cent! And you and me, we gotta carry all the rest of the people on our backs." He waved vaguely in the direction of the university, and saw three students, coming down the sidewalk toward him. He lowered his voice:

"And I don't mean just employees, either. You take all them high and mighty professors up there. Where would they be if us businessmen didn't carry them on our backs?"

Henry pursed his lips judiciously.

"Well, you're right, Harry. But we gotta be big about this thing. Can't afford to be narrow-minded and not see the other fellow's point of view. Takes all kinds of people to make a world, you know."

"Oh, sure, sure, Henry. But on the other hand birds of a feather flock together and too many cooks spoil the soup. When you boil it all down there's still only about five per cent of the people that aren't completely worthless."

They fell silent as the three young people came within earshot.

Mabel and Joe both gasped at the sudden spasm of laughing mischief which flooded Jeff's mind.

"No, Jeff," Joe murmured aloud. "Don't."

But Jeff lacked Joe's lifetime of caution and concealment. He spoke just loudly enough to be overheard, and in the learned accents of the scholar which practical men find so insufferable.

"I tell you we must be careful who is allowed immortality. Some attention must be given to the appearance of the human race."

He seemed to become conscious that the two men were watching them.

The three passed the two on the sidewalk. Each group was silent so as not to be eavesdropped upon. Each group eyed the other with a compound of contemptuous and amused hostility which usually separates one generation from another.

"Think what the human race would look like," Jeff continued, still in earshot, "if a couple of tubs of lard like those two were given immortality to seed the earth with broadbottomed, potbellied kids!"

Mabel gasped and staggered under the impact of the wave of choleric fury which swept over them. Even Jeff was silenced. Mabel drew a deep breath and straightened.

"Your therapy is pretty strenuous, Jeff," she said. "A couple of days ago I couldn't have taken a blast like that."

Jeff's concern washed over her, healing, soothing.

"I didn't think about the effect of their reaction on you, Mabel," he said contritely. "I was just testing to see just how big about it all they were capable of being when they made their selections. In their minds they had already summed us up and rejected us, you know."

"I'm glad to know I can take it," Mabel said.

"Yes," Joe agreed silently. "So am I. Let's turn this corner wide open, without testing first. Try to stay wide open. I'll be there."

They turned the corner—wide open. The visual scene and the psionic scene both lay in clear view.

A car, driven by a scholarly old gentleman, had just pulled past the pumps of the service station and over to the door of the garage at one side. The motor was missing, would the mechanic please look into it? The mechanic lifted the hood, and saw that one of the wires from the distributor cap had worked loose. Well of all the stupid old goats. Naturally that spark plug wouldn't fire without any juice getting to it! He curbed the impulse to flare up in disgust at the helplessness of drivers in general. All the guy had to do was lift the hood and look!

But that was human beings for you. Ninety-five per cent of them wouldn't know a piston ring from a fan belt. If it weren't for the five per cent of guys like himself, guys who knew what made motors tick, the whole civilization would come to a stop. No matter how mechanized things got, it still boiled down to five per cent of the people carrying the other ninety-five per cent on their backs!

Interplayed with his thoughts was the great excitement in the old man's mind. He was on his way up to the University with an unmistakable connecting link between the Tu'un and the Sung Dynasty in Chinese Art. He was filled with elation at this long sought discovery. He could hardly contain his impatience at the delay, but his visit would be a long one and last far into the night; a night of exhilarating discussion. And if that pesty motor got worse he might be left afoot. The mechanic was still bent over the frame of the car, fiddling with wires.

The old gentleman tasted the triumph of saying to the mechanic, "I have just discovered the connecting link between—" The awe which would fill the man's face!

Then realization. The mechanic probably wouldn't even recognize a Ming piece, much less a Tu'un! Like the simple peasants of China, beasts of toil and burden, living only to sleep, to eat, to procreate their own misery.

It was only about five per cent of mankind which carried the lamp of knowledge and kept it glowing! Only five per cent to carry the other ninety-five per cent on their backs.

He unconsciously straightened his back, as if to shift the load, make it easier to bear.

From the window of his third-floor walk-up across the street, a middle-aged writer looked down on the scene below him. Gradually his eyes focused on the three students, the mechanic and the old man. His thoughts left his space scout still fighting the controls of his ship to keep from being pulled into the sun, and, instead, analyzed the people below him in terms of his possible reading public. It would be a miracle if more than one of these belonged to the elite five per cent who read his stuff.

What a tragedy, what a horrible condemnation of the human race. Ninety-five per cent of the culture lagged far behind, as much as a quarter to a half century. Only five per cent were capable of speculating about a new idea, looking to the future, harbingers of progress. Five per cent who had to carry the rest of the culture on their backs, otherwise man would never progress at all!

Jeff could not resist the temptation. He shafted a thought into the writer's mind.

"The trouble is," the writer said aloud to himself in the way writers have, "ninety-five per cent of the people think in terms of single values. But what about multiple values?"

At first the words made no sense to him, also characteristic of writers, then he rushed over to his typewriter. He was triumphant at the breadth, the incredible vastness, of his inspiration. He tore the half finished page of space opera out of his machine. With nervous haste he threaded in a new page. He poised his fingers.

He did not write.

He picked up the pages of the half finished story from his desk. He did not even need to glance through them to know they were already out of date. His pseudo science analysis was no more than some tricky applications of thin single values. He tore the manuscript across and threw the pieces in the wastebasket.

He poised his fingers over the keyboard again. But no sentences formed into his mind to flow through his fingers. What would happen to his popularity with his audience if he implied that the beloved scientific method was a single value, only one way of interpreting reality? Were the disciples of science sufficiently scientific to question their own articles of faith? And what did he mean, even by these questions? He felt his inspiration slipping away from him in chaos and confusion.

He got up and walked over to the window where he had first felt his inspiration. Of course it wasn't superstition. But then, what about superstition? Had superstition ever been investigated in terms of multi-valued logic? How could each man be so positive that his path, and only his,

was the road to comprehension?

He gasped his exasperation and concentrated on the scene of reality. The elderly man was driving out of the garage. The mechanic was putting five dollars into the cash drawer. Odd, how he knew the denomination of that bill with such certainty! The three students had reached the corner of the block, and were turning it. Odd, that there seemed to be some connection between them and the inspiration he had just felt. Association of ideas, of course. They had been within his vision range when he had thought of the concept; therefore the concept was associated with them. Elementary psychology, nothing mysterious about it at all.

But then, wasn't that explaining things in terms of single values and dismissing the thought as solved?

The inspiration flooded him again, and the writer was appalled. What if each of those people down there on the street represented the only worthwhile five per cent? What if every person in the world were a member of some special and necessary five per cent?

What if, to them, he, an acknowledged brilliant writer in idea speculation, were merely one of the worthless ninety-five per cent? He walked slowly over to his typewriter and sat down again. But he did not write anything — not yet.

"Instant acceptance of an idea is as self-defeating as instant rejection," he mumbled, and wondered where the words came from. "The implications of multi values cannot be mastered in five seconds."

The thought consoled him a little, for the implication was that, in time, it might be mastered; that the destruction of single-value foundations only appeared to produce chaos because one didn't know how to find order in the new relationships of things. That is, not yet.

XXV.

The clamor which followed Jeff Carney's rejuvenation mounted to a national frenzy.

Everybody wanted Bossy. Business and industry wanted Bossy, for quite aside from her rejuvenation possibilities, Bossy was the universal substitute for undependable manpower, the sure cure for faulty management judgment. Every government agency had to have Bossy immediately. There was no other possible way of solving the intricate and massive complexities of their responsibilities.

Both the sincere and the power-grabbing investigative committees had to have Bossy for obvious reasons. Law enforcement agencies saw the ultimate lie detector which no one could baffle. There was no end to the claims upon Bossy, no restraint upon the special axes which Bossy could grind. There was no conception that Bossy transcended single-valued frame-

works, fostered no narrow vision, no finely meshed prejudice screen of the only possible right.

The Secretaries of the Interior and Treasury nearly came to blows in the anteroom of the White House, where each was waiting to see the Chief Executive to demand exclusive jurisdiction over Bossy. The incipient fray was halted only by the confusion of arrivals of the Secretaries of State and Defense to press similar demands.

"Quite obviously," said State, flicking a speck of dust from his Homburg, "Bossy must be reserved for international diplomacy. There can't possibly be—"

"Nonsense," snorted Defense. "Bossy is obviously the ultimate weapon. It would be suicide for any but the Armed Forces to have control over her."

"Bossy is a revenue problem," stubbornly insisted Treasury. "Already two people have been made immortal, without payment of taxes. Why the cessation of inheritance taxes alone - "

"Bossy is a national resource," shouted Interior.

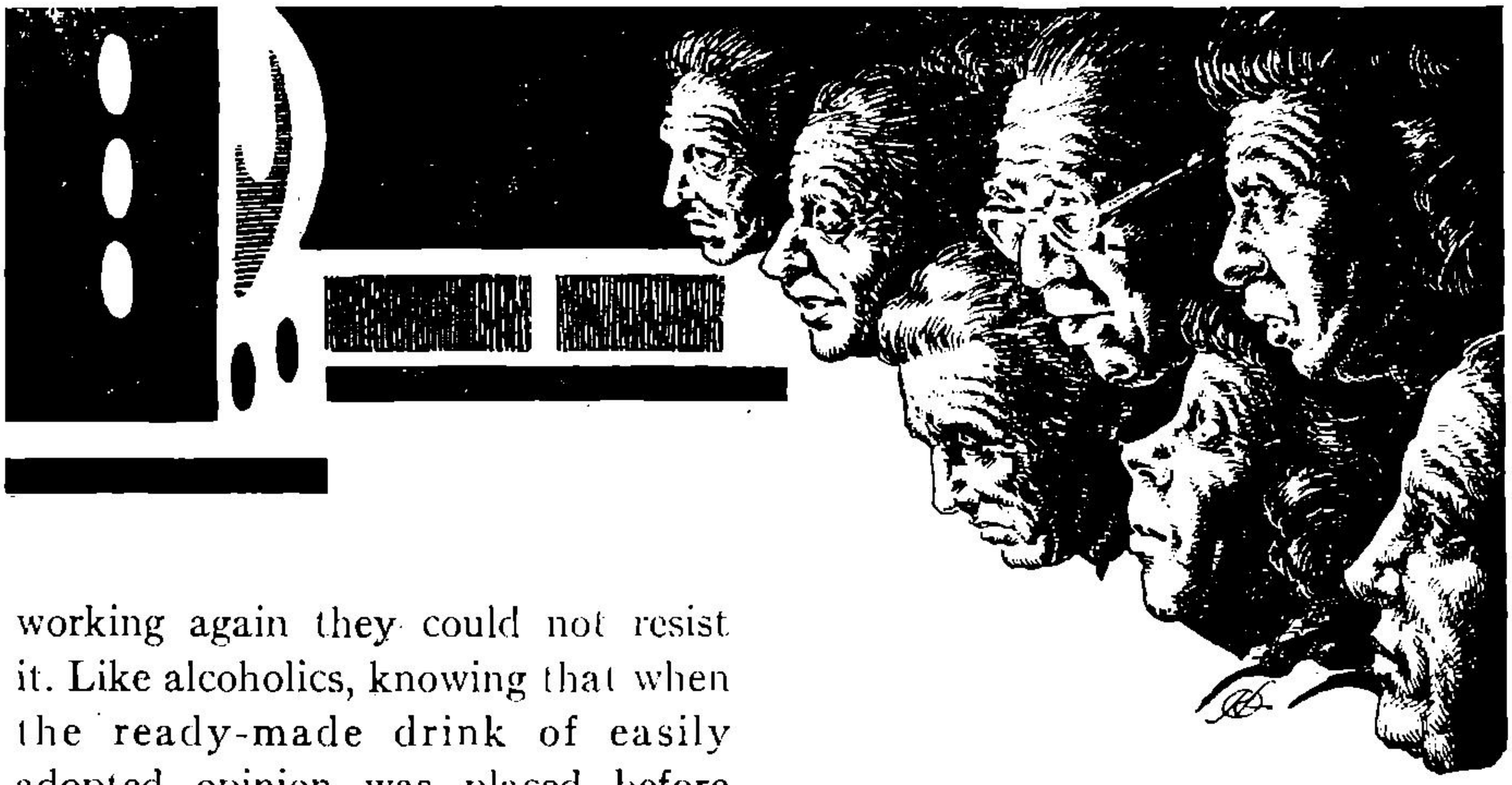
Foreign governments, present and budding dictators, here and abroad, all wanted Bossy. Moscow pointed out, blandly, that she had as much right to Bossy, for peaceful pursuits of course, as she did to the atomic science which had been given to her so freely. The Mafia planned the greatest kidnap scheme of all time, the kidnaping of Bossy. What race track, what gambling casino could possibly play percentages against Bossy?

The post office demanded Bossy as the only possible solution to handling the avalanche of mail which was pouring into the Kennedy Enterprises-- the offers, the special deals, the demands, the threats, the claims. Steve Flynn's masterpiece had received public opinion.

As the days passed the chaos of reaction began to coagulate into masses of definite opinion. As yet the opinion was undirected. The machinery of the opinion controllers had not yet taken up the load. The coalitions in Washington had not yet formularized coöperative policy, catch phrases had not yet been manufactured to supply magnetic islands around which convictions could form.

For the first time in more than a generation, people were reacting independently, honestly, with opinions unslanted to directive semantic loads. The preponderance of mail, therefore, showed more trust in Kennedy than in any of the five per cent groups who were trying to get Bossy. The letters pleaded with Kennedy not to sell out the people.

There was a strange undercurrent of pleading with him not to release Bossy even though they later demanded he should — as if, instinctively, they knew that when the machinery of opinion control got to



working again they could not resist it. Like alcoholics, knowing that when the ready-made drink of easily adopted opinion was placed before them they could not resist it, they pleaded with Kennedy to keep sober and get them safely home.

