

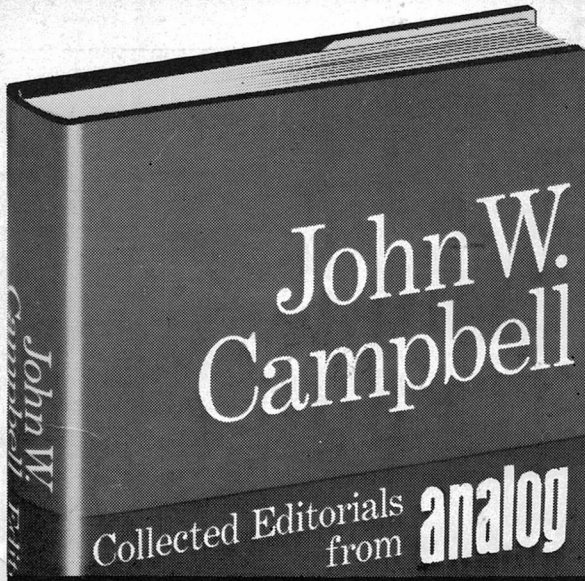
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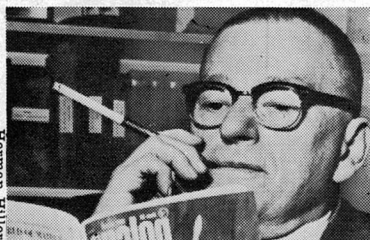
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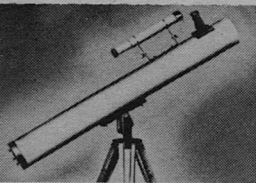
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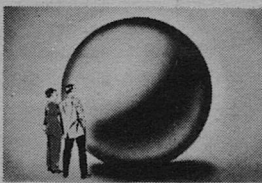
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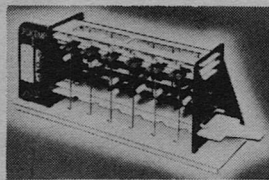
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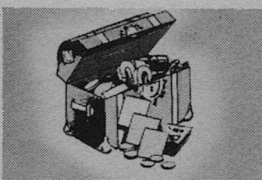
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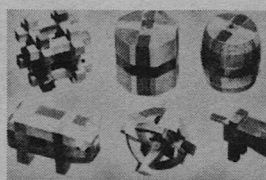
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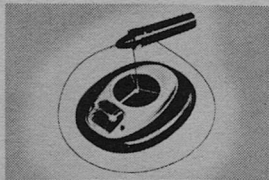
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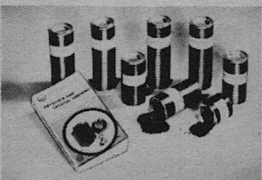
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NEXT ISSUE ON SALE
December 8, 1966
\$6.00 per year
in the U.S.A.
60 cents per copy

Cover by
Kelly Freas

Vol. LXXVIII, No. 4 December 1966

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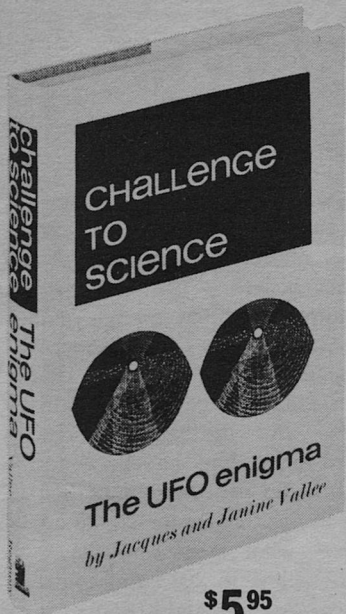
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Analog Science Fiction/Science Fact is published monthly by the Condé Nast Publications, Inc., Executive, Publishing, Editorial and Advertising offices: 420 Lexington Avenue, New York, N.Y. 10017. I.S.V. Patcivitch, President; Alfred W. Cook, Treasurer; Mary E. Campbell, Secretary. Second class postage paid at New York, N. Y. and at additional mailing offices, under the Act of March 3, 1879. Subscriptions: In U. S., possessions and Canada, \$6 for two years, \$13 for three years, \$18 for four years, \$24 for five years, \$30 for six years, \$36 for seven years, \$42 for eight years, \$48 for nine years, \$54 for ten years. Single copies: In U. S., possessions and Canada, 60¢. Six weeks are required for change of address. In ordering a change, write to Analog Science Fiction/Science Fact, Boulder, Colorado 80302. Give both new and old address as printed on last label. The editorial contents have not been published before, are protected by copyright and cannot be reprinted without the publisher's permission. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. We cannot accept responsibility for unsolicited manuscripts or art work. Any material submitted must include return postage.

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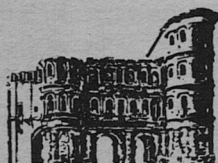
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"Too Many Chiefs..."

AN EDITORIAL BY JOHN W. CAMPBELL

The repeated theme of all human history is that men would rather die—even die by torture—than give up their sincerely held beliefs. Boiling oil, the rack, disemboweling, skinning alive, roasting over slow fires—none of these threats, or actualities, has been enough to make men give up deep convictions. And it hasn't been a case of Christian martyrs alone—it's just that being members of a Christian culture, we hear about them.

The best definition I've found for that hated concept "Slavery" is: "The emotionally painful situation of being forced to learn a way of life you do not choose," for "Slavery"—which is in large measure an emotional-concept word more than anything else—cannot be defined in legal terms. It's a purely subjective thing.

Perhaps an even more accurate definition would be "The emotionally painful situation of being forced to give up a sincere conviction, and accept a contrary belief."

Throughout history you'll find instances where an individual has been captured, enslaved, forced physically, mentally, and emotionally to give up a sincere belief, to

accept another—and has come to love the new belief, and thank the "cruel master" who forced him to the new belief.

Many times that change of attitude stems simply from the fact that his original belief, however deeply and sincerely held, happened to be wrong—and the one so cruelly forced upon him happened to be much better suited to the reality we have to live in. Simply explained, of course—what men *want* they sincerely believe they *need*; if someone else comes along and "cruelly forces them" to accept what they do in fact need, they are apt to undergo a marked change of attitude—after, *but only after*, they have fully accepted the contrary belief. The drug addict, for example, is convinced he *needs* his dope; if he should be forced to go to a doctor, pleading for help, he means by "help me," "give me what I *want*"; his reluctance to go to the doctor in the first place is the well-founded conviction that the doctor will, in fact, give him what he *needs*—an anti-drug treatment.

The essential point is, simply, this: It is deeply basic in human psychological structure to find the loss of

a deeply held, sincere belief emotionally painful in the highest degree.

A child can learn things easily and rapidly; he can learn any language—or several languages—with ease, rapidity, and perfection. He has no pre-established language patterns that say “This, *not that*, is the way to say such-and-such!” The adult has such patterns—and has far greater difficulty learning a new language—and almost never does learn the new philosophy of life that a new language implies in its very structure.

And that fundamental of psychology underlies the history of scientific rejection of new ideas, underlies the tendency of modern scientists to reject new concepts, and will, so long as human beings remain *homo sapiens*, continue to underlie scientists’ rejection of new basic concepts.

The Church Fathers rejected Galileo’s observational data on such things as the moons of Jupiter, because acceptance of such data would force the abandonment of their deep, honest convictions on the nature of cosmology.

To appreciate why scientists do,

and will continue into the indefinite future, to react in the same way, it’s necessary to recognize the fundamental nature of the scientific orientation. And that can be recognized only by contrast with an alternative orientation, an alternative approach to Reality in the Universe.