It was the age-old drama being played out again. As soon as they were able to reconcile differences among themselves, the self-appointed few would at first subtly, by slightly slanted news releases, by vocal inflections in reading supposedly unbiased copy, begin to formulate public opinion. Through the use of semantics the few would become the many. As always just one drink would lead into a total drunk.

The conscience bearers, secure in the mass of supporting opinion, could then say aloud: "We, and only we, are ordained to decide what shall become of Bossy. We intend to be nice about this if you follow along docilely, but if you should resist - -"

The man in the street, forlornly, could predict no other outcome. The pattern and the precedence had been so well established, he could see no escape.

These demands upon Kennedy to protect Bossy from falling into the control of special interests did not go unnoticed in Washington. There were others there as responsive as Steve Flynn to the temper of the people. The acid of people's trust in an outsider coagulated the mixtures in Washington as nothing else would. Concessions were made among opposing interests. A formula of control took tentative form.

In view of the temper of the people, direct opposition to Kennedy was unwise. Just possibly they might kill the goose which laid the golden egg. Bossy was still largely an unknown quantity. Kennedy's scientists were not the only ones who had tried to build, independently, a duplicate of

Bossy and had failed. Other groups had failed even more miserably than Kennedy's men, for the unwillingness to consider another point of view than their own was greater among men who would not have that bond of loyalty to Kennedy as an assistance to progress.

They might find themselves in the position of the savage who could possibly figure out how to steer a car which had its motor running, or by trial and error find and turn the ignition key to get the motor started; but be completely baffled if the distributor key had been removed. It would be better to move cautiously, to get hold of Bossy while she was still intact.

A deal must be made to get Bossy into their hands while she was intact and working. Once they got Bossy, then the deal could be repudiated.

The danger from Billings and Hoskins was slight. They were only scientists. And scientists are noted for avoiding any responsibility for the implications of their work upon mankind. They asked only to be fed and housed and allowed to tinker around in their workshops, leaving it to the practical men to run the world the way it should be run.

Joe Carter was just a kid who had been secretary of the project, and his only claim to fame was that Mabel had fallen in love with him. Boy, that must be really something, considering what she had been all her life! He'd have his hands full, and anyway he was a lightweight who could be ignored.

That left only Kennedy, himself. And Kennedy was open to deals. He'd made them by the hundreds around Washington. There wasn't any reason to believe he wasn't open to one more. Like a shrewd bargainer, he was waiting for them to make the first move, that was all.

Maybe they wouldn't have to repudiate the deal they made with him. Why not cut him in on it? Wasn't he a successful industrialist? Hadn't he built an industrial empire which would overshadow many kingdoms? Could a man attain that position without coming to believe that he was something set apart from common man—like themselves? He probably had the same identical views as they did. It was probably as upsetting to his business plans to have to endure an election every four years as it was to their political plans.

There was room in the hierarchy of immortals who would eventually rule the world for a man of Kennedy's ability — if it could be determined that he shared the only right way of thinking.

Hap Hardy, free-lance investigations counselor, had handled many ticklish deals successfully. He was a shrewd one, behind that affability, for setting up precedents upon which later action could be based. There wasn't a better semantics twister in

all Washington. Hap Hardy was the man to deal with Kennedy.

And if he failed, why, then, of course, there was military action.

Hardy wasted no time once he was given the commission, and guaranteed his fee. His phone connection with Kennedy was soon established.

"Howard," he boomed cordially, "how are you, old boy? A couple of us are flying out to the Coast tomorrow on a little matter—my counselor, Oliver Mills, and myself. We thought we'd just stop in and say hello while we're out there—on this other matter."

XXVI.

The meeting, held in Kennedy's San Francisco office, started off well.

Hap Hardy was at his most genial and affable best. His associate counselor, Oliver Mills, carefully coached in advance, was still unable to bring forth a downright smile, but at least he hooded the ice in his eyes and softened the fanatical planes of his face in a sort of grimace meant to be pleasant.

The two of them sat in big leather chairs, Hardy lolling back comfortably and wreathed in cigar smoke; Mills sitting upright as if he would not yield his body to such a thing as comfort.

Kennedy sat at his usual place behind his huge desk, framed by the plate-glass window which spread the panorama of San Francisco for the delectation of visitors—and incidentally lighted their faces while his own was shadowed.

Joe sat at one corner of the desk, a notebook open before him, playing the part of confidential secretary at Kennedy's request.

"What a couple of characters," Jeff Carney exclaimed from his room over in Berkeley. He was participating in the scene through Joe's eyes and consciousness. "That Mills is a dead ringer for Torquemada, straight out of the Inquisition. And jolly old John Silver Hardy—"

"They're just blindies about to enter into a business deal—they think," Joe answered tolerantly.

"I've got a strong temptation to let Kennedy see what's in their minds," Jeff threatened.

"As if he didn't already know," Joe answered disparagingly. "He may not be telepath, but he wasn't born yesterday. Now you listen, sonny boy, you're purely an observer, seeing how things are done when good fellows get together in a spirit of friendliness."

If either of the visitors objected to Joe Carter's presence as secretary, they did not show it. Hardy raised his brows that Kennedy should think a secretary was justified at a purely social meeting, but it was only a token move in the gambit.

Actually, Joe knew that he was pleased and on more than one count. It showed that Kennedy openly rec-

ognized they were here for business, and therefore they need lose no time by beating around the bush and coming into the subject accidentally. And it showed that Kennedy might be ready to talk business, too. You don't need a secretary to take down an obviously flat and positive "No."

Equally important, this kid sitting at the corner of the desk putting down those silly little squiggles could be a valuable witness later, when they went through the legal motions of convicting Kennedy of something or other in order to repudiate the deal. One look at the kid's weak face, and all their previous judgments of him were confirmed. He was a lightweight, who thought he had a good berth in hanging onto this project. When he came up against a man really skilled at questioning and semantics twisting, he'd convict Kennedy with every word he uttered.

A few years back Kennedy would have had more sense than to have a witness of any kind at such an important conference. The old man must be slipping, getting senile!

Hardy settled back in his overstuffed chair with a sigh of contentment. The battle was already half won. Sure, there was probably a wire recording being made of the whole conversation, but it didn't matter. The law was specific on that. The prosecution in certain cases could use such evidence, but the defense couldn't. That precedent had been set ages ago; on another matter entirely, of course, but then even a high-school debating society could prove parallels of similarity between cases once a precedent had been established.

Let them bring on their wire recording. If there were any dangerous slip in it, the case could easily be rigged in such a way that it would be purely an investigative matter, and Kennedy wouldn't even be allowed a defense much less a jury.

"Howard," Hardy said and leaned forward in his chair after the amenities were over. "America owes you a great debt. I want to congratulate you on the foresight you showed, the way you stepped in and took over Bossy, kept her out of the hands of the radicals and scientists. That shows the value of being able to make an instant decision and acting on it, without a lot of folderol from the opposition party."

"Well," Kennedy demurred, "actually it's still in the hands of the scientists, although I wouldn't call them exactly radical. Professors Billings and Hoskins still have full charge of Bossy, you know."

"As they should! As they should!" Hardy boomed approvingly. "That's our tradition, you know. The inventors of Bossy should reap some of the benefits of their work. And no doubt you're paying them well for their mechanical skill in your behalf."

Kennedy laughed.

"You might not believe this, Hap," he chuckled, "but I haven't paid them anything yet — just their keep and a place to work."

Hardy roared his laughter, and looked at Kennedy admiringly.

"It would be better if a token cash payment were made," Oliver Mills said incisively. He had stopped his efforts to appear pleasant and was functioning as he was paid to function. "A legal token cash payment, and a quit claim—"

There! That would be on the record which the young man was scribbling down so industriously. In complete accord with legal procedure they had advised Kennedy to leave no loop-holes for later prosecution and claims.

"I have considered my tenure of Bossy to be more in the nature of a trust, pending final disposal," Kennedy answered. "I wanted to make no more moves until adequate disposition could be made."

Hardy shifted his foundations rapidly. This was going to be easier than he had anticipated. Kennedy obviously recognized he had bitten off more than he could chew. He had plainly said he was ready to unload.

"I can see why you've acted as you have, Howard," he said easily. "Until we can change things a little more, we get all tied up back in Washington with debates and opposition; and somebody had to step in and take charge. It just proves what a bunch of us back there keep saying. But I guess you realize you've caught a tiger by the tail; that Bossy is bigger than any one man."

"It's bigger than both of us, Hap," Kennedy chuckled again. The old saying was at the peak of its popularity cycle again, and they all chuckled in agreement.

Hardy's face terminated the chuckle by assuming an expression of resolute nobility.

"Yes," he agreed soberly, "we are only instruments in the hands of a glorious destiny. But it is our duty to shape that destiny, too, Howard. No man willingly takes the destiny of the world in his own hands, Howard, but there are times when we must. We cannot permit Bossy to fall into the wrong hands. We cannot thwart the destiny of our own people by allowing those traitors to hand it over to the United Nations—which even now has begun its debate on how Bossy is to be controlled."

He paused and eyed Kennedy shrewdly. There it was. The old devil would either have to commit himself to believing it should be shared, or evade the issue which would be the same as committing himself to it, or he would have to declare himself in with the right thinking people.

Joe knew that Kennedy's plans were not quite mature. It was time he took a hand.

"Pardon, sir," he looked up from his notebook. "Uh . . . may I read back the last couple of sentences to check accuracy. It came so fast."

The three men looked at him with exasperated patience of an executive with an inefficient secretary. But Hardy was not unwilling. It had sounded pretty good, and he wouldn't mind hearing himself repeated. Kennedy suppressed a smile and nodded his permission.

"There it is, you old devil," Joe read in the expressionless voice which is the trademark of the unimpressed secretary reading back. "Either you will have to throw in with those namby-pambies, or declare yourself one of our group who intend to get hold of Bossy for our own purposes."

There was a stricken silence in the room. There was the immobility of mummies in a tomb.

"Isn't that what you said, sir?" Joe asked in a faltering voice.

"I . . . I —" Hardy gasped and began to turn purple.

"He did not!" Oliver Mills rapped out the words as if they were cutting blows.

"What's the matter with you, Joe?" Kennedy asked in a harsh voice; but Joe knew the anger was only simulated, that the old man was laughing heartily behind his poker face.

"I . . . I don't know, sir," Joe said, hesitantly. "Several of us have noticed it; those of us who have worked around Bossy a great deal. We keep hearing things, things people don't actually say. That's why I wanted to check. I wasn't sure Mr. Hardy had said them, or was only thinking them. It's . . . it's very confusing!"

"Attaboy!" Jeff Carney's thoughts, from over in Berkeley, approved. "Keep 'em off side."

And they were off side. The implications were too plain. They could not be missed. This secretary could read their thoughts! The idea formed in their minds to escape the room, to get completely away and replan their strategy. They must act at once.

"Give 'em the other barrel, Joe," Jeff urged delightedly from across the bay. He didn't mind if the metaphors were mixed, Joe would know what he meant.

"We're trying to fix it so it won't happen again, sir," Joe said apologetically. "Apparently there's some kind of a broadcast power loss. So we have her completely dismantled, and—"

"Bossy is dismantled?" Hardy screamed the words hoarsely, as he sprang to his feet.

"Why, yes, sir," Joe said innocently. "The machine is purely experimental. you know, and —"

The slam of Kennedy's door behind Hardy and Mills shut off the need for further words. They were gone in a panic. They would, indeed, have to reorganize their strategy.

Kennedy sat looking at Joe from under his bushy gray eyebrows.

"Does Bossy broadcast mind-reading ability, Joe?" he asked mildly.

"No," Joe laughed. "It was pretty obvious what they were thinking."

Kennedy nodded.

"And I don't suppose she's dismantled, either," he stated.

"Not unless Hoskins has thought up something to tinker with," Joe answered.

"I gather you didn't approve of my making a deal with Hardy, then."

"Had you planned on it?" Joe asked.

"You know I hadn't," Kennedy said slowly. "You know that, in the same way you know everything else in the minds of people around you. I've watched you and Mabel and Carney, Joe. I've questioned Billings and Hoskins. They pretended to know nothing, but they weren't fooling me."

"Are you sorry, sir?" Joe asked, and this time he used the term of address in sincere respect.

"No," Kennedy answered instantly. "Maybe a little indignant at first, when I first realized your talent, over rights of privacy and such nonsense. But I've lived long enough to know no man stands on the pedestal he pretends to occupy, and I'm probably no worse than the run of the mill. No, I'm quite glad.

"A solution for Bossy has to be found, you know. This is just the first of the possible deals. I've known the problem from the first. I thought I was alone. Two misty-minded professors, and a stripling kid. I thought the whole burden of deciding what to do with Bossy was up to me.

"I'm glad it isn't."

XXVII.

A solution had to be found.

Bossy was at least one loaded gun which could not be tossed into the nursery of playing children with the usual irresponsible attitude of science.

"There, children, is a new toy. I suppose I should tell you it is dangerous and you really ought not to point it at one another when you pull the trigger. Of course if you do it's not my responsibility. I have all I can do in simply discovering the principles of how it works and in putting it together. Have fun, kiddies; and if you should kill one another with it, I will be the first to wring my hands and say it wasn't meant for that purpose."

Yet if the scientific product and principle is withheld, wouldn't that be even worse? What differentiates the man from the child, the civilized from the savage, man from beast, except a knowledge of the interrelationships of the parts of the universe, and how they work in the cycles of cause and effect? Can the child ever grow up, mentally, if the principles discovered in the laboratory are withheld from him?

A solution for Bossy had to be found.

In essence, Bossy was the ultimate weapon, and raised the same old problem which all ultimate weapons raise.

"How far and how long can the trustees be trusted?"

Nor was this question being asked only by a few men of high intellect. The conversation overheard on the street by Joe and Jeff and Mabel was taking place everywhere. Solutions by the hundreds were pouring over the airwaves, published in every newspaper, offered in every crank letter. Each had some single-valued purpose which must be fulfilled. Each had some bogeyman which Bossy must be used to destroy.

Everyone recognized that only five per cent of all the people born ever amount to anything at all. Everyone humbly thanked his providential stars that through his own personal efforts and merit he had become one of the superior five per cent. Everyone looked with pity and contempt upon the ninety-five per cent who did not share his grace.

A solution had to be found.

The pressures of each group who had its own little solution began to mount. There had to be some relief of these pressures. The move made by Hardy as spokesman for the group, who believed that linear government was the only possible way of controlling man, was only the beginning.

The Margaret Kennedy Clinic took on the appearance of an armed camp. But these were Kennedy's own guards, a recognizably futile safeguard against any really organized effort to get at Bossy, but a deterrent to disorganized attempts. Awaiting the revised strategy, the Pentagon had not yet supplemented its contingent, and the disgusted sergeant continued to change his sentry at regular intervals. The sentry challenged no one who went in and out of Bossy's room, and amused himself by pretending that he was an honor guard and presented arms for every person who passed down the corridor. The sentry who had let Carney into the room had embellished his story with the telling, and you never knew who might be a five-star general disguised as a janitor with a mop and a pail.

At present the sentries were even more alert than usual. Everybody around the Bossy building knew that all the principals were in a meeting: Kennedy, Flynn, Billings, Hoskins, Carney, Mabel, Joe. The doors were closed, and Kennedy's own guards let no one into the corridors leading to the room.

Inside the room the meeting was casual, more in the nature of a group of people who were merely visiting.

Steve Flynn, an almost infallible mirror of the public mind, expressed the mass bewilderment.

"What's going to happen with

Bossy?"

The question served to take the conversation away from the coffee and rolls which they had brought in with them.

"As a point of information, Joe," Kennedy asked, "suppose I had made a deal with Hardy and his gang. Suppose now or at some time in the future a would-be dictator did get hold of Bossy? He asks for the most effective strategy. He gets it. He asks for the most powerful weapons; he gets them. He asks for the most effective defense against other weapons; he gets it. He could conquer the world with ease."

"He would still need followers," Hoskins pointed out. "If people didn't back him up—"

Flynn snorted in derision.

"A little bit of semantics twisting will get him followers by the millions. People will tie in with a fanatic if for no other reason than to break the monotony of their lives. That wouldn't be a problem at all."

"But he couldn't be made immortal," Billings objected. "As long as he held to a one-track idea, he couldn't be relieved of his tensions and be renewed again. I would assume that the desire to conquer the world, or any part of it, would be in the nature of a fixation, a tension. As long as he clung to a one-track idea Bossy couldn't renew him. He would know he'd die."

"So what?" Flynn countered. "He'd have his fun while he was here."

"Would he want it?" Kennedy asked slowly. "As against immortality, wouldn't the satisfaction of pushing other people around for only a short while be pretty small potatoes?"

"If I know people—and that's my trade," Flynn answered, "he could convince himself that it would be all right to conquer the world first, and then he could repent his ways and have immortality, too. At least, that always has been the pattern."

Jeff and Mabel were looking at Joe, their thoughts all identical.

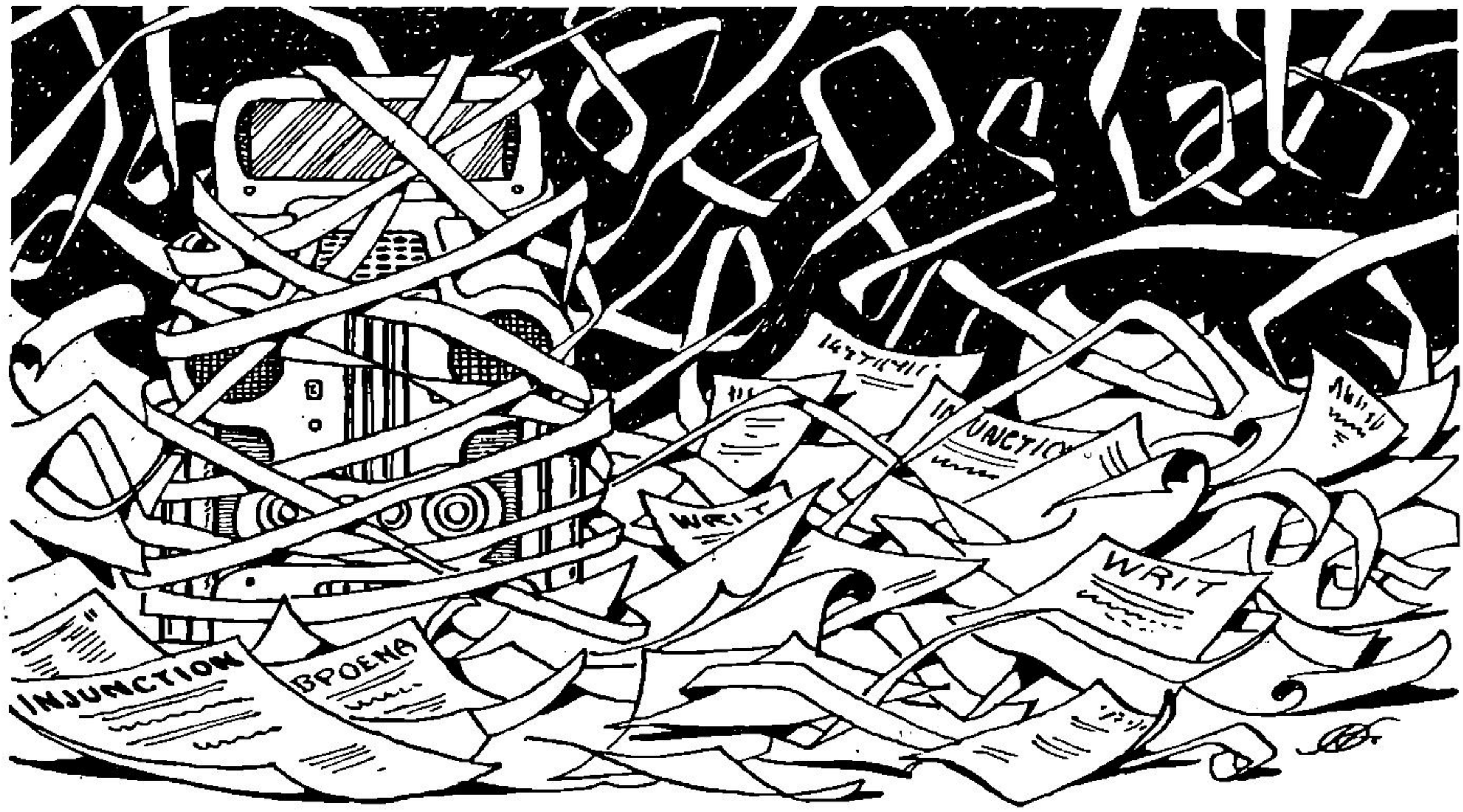
"In the long run of history," Joe said quietly, "it really wouldn't matter. Man's destiny would work out whether it were under a dictator, a democracy, or some form of government which we haven't yet conceived."

Kennedy and Flynn looked at him in amazement.

"I think the real problem here is in concept of the universe," Jeff said. "And the meaning of science itself."

Joe nodded.

"Bossy conceived the universe to be a totality," he said. "Where all facts and processes and forces are interrelated to form a total concept. At this stage of man's evolution, our scientists have been like little children facing a table piled high with the pieces of a jigsaw puzzle. One piece is



picked up and its holder says, 'This is the important piece. I hold the one key to everything in my hands.' Well, of course, he does. Because every piece *is* a key piece."

Mabel put down her cup and took up the thread, unbroken.

"In most areas we haven't even begun to try to fit the pieces together. Or where we do try, we find discrepancies. Like children, we are inclined to make one or two futile attempts and then throw the whole thing back on the table as a hopeless job. But all the pieces do fit to form a total picture. We haven't any idea yet what that picture is. We haven't even yet worked out an adequate method of approach."

"We often think we have," Jeff continued. "We form a theory and it seems to work until we run across a piece which proves it doesn't. At least we've made some progress in going back over our previous work to see if a new theory, which will bring the new piece into line, would also have fitted into the past."

"We're still doing too much jamming and forcing the pieces together, though," Joe picked up the thought. "We seem to have almost a mania for answering questions prematurely."

"Life has been short," Billings said with a note of nostalgia. "A man can be forgiven for trying to find an answer, a summation of all his efforts."

"It plays hob with the total picture, though," Joe answered. "We get some very strange linkages by forcing the pieces, to say nothing of the fact that such tactics will always defeat us."

"I'm not sure I'm following that,"

Kennedy said.

"The scientists who supplied Bossy with basic knowledge," Joe explained, "were all familiar with the concept we've just outlined. They leaned over backwards to limit themselves to differentiate between demonstrable fact and assumptions drawn from such fact. Here's an example:

"Virtually all books of astronomy state categorically that Mars has two moons. We've charted their courses, and toss away the fact as not being of any consequence that they do not follow the usual course of other bodies in the solar system. We've named them, given them their mass ratings. And we've dismissed them as a known fact.

"Actually all we can demonstrate is that our telescopes pick up some reflected light from what appears to be material bodies which appear to be satellites of Mars. And that was the information fed into Bossy—not that Mars has two natural moons, but that our telescopes pick up some reflected light.

"We know now that they could be artificial satellites, and if they were metallic then their reflected light could account for much smaller bodies than we have assumed. We didn't think of this at the time we postulated the moons because artificial satellites were an impossibility, or so we thought.

"So here are two possible explanations where we had only one before. It is reasonable to ask what new developments in science next century will give us still further explanations?

"Apply this everywhere in man's knowledge. The vast majority of what he thinks is knowledge is pure assumption—the forcing and pounding of unlike pieces together to make them fit."

"I don't see what this has got to do with a dictator getting hold of Bossy," Steve said. "It's like the trees, it seems to mean something to you people, but I'm the common man, remember?"

"What I'm trying to say," Joe answered, and took the cup of coffee Mabel poured for him, "is that Bossy deals only with proved fact, not assumptions. Her answers then are based on factual relationships. She fits the right pieces together. If a dictator had Bossy, he would ask her questions. She would answer the questions, and if he acted on the answers, he would, inadvertently, be fitting the pieces of the puzzle together for mankind."

"If he acted on them," Steve said cynically. "Suppose he didn't like the answers Bossy gave him. Suppose he got mad and picked up a club and smashed Bossy because he didn't like what she said. That happens, figuratively, all the time, you know. It's pretty human to smash the guy or the thing which tries to tell us something we don't want to hear."

"Well, yes," Joe sighed. "there's that. Of course you're overlooking the fact that Mabel or Carney could rebuild Bossy. Hoskins, Billings and I all working together could do it—but Mabel or Carney could do it alone. In a way they're sort of a duplicate of Bossy; and Bossy, given the proper attachments, could rebuild herself."

"But you three could be destroyed, just as Bossy could," Kennedy argued.

"Man would eventually rediscover Bossy," Mabel answered him. "The one thing we persistently overlook is faith in the future generations of man. We attack everything as if the final solution depended upon us, as if everything had to be settled because our moronic dependents couldn't possibly cope with them. Suppose Bossy were destroyed, and us along with her? Time is long. There are millions of years ahead of man."

"I can't wait that long," Kennedy said gravely, but with a wry twist of self-deprecation in his voice. "I'm still clinging to my old tension that I've got to protect man against his own self-destructiveness. I want to make sure there *are* some descendants—moronic or otherwise.

"You people, you're different. Maybe you can look at things on the grand scale, what they call the cosmic point of view, but I . . . I can't wait a million years for a solution."

"I suspected you wouldn't," Joe smiled.

"But what are you going to do, Boss?" Flynn asked.

"There's only one way to guard a secret so effectively that no one can misuse it to his own advantage and the detriment of others," Kennedy mused slowly, "and that's to give it away—make it open knowledge. Give it to everybody."

"Scientists have known that for a long time," Hoskins said. "That's why we keep insisting on free trade of ideas."

"But how can you do that with Bossy?" Billings asked. "Ten days to two weeks per person. You couldn't begin to process more than a selected few . . . and that takes us right back—"

Kennedy turned to Joe.

"Is there any reason why Bossy can't be put on the production line, turned out en masse like vacuum cleaners, radios, automobiles?" he asked.

Mabel and Jeff and Joe looked at one another and smiled openly.

"That was the answer Bossy gave us weeks ago," Joe said.

Kennedy's mouth fell open.

"You see," Joe went on, "when you've got a problem, all you have to do is ask Bossy."

"You could have saved me a lot of sleepless nights," Kennedy said reprovingly.

"We felt it better you came to the decision on your own," Jeff said. "You control the factories. It was the problem of the dictator, you see.

If the idea came to you before you were ready for it, and you didn't approve of it, you might smash it. As you say, time for us has a different value. We could afford to wait."

"Although we have been busy," Mabel said with a teasing smile, "I've been working a regular factory shift. You see, Bossy has been turning out blueprints of herself, and of all the special tooling necessary to make her parts in mass quantity. Everything's ready to hand to your engineers and production foremen right now."

XXVIII.

There is a time lapse necessary between deciding to put a machine on the production line and the act of shipping out the crated article. The vast proportion of the time cycle is taken up with the engineering. So much assumption is confused with fact, so little is known of process, that each thing must be tested anew when tried in different combination or pattern.

All but one phase of the enginering work on Bossy was done. But there is still time consumed in the doing of a thing after man knows what it is he must do and how to do it. The vast resources of Kennedy's far-flung enterprises were filled with trained and loyal personnel, but it still takes time to make a new tool and bolt it to the floor.

And time was pressing.

For a few days, Joe's announcement that Bossy was dismantled held the Hardy group in a suspension of indecision. But this only allowed other groups to catch up in their own plans for taking control of Bossy. Kennedy's legal staff bogged down completely with writs, subpoenas, injunctions. A little man would simply have been arrested and pushed around until he consented to do what was required of him. But Kennedy was not a little man.