The scientist, naturally enough, tends to contrast his orientation with the alternative of Mysticism—to his great advantage. Mysticism generally denies logic; mathematical analysis, rejects the imposition of logical consistency, and insists that intuition is All.

However, there’s another orientation, a very non-mystical orientation, that we need to contrast with that of the scientist—one the scientist is not so darned eager to accept as truly alternative—the Engineering Orientation.

An Engineer is *not* a Scientist. He doesn’t think like a Scientist. He doesn’t have the same value-system in his judgments. But he’s even more anti-mystic than the Scientist!

The basic difference between Scientist and Engineer happens to have one factor in common with the Scientist-Mystic difference; the Engi-

neer says, "I don't give a darn if this thing isn't logical—if it appears logically inconsistent, and mathematics 'proves' it can't exist, that if it existed it couldn't work, and that if it existed and if it worked, it would destroy itself. I can build it; it works, and keeps on working, so I use it."

The Scientist, basically, is deeply and honestly convinced that *understanding why* is the key to Reality—and that those things which do not fit his understanding do not, and of a right ought not to, exist. To the Scientist, only *why* is important; he is not interested in *how*. It's not his business. His dedication is to discovering and developing the logical *relationships* of Reality. He has nothing whatever to do with the entirely different business of how to use real phenomena.

The great American scientist, Joseph Henry, had set up and operating in his physics laboratories at Johns Hopkins a true magnetic telegraph system, which he used as the world's first telegraphic intercom system, for summoning his assistants when he wanted them, decades before Samuel F. B. Morse patented the magnetic telegraph system. But Henry—for whom the unit of magnetic inductance was named—was a pure scientist, and was positively opposed to the *use* of Science—as thoroughly so as any High Priest of Zeus would have been opposed to the idea of finding some way to make Zeus carry messages for

the mere furtherance of commerce.

The pure Scientist genuinely is not concerned with the useful functioning of Science—with a capital S, for it is holy—but is, to a large extent, opposed to the concept. Like the pure mathematician who, when asked "What is Group Theory for? What can you use it for?" replies, indignantly, "Why . . . to solve mathematical problems, of course!"

The pure mathematician doesn't see mathematics as a tool needed to solve problems in physics—mathematics is for *mathematical problems*.

The pure Scientist in any field is basically oriented toward pure theory—not toward use of theory.

The Engineer is different; Engineering is a different orientation altogether. He does not need to understand *why* a thing works; he needs only to know *how to make it work*. He has not the slightest objection—in fact, he is completely delighted and happy—if he has something that works, that he can't understand, that doesn't fit any known theory, that can't be explained—but can be described in "do this and you get this" terms. He *needs* only to know *how*—though, of course, he would like to know why.

That understanding is necessary to accomplishment is a 100% false doctrine that the Scientists have been promulgating vigorously for centuries, and have succeeded in putting over almost completely in the last half-century or so. It is, in fact, just as false and misleading a

doctrine as the witch-doctor's insistence that you must chant the proper spells and mumbo jumbo before quinine will benefit the malaria patient.

Understanding—the why of things, the logic and relationships underlying phenomena—is totally unnecessary.

Science as the pure scientist means it, is *absolutely not necessary to high technical achievement.*

The bumblebee has absolutely zero point zero zero zero . . . understanding of theoretical aerodynamic science; he flies. But a theoretical scientist, with an unfortunately misguided assumption, proved mathematically that such a structure could not fly.

Conclusion: Science is not necessary to technical achievement, and can be a distinct impediment.

Algae have no understanding whatever of biochemistry; nevertheless they live, and manage their biochemical processes, with most astounding proficiency. There are totally nonscientific, completely non-understanding fungi and bacteria that live happily in such media as sulfuric acid, phenol, kerosene, Antarctic ice, hot springs pools with temperatures 50°F. higher than the standard pasteurization temperatures.

It is totally unnecessary to have any understanding whatever of the relationship of forces in the Universe in order to achieve highly technical ends.

It is not necessary to know *why* things work; it is only necessary to know *how to make them work.*

Moreover, knowing systems of relationships, knowing *whys*, can lead to conclusions that block achievement—Science can, in other words, be a positive hindrance to achievement.

The Engineer does not need to know why; he need only know *how.* One of the perfect examples of that difference is the accomplishment of Thomas Alva Edison—who knew practically no science whatever, was not a scientist, and had relatively little respect for pure scientists—but was a typical engineering-type developer of things that worked. He had almost no formal education—he invented things that worked, by highly astute reasoning and observation, and *very* little use of mathematical analysis. He was concerned solely that things *work.*

The Scientists of the time developed a solid mathematical proof that Edison's scheme of electric lights was physically impossible. (They had a perfectly reasonable postulate in their computations that happened to be wrong.) Bumblebee Edison simply went ahead and made it work.

Now, as of the time Edison was working on the electric light problem, no one had the foggiest notion of what electricity was. Sure—every ten-year-old kid today knows about

continued on page 170



Amazon Planet

MACK REYNOLDS

Part I of III.

*The United Planets had worlds
with all kinds of governments—but Amazonia
was unique in its dedication.
For Women Only—and, just now, unbeknownst to
its female rulers, For Trouble In Large Doses!*

Illustrated by Kelly Freas



Something there is about a passenger freighter that is unchanging, down through the centuries. Be it a Phoenician galley that sets bravely forth from Tyre with stops at Malta, Carthage, Tingis and Cadiz on the way to far Cornwall. Be it a motorship originating in Sydney and stopping off in Madras, Ceylon, Aden and Port Said on its way to Genoa. Be it a spacecraft, burning off from Earth and orbiting in turn, Avalon, Kropotkin, Shangri-La and Amazonia as touching points en route to Phrygia, man's farthest frontier in his reaching toward the center of his galaxy.

Something there is unchanging. Unlike on a liner, the freighter passenger is an afterthought. The cargo is the thing; the occasional traveler, a secondary matter and a method of realizing a bit more on the trip, not to be pampered. His needs can be met when more pressing matters have been disposed of.

He comes hesitantly aboard, carrying his own luggage. A harried steward, with a thousand duties before departure, hustles him to his drab quarters, mumbles something about the location of the mess, the hour of the first meal aboard, and is gone.

There is the sinking feeling of dismay. Is this to be home for the following long weeks? Is it too late to change plans? Couldn't the budget be stretched to acquire more

comfortable passage? Couldn't . . . ? But no, the die has been cast.

It is with a certain trepidation he first sets foot into the dining salon to meet passengers and officers of the craft that carries him.

Guy Thomas, thirty-odd of years, medium of height, average of weight, less than handsome of face and with a vulnerable quality in his brown eyes, hesitated at the entry of the *S.S. Schirra's* salon.

A lackluster steward, on the young side for a spaceman, Guy thought, was setting up. He shot the passenger a glance from the side of his eyes, grunted, and went on with his work.

Guy said, "I didn't understand just when it was that . . ." He let the sentence dribble away.

The steward grunted.

Guy said, "I suppose I'm in the way. Is there any place I can locate some reading tapes, or . . ." He let that sentence fade, too.

"You're supposed to bring your own entertainment things," the steward said. "You think this is some molly passenger ship, huh?"

Guy looked at him. "Sorry," he said.

"Maybe some of the officers got some stuff you can borrow. They got lots of time on their hands. Nothing to do but sit in front of all them dials a few hours a day. You don't see me with time to sit around reading. I shoulda gone in for deck candidate school."

Guy said, "Is it too late?" The other was a weasel-like type; in a month of Tuesdays the traveler couldn't have pictured him as an officer, a leader of men.