In a strange way, the terrifying danger which had faced the country for several decades, acted to protect Kennedy. Gradually the position had changed from government by representative to government by representatives' hired staffs. And these staffs had been hired on the basis of loyalty to given persons.

With such a prize at stake, it was an inevitable part of the pattern that there should be more strife between these factions than normal, and that much of their potential effectiveness was lost in counteracting one another's moves.

Even so, at times, the attorneys of each faction found time to add another writ to the fast growing pile, demanding Bossy be delivered into their hands in perfect working order upon penalty of — the penalties varied according to the powers the factions had usurped for themselves to carry out their own brands of tensions.

Kennedy astonished his legal staff by telling them to answer each writ with a compliance promise. As per their demands, Bossy would be delivered into their hands on a given date. He coördinated that date with his production plans.

It was well known that Kennedy's word was good. Each faction, upon receipt of the compliance accepted the promised delivery date, and ceased its demands lest Kennedy change his mind and favor someone else. Each faction labeled the compliance as ultra secret. Each faction set about with frantic plans to lay the groundwork for its ascension to the pinnacle of power, to control the country, to control the world.

Some of the factions, such as the prohibition league still barely alive, had demanded Bossy more as a token gesture than anything else. They were vastly astonished to receive Kennedy's promise that Bossy would be turned over to them on said given date. They accounted for it through belief that he was in secret sympathy with them. A man does not find it strange that someone else should share his prejudices and tensions, even a fanatic realizes there may be a few others who know right from wrong — his brand of it. These obscure little factions, too, kept their pending triumph secret; and basked in the anticipated power they would have to force everybody to believe and do the right thing — or else.

In this manner Kennedy bought the preciously needed production time with his promises. Even the private citizen cranks who wrote in demanding Bossy be given to them so that they could take their rightful place in controlling their fellow men were answered with the same promise.

For when Kennedy said that he intended to give the secret to everybody, he meant precisely that. He would not be content with merely publishing the plans and theories behind Bossy; which still would limit her use to the favored few who had the money and equipment to produce her. No, he intended that the actual machine, itself, be available to anyone who wanted her.

He realized what this would do to the economy of the world; but the changes which Bossy would bring about were only magnifications of the changes which had occurred when the steering wheel replaced the buggy whip. He greatly suspected that making Bossy available at cost to those who could buy her, and opening up vast clinics for those who could not, would make less dent in his vast financial holdings than the secondary changes which would come about because each man would now hold all the answers he needed to solve his own economic problems—the answers would be limited only by the man's inability to ask the right questions, or by Bossy's persistently irritating "Insufficient data."

No, the legal department need not worry about the consequences of promising Bossy to each faction who demanded her. Each would receive her.

The one problem remaining, engineeringwise, was that there would be a great many Bossies indeed, and as fast as it could be managed they would be scattered over all the world. Bossy did not know all the facts of the universe. Bossy knew only what the science of today knows.

Man has not even scratched the surface of the facts surrounding his own fingernail, as yet. He has not yet even made a dent in the facts about the universe which remain to be discovered. Some of the Bossies would be receiving this new knowledge, others would not. And the total picture of the universe, as it unfolded, as the pieces were put together, must be made available to every man. Otherwise, Bossy would be self-defeating.

There must be intercommunication between all the Bossies.

It was not difficult to found the principles on which this would operate. Bossy functioned already by a harmonic vibration which activated her selectors. This vibration needed to be broadcast on the same principle as the radio wave. No new principle was needed. Any cookbook engineer could do it — even those who believe what they read in the textbooks and consider pure assumption to be proved fact.

It was not difficult to design the sending and receiving apparatus, nor was extra time consumed since this small alteration was being made contiguous with the production setup time of the rest.

The production of countless copies of the brain floss itself was likewise no real problem, no more difficult than using a key-punched master card to duplicate others by the thousands or millions on the old-fashioned hole punch computer system.

There was no hitch anywhere along the line. Government interference had ceased, the raw stocks suppliers were long practiced in giving Kennedy Enterprises preferential treatment on any sudden orders, Kennedy's own organization was long skilled in making quick changes and adaptations in his various functions.

Complete Bossies began to roll off the production line. They were crated and made ready for shipment long before the promised date. The contingency time for unexpected delays, based upon sound industrial engineering standards, had not been used.

And every retail outlet of Kennedy's entire chain began to receive crates of a new piece of household equipment which would go on sale within a short time.

Steve Flynn received his orders to set up another world-wide television coverage with a shrug of his shoulders. This was old stuff now. He merely

had to breathe the word that a new announcement was to be made concerning Bossy and he got instant cooperation.

But when he was told that after the announcement of Bossy's availability to everyone had been made, Joe would step in front of the cameras and give an explanation of what Bossy meant, he shook his head, blew a long breath through his lips.

"Oh, brother!" he muttered. Then to Kennedy, "Look, Mr. Kennedy, will you tell Joe, please, that these aren't Brains he's talking to — that these are just people who don't know nothing from nothing, and don't particularly want to! Will you tell him he can't talk about evergreen trees or jigsaw puzzles or anything like that and expect to get across?"

"I understand he's going to talk about water," Kennedy answered with a chuckle.

"Oh, brother," Steve groaned. "And half the people will wind up thinking that Bossy is just a hot-water heater or a new kind of bathtub! Well, at least, will you please ask him not to mention . . . what was it he and Hoskins were talking about the other day . . . multi-valued physics?"

He looked as if he were going to break down and weep.

He was apprehensive all the way through the preliminaries of the broadcast. A production was made of it, for the world had come to a stop and was listening. The world sat stunned at the announcement that everyone would have Bossy.

No one had ever believed that any except a special privileged few would benefit from her. They did not grasp it all at once. They sat in the stunned immobility of a poverty-stricken man who has been told, without warning, that he is a millionaire. Their minds, like his, could conceive of only the simplest poor uses for it, or wild extravagancies.

They saw Kennedy's face on the screen as he was introduced. They saw Billings again, who told them he intended to make another try at renewing his youth, that he had learned a great deal since his failure. They met Hoskins who confined his short talk to cybernetic principles understood only by a few like minds. They met Carney and Mabel again. Even Steve Flynn, usually confining himself to background operation, consented to say a few words about Bossy. He tried to keep his voice and talk out of the pitchman framework of pushing a new kitchen can opener which would also peel potatoes. He almost succeeded.

He did succeed in restoring a sense of the familiar to his listening and watching audience. They began to breathe again. There was enough of the commercial about his appearance and manner, enough of that frantic urgency — as if a sponsor were standing just out of sight with a long black

whip — to make them realize, as had nothing else about the program, that Bossy was available to them at the nearest Kennedy Enterprise store, and at a price which they could probably afford.

Some of the jaws returned to a rhythmic chewing of gum, some realized their beer glasses needed refilling, the odor of burning food on the stove penetrated some nostrils. Enough normalcy was restored that they were able to perceive Joe as he stepped before the cameras, and their minds picked up at least some of the things he said.

"There have been many misconceptions about Bossy," Joe began his talk. He hoped, contrary to Steve's predictions, that he would get across, for the things he had to say were a summation of what Bossy meant to the world, and to each man.

"One of the most prevalent misconceptions has been that since Bossy can think faster and more accurately than a man, Man will cease to think, become an indolent slave of the machine and thus fail to reach his destiny.

"The adding machine can think faster than a clerk with a pencil and paper, but it has not destroyed business. The automobile can go places faster and easier than a man can walk there, but it has not stopped man from wanting to go. These things are simply tools which man uses.

"Bossy is just a tool. Bossy can answer your questions, but only if you ask them.

"There is another even wilder misconception. It has been said that Bossy is a soulless machine, and man, being guided by her, will become likewise no more than a soulless monster, losing his sense of faith, yearning, reaching.

"Bossy is a product of science. There is not now, there never has been any real issue between science and faith. Both strive for the same identical goal; both seek comprehension; both wish to benefit man that he live happier, healthier, more harmoniously with himself and with his neighbors. Man seeks to comprehend, to understand the forces which govern his life. The sometimes apparently different paths taken by science and faith are of no consequence in comparison with man's yearning to know.

"Both science and faith have produced examples of fanatic adherence to one single value, proclaiming it and only it to be the ultimate and absolute truth. This is understandable, and even forgivable.

"Truth frightens man. He plants illusion in the debris of his mind to hide him from the clean white light she brings. His arguments defeat her wisdom. In his preconceptions and prejudices he dictates, in advance, what form she must take, what garments she must wear; and because of this he often does not recognize her when

they meet. His illusion drives her from him.

"And yet he still yearns and seeks for truth.

"That is the inherent nature of man. That is the inherent nature of intellect, itself. It seeks to know. Bossy will not replace this drive of mankind. Rather, she will supplement it and aid in its furtherance. Bossy is man's tool. Like all the other tools, Bossy is for man's use.

"Yes, she will give you immortality. And therein lies another misconception. If you are sitting on a hillside above a lake of water, and you point your finger at the lake and command it, 'Come and bathe me!', it will be unmoved. It will ripple and sparkle in the sunlight, and not heed you.

"Water obeys certain laws of the universe. To get bathed, you must use at least some of those laws. As yet man has no mastery of forces which will make that water leap out of its bed and come up the hillside to bathe him.

"But wait a minute. Yes, he does have at least some of the laws governing water under his command. He has pumps and pipes. He can and does command the water to come up the hillside to bathe him, and it obeys him when, and only when, he makes use of the laws which have been determined through the applications of science.

"Bossy is a product of science. Bossy will obey you when you command her to renew your youth only when you make use of the laws of life which must be applied to the cells of your body to restore your vigorous youth. Bossy is no thing of magic, no super being. Bossy is only a tool. And tools are used successfully only when they conform to the laws which operate in the universe.

"Bossy is only a tool. She will not plead with you to learn and use the laws of life and matter. She will not threaten you, cajole you, bribe you, promise you either the fires of hell or the delights of heaven. If you are seeking a parent substitute, a return to mother's arms, Bossy will give you cold comfort. Bossy does not care.

"Water does not care whether you bathe in it or drown in it. The mountains do not care whether you climb them or go around them. The stars do not care whether man reaches them or not. The universe does not care whether man masters all the relationships of its forces and processes, or dies because he refuses to master them. Life continues as it uses those relationships to further its growth. It ceases when it becomes overcome by still other forces which it cannot master.

"This is cold comfort for those who would pay any price for security, lethargy, the return to the mothering womb, no, even farther back than that for even the womb is a struggle, to nothingness.

"But it is bright hope indeed for those who see something more in store for man than indolence and endless repetitions of purposelessness of generation after generation. For it means that there is still a challenge facing man.

"That challenge is Bossy. She will not command you, or cajole you. She does not care whether you are made immortal or whether you would prefer clinging to your thin and single-valued ideas and prejudices—and die. But there she sits. She is a tool who will heat your homes, or bring you entertainment, or cook your food, or bathe the baby, or walk the dog, or figure your income tax. She will do these things as she is commanded, and not care whether they are big or small. Because Bossy is only a tool.

"She can also give you a tremendous comprehension in time, the nature of which we do not yet even dream. She can give you immortality. But you must rise to her requirements. You cannot make use of the tool unless you comprehend something of the laws of the universe governing life.

"There she sits. She is yours. She is not a threat. But she is a challenge. She is perhaps the greatest challenge which mankind has ever been called upon to meet. She is a challenge to your willingness to admit that you might not be right, that you might not already have all the answers. She is a challenge to your willingness to learn rather than to argue.

"Ladies and gentlemen of the world. There she sits. Bossy is yours."

THE END

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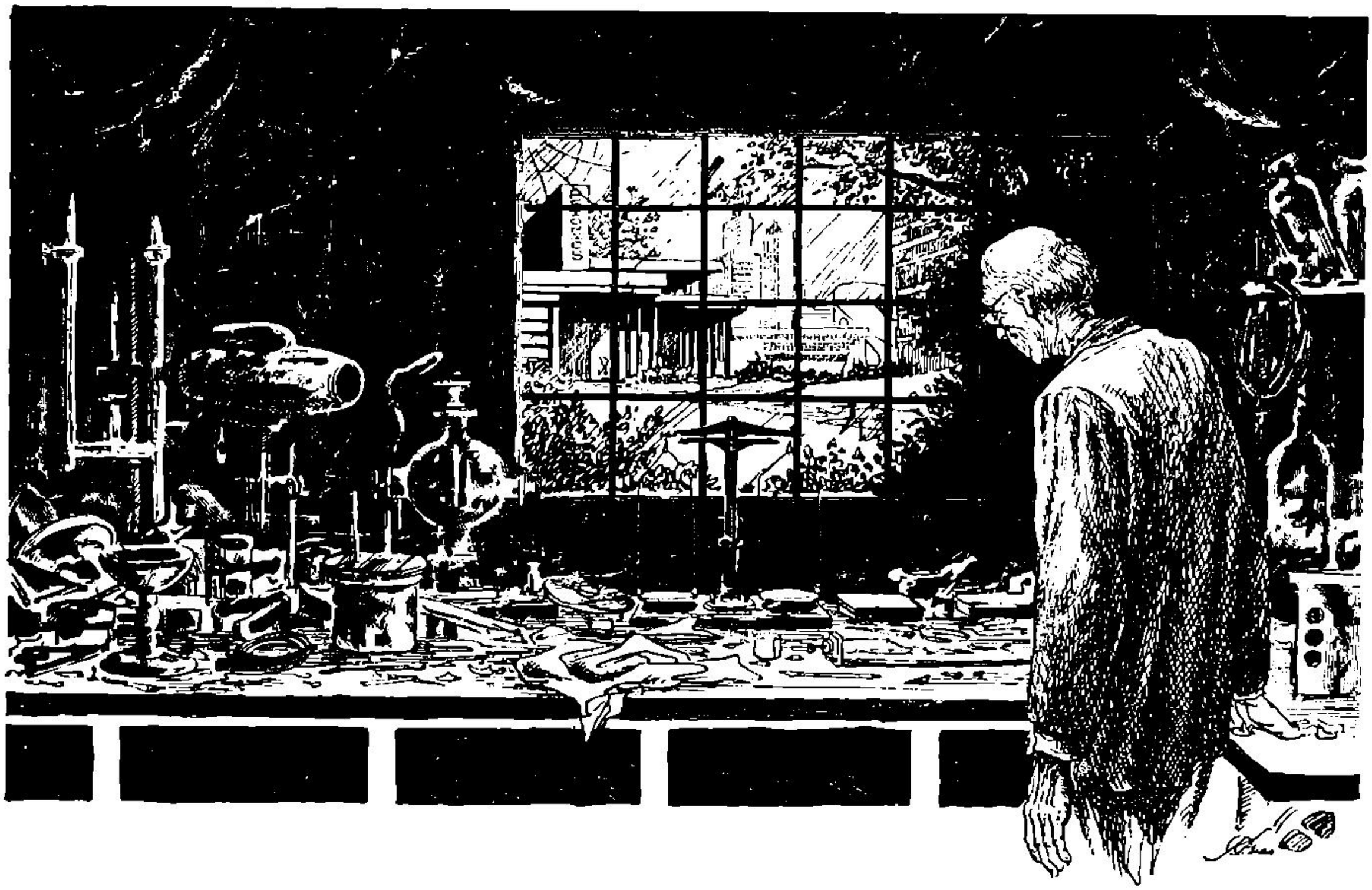


HELPER

BY IRVING REICH

There are times when a man does not want help—even kindly given help that makes possible the action he desperately wanted!