The steward finished with the table he was working at, and stood erect. He scowled at the newcomer, possibly wondering if there was a crack intended in that last.

"I wouldn't want to be no molly officer," he sneered.

Neither of them had noticed the newcomer who said now, from the door: "A what kind of officer, Happy?"

The steward's eyes darted, but relief came into them immediately. He said grudgingly, "Yes, sir. I was just telling this here passenger, maybe he could get some reading tapes from some of you officers."

"Happy," the other announced pleasantly, "you're not only the laziest cloddy aboard but a lying funkier." The ship's officer, two gold stripes on his sleeve, grinned at Guy Thomas. "That reading tape thing applies only to deck officers. Engineers can't read."

He was cheerfully outgoing, about Guy's own age though some forty pounds his senior and already tending to a bit of German goiter around the waist, a heaviness about the jowls.

Guy said, "My name's Thomas. Guy Thomas. I'm one of the passengers."

The deck officer shook easily. "That makes you fifty percent of the

list then. There's only one other." He hauled a heavy envelope from a pocket. "I might as well get this over with. Sit down and we'll twist Happy's arm until he brings us some coffee. I'm the second on the *Schirra* and one of the duties they shuffle off on the second is the paper work involved in passengers. No purser on a kettle the size of the *Schirra*."

He had plopped himself down at a table even as he spoke. "My name's Rex. Rex Ravelle. I'm an easy-going slob. Even cloddies like Happy, here, haven't any respect for me. If all the officers were like old Rex, the ship'd go to pot, eh Happy? Holy Jumping Zen, how about that coffee, fella?"

Happy grunted sourness and left.

Rex Ravelle looked up from the papers he was drawing from the folder and looked after the little steward for a moment, shaking his head. "What is it about the eternal yoke?" he said.

Guy had taken a chair to one side of the ship's officer. He said, "Do you mean to tell me there're only two passengers aboard?"

"That's right," Ravelle said. "And I hate to be blunt, fella, but the other one's better looking than you are." He scanned one of the papers. "Let's see. Her name's Patricia O'Gara and she's going to . . . well, well . . . Amazonia. Huh. Doesn't look the type. Well, let's see. What's your own destination? Have you taken care of whatever landing

technicalities apply? Visas? Shots? What citizenship do you carry?"

Guy said, "I'm going to Amazonia, too. I'm from Earth. Citizen of United Planets. All papers in order."

But Rex Ravelle was staring at him. "Amazonia! Are you driveling happy?" His eyes rapidly scanned the other's ticket. "Zen, you are!"

Guy said, "What's the matter?"

"The *matter*? No man ever sets down on Amazonia." He was goggling at the passenger as though dumbfounded.

Another officer, a one striper, entered the small salon. "How about some coffee?" he said. "Where's Happy?"

He couldn't have been more than in his early twenties, and had a freshness about his open face that hinted he needed to shave but once or twice a week.

Ravelle said, "Hey, Jerry, Citizen Thomas, here, guess where he thinks he's going? Amazonia."

Jerry looked from one of them to the other. "Amazonia? The old man wouldn't let him land there. He wouldn't have the heart."

Guy said, in growing perplexity. "What do you mean, I *think* I'm going? You've got my ticket. It's in order. You put in at Amazonia, don't you?"

"We orbit the planet," Ravelle told him earnestly. "We don't set down. If there's any cargo being dropped, they send up lighters for it. No, sir, we don't set down on

Amazonia and neither does any other spaceship."

Happy came in with the coffee, grumbling still, but passed it around to the three of them.

Jerry took a seat next to Rex and across from the passenger. "Nobody lands on Amazonia." He dropped a pellet of sweetener in his beverage and stirred in agitation as though at the very idea.

There was an element of mild irritation in the voice of Guy Thomas. "Look," he said. "You just told me the other passenger was going there, too."

"But that's a *girl*, or at least a woman," the second officer said, as though that explained everything.

Guy looked from one of them to the other. "What in the name of the Holy Ultimate are you talking about?"

They leaned forward, ignoring their coffee in their earnestness. Both began to speak, but the senior officer took the conversation, overriding the one striper.

"Listen, that planet's a matriarchy. Women run the place."

"Well, I know that, of course. What's it got to do with me? I'm a resident of Earth. A citizen of United Planets."

"Sure, fella, but the moment you set foot on Amazonia you come under the jurisdiction of old Hippolyte and her government, or Myrine and hers, and then, fella, you've had it."

He pecked at the table top with his forefinger for emphasis. "Under Articles One and Two of the United Planets Charter neither Earth, as the planet of your birth, nor even UP itself, can interfere with the internal affairs of Amazonia. And once you land of your own free will, you're under their jurisdiction."

Guy was completely flabbergasted now. "But what could they do? I'm going there on a strictly business deal."

"What could they *do*?" Jerry interjected, as flabbergasted as Guy himself. "Suppose one of those brawny mopsies took a shine to you? You'd wind up in a harem and spend the rest of your life there."

"Harem?" Guy said blankly.

"Harem," Rex echoed. "You know what a harem is, don't you?"

"I thought I did. Under polygamy, it's a man's collection of wives. Well, I guess it included the children and his women relatives, too."

Rex said sarcastically, "Well, under polyandry it's the same thing, only different."

"You mean . . ."

Jerry said, "Yes."

"Oh, don't be ridiculous."

There was a silence during which he stared at them.

Rex Ravelle said finally, "I wouldn't want to see even an engineer set down on Amazonia. Zen, I wouldn't wish it on Happy, here."

"All right, all right," Happy whined. "Very funny." He snorted and looked at Guy Thomas. "But

the second's right. Haven't you never heard of Amazonia? A man's got no rights there."

Rex said, "It was settled by a bunch of women crackpots two or three centuries ago."

"Feminists," Guy said. "I know about that, of course."

Happy interrupted his work long enough to say, in puzzlement. "How come they've never talked any men into going?"

The second officer leered. "They didn't. No men at all."

Happy said, "But they had to have *some* men."

Rex Ravelle said, "Artificial insemination. They took frozen sperm along. Of course, half the kids were born male, but the old biddies were ready for them. By the time they grew to adulthood, they had reins around their necks. Education, customs, even religion, I guess, had them all prepared to be the weaker sex."

"Weaker sex?" Guy Thomas said—weakly. "Listen, how come more of this information isn't available in the literature I read up on back on Earth?"

The second officer spread his hands. "It's the most secretive world in United Planets. They don't give out with information. They don't want any curd with the other worlds, just to be left alone where they can give it to the men, in the neck, all they want."

"Well . . . what else do they do?"

"Look, what's the most restrictive government you ever heard about? Back in history, or in existence now, or whenever?"

"Why, offhand, I don't know." The dismayed passenger ran his hand back through his hair.

"Well, whatever it was, it's worse on Amazonia, at least for men. You're not allowed to own property. Only women. You have no vote. You have no rights before the law, except through your wife."

"Suppose you're not married?"

"You haven't got any rights at all, until you're married. You've got to be married, as soon as you're not a child any more. You've got to be under the wing of some female or other."

"This is getting ridiculous. I'm going there for business. I'll just be there for a short time. They want this business deal as much as my clients do. They're not interested in throwing me into some harem. I think you're feeding me a lot of jet-sam."

Rex Ravelle came to his feet, finished the coffee which by this time had grown cold, and shrugged. "Don't say I didn't warn you, fella. For your own good, I hope the skipper doesn't let you land." He had checked the passenger's papers even as they had talked and now he handed them back to the other.

He was turning to go when a new voice snapped, "Just a moment, Ravelle!"

The three of the ship's company

and the now bewildered passenger turned.