Illustrated by Freas

He thought about the Crookes tube back in his office. If he could manage to doctor up the vacuum pump somehow — But, then, he'd spent the past several week ends trying, without any luck. You just couldn't expect a fifty-year-old pump to draw enough vacuum to operate a Crookes tube.

He looked up and counted the handful of students who sat in the lecture hall. Eleven. He relaxed and smiled faintly. The minimum requirement was ten — the course would not be cancelled.

He stood up and faced the students. He was tall and thin, perhaps in his early fifties. His hair was nearly white. There were tired wrinkles around the corners of his mouth.

"This course," he began "is Science 101 — Introduction to Physical Science. My name is Barlow — Emmanuel Barlow. Today I will outline the material which we will cover in —"

A plump girl got up and walked quickly to the door. "I'm sorry," she said with a weak grin, "I'm in the wrong room."

He licked his lips and bent forward, leaning his hands on the table. "This semester we will take up the basic principles of mechanics and electricity. Mechanics is the study of the motions and interactions among physical bodies." He went on, telling how the science is based on three simple laws of motion discovered by Newton, how starting with these one can predict the motions of rocketships, of planets, or of molecules. The students yawned or fidgeted, all except two young men and a girl in the last row who were absorbed in a whispered conversation.

The bell rang. "That will be all for today," he said. "Please get a copy of Sitwell's 'Basic Physics' before the next meeting." He sat down and watched the students leave the room. The three who had been in the last row were still talking, in normal voices now. They did not look where they were walking. They walked rapidly among the irregularly placed chairs, looking at each other, and amazingly not falling over any of the chairs. The girl smiled at Barlow as they passed his table. They walked toward the closed door still absorbed in conversation. Just as they reached the door it opened and someone stuck his head in. They walked through the doorway; the head looked around the room for a moment, then withdrew, and the door closed.

"Two more meetings," he thought. After the third meeting the class would not be dropped even if someone dropped out. "Of course," he thought, "they might not cancel the course in any case." They prided themselves in keeping up traditional academic disciplines. He pushed to the back of his mind the fact that two of the trustees had spoken strongly against what they called "this mossback policy," that the president had been talking about modernizing the curriculum and pruning away the deadwood.

"No," he thought, "they'll keep things going. Until this rotten period passes — until people wake up again and realize what they almost threw away — the glory, the beauty, and the power. The equations that describe the innermost secrets of the universe. The laws that tell you how to build an atomic converter, or how to predict an eclipse that won't happen for another hundred years. They aren't going to lose all that."

Again he thought of the Crookes tube. It was only a lecture demonstration — certainly not essential. "But I want to show it," he thought. "I suppose it's a bit theatrical. But it's beautiful. It's a visible demonstration of the unseen particles that make up the universe, a demonstration in beautiful columns of light and fluorescent glass. It proves the precise unchanging laws that govern these particles and in turn, govern the universe."

He was aware of the door opening. He looked up and saw the janitor standing near him. "Locking up now, Dr. Barlow," the janitor said. Hastily he gathered up the loose papers from the table and stood up. He walked stiffly but quickly to the door, knowing that the janitor was surveying him with an amused grin all the while.

As he walked across the campus square he glanced at the broad glass façade of the Psionics Building. Someone fell in step alongside him. He looked sideways. It was Sanderson, the university president.

"Good afternoon, Dr. Barlow," Sanderson said, "enjoying the warm weather?"

"Yes, it's very pleasant," Barlow said. He thought, *What does he want? He's after something.*

"I'd been hoping to have a talk with you," Sanderson said. "You know how it is" — he gestured vaguely — "always business affairs that have to be taken care of — building plans, alumni meetings. It's a pleasure to have a chance to discuss what is really important — our educational program. Why don't you come up to my office where we can relax?"

"Of course," Barlow said.

As they walked toward the Administration Building he realized that it had become very dark. There was a hissing noise, and then rain was pouring down just ahead of him. It was falling over a circular area about fifty feet in diameter, separated from the dry area as though by an invisible curtain.

Sanderson grunted "Fool kids." He walked quickly around the circle, followed by Barlow. Four young men and two girls were standing in a group, their eyes turned upward toward the sky. One of the girls suddenly became aware of Sanderson; she nudged the two men alongside her. They looked down, then the others did, while Sanderson stood and glared at them. The rain died to a light patter and stopped; the sky became bright.

"Well, which group are you?" Sanderson demanded.

"Junior class — group fifteen," one of the men answered hesitantly. "Uh . . . we're sorry, sir."

Sanderson said nothing for several seconds. Then, "All right — you're getting away with it this time. But the next group that starts acting up on campus is going to regret it."

With mumbled apologies the six stu-

dents immediately walked away.

Barlow sat erect, a bit stiffly, in the padded armchair. Sanderson leaned forward across the desk toward him.

"You know that some of the trustees want me to scrap the science department."

Barlow felt a numb coldness in his insides.

"They say we have the curriculum cluttered up with stuff that's of no value — practically or educationally."

He paused. Barlow remained silent. He leaned back and the stern expression on his face changed to a benign smile.

"But they're wrong, Barlow. You know it and I know it. And it is the job of this university to keep alive the great achievements of the past. The historical value of understanding the work of men like Newton, Einstein and Edison cannot be overestimated. So I can assure you that the science courses will continue even if the enrollment falls below the usual minimum."

"I'm glad to hear that," Barlow said. "Of course enrollments are not very high just at present, but we have ten in 101 and twelve in 102."

"Fine, fine," Sanderson said. "I wouldn't be surprised if the number increased next year. I've been talking with some of the psionics people this morning, and I think we have a pretty good plan worked out. Beginning next semester the science courses will be transferred to the Psionics Department. We may want to change their titles since they'll be part of the group of courses in pre-psionic thought.

"I don't understand," Barlow said. "This is a completely different field. Surely there are enough psi courses without —"

"Now wait — this is largely a formality. The subject matter need not be changed appreciably, but it will be helpful to integrate the science work into the broad program. For one thing, you'll get a higher registration."

"Do you want to change the label in order to trick students into registering?"

"No, of course not. It's just a matter of the best psychological approach. But there is another, perhaps more solid reason. Under the guidance of Dr. Vick and his eminent colleagues, you will be able to orient these courses in a more useful direction. The bulk of the material will, of course, remain under your discretion. But, with the aid of the department, you will be able to tie the material in with modern developments. After all, you know, science as our grandfathers knew it was one of the roots of present day psionics." He smiled indulgently. "Surely you can see how much better it is to give them the big picture instead of isolated theories."

"But I still don't see it. There isn't any connection between science and this . . . this parlor magic. You can't

apply scientific method to psionics. It doesn't work. They tried for the first fifty years. The factors are too erratic — too subjective."

Sanderson's smile was a bit artificial. "How much do you know about psionics? For example, can you tell me how that group got up the rainstorm a few minutes ago?"

"Not too well. They pool their psi forces somehow."

"But doesn't an occurrence like that violate physical laws?"

"Of course not." Barlow's voice was now steady and incisive. "That's been established beyond doubt. Psi phenomena never run counter to the laws of nature. If anyone had made meteorological observations, they would have found the rainstorm perfectly explicable. Psi phenomena are simply coincidences which are controlled somehow by human minds."

"Well, that's one point of view. Now I'm not a philosopher, so I can't go into details but — new horizons are unfolding, Dr. Barlow. I do not ask you to accept anything on my authority. However, when men of the standing of Griswold and Grant and our own Professor Vick conclude that twentieth-century science was simply a limited psionic structure maintained by a few thousand men who had unwittingly hit upon a method of unifying some of their psi forces — we cannot ignore its importance."

"But what about all the practical achievements of science?"

"Well, what about them? What good will all those calculations and gadgets be when even schoolboys can get equivalent results by a series of seemingly lucky coincidences? By magic, if you wish. The next generation will all be organized into psi groups."

"Well, suppose I think about this and drop by in a few days."

Sanderson pursed his lips, then smiled. "I don't think that will be necessary, though, of course, I'm always glad of a chance to chat with you. I'd suggest that you see Dr. Vick soon. He'll be able to tell you what he has in mind much better than I can."

"Yes, I see. Well —" He stood up and pushed the chair back slowly. "And I've enjoyed this talk. I'm sure we've worked out something constructive."

"I suppose so. Well, good-by."

"Good-by, and please feel free to visit me here at any time."

He sat at the neatly arranged desk in his office. He did not remember walking back across the campus. After a while he said aloud, "I'm not going to think about it today. I'll work it out tomorrow." His eyes wandered to the wooden bench alongside his desk. There was a large elongated glass bulb mounted on a wooden pedestal. A rubber tube led from one end of the bulb to a squat rusty vacuum pump nearby. He stood up and pressed

a wall switch. The pump began to chug noisily, then the sound softened to a rhythmic swishing. After a while he plugged a wire which emerged from the tube into a wall socket. Nothing happened.

A knock sounded at the door. The door opened and the girl who had sat at the rear of his class entered. She was slender and had large alert brown eyes.

"Have you got a moment?" she asked.

"Yes, of course. Here, sit down."

She smiled at him and sat down facing him. "I . . . er . . . won't be able to attend classes next week. Jenner and Blake also — they're in my group — we'll be attending a special lecture series." Her eyes brightened. "Grant is coming up from the Duke Institute. He's going to cover the gravity-control methods that they've been working out."

Barlow nodded slowly. "Yes, I understand. Of course you'll be excused."

She went on quickly. "I wanted to be sure that you understood. We aren't dropping out; we'll be back after next week."

"Thank you for letting me know." He glanced sideways at the large glass tube which still showed no change.

She followed his glance. "What is that?" she asked.

"It's something I'm planning to use for a demonstration next month.

The trouble is, I can't seem to draw a high enough vacuum. If I can't repair the pump, I'm afraid there won't be any demonstration."

"What is it supposed to do?"

"You know what electrons are? Well anyway, it sends a current of electricity through the air between this metal piece — here — and this other one. Charged particles travel through this space and . . ." he went on describing the way the apparatus worked and how it looked in operation.

She smiled at him and looked at the tube. "That's perfectly charming," she said. "It's too bad about the pump."

Suddenly a fat arc formed between the two electrodes in the tube. It waved around in the space between, then broadened to a luminous column. Black bands appeared across the glow and slowly widened.

Barlow bent over the tube eagerly. He looked at the vacuum gauge attached to the tube and he frowned. He reached for the wall socket, hesitated briefly, then pulled out the wire. The column of brilliance did not change. He grabbed at the rubber tube and pulled it off the nozzle of the vacuum pump. There was a loud *woosh* as air rushed into the tube. The column glowed unwaveringly.

He wheeled around. She was looking at him with a pleased smile. He felt his nails digging into his palms and the tendons of his neck pulling down painfully on his chin and throat.

"Get out — get out of here!" he shouted.

The smile vanished; her mouth opened a bit and she stepped backwards. Then she turned around and went quickly to the door. As she opened it she looked over her shoulder. He was standing in the same position; his hands were trembling. She ran out, not closing the door behind her.

He turned toward the bench. The glow had disappeared. He picked up the tube and threw it against the opposite wall. It hit the wall and crashed into a hundred fragments which clattered to the floor. He walked to the desk and slumped down into the chair. The flesh of his cheeks and lips hung slackly; his eyes looked dead.

"Stupid," he thought, "that was a stupid thing for me to do. I should have thanked her."

THE END

THE REFERENCE LIBRARY

BY P. SCHUYLER MILLER

JUNIOR DEPARTMENT

You may be asking yourself—it's a legitimate question— why I take time out at irregular intervals to round up the books of juvenile science fiction published during the previous few months.

Some books—Robert Heinlein's, for example, and Andre Norton's originals and anthologies—deserve anyone's attention: by and large, they're as good as all but the best adult fare now being published, and better than much of it. This round-up is as late as it is because I've been waiting, hopefully but apparently fruitlessly, for the usual spring Heinlein.

But remember this: the science fiction we know today started as a literature for and to a large extent by young people. I've spoken of what seems to me to be a clear "Tom Swift" element in many of the early stories—and it wouldn't be hard to comment on the "Captain Video" flavor of some of today's output. Those of us who prefer the distinctive flavor of this or some other magazine might be quite happy as a mutual admiration claque, writing stories for each other, writing letters to praise or condemn each other, holing up in each other's poker games at the conventions—but there certainly aren't and won't be enough of us to

keep our several magazine favorites from folding up.