She was standing in the entry, her eyes flashing. Since grammar-school days, Guy Thomas had read on the fiction tapes of persons whose eyes were flashing. He had always wondered what flashing eyes looked liked. Now he knew. Her eyes were flashing.

If it hadn't been for her odd, ultraconservative dress, he would have snap decided that she was as attractive a young curve as he had seen for many a day. Well, not as young as all that. She must be at least in her mid-twenties. It wasn't only her dress, either. She was innocent of cosmetics, even a smidgeon of lipstick, and her hair, unfashionably long, by Earth standards, was done up in a pile at the back of her neck. Attractive, he grudgingly admitted, but, well, all but prehistoric so far as style went. It was a good face, though, you had to admit that. Angry and aggressive now, for whatever reason, and handsome rather than pretty. Wide mouth, a well shaped nose to go with it, eyes wide apart and a sparking blue.

The second officer, taken aback, blinked at her. "Ah, Miss O'Gara."

"And don't call me *Miss*! I object to the term in both meanings of the word. The word mistress, from which the term Miss is derived, is the feminine of master, and I want to be no one's master any more than I want anyone to be

mine. And so far as the other definition is concerned, I am no man's mistress and will never be, nor his wife either. I hope that's clear."

"Say that again?" Jerry muttered, with only a hint of derision.

She spun on him. "Sarcasm doesn't particularly become anyone who's been uttering the blithering jetsam you have, the past ten minutes, whatever-your-name-is."

Jerry came to exaggerated attention. "Gerald Muirhead, Third Deck Officer, *S.S. Schirra*, at your orders, ah, Citizeness . . . is it all right to call you Citizeness . . . ah, Citizeness O'Gara?"

She snorted and turned back to Rex and Guy.

She demanded of the second officer, "What in the name of Zen is your purpose in filling this poor cloddy . . ."

"Hey!" Guy protested mildly.

" . . . Full of your masculine prejudices against Amazonia? Hasn't there been enough said in the way of snide propaganda promulgated against the sole member planet of all United Planets with a rational government?"

"Zen!" Jerry said. "Promulgated, yet. I'd love to sit in on this, but I'm going on watch. Gentlemen, I leave you to Miss, uh, that is, Citizeness O'Gara's mercies."

He left, leaving behind Guy and Rex, and an apprehensive looking Happy, who had retired into the farthest background, to face alone the indignant feminine passenger.

Rex Ravelle said, in a weak attempt at placation, "Uh, sorry if I've offended you, Citizeness. I was only repeating to Citizen Thomas what is commonly known throughout the system."

Her eyes were still sparking, and then she put her hands on her hips in a stance of indignation so stereotype that the most tyro of Tri-Di performers would never have dared it; the Irish colleen in fractious mood.

"Commonly known, eh?" she snapped. "What jetsam hasn't been blathered behind that aegis down through the centuries, eh? Jews controlled practically all the wealth. Negroes were less intelligent than whites because they have thicker skulls. Amerinds couldn't be allowed to drink because they couldn't hold their firewater. Scandinavians were slow-minded and Japanese were good at copying but weren't inventive. Englishmen had no sense of humor, the French were sex mad and the Americans would sell their mother to make a fast buck."

Guy looked from one of them to the other. The girl metamorphosed from handsome to beautiful when in the flush of argument. He held his own peace.

Rex Ravelle was not of the temperament to remain under attack without rising to the fray.

"Aw, now look," he protested, holding a hand up in an attempt to stem her tirade. "I'm not as flat as

all that. I've been around. I've met people who've been on Amazonia. I've met, oh, a dozen or more of these Amazons."

She simmered down a fraction. "Have you ever landed there yourself?"

"Well, no, but I've met port officials, customs officers, and also the pilots, crews and longshoremen, or women, who crew the lighters."

"But you're still spreading cheap rumors about male harems and such jetsam!"

Rex turned to Happy, still performing make-work in the background while he gaped in fascination at the war of words going on between officer and passenger. Oh, they'd love this down in the crew's mess later on. For once, Happy Harrison would hold the center of the stage.

"Happy," Rex called, "bring us some more coffee, eh?" Then, "Citizeness, let's sit down and go at this more reasonably. You're headed for Amazonia yourself, aren't you? Do you mind my asking why?"

She glared at him still, for a moment, then quickly took the nearest chair. Guy, who had stood, upon her arrival, sat down.

Patricia O'Gara snapped, "I'm an anthropologist. Well, an ethnologist, really," as though that explained all. She looked at Guy Thomas. "These men have been joshing you with this fling. Amazonia is the most advanced planet in the confederation."

"By what standards?" Ravelle said sarcastically.

She turned her wrath on him again. "By any intelligent ones! The only true matriarchy in United Planets."

It occurred suddenly to Guy Thomas that the *S.S. Schirra* was spaceborne. So engrossed had he become in the debate that he had failed to notice the low throb that denoted engines at strain.

"Zen!" he said. "We're on our way. You know, it's my first time in space."

The second officer looked at him sourly. "And if you land on Amazonia, it might well be your last. You'll be lucky to get off again." He turned to Patricia O'Gara before she could say anything to that. "And if you disagree, I speak from experience. Never in the ten years I've been on this run have I ever known of a case of a man leaving the planet for elsewhere."

She scowled unhappily at him, but managed to retort. "Are you sure that isn't because the citizens of Amazonia don't want to leave, that they'd rather remain on their own world, which they find more desirable than any alternative?"

Ravelle leaned back in his chair as the steward served them with the fresh coffee he'd requested. "I didn't say I'd never seen a citizen of Amazonia leave the planet, I said I hadn't seen any men leave it. On several occasions we've picked up women headed back to Earth as

embassy personnel, or even to some other planet on rare trade missions." He spoke the next sentence more slowly. "But I've never seen, or heard of, a man who was allowed to . . . escape."

She took several deep breaths, half opened her mouth as though to respond, but closed it again. But she hadn't given up the battle. Guy Thomas could see that. She was simply building up steam.

The *Schirra's* second officer bored in. "You still haven't mentioned why you're going to Amazonia, Citizeness."

"I've told you I was an ethnologist. All my life I've studied the origins of man, societies and cultures and particularly political and socioeconomic institutions from the most primitive up to and including the most recent."

"What's that got to do with Amazonia?"

"Just this. When I decided to escape the planet of my birth . . ."

Ravelle looked down at the papers. "Victoria," he said.

". . . I took plenty of time deciding what alternative world I would choose to make my home. Amazonia stood head and shoulders above all others."

Guy Thomas frowned and spoke for practically the first time since she had entered. "Victoria," he said. "I've heard of that planet. One of the first hundred or so colonized."

She looked at him scornfully. "Victoria. Named after some silly queen back in the old days on Earth. A period when man's domination over woman had reached a particularly ridiculous height. Man was the brains, man was the head of the family, man was the breadwinner. Only the exceptional woman was thought to have enough sense to be worth educating at all, beyond simple reading and writing. No, her place was in the home, in the kitchen, in the nursery. Intellectually, she was supposedly a child that had to be taken care of by her husband, her lord."

"Victoria," Ravelle murmured. "Don't think I've been there."

"Lucky you," she snapped. "The colonists fled Earth because the institutions they favored were being thrown into the wastebasket. Woman was beginning to recover some of the ground she had lost. This was simply unbearable to the Victorians. Their only answer was to migrate to some new world where they could continue their antiquated customs. Victoria! Where new ideas, where the slightest of changes, are anathema."

Guy said, "Well, you seem to have risen above it. I thought you said they discouraged women obtaining an education." The girl and her strong opinions fascinated him. On the surface, at least, he wouldn't have seemed to be one to hold overly hard to his own beliefs. The impression he gave was of one who

would flow with the current, and the swifter it flowed, the more readily. Not for him to contradict, or insert his own mild opinions when the controversy grew hot.