Science fiction—and it's basically a wholesome field, similar to the lost adventure fiction, the declining western, and in contrast to what's happened to detective fiction—must continually pick up new, young readers. It's for their good, because above all I think we want them to enjoy reading *per se*—and that's not always the effect of a secondary school education, here or anywhere. It's for our good, because we want a growing audience who will buy the magazines that print the kind of stories we consider best . . .

And I hope we have good enough sense to use some of these books as gifts from time to time.

Let's take the novels first: The best of the lot at hand is T. Morris Longstreth's "Time Flight" (Macmillan Company, New York. 1954; 216 pp; $2.75). The author has a series of popular boys' books to his credit: sports, the out-of-doors, history and biography. You may consider this an historical novel, because the time flight gimmick—ephemeral, but of the same order as the symbolic logic which took Harold Shea so many places—is used to get Doug Kennan and Rich McClain back to Salem of 1692, where they have a difficult time keeping themselves and their friends out of the hands of Cotton Mather and his witch-hunters. Now it's a wholly legitimate and recognized purpose of time-travel yarns to examine the past—or future—through the eyes of someone of our own time, to play up similarities and contrasts or just to show off. "Time Flight" does the job extremely well: I hope it will attract young people to historical as well as science fiction.

Time travel done rather poorly, I'm sorry to say, is the theme of another of the generally very good Winston juveniles, "Danger: Dinosaurs," by Richard Marsten (John C. Winston Co., Philadelphia; 1953; 210 pp; $2.00 . . . which, except for a few pages more or less, will describe the other Winston titles when we come to them). Chuck Spencer and his older brother Owen guide a party of time-hunters through the Time Slip back into the Jurassic, ostensibly to watch assorted dinosaurs in their natural habitat. But villainous Dirk Masterson wants blood, not photographs, and it develops that he has scented some uranium. He breaks through the protecting force field, drags the whole party off on his big game hunt, and leads to Owen's tragic death. Somehow the book doesn't come off: Masterson is too black a villain and so are the dinosaurs—almost without exception, vegetarian or not, they seem bent on wiping anachronous humanity out of the Jurassic. And the time paradox that's used really doesn't hang together.

Bruce Carter's "Into a Strange

Lost World" (Thomas Y. Crowell Co., New York; 1952; 196 pp; $2.50) appears to be British in source and reads like something out of a pre-war weekly boys' paper. Johnny Wild and Danny Black, young fliers shot down over the Channel, land on a sand-spit which has a hole in it. They tumble through into a system of caverns--why the sea doesn't follow them at high tide I'll never know—which in turn lead them through the roof of Red Valley. This is inhabited by descendents of seventeenth century English castaways who have kept an archaic social structure but advanced technically. They are in the midst of an insurrection in which our heroes help out, eventually escaping through the caverns to South America —after all, Jules Verne's heroes went in at Iceland and came out in the Mediterranean, and our boys had built a plane underground. It has a few interesting spots, but is pretty old-fashioned, as is so much British science fiction for teen-agers *and* adults.

"Starship Through Space," by physicist Lee Correy (Henry Holt & Co., New York; 1954; 241 pp; $2.50) is completely modern in tone, but a bit conventional and disappointing. Don Salter and Walt Hansman leave the Space Academy on Mars to join their fathers in" Project Thunderbird," a starship bound for Alpha Centauri. After a brush with something like flying saucers—interstellar fireballs—whose explanations seems left for a sequel, they land and find human inhabitants, the Ainsath, whose religion is based on *Genesis* and whose original home was the now shattered planet between Mars and Jupiter. It's good, breezy entertainment.

Series stories now seem to be the vogue for the teens--Lee Correy may be launching one, and I hope Bruce Carter isn't. Oldest of the lot is Paul French's "David Starr: Space Ranger" (Doubleday & Co., Garden City; 1952; 186 pp; $2.50) and "Lucky Starr and the Pirates of the Asteroids" (1953; 188 pp; $2.50). These read like a cross between "Skylark" Smith and "Superboy" with the mysterious ancient race of immaterial beings, deep under the deserts of Mars, who bestow added powers on the already strangely gifted David Starr, member extraordinary of the Council of Science, and dub him "Space Ranger." In the first book he plants himself as a secret agent among the Martian farmers and finds out why Martian crops are poisoning people right and left; in the second he offers himself as bait and scoots outrageously around the solar system, practically bouncing off the Sun at one point. It's fast-moving space opera of a type we all know, with no particular regard for scientific plausibility.

Murray Leinster, on the other hand, in the first of Shasta's juvenile pub-

lications, is establishing himself as a sort of Arthur C. Clarke of teen-age s-f with "Space Platform" (Shasta Publishers, Chicago; 1953; 223 pp; $2.50) and "Space Tug" (Ibid; 1954). These are the first two episodes in the saga of Joe Kenmore, his assortment of pals—a midget, a Mohawk Indian, a technician—and Man's conquest of space. In "Space Platform" they are involved in a mad whirl of sabotage as agents of several powers and agencies try to keep the United States from putting a platform into an orbit around the Earth. In "Space Tug" the Kenmore gang brush with Navy red-tape and brass-polish as civilian space jockeys, charged with getting a ship safely to the Moon. It's the fastest kind of action all through, but as a bonus is the feeling of technical authenticity which Murray Leinster knows so well how to give. It's the kind of thing which I hope will carry youngsters from Leinster's pure-action series to Heinlein and Clarke.

Gnome Press has also just started a teen-age series with "Mel Oliver and Space River on Mars," by William Morrison (191 pp; $2.50). This has everything in it but the space-head, but it's kind of fun at that. Mel Oliver, an orphan at whom someone is sniping, stows away on a Mars ship. So does Space Rover, a superdog who is apparently a direct deseendant of Albert Payson Terhune's collies and Olaf Stapledon's Sirius. They are befriended by the animal-trainers of a Martian circus, fend off a certain amount of rough stuff in space, and then get into real trouble with the circus on Mars. Mel's principal allies in all this are the circus proprietors, Bolem Turïno the Martian strongman and Hakin, the Venusian rubber man. We'll hear more of Rover, I'm sure.

Raymond F. Jones' "Son of the Stars," one of the first and best of the Winston series, now has a sequel in "Planet of Light." Ron Barron and his family are invited by their friend Clonar, from the Andromeda universe, to represent Mankind in a bid for fellowship in an intergalactic federation. They meet unhuman races and after some quite normal qualms come off quite well; then Clonar's own folk begin to indicate that men are too primitive for consideration, Ron's father is tricked into a seeming murder and the trouble really begins. It's not up to the first book.

Milton Lesser, in "The Star Seekers," also takes the Winston collection out of the solar system with a version of the generations-long star ship bound for Alpha Centauri. In two hundred years the people of the ship have fragmented into fourworlds—the outer Astrosphere, where the Engineers live and cherish their traditions; the Jungle, a pastoral inner world where all food is produced; the Place of Revelers, whose people have started proselyting among the Jungle folk; and

Far Labry. Mikal sets out to gather trophies from each "Circle" and succeeds in bringing them all together in time to land the ship. I'm not sure two hundred years would bring about so great a rift, but it's a strange theme well done.

Lester del Rey uses the Atlantis theme in "Attack from Atlantis," in which the crew of an atomic submarine are trapped, drawn into the subsea bubble-city of the Atlanteans, trip off a couple of prophecies, and get away again. It's notches below the same author's "Marooned on Mars" in this series.

The best of the 1953–1954 Winstons —I haven't had 'em all— is Philip Latham's "Missing Men of Saturn," in which a cocky youngster from the Space Academy grows up amid mystery and battle on Saturn's moons and on the frozen planet itself. Dale Sutton is less the super-hero than the boys who star in some of the other Winston books: or has this become a cliché in itself? And since "Philip Latham" is R. S. Richardson of Mount Palomar, the astronomy holds water. It doesn't always in Donald Wollheim's "The Secret of Saturn's Rings," which also presents Big Business as willing to destroy the Earth and any number of scientists for the sake of a few megabucks. It's an old saw in the magazines, I know, but is it a good one for the junior division? I'd like to see someone do a story from *inside* interplanetary business for this series instead of making this sound like an Iron Curtain pamphlet—which some school librarian is bound to consider it, to the condemnation of the entire Winston series and teen-age science fiction in general.

I have also three anthologies before me. The handsomest by far, with a wrap-around jacket by Alex Schomburg—who does a lot for the Winston books, too—showing a scene on the Moon, is "Space, *Space*, SPACE," edited by William Sloane (Franklin Watts, Inc., New York; 1953; 288 pp; ill.; $2.50). Why can't adult anthologies look like this? The stories are all from the adult magazines, and are good selections by and large, though I wouldn't call them outstanding nor in some cases particularly well chosen for a neophyte's first fare. The contents: Walter M. Miller's "No Moon for Me;" Edward Grendon's "Trip One;" Raymond Jones' "Tools of the Trade;" Arthur C. Clarke's "Hide and Seek;" Richard Ashby's "Master Race;" Eric Frank Russell's "Dear Devil;" Clifford Simak's "Courtesy;" Alan Nourse's "Nightmare Brother;" "Second Chance," by Walter Kubilius and Fletcher Pratt, and Irving Cox's "Like Gods They Came."

Since he was picking stories anthologized elsewhere—and thus pretty well cutting off his adult audience—I wish Mr. Sloane, whose own two books are classics, had done as good

a job as Andre Norton with her anthology "Space Pioneers," teen-age by definition only (World Publishing Co., New York; 1954; 294 pp; $2.75). The book has two sections, "The Explorers"—Eric Frank Russell's "The Illusionaries;" H. B. Fyfe's "Moonwalk;" Raymond Z. Gallun's "Trail Blazer;" K. Houston Brunner's "Thou Good and Faithful;" and James Schmitz's "The End of the Line"—and "The Settlers," with Fritz Leiber's "A Pail of Air," Raymond Jones' "The Farthest Horizon," Gallun's "Asteroid of Fear," and Jerome Bixby's "Page and Player." I liked 'em all.

Actually, all these stories were originally published for adults, in this and other adult magazines. The first and only anthology I've seen which has used science fiction written for young people is another new Winston title, their first anthology, "The Year After Tomorrow" edited by Lester del Rey, Cecile Hulse Matschat and Carl Carmer. The two latter edit the Winston series of juvenile s-f. Lester del Rey's two rather elementary stories in the collection, "The Luck of Ignatz" and "Kindness," both appeared here, in 1939 and '44. Robert Moore Williams' "Red Death of Mars" was here in 1940. They're typical action stories of the mysteries of far worlds.

The other six stories come from *The American Boy* and I remember them—and a few others—well from my own teens. Carl H. Claudy's "Master Minds of Mars" is formula but well done; his "Land of No Shadow" I still consider one of the best-done dimensional yarns on the books, simple though it is. His "Tongue of Beast" is minor stuff. Some of these—the first two at least—were published as separate books in somewhat rewritten form. Peter van Dresser contributes two adventure comedies with his space-cook hero, "By Virtue of Circumference" and "Plum Duff," and finishes off with "Rocket to the Sun." Good introductory stuff, for about junior-high ages.

And for elementary school ages, try "The First Book of Space Travel," by Jeanne Bendick (Watts; 1953; 69 pp; ill.; $1.75). It's no Coggins and Pratt masterpiece, but the cartoon-like pictures and the simple text are clear. Antidote to "Captain Video," sort of.

ENGINEERS' DREAMS, by Willy Ley. Viking Press, New York. 1954. 239 pp. Ill. $3.50

This is technically rated a book for teen-agers. The principal effect of the rating is a lower price—presumably meaning a bigger printing—than if it were aimed at an adult audience, and a slightly less detailed treatment than we're used to from the Willy Ley of "Rockets . . ." or "The Lungfish, the Dodo and the Unicorn."

Invention and engineering triumphs have played a smaller part in recent science fiction than they did in Jules Verne's time or even in the old *Science and Invention* era. The space-station is perhaps the only major realizable engineer's dream that gets into the magazines now. But those of you who are designing a future for the race may want to see some of these projects translated into reality in your lifetime. I think you'll find their stories interesting and they may be challenging.

Covered with true Ley thoroughness and clearness we have the English Channel tunnel, various floating islands—ever read "F.P. 1 Does Not Reply?"—the harnessing of volcanic heat for power, the various Jordan Valley projects and their relatives, the great Congo Lake proposal—my own favorite—the "Atlantropa" scheme to salvage part of the Mediterranean bottom—better let the Dutch handle it: they know what to do with salt-soaked soil when they uncover it—and projects to win power from the sun, waves, tides, the temperature gradient in the sea, and the wind.

Some of this was familiar to me; most of it Willy Ley made new-seeming, as he has a way of doing, by his patented process of fitting in bits of unexpected detail. And from the whole thing I've picked up something that I certainly never expected: a better idea of the vastness of the Earth and the forces that operate over its face. For example: the Congo pours 1,500,000 cubic feet of water into the Atlantic every *second* during the wet season, twenty per cent less in dry times. Yet, once damned, it would probably take up to half a century for the Congo Lake to fill, spill over into a Caspian sized Chad Sea in the middle of the Sahara, and drain out around the end of the Ahaggar and through Algeria and Tunisia into the Mediterranean. It's a big world!

A HANDBOOK OF SCIENCE FICTION AND FANTASY, compiled by Donald H. Tuck. The Author, 17 Audley St., North Hobart, Tasmania. 1954. 151 pp. $1.50 (from Howard De Vore, 4705 Weddel St., Dearborn, Michigan)

The diligence and enthusiasm of fiction fandom is proverbial and amazing. Its members do work which would appall professional bibliographers, then use their own scanty money to make it available.

Latest in the list, and right up in the ranks of the Day bibliographies, is Don Tuck's "Handbook of Science Fiction and Fantasy" from—of all places—Tasmania. The energy that we've learned to associate with the continent "down under" apparently spills over into its satellite.

The core of this well mimeographed legal-size paper-bound manual is 107

pages of brief but complete notes on authors, magazines, books and stories, including synopses of many of the latter. I don't know any other source that will give you the contents of all the anthologies of the past several years. Appendixes add information on the appearance of most of the principal magazines in the field—pseudonyms —story-series (*that* I'll make good use of!)—and paper-backs. All this is as of mid-1953, since Tuck had to sit down to a good many hours at his stencils sooner or later. He hopes to make it a perennial. If you collect, you'll need it. Howard De Vore, 4705 Weddel Street, Dearborn, Michigan is the United States source; Captain Kenneth Slater of "Operation Fantast" handles European wants. (He should have a "back home" address in England by the time this appears so I'm not giving his G.P.O. address.)

REVOLT IN 2100, by Robert A. Heinlein. Shasta Publishers, Chicago. 1954. 317 pp. $3.50

This third volume in the five-book "Future History" series is a distinctly minor Heinlein contribution, and probably the low point in the series if I remember the Lazarus Long and "Universe" episodes. Heinlein has blown his novelette, "If This Goes On . . ." up into a 60,000-word near-novel, and added "Coventry" and the fragment, "Misfit."

The most interesting part of the book to me, and the element which makes it really essential to the series, is the author's foreword: "Concerning Stories Never Written." As you will recall, the time-chart of the next seven centuries which Shasta uses as the endpapers of the books show a number of titles in parentheses as "Stories-to-be-told." Heinlein explains why many or most of them never will be told. He also explains his organization of the series.

"The Man Who Sold the Moon," with its magnificent original title story, stretches from our time to the achievement of the Moon. Volume Two, "The Green Hills of Earth," deals with the years around 2000 A.D. when Mankind bursts out among the planets. Then, in the Heinlein future, come the dark ages of Earth—and the TV evangelist, Nehemiah Scudder, who becomes First Prophet and founder of the American theocracy. It is Scudder's story which, now, will never be written.

"If This Goes On . . ." you may remember, is the story of the rather stuffy young guardsman in the Angels of the Lord, John Lyle, who lets his sinful emotions draw him into the revolution against this theocratic state. There are some excellent and typically Heinlein touches; Lyle's method of escaping from a robot-guided jet, for one, and the episode in the cavern refuge of the Cabal in which he blunders into a few of the facts of life. But by and large it's

way, way below the mark Heinlein has set himself in his recent teen-age books.

"Coventry" shows us another kind of authoritarian society, this time set up in reaction from Scudder's state-church, in which every citizen is free to do as he likes—as long as he doesn't disturb the pattern set by his fellow citizens. Individualists may be "corrected" surgically and psychologically, or they are put through a force-wall into Coventry, where at least three bickering societies of nonconformists are living off the land. Our individualist, needless to say, finds himself horror-struck at the anarchy around him. It's a good story.

"Misfit," the closing short story (which I failed to remember from its original publication here fifteen years ago), is a so-so item set during the resurgence into space, in which a misfit youth discovers special powers which give him a place in the company of space-men.

MESSIAH, by Gore Vidal. E. P. Dutton & Co., New York. 1954. 254 pp. $3.50

Robert Heinlein, as I've noted above, has resolved never to write the untold story of Nehemiah Scudder and the creation of the American Theocracy early in the Twenty-first Century. But one of the country's leading young novelists has done it for him in "Messiah."

Naturally, Gore Vidal's novel can't be dropped bodily into the gap between "Green Hills of Earth" and "Revolt in 2100," but it does develop Heinlein's theme for those missing years. Scudder was a hill-billy evangelist, one of whose followers left him a few million dollars at a time when the country wanted a strong leader and the reassurance of a strong religious doctrine. He teamed up with a Senator, hired an advertising agency, and went on TV: he ran for President, bludgeoned his way through the campaign and "the next election was never held."

The messiah of Gore Vidal's novel, John Cave, is an embalmer with a message and great hypnotic powers. We follow his rise with the dilettante historian, Eugene Luther, who is at first superficially amused by his assignment to write the Caveite "gospels" ("Cavesword") then irrevocably drawn into the theocracy which Cave's advertising manager, Paul Himmell, builds around him. Luther, an old man in hiding after Cave's murder—the Messiah, who preaches the joys of death, must take Cavesway if his disciples are to consolidate their religious empire—looks back some thirty years from a time when the Caveites have swallowed up all the Christian and Communist peoples and are trying to infiltrate Islam.

Heinlein's theocracy never becomes really convincing—which, I expect, is why he has no intention of expand-

ing on it further. It is all framework and no doctrine: as we see it in "If This Goes On . . ." a tight corporation in which the unreasoning and unthinking devout are manipulated by a cynical hierarchy. But in "Messiah" we see the man, John Cave, building his cult of death on a psychological and philosophical structure, sincere in himself but allowing himself to be used by the intellectuals who have joined his train, and under it all relishing the growing power they are giving him.

Between these two books is the difference between the way the same theme, and many of the same mechanical details, are handled in mainstream writing and in routine science fiction. "Messiah" may be unreadable to many of Robert Heinlein's followers, but in its way it supplements the train of thought of the Heinlein "Future History."

THE CAVES OF STEEL, by Isaac Asimov. Doubleday & Co., Garden City. 1954. 224 pp. $2.95

This excellent future mystery, Isaac Asimov's best book since "I, Robot," was serialized last year in *Galaxy*. It's as honest a combination of science fiction and detection as we've seen, though not the virtuoso job that "The Demolished Man" was.

Sometime in the future the Spacers have taken over Earth, smoothed out Man's troubles, and squat in their own domed communities on the edges of the great cities, quietly policing. They aren't aliens—they are the descendants of the Earthmen who went out to the stars and returned—but they might as well be. One of them is murdered, and it's up to New York cop Lije Baley, who hates Spacemen and doubly hates their robots, to solve the murder with a Spacer robot as his partner.

If and when the returns are all in, the entire Asimov galaxy of stories, from "Pebble in the Sky" to "Second Foundation" and beyond, are going to fit into a smoothly dovetailed future history which may make Heinlein's look anemic. This ties the robots and the Laws of Robotics into the epic of Man's galactic expansion. And to me the earlier books in the sequence have been the best. "Caves of Steel," dated a mere three thousand years in our future, bears this judgment out.

EXPEDITION TO EARTH, by Arthur C. Clarke. Ballantine Books, New York. 1954. 165 pp. $2.00; paper 35¢

Here is an excellent collection of short stories by the versatile author of "Childhood's End," "Prelude to Space," and "The Exploration of Space"—eleven of them. They span the whole range of his talents, from the alien atmosphere of "Second

Dawn" to the simple realism of "The Sentinel" and "If I Forget Thee, Oh Earth . . ." The closest to conventional is "Breaking Strain"—which uses the limitations of real space flight to create a situation which space opera would solve with a twist of coincidence. And "Superiority," in which a galactic war is won by the inferior science of the enemy, is now a classic.

Others in the collection: "History Lesson," which shows us ourselves as others will some day see us; "Exile of the Eons," an ironic tale of time; the deceptively simple "Hide and Seek," which also handles rocket flight with full realism; the title story, in which a civilization is launched from outside; "Loophole," a switch on the Martians-stop-war story; and still another realistic bit about rocket test pilots, "Inheritance."

PRELUDE TO SPACE, by Arthur C. Clarke. Gnome Press, New York. 1954. 191 pp. $2.50 (Ballantine Books, 35c)

There are very few science-fiction books which I would recommend unreservedly both to the initiated readers of this magazine and to the "gentle reader" who vaguely remembers Verne and Wells, and turns the junior space-operas off on his television (I wonder if he turned off the powerful TV drama made—from all reports—from Judith Merril's "Shadow on the Hearth?"). Arthur Clarke's "Prelude to Space" has been one of these ever since *Galaxy* brought it out four years ago as a paper-back.

Why four years had to elapse and Clarke had to sell "The Exploration of Space" to Book-of-the-Month, before anyone would put this classic between hard covers, I can't imagine. I'm told that the British edition from Sidwick & Jackson (1953) is the English first, though I've been assuming all along that the author's fellow-countrymen must have recognized what they had before Horace Gold did.

Here are the months of prelude to the take-off of the first Moon-rocket, just as they will be. We watch the preparations with a young American historian, first in London where the international Interplanetary Society is getting ready to lift the step-rocket *Prometheus* from the Australian desert, finally in the desert itself. As Dirk Alexson probes and fumbles to understand the motives which have brought these oddly assorted men together, and to catch their dream of space, we follow with him and little by little come to feel as they do.

This book has all the documentary quality of "Destination Moon," though it ends—but for an epilogue—when the *Promethus* leaves Earth. There is no melodrama, but there are many of the poetic bits which we look for in Arthur Clarke's other

mood. Whenever anyone comes up to you with that "What's this crazy Moon business?" look in his eye, give him (or her the Ballantine paperback edition. If it's someone who looks like a possible convert, give him the Gnome book.

BACK OF HISTORY, by William Howells. Doubleday & Co., Garden City. 1954. 384 pp. Ill. $5.00

In spite of the growing popularity—and competence—of stories with anthropological and sociological themes, I have the impression that most regular readers of this magazine are better grounded in the physical sciences than in the so-called sciences of humanity. Here, from the author of "Mankind So Far" and "The Heathens," is a kind of primer of the field. It's oversimplified and over-generalized, but the author knows it, admits it, and lays exactly the kind of foundation you'll need for tougher reading.

What Dr. Howells does is give you a kind of stratosphere view of humanity, from pre-human times to the dawn of written history, and at the same time show you the kind of evidence and the kind of reasoning on which our ideas of Man are based. (He's brought it right down to the recently announced translation of the Mycenean "Linear B" script as a form of primitive Greek.)

We see the primates and their societies. We watch man adding culture and language, follow him through the Stone Ages and see him transformed into the races of modern times. We see how different men in different times and places have built themselves strangely different but wholly self-consistent societies and cultures—ponder a very little over the principles behind social organization, religion and the great fact of perpetual change—then look in on the Americas and on the beginnings of Old World civilizations.

I'd recommend reading this and the same author's "Mankind So Far"—which amplifies the fossil man sections—filling in with the two outstanding paper-backs by V. Gordon Childe, "Man Makes Himself" (Penguin) and "What Happened in History" (Mentor), and if you're still interested, coming back to Howells' "The Heathens," a perspective of Man's religions for some stiffer and sterner stuff.

SPECIAL REVIEW

DESIGN FOR DECISION, by Irwin D. J. Bross. The Macmillan Co., New York. 276 pp. $4.25

What do you know about statistics? If you have a fund of ignorance as vast as mine on the subject, you'll find this a tremendously interesting book.

Dr. Bross—who is, by the way, a

reader of ASF—has done a noteworthy job of popularizing the newer developments in the field of statistics. He neither frightens the reader with a show of to much erudition, nor does he offer him pre-digested intellectual pap. He has produced not a textbook, but an interesting and informative survey of the use of statistical methods in making decisions.

Statistical Decision, a pragmatic and operational way of choosing one of a number of alternative actions, is a rather recent development. It got started about in 1940, and took in ideas from the Theory of Games, cost-accounting, information theory, symbolic logic and cybernetics; it has also spread into military uses, such as fire-control and strategic decisions.

In a clear, succinct and gently humorous style, Dr. Bross develops the theme that decision-making is a typically mammalian function; unlike the lower orders, where the new born or new-hatched apparently can rely mainly on built-in, instinctive knowledge, the young mamal must learn from emulating the behavior of others or from trial and error. Learning, then, involves decision; it requires the asking and answering of such questions as, "Shall I do this again?" "What are the chances of getting pleasure or pain from this action?"

As our society evolved and became more complex, it was inevitable that specialists in decision should appear.

It was useful for the average citizen to permit certain men to make decisions for him—the specialist could make better decisions, simply because he was better trained. He could, moreover, made decisions which involved and coördinated the actions of large numbers of people.

It is also pleasant to be a decision-making-specialist. As Dr. Bross points out, "It is generally easier to make a decision when someone else must bear the consequences."

And yet decision-making by specialists has its dangerous features: two examples are seen in the benevolent bureaucracy and the tyranny.

Decision-making has gone through an evolutionary cycle, one which is repeated in smaller epicycles. The first step is the *devil theory*, in which is set up an anthropomorphic personification of the real world. An example would be the naive syllogism: "A person can hurt me; a falling rock can hurt me; therefore a falling rock must have a spirit in it, just like a person—and I'd better be kind to rocks!"

The second step is that of *Reason*. Reason is practically equivalent to Logic, and is based on consistency, rather than truth. "As a method of persuasion Reason is, even today, the most important procedure. As a mechanism for arriving at a decision, however, it is subject to several weaknesses."

The third step, the one which is increasing in importance every day, is called *Science*, a label for the principles used in research. By use of the techniques of experimentation, measurement and an easily manipulable symbolic language (mathematics, et cetera) we have found that we can make better decisions and more accurate predictions.

Dr. Bross' book abounds with neat devices for clarification of discussion; he is also able to present them in such a way that one doesn't confuse the model with the actuality. For example, he discusses a Decision-Maker as a machine, into which flows information, out of which comes a recommended course of action. The mechanism consists of three components: the Prediction System, which deals with alternative futures, based on past experience; the Value System, which handles the various conflicting purposes; the Criterion, which is taped to choose the action with the highest desirability, and, therefore, integrates the other two components and selects an appropriate action. And if we re-label these three components as Memory, Emotion and Intellect respectively, we have another model—the human being.