She took him in, again, as though wondering if it was worthwhile answering. Then, "Even in the so-called Victorian period, back on Earth, with all its crushing of feminine initiative, some were strong enough to rise above its restrictions. Scientists such as Curie, novelists such as Sand, Austen and the Brontës, medical pioneers such as Nightingale, politicians such as Victoria herself, rebels such as Carrie Nation."

"You seem to be up on the period," Rex Ravelle said wryly.

"Why not! I took the same stand myself. Against parents, relatives, friends"—she hesitated only briefly—"against any men of my acquaintance who might ordinarily have been potential husbands." Her voice was bitter now. "In the eyes of all, I desexed myself by refusing to become a chattel in some man's kitchen."

Quiet Guy Thomas might be, without imagination he was not. Into his mind flashed the long years this less than hefty girl must have put in bucking the tides of her native culture. The rejection of the femininities, the aggressive effort to hold her own in a world made for men.

Rex Ravelle said, "So now you think you're fleeing to Utopia.

You're swinging the pendulum to the other extreme, eh? Amazonia, where women dominate and men are the weaker sex. Well, at least it's admittedly different. On one world or the other, in United Planets, they're trying every political theory, every socioeconomic system, even every religion ever dreamed up by man." He shrugged as he shuffled the papers before him, as though indicating that she was free to choose her own poison, if she would.

But Pat O'Gara's voice was snappish again. "You sound as though the Amazonian ideal is a new one, as though a matriarchy is a brand-new idea dreamed up by some off-beat yokes."

Her answer had been to Rex Ravelle, but Guy said mildly, "I understand that there's various mention in early myths of the Amazons, but, well, it's not exactly historical, is it? It was all back before Homer's day, along with centaurs and the Golden Fleece, the Trojan War, and all."

He winced, in anticipation, as she drew in her breath to blast.

But it was Rex Ravelle who spoke next. He had been fussing over the ship's papers pertaining to Guy Thomas and Patricia O'Gara, the sole passengers. Guy's matter had already been finished with; her papers were in the second officer's hands.

He rapped in interruption, "Miss O'Gara! You have no exit visa from your home planet, Victoria!"

She flushed, but not exactly in anger, this time. She said, "I told you I was a refugee from the world on which I was born."

"But that's not the worst. Do you realize that you have no visa to land on Amazonia?"

II

Guy Thomas seemed to adapt easily to the routine of life aboard a spaceborne passenger freighter. But on the face of it, he was the type that adapted. The Guy Thomases of life drift easily along the buoy-marked way, not for them to venture this way or that into uncharted waters.

Had any of the ship's officers, or crew, been called upon to make a snap judgment of Guy Thomas, to be expressed in one word, surely it would have been *average*. For Guy was all but unbelievably average; in height, in weight, in countenance, in color of hair and eyes, in clothing worn. Had your same officer, or crewman, on having met the quiet Earthling but once or twice, been asked to describe him or do a quick sketch, he could only have admitted inability. It was necessary to meet Guy Thomas a half dozen times before such individuality as he boasted came home to another to the point that one could remember the man.

He adapted easily to the spaceship routine. Following Earth Basic Time, he arose as late as possible in

the morning still able to have his breakfast. He spent the next few hours either reading borrowed fiction tapes of the most bland variety, or taking in the Tri-Di shows they had brought along. After lunch he often idled around the ship, making a nuisance of himself, staring at officers and crew at their duties, managing from time to time to get into compartments off bounds to passengers, so that he had to be ordered away wearily—albeit respectfully, since he was a paying passenger—by engineer or signalman, ship's cook or navigator.

Largely, he seemed impressed by these men of space. For all but a few, such as Happy Harrison, it was far more than a job. It was a sharing in the big dream that man was currently embarked upon. The big dream of achieving his destiny, his explosion into the stars, his releasing of the bounds that had for so long tied him to Mother Earth. Out here were the stars, and the officers and crew of the spaceship *Schirra* were participating in their conquest.

Colorless, perhaps innocuous would be better, though he might be, he was company and on more than one occasion he sat in the copilot's acceleration chair before the ship's controls with this deck officer, or that, who was standing easy watch. Easy, since there is so very little to do when a vessel is in under-space. Guy Thomas proved a good listener and a means whereby to

break the boredom of a watch when no watch is truly needed in this era of automation.

He sat and listened to it all, dropping occasionally only such affirmations, questions or answers, as were needed to keep the conversation flowing, to indicate that his attention failed to wander from the other's biographical discourse, romances, opinion of United Planets affairs, bigoted beliefs, off-color jokes, wistful descriptions of family at home, or spaceman's dreams.

They told him of far planets with offbeat cultures that would make even Amazonia pale by comparison. They commented upon the fact that nowhere in all his explorations had man found other intelligent life. They told of shipwrecks and of rescues, and of shipwrecks that had failed of rescue. And always he listened, as though fascinated by every word.

He didn't exactly avoid the fiery Pat O'Gara, but when in the presence of that aggressive feminist, usually let others bounce the ball of argumentation. Seldom it was he got in a word, in support of either side in the almost continual controversy that Citizeness O'Gara managed to keep astir. But seldom, obviously, did he wish to add his own supply of fuel to the source of heat.

Once or twice he was unable to avoid participation at the salon table, or afterwards during the evening's leisure hours, when Pat and Rex Ravelle, her most usual oppo-

nent, had it out hammer and tongs. He suspected, as would have anyone, that the second officer was debating more out of amusement than sincere conviction; only his opponent was so blinded by her own earnest belief as not to realize her leg was being pulled.

Over coffee, following dinner one evening, Rex had typically slipped her the needle.

"All right, suppose I concede women are just as competent to handle government, although I'll be a funkier if I can think of any historic . . ."

She let him get no further than that. "I assume you've never heard of Elizabeth the First, of Cleopatra, of Zenobia, of Catherine the Great!"

"Touché," Guy murmured.

Rex grinned. "O.K., I'll take that. There've been exceptions. But that's not the point. Suppose we admit women are potentially as competent to handle state affairs as men. But why should we think they can handle them any better? There's no proof, and no reason to believe it would develop that way."

Pat O'Gara said testily, her face pinkening as usual in verbal combat, "It's unfortunate, Ravelle, that you're so uninformed on the subject. Otherwise, we'd be able to discuss the matter on a higher level."

The ship's officer continued to smile mockingly, "Aw, you can't get by with that, you know."

"The fact is," she said contemptuously, "that such government as existed during the overwhelmingly greater period of man's existence was predominantly in the hands of the women. It has only been in comparative recent history that man usurped the female position of control of society."

"Hey, wait a minute," Jerry Muirhead, the third deck officer protested. "I got lost somewhere. What's all this about women running the shooting match for most of history?"

"What do they teach you in the Space Academy when it comes to primitive society and anthropology?" she scoffed.

Guy Thomas said apologetically, "As a matter of fact, Jerry, it seems to me that I have read that earliest man did trace his descent through the matrilineal line. But . . ."

"What is that supposed to mean?" Rex said. He grinned around at the other deck and engine officers seated in the salon *cum* mess hall. "I think we've got a traitor among us, men."

Guy said quietly, "It means that the children of a relationship between a man and woman, took the woman's name."

Pat snorted her superiority again. "Which means, in turn, that women dominated the family. That in case of a 'divorce' the children remained in her clan, not that of the father's. That property, such as there was

in those days, was inherited by her relatives, remaining in her clan and that of her children on death or split-up of a relationship."