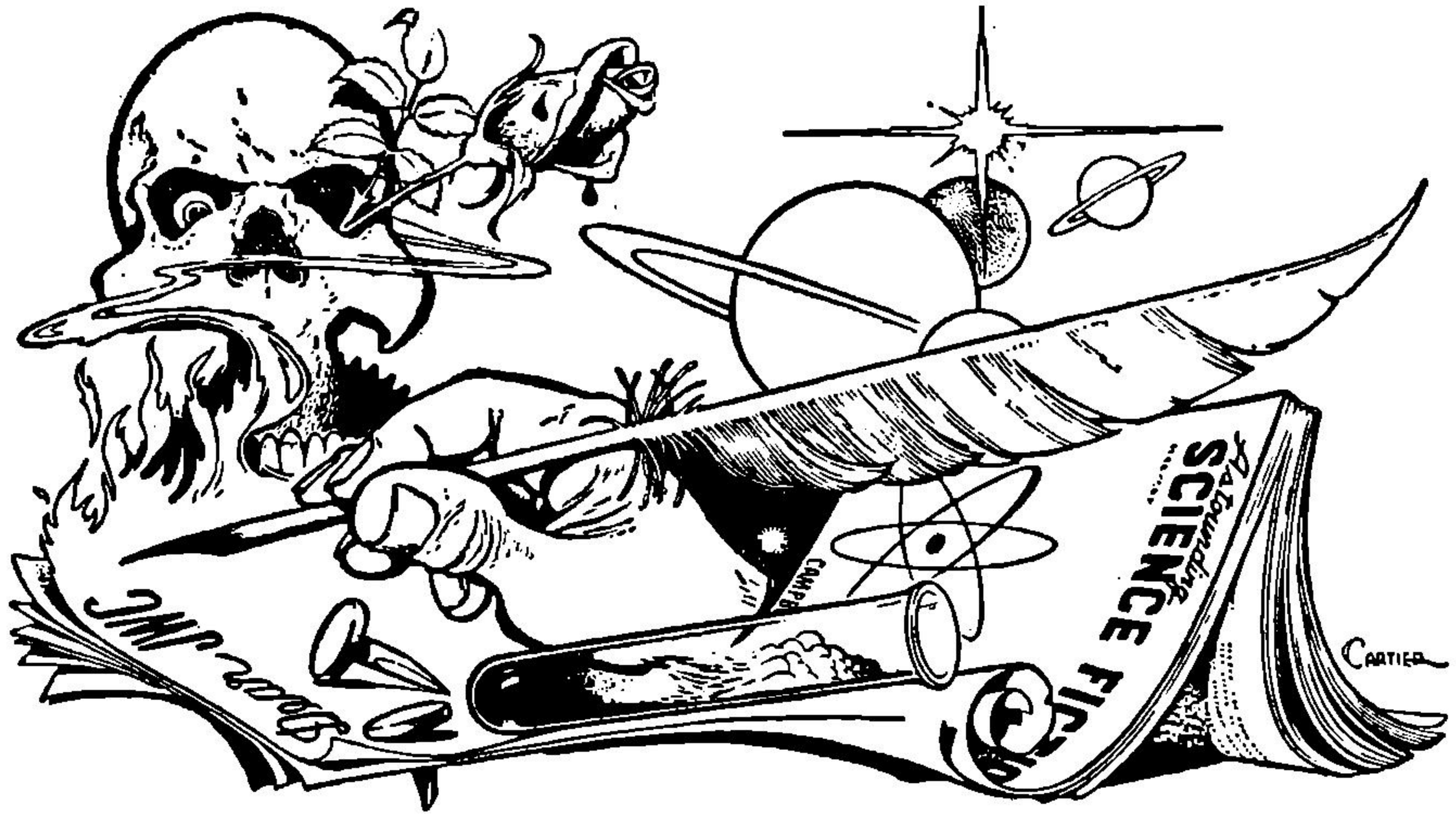
To me, Design for Decision is a valuable book. It is valuable not only for what it says and how it says it, but also for what it implies and suggests. It opens up new avenues for thinking, and offers new viewpoints on old relationships. As Dr.

Bross presents his subject, you can see it as an integrative discipline, one which can bring together previously unrelated bodies of knowledge.

As an example, it should not be too difficult to develop a form of psychotherapy based on Statistical Decision. A good many of our so-called neuroses seem to be based on faulty decision—for instance, the man who, after one unhappy love-affair, says, "All women are alike—I'll never go out with another one." As a matter of fact, Gestalt Therapy and General Semantics both lean heavily on techniques which are inherent in Statistical Decision.

More than that, there is a philosophy inherent in his writing, a philosophy which is sorely needed in these troubled times. To use his words, "Decision is predictive. When alternative futures are admitted it is no longer certain which outcome will occur—and this makes many people quite uncomfortable and they argue that there can be no guide to action if the situation is uncertain. But all actions in the real world are shrouded in uncertainty. The question is merely one of learning to live with uncertainty—and Statistical Decision is designed to accomplish this purpose."

THE END



BRASS TACKS

Dear Mr. Campbell:

Many thanks for publishing my letter in the March 1954 issue. I suddenly found that a number of my rather close associates were S-F readers—they congratulated me very gratifyingly—and yet none of us knew that the other was reading Astounding with great regularity. A moral of some sort is lurking here.

One more shot at the controversy over Logic, et cetera:

If a farmer had an excellent section of land, fertile, and well drained everywhere but in one corner of the East 40, where, let us say, an outcropping of rock was located, wouldn't he be all kinds of a fool not to cultivate *any* of the section simply because of that one imperfection?

The answer is too obvious to bother with. Now, Boolean Algebra (the original scope and form of present-day Symbolic Logic) is a very useful tool for handling problems of a certain kind—not *all* kinds, just certain ones. Similarly, Thermodynamics is an excellent statistical tool for handling certain Physico-chemical problems involving energy transfer. It is of no use at all when the fine points of interatomic relations are involved—at this point we should use Quantum Mechanics. In the Sciences and in Engineering we use whatever tool serves us best at the time.

Modern Logical Theory, and in particular Godel's work, points out that we will never have a system that can in all cases be *proved* to be self-consistent. In other words, every form of chain-thinking reveals a weak link somewhere. Too weak at least to support the full weight of *all* reasoning. So Consistency, the ideal of all philosophies since the Athenian Greeks is unattainable.

Then what goal *can* a Philosophy pursue that is not in vain? Summing up the present-day practices extant among engineers and other practical people—including many scientists with VERY long hair—in one word, the answer is ECLECTICISM. And if the J. W. Campbell Rope-reasoning theory is workable, then let's use it, by all means.

Incidentally, I think it possible to formulate your Rope-reasoning into a mathematical symbolism—with your permission I'm going to try it.—John P. Fairfax, 1620 Howard Avenue, Burlingame, California.

I hope you can! I use it in practice—but I can't, as of now, explain how I use it!

Dear Mr. Campbell:

Mailed simultaneously with this is my first subscription coupon. As long as I buy every issue anyway . . . There's no other publication that I read cover to cover.

My ratings for the June issue:

1. Operation Syndrome. Really had me sweating.
2. Wing Shot.
3. Question and Answer—Part I.
4. Neighbor.
5. Growth Process.

These choices were based on my opinion of each story immediately after finishing it.

The four-story issue is fine by me, but please, not more than six times a year. I like the short ones, too.

I've become very interested in the problem of handling, storing, and making available the immense quantity of data that our sciences are producing. In doing research on it, however, I have become its victim. Would you know where I can find out what has been done in this field? By the way, does the science of handling data have a name?

In answering that letter correcting the physics of the Trojan system, you pointed out that each serial is based on the same situation. Would you have told us this, letter or no letter, or just let us guess it?—Ken Deveney, Jr., Millington, New Jersey.

1. Can anyone help the gentleman with a bibliography on data-handling?

2. I'd planned on explaining. It would be necessary for the readers to know why two authors used one locale — and represents an interesting idea in itself.

Dear Mr. Campbell:

I just finished the July issue in which I liked two stories very much: Poul Anderson's "Question and Answer," and Abernathy's "Pyramid." Anderson, by the way, is rapidly becoming my favorite SF author. I wish you would recommend "The Next Million Years" (by the younger Charles Darwin) for his reading, as it contains some remarks very pertinent to the guiding of human destiny by an elite such as his "psychocrats."

Both of these stories were about interstellar colonization which is the most hopeful subject for the SF reader today, now that the discouraging nature of the other planets of our system is so evident. As this is my favorite type of story, I would like to propose a couple of ideas that might be used in one some day. They are certainly not original with me, but I think they should be given more prominence than has been the case up to now.

If a workable method of interstellar travel is ever invented, we all expect to meet alien races, such as the Rorvan and the teglatha. I very much doubt, however, that we will ever run into a species, like them, of approximately our own degree of cultural development—on purely statistical grounds. It takes about three billion years for a suitable civilizing race to arise from the mud and fire of a habitable planet; but the races in general will develop at different

rates. Minor differences in land masses, average temperature, and other historical accidents will make differences on the order of hundreds of millions of years in the time of development. Consider the rates of evolution in Australia and Asia, in the Arctic and Tropics—for cold-blooded animals—and—in mammals—in the Mesozoic and Cenozoic, for examples. To this must be added differences in starting time, for not all stars are the same age as ours.

For the sake of the argument let us say that the average difference is of the order of a hundred million years; that is, of a hundred dominant planetary races, as many are more than a hundred million years ahead or behind us, as are less; I am sure this is a conservative estimate. To be considered seriously as an equal, a partner, or a competitor, an alien race could not be more than ten thousand years behind us, or more than a thousand years ahead of us. We can expect to meet one such race out of every ten thousand habitable planets we find. It would be queer indeed if we struck one right off the first pitch, or before we had met a few hundred races a couple of million years ahead of us.

A problem akin to this is why we haven't met some such super-race before now—indeed, why aren't we the tamed domestic animals of one by this time? SF authors usually handle this problem by assuming moral and ethical principles of the super-races that are not at all conducive to the survival of such races; and it can be inferred that anything that tramples, as we have, to the mastery of a planet over the corpses of its competitors, and then holds together for a million years as an interstellar colonizer, must have

learned the lessons of survival well indeed. I heard this subject argued once when I was in Japan. The proposed explanations were as follows:

1. The supermen are here, but so smart we haven't found any traces of them. (Generally rejected.)

2. Variations of the collision theory: habitable planets are so rare they can't find each other. (About 50% adherents; perhaps the number would be less today, as astronomical thought is changing.)

3. Interstellar travel will always be so difficult a species must be limited to a few light-years from the home planet. (About 30% voted for this one.)

4. The extermination theory: the cultural level necessary for interstellar travel makes race suicide inevitable. (20%)

To this I would like to suggest a 5th: Is it possible that we just happen really to be the first? The probability seems fantastically small, but so is the chance that we happen to belong to the dominant species of Earth. Whatever species on a planet happens to be the first to develop culture, all minds capable of being amazed by probability would have to belong to it, judging from the fate of mammals since the ascent of Man. Similarly, if interstellar travel proves feasible (as in Asimov's "Foundation" series), and the race does *not* commit suicide for cultural reasons, the first species in the galaxy to develop interstellar travel will probably be the last; for its own protection it must exterminate or make domestic animals of competitors. There will be no cross-breeding to soften the struggle of races, as there is between human races. Perhaps other types of commensal relations between alien races may develop; but as in "Pyramid," ecological forces between civilized animals are very unstable things, as unstable as human culture. This idea is not really as absurd as it sounds, if the universe has a starting time.

If we take proposition No. 5 for the background of a SF plot, some fascinating applications of evolutionary theory are possible. In our own paleontology, rapid and radical advances of evolution happen when competition is removed for some reason; the first air-breathing vertebrates became mammals—described as "mammallike reptiles" because we can't tell about their physiology or soft parts from fossils—in a few tens of millions of years, then the latter did practically nothing until the dinosaurs were killed off. At such times evolution goes so fast that some theorists have called it "macroevolution" and supposed that it worked differently from the ordinary mutation-selection type; yet it follows logically from the fact that radical mutations do occur today, but have a hard time in competition with normals. (Much of the "irreversibility" of evolution is a consequence of the same

factor.) What would happen to the housefly, for instance, accidentally introduced into a virgin planet that provided no checks or controls but did provide food supply? The obvious thing would be an enormous increase in ordinary flies, and perhaps changes in size; but think of all the ecological niches to be filled by such an adaptable creature! In a few hundred years we might see aquatic, marine, burrowing, and terrestrial types all descended from the same ancestor; perhaps radical variations in the life cycle, from intermediate larval stages to live births of adults. The possible plots and garnishings of plots on this theme are endless. Why hasn't someone used this in a story before?

Less believable, perhaps, are the ideas of radical evolutionary variations of the species Homo sapiens in his interstellar career. The time scale for big changes in such a slow breeding animal would require the projection of the story too far in the future to be interesting. I never did care for plots in the year 10 million A. D., et cetera —Asimov's Foundation, about a hundred thousand years ahead, is about as far as I can see. However, we might be surprised even there at how rapidly changes might come.—Alfred B. Mason.

Hypothesis No. 6: That a race 100,000 years ahead has motivations we can no more understand, now, than a three-year-old can understand and accept the idea of true self-sacrifice. It certainly seems nonsurvival, doesn't it? Isn't it nonsurvival for you, doctor, to knowingly expose yourself to a patient with a lethal, contagious disease?

AMERICAN ASTRONAUTICAL FEDERATION

Founded July 4, 1954

Secretarial Address:
Rinehart S. Potts
236 E. Courtland St.
Phila. 20, Penna.

Dear Mr. Campbell:

We would like you to be among the first to know of the formation of the

AAF, as you have shown by your writings and personal speeches that many of your goals are the same as ours.

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It has long been recognized that a unified movement was needed in astronautics. However, the very quality that made for strength in each local society—individualism—also held up any federation for years, until gradual negotiation by mail brought about such a common background that it was possible for the delegates to agree on all the major points involved in just two days. The Federation will attempt to maintain that factor of individual differences among the societies, while furnishing each with a strong national and international voice, and facilitating technical and procedural coöperation and exchange through a journal and correspondence. Dual purposes exist: the advancement of amateur technical progress in rocketry by means of full exchange of experimental results, and the gradual education of the public to more sound attitudes towards spaceflight and rocketry than exist at present.

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I am hoping that you will find it possible to get the word of our founding to others in the field who might be interested, either in the Federation or in its Journal, which should first appear in December, if present plans work out. Thanks very much for whatever you can do.—Rinehart S. Potts, secretary, AAF

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