Jerry twisted his youthful face. "Well, I don't know about that, but whether or not kids were named after their mothers or fathers, it was the men who really ran the tribe."

"If you mean they did the hunting and the fighting, largely, you may be right," Pat said overbearingly. "Although even in those fields the women had a great deal more to say about nomination of chiefs and the deposing of them. You should read Bachofen's '*Das Mutterrecht*.'"

"*Das* what?" Rex scowled.

"It's been translated into Earth Basic," Pat said. "'The Mother-right.' It's possibly the first serious work on gynecocracy."

They looked at her.

She said smugly, "Or would you rather, gynarchy? They mean approximately the same thing—rule by women. Why even as recently in time as the Iroquois Confederation, women were the great power among the clans and didn't hesitate when occasion required to 'knock off the horns' as it was technically called, from the head of a chief and send him back to the ranks of the warriors. The original nomination of the chiefs also rested with them."

Rex Ravelle said, "It's not quite the picture of braves and squaws that I've been familiar with, Pat."

Patricia said firmly, "Then you're the victim of a false picture that male propagandists and pseudo-historians have painted. There was, admittedly, division of labor among the primitives and ancients. Men made superior hunters and warriors. The women did the just as important agricultural work, raised the children and maintained the long houses or the adobe community houses. But they also dominated in such government of the tribe as was necessary."

Rex said impatiently, "All right, suppose we take that. But what it amounts to is you're admitting that back when women ran tribal affairs the race was nothing but a bunch of savages. It wasn't until men took over that we started getting anywhere."

"Hear, hear," the chief engineer called from another table. "Well put, for a deck man."

"It's according to what you mean by getting anywhere," Pat said, with unwonted mildness. "I wouldn't deny that when descent and government changed, institutions changed." She pursed her generous mouth. "For instance, war became one of the new institutions."

Guy Thomas cleared his throat at that one. "I was of the opinion that war we have always had with us."

She turned on him. "Then you are mistaken. War, as we still know it on some of the more backward member planets of UP, is a com-

paratively modern development and didn't evolve until man's domination of government."

Captain Dave Buchwald seldom entered into the discussion. He was a taciturn man, heavy, straight of eye, and long used to command. So used, perhaps, that he seldom found need to issue orders. He expected his officers and men to handle the workings of the *Schirra* with such competence that his presence and decisions were seldom needed for the smooth operation of the ship.

But he said now, voice low and courteous, "Without disrespect of your scholarly attainments, Citizeness, I would like to ask how far back in man's history we must go to find this rule of the gentler sex. I confess, I, too, have been of the opinion that conflict we have always had with us."

"Conflict, yes," Pat said quickly. "But war, in the modern sense, no. I understand, for instance, that in the past the bull gorilla would defend his little patch of ground which he and his family needed for sustenance against the encroachments of other gorillas or other animals in general. In such defense he might engage in combat, but I would hardly call this war. Any more than I would call two stag deer fighting for a doe's affections, warfare."

Rex chortled, "O.K., define your terms as that old-time comedian was always saying in the Tri-Di

comedy we watched after lunch."

Pat O'Gara reserved her sharpest tone for the second officer. "Raids, semi-organized skirmishes between tribes disputing over hunting grounds or whatever, personal feuds, and such, have certainly existed, even under matriarchal society, but war in the modern sense, no."

"Some examples, Citizeness?" the captain rumbled.

"Well, take the impact of the Spanish upon the Mexicans. To the very end, the Aztecs never quite figured out what it was the Conquistadores *wanted*. They had no concept of war as their European contemporaries knew it, and they were the most militaristically inclined of the New World tribes. When they fought, they dashed valiantly forth as individuals and it was considered much more valorous to capture an enemy than to kill one. Their conflicts were conducted for the purpose of securing victims for sacrifices to their gods, or for simple loot. So far as war was concerned, they never got to the point of waging it for the purpose of acquiring some other tribe's territory and enslaving its people. It just never occurred to them. Confused Spanish historians to the contrary, there was never any such thing as an Aztec empire; they never even completely dominated the valley of Mexico, an area about the size of the old state of Rhode Island."

She went on wryly, "In a way, it was pathetic, this conflict between the civilized white men and the Amerinds. Why down to as late as the battle of the Little Big Horn, the Sioux of Crazy Horse and Gall rode into the fire of the repeating rifles of Custer and Reno, some of them armed solely with *coup* sticks, since it was a far greater honor in the tribes to count *coup* on a man by touching him without harming him, than it was to kill. The so-called wars the Indians waged from King Philip to Geronimo were actually no more than raids. They had no concept of war as the white man saw it."

Guy Thomas said uncomfortably, "This isn't my field, but do you count the Trojan War as one of these, uh, raids, or was it a full-scale military expedition? And, where does it fit in on your time scale? Had the men taken over as yet?"

"That was a period of transition," she said. "Some peoples were still matrilineal, some patrilineal. But read your Homer well, and you'll see that the Trojan War was a sad example of warfare by any modern standard. The heroes, the champions, would spend most of their time standing around yelling boasts and insults at each other. Occasionally a couple would dash out before their respective hosts and fight man to man, as often throwing huge stones at each other as using weapons. And when one or the other was killed or injured, then the

big wrestling match was brought on by each side trying to seize the corpse for its armor. Troy was never really under siege. It was just suffering a ten-year series of raids against itself and its neighboring towns and allied cities. Siege weapons, such as catapults and battering rams, were as unknown as fighting in ranks. Later the Mycenaean Greeks were to learn, upon the onslaught of the Doric tribes coming in from the north with their patriarchal society and the institutions that came with it."

The captain grunted noncommittally.

But Pat O'Gara was in full voice. She concentrated on Guy Thomas. "So far as this *war we have always had with us* bit is concerned, that's one of the inevitable stances of the misinformed. The idea that institutions with which they are familiar are unchangeable, have always been and will always be. Actually, nothing is so prone to change as institutions, socioeconomic, cultural, religious, or whatever.

Jerry entered into the fray.

"I don't know about that. Some have been under observation for a long time. Take the Judeo-Christian religion. It can be traced back without unreasonable change for thousands of years."

She overrode him. "Oh, can it? Or has it been changed over and over again through the centuries to suit the current situation? Take the Laws of Moses, supposedly the di-

rect word of Jehovah to humanity. Who among your Jews, or Christians, have followed them for centuries past? Who could? Time after time, the religious books of the great religions are edited, to update them. Sometimes a fragment remains which must puzzle the less than scholarly. For instance, let me remember . . . yes, 1 *Kings* XV. 12 and 2 *Kings* XXIII. 7 of the Old Testament. Over the years it must have proved somewhat puzzling for the faithful to read of the expulsion of the sodomistic priests from the Temple in Jerusalem. *What* sodomistic priests, they must have wondered, not knowing that the worship of the pagan goddess Cybele was widespread among the supposedly monotheistic Hebrews up until just before the Exile. Cybele's worship was one of the most gruesome of the ancient world. Her male devotees tried to achieve ecstatic union with her by emasculating themselves and dressing like women. All this, of course, has been edited out of the holy book now perused by the followers of this faith."

Guy Thomas was looking at her in some surprise. She was the only woman aboard, but that restrained her not at all when it came to argumentation dealing with her beliefs.

She pressed after Jerry. "Unchanging? Jesus, as a Jew, celebrated the Sabbath on Saturday, as did Mary, Joseph and all the disciples and early saints. His followers don't; they celebrate Sunday, the

Day of the Sun, of the pagans. Why? Or take Jesus's supposed birthday. Early Christians considered January 6th the date of the Nativity, but about the beginning of the Fourth Century December 25th was adopted. By coincidence it was also the winter solstice which people were used to observing, and the birthday of the rival god Mithra, who at the time was racing neck and neck with the Christians to secure dominance of the Roman Empire."

The fact was, Pat O'Gara seldom lost an argument, if only because she was willing to stick it out, hours on end, if need be, until her opponent wearied of the debate, or had to stand his watch.

Evidently, she wasn't overly worried about her lack of visas. And, ordinarily, she would have been right. The visa was a permission to land, seldom required on most of the member worlds of the United Planets. And even less often was an exit visa needed for a citizen of one world to leave that planet for another. Most usually, only the more backward, the more reactionary of governments required the bureaucratic red tape involved in the issuing of visas, or even the possession of a UP passport. A minority of worlds there were, afraid that their institutions would be subverted, their sometimes extreme religious beliefs held up to scorn, their socio-political system threatened, if outsiders were allowed to come in.

But Amazonia? Pat O'Gara simply couldn't believe that the world of her dreams could possibly be serious about the requirement for a landing visa for visitors from any other UP planet.

The captain, when the matter had been brought before him by Rex Ravelle, had shrugged and had had a few words to say to his second officer on his not having checked the passengers' passports before burn off of the *Schirra*. He was not going to upset his schedule to return Citizeness O'Gara to Earth, but if the Amazonian immigration authorities prevented her landing, he was going to have no alternative but to continue with her until they reached far Phrygia and then returned to Earth. If such was necessary, Citizeness O'Gara was going to pay the full fare.

She tossed her head at that. "I have no funds, Captain Buchwald. I told you I was a refugee from my home planet. I used my last credit to exchange for my ticket to Amazonia."

He looked at her in bafflement. Captain Buchwald was not used to being baffled; his life was so organized as to avoid such upsets.

"But what did you plan to do, if they refused to allow you to land, Citizeness O'Gara?" he asked in bewilderment.

"I planned to argue with them," she said defiantly.

Rex Ravelle chortled in the background.

They arrived off Amazonia during the sleeping hours and went into orbit around the destination of the passengers whilst those two were asleep, not having been informed by the ship's officers that their goal was so near. It was not deliberate. Each had assumed that someone else had notified the travelers.

They awoke, then, to find the ship's personnel hurrying through an abbreviated breakfast so as to be ready to receive port officials.

Guy had come into the salon first, looking over his shoulder at Jerry Muirhead who had brushed hurriedly past him, a piece of toast still in hand.

"What's the emergency?" Guy said to the steward.

Happy Harrison shifted his little eyes about. For the present the lounge was empty. He sneered, "These deck officers, nothing to do with themselves, week on end. When something comes up they gotta charge around showing how important, like, they are. I shoulda gone in for deck, instead of this nardy steward department."

"What's up?" Guy repeated.

"Them big mopsies are coming alongside. What'd'ya think? The customs and immigration and all that curd."

Rex Ravelle came bearing in, grabbed up a cup of coffee, took a deep swallow, popped his eyes as though he was about to spit it all out again. He got the coffee down and glared at the steward.

"Harrison, damn your cloddy soul. As long as we're in space the coffee is too cold to drink. But come up with a hurry and it's so boiling hot you'd crisp yourself drinking it."

"Always complaints on this kettle," Happy whined. "I don't know why I've ever so flat as to sign up on the *Schirra*."

Guy said to Rex Ravelle, "When are they coming aboard? These are the Amazonian authorities, eh?"

"Right as rain, fella," Rex told him, blowing on his coffee. He cocked his head to one side as though he had heard a sound that hadn't come through to the other. "That's contact. They'll be here in a couple of minutes. Happy, Holy Jumping Zen, get a move on. Get some refreshments on the table. Some guzzle, some sandwich things."

"Guzzle," the steward said indignantly. "You know there ain't supposed to be no alcohol in space, Second."

"Knock it, we're not legally in space. We're in planet orbit. These mopsies are two-fisted bottle babies. Get some guzzle on the table. You got to butter these curves up. It's not like most planets. Amazonians don't *want* you to be coming around. Doing business here's like to drive you drivel-happy."

Happy, grumbling, got about it.

A few minutes later the second officer set down his coffee and faced the entry.

"Ah, welcome aboard, Major."

Guy Thomas did a double take.

Through the entry strode a figure straight out of the historical fiction Tri-Di shows. Though it was this he was expecting, still it took a fraction of a second to realize that it was a woman.

Not that . . . well, not that it didn't look like a woman. It was a woman, all right. It was just that . . .

She was probably about five foot ten. It was the high boots, which had an effect of looking like greaves, that gave her the added inch or two of height, and then the helmet, which wasn't really gold, on quick second scrutiny, also exaggerated her size. Nor was she as brawny as a first impression gave. That was attained by the cuirass she wore, and partly by the heavy military cloak that hung from her shoulders almost to her ankles. Strictly out of a Tri-Di historical, Guy Thomas decided all over again, and so were the others who pressed behind her, somewhat less ostentatiously dressed, but in the same tradition.

"Morning," she snapped to Rex Ravelle. Her eyes went around the small salon, touched on Happy Harrison, who had shrunk back into his pantry corner, touched on Guy Thomas, and went on.

There were four of them in all. The major, as Rex had ranked her, alone was weaponless. Her three assistants bore quick-draw holsters on one hip, a decorative short sword, or possibly heavy dagger would be

the better term, on the other. Their helmets were a pseudo-silver, rather than gold. They looked remarkably efficient. All, including the major, wore their hair short in what would have been called page-boy bobs in an earlier age, and all wore a type of heavy shorts, reminiscent of the pedal-pushers of the past.

Rex said hospitably, "The skipper suggested you might like a bit of refreshment before coming up to his office for business."

One of the younger women caught up a bottle of pseudo-whiskey from the table where Harrison had laid it out along with sandwich meats, cheese and other cold table spread.

"Artemis!" she chuckled. "Earth-side guzzle!" She stuck the bottle to her mouth and gurgled.

Happy Harrison's face expressed pain.

The major gruffed, half humorously, "Easy, Lysippe, you wouldn't want to get drenched on this nice men's ship!"

The other two Amazons crowded up to get at the food and drink. "The Goddess forbid!" one roared, rather than spoke. "Lysippe's a mean drunk if there ever was one." However, she, too, took up a full bottle, rather than bothering with the time-consuming amenity of a glass.

Guy Thomas was sitting a bit beyond at a smaller table.

One of the girls, busy a-building a king-size sandwich, looked over at

him and winked. "Hi, Cutey," she said. "That's a pretty little suit you're wearing."

Guy Thomas blinked.

Rex said, "Dig in, ladies."

"Ladies!" the one called Lysippe guffawed. "That's a good one. Hey Minythia, did ya hear that?" She took another hefty swig from her bottle.

The major was working a cork from a champagne bottle. She said to Rex, who was standing back a few feet, watching them, a half twist on his mouth, "What's this about a passenger?"

He nodded. "Yes, I have the papers here." He half lifted a hand which held his heavy envelope. "In fact, there're two. This is one of them. From Earth. Citizen Guy Thomas." He motioned toward Guy with the envelope.

"Guy Thomas!" the major blurted. "Guy Thomas! We've issued no entry visa for a Guy Thomas."

Guy came to his feet. "But . . . but there must be some mistake."

"Minythia! Hand me that damned directive!"

Minythia, the slightest in build and evidently the youngest of the four, dropped her imbibing and enthusiastic eating long enough to deliver a paper from the heavy leather wallet she had slung over one shoulder.

The major ripped it from her hand and glared at it. "We have records to show only one passenger,

and the entry visa was issued to Guy Thomas, not *Guy* Thomas."

III

The Earthling was uncomprehending. He stared at the domineering port official. "But . . . it's obviously some minor mistake in transmission. I . . . I secured my visa from the Amazonian Embassy in Greater Washington. They were most cooperative and . . ." He let the sentence dribble away.

The Amazon major threw the paper to the table top and slapped it with the back of her hand.

"It says *Guy* Thomas! What in the name of the Goddess did you say your name was?"

"Guy. G-u-y. Don't you see? A mistake. Only one letter wrong." He seemed bewildered.

"One letter wrong! You blithering flat! You're a man!"

He looked at her. There didn't seem to be any answer to that.

"Cute, too," the assistant they called Minythia said. Of the four port officials, she alone had gone to the nicety of pouring her drink into a glass.

"Quiet!" the major rasped.

Unfazed, Minythia said easily, "All I meant was, if he lands, I saw him first." She winked at Guy. He stared at her in dismay. She wasn't quite so awesome as the others, not so large, but she managed to project the same swagger.

The major spun back to Rex Ra-

velle. "What's this curd about another passenger?"

Pat O'Gara came through the entry at that exact moment. For once, the fiery feminist was spellbound. She took in the four Amazonians, her eyes slowly going rounder.

Rex Ravelle chortled. "Major, may I introduce Citizeness Patricia O'Gara, refugee from the planet Victoria."

"Refugee!" The one named Lysippe took her bottle away from her mouth long enough to say, "Why, you poor kid."

"Shut up!" the major roared.

Rex Ravelle looked at her strangely, as though there seemed more of a hassle here than he had expected. He said, placatingly, "Don't let it worry you, Major. The skipper has already stated he would take Citizeness O'Gara on with us, and finally back to Earth, if you forbade her setting down here. It's no problem." He added, absently, "Even though she hasn't any exchange—Earth type, Victorian type, or Amazonian, whatever that is."

The Amazonian officer glared at him but for the moment seemed speechless.

Pat said weakly, "I . . . I thought . . ." Then she took a cue from the Guy Thomas conversation book. She let the sentence fade away.

The eyes of the four Amazonians were on the girl. She seemed to shrink a few inches in stature.

Minythyia said gruffly, "What're you a refugee from?"

Rex Ravelle laughed. "A planet that's as strongly male dominated as Amazonia is female, evidently."

Lysippe had put her bottle down on the table. She said, lowly, "I think I've heard of this Victoria. They've got the sexes all mixed up even worse than usual. The men are *really* on top. It must be gruesome."

The major said, her voice for once without dominating inflection, "What'd they do to you, kid?" Then her eyes came up and suddenly swept Ravelle, Guy and even Happy Harrison contemptuously. "No, don't try to tell us now."

She turned to Pat again and looked at her for a long moment. She said finally, sharply, "You're not a deviate, are you? We don't go for that sort of abnormality on Amazonia."

"Deviate?" Pat said blankly.

Rex Ravelle began to chuckle softly.

The major glared at him, then turned her eyes back to Pat. "How come you're in drag?"

"Drag?"

Guy Thomas cleared his throat, apologetically. "Uh, Major, there's nothing out of line in Citizeness O'Gara's clothing. I understand it's the usual garb on Victoria. I've seen similar dresses on historic tapes of the Earth Victorian period."

The four uniformed women looked unbelievably at Pat O'Gara for a while until she flushed, and

then they turned their eyes away quickly.

The major snapped at Rex, "What are you laughing at, you overfed yoke? Look at the clothes they put on this poor kid. It's enough to give her an inferiority complex."

But Rex Ravelle wasn't that easily squelched. "Aw, come on, Major. You've probably never been over-space, but you should realize that what's the height of style in clothes on one planet can be a laughingstock on another. How do you think your own outfits would react on people on, say, New Delos, or Earth, for that matter, although they're used to just about anything on Earth."

The major's voice was dangerously gentle. "And what's wrong with our uniforms?"

Rex backpedaled only slightly. "Well, for one thing, there're a lot of anachronisms. For instance, those little swords. They're obviously just for pretty. What in the world good would an overgrown cheeseknife do in combat? You'd . . ."

The major's manner was still deceptively gentle. She took one step to the table, laden with its cold buffet and took up an uncut red cheese, about the size of a small grapefruit. She looked in Ravelle's eyes as she hefted it once or twice.

She snapped suddenly, "Clete!" and tossed it into the air.

In a blur of motion, one of her three aides flicked her supposed for-

pretty knife from its scabbard and without swinging back, let fly. There was a *whoosh* as the weapon penetrated the rind of the cheese, the whole blade passing through until halted by the guard. Cheese and knife clattered to the metal decking.

The warrior called Clete reclaimed her weapon, grumbling as she inspected the nick that had been acquired. She tossed the cheese to the *Schirra's* second officer for his inspection. It was hardly necessary; it had been obvious that the hit had been a bull's-eye.

The major hadn't bothered to watch developments after she had tossed the target. She had returned to Pat, thoughtfully. She said, "I'll check back with my superiors, kid. Don't worry about it. We're not as tough as we're supposed to be on this planet."

"Oh, I know it," Pat gushed suddenly. "It's been man's rule that's caused all the hurt, down through the centuries."

The major looked at her thoughtfully some more and grunted.

Lysippe chuckled.

The major turned back to Guy Thomas. "Now, you're another thing. You probably think you're pretty stute, getting an entry visa under false pretenses. Letting them think you were a woman."

"But it wasn't that at all."

"What do you want to land on Amazonia for?" the girl Clete said in all honesty. "Are you drivelhappy?"

"Shut up, Clete," the major said. But she looked at Guy. "Well?"

Guy held his hands up, in the ages-old gesture of weary submission. "I'm from the Department of Interplanetary Trade of United Planets. Our job is to expedite trade between the member planets."

"Why?"

Guy said patiently, "The whole purpose of UP is to keep peace between the member planets. To keep peace and encourage progress. We sponsor trade as one way of achieving those goals. Very well, some time ago the member planet Avalon, through her UP embassy on Earth, revealed her interest in acquiring rather large quantities of iridium. For a time, Statistics was symied, the metal being so useful that those worlds possessing it have their own uses. Then through one of your own embassy officials, I don't know which, it was dropped at a reception that Amazonia was long on iridium but short on niobium. Perhaps you call it columbium on your planet."

The major was scowling. "You mean that Avalon has a surplus of columbium?"

"Not Avalon herself, but her sister planet of Catalina. They'll work out a deal between them. They can supply your industries with an almost unlimited quantity of either niobite ore or ingots of columbium."

"I don't know anything about iridium or columbium."

Guy said reasonably, "No one would expect you to. I suggest you allow me to land, in spite of the minor error on my visa, and consult with your engineers. Your Earth-side embassy issued me a visa. Do you think they're a bunch of flats?"

The major made a quick decision. "Minythia, get back to the boat and report all this to headquarters. Get instructions."

When Minythia left, the major turned back to Rex Ravelle. She gestured with a thumb at Guy. "Get all this cloddy's gear out and let's take a look at it."

"The captain is waiting up . . ."

"I'll go talk to the captain. Clete and Lysippe can check his things. I don't like this. Something smells like curd about it."

Rex said, "Happy, take the major to the skipper's quarters. On the way, tell a couple of the boys to bring all Citizen Thomas's things to the salon here."

"Practically all of it's in my cabin," Guy said unhappily. "I've got only one footlocker in the luggage hold."

"All of it," the major rasped. "No matter what instructions I get from the port, nothing leaves this ship we haven't checked. And I mean *checked*." She glared at her two underlings, who had meanwhile returned to the food and drinks. Earth-side food, Guy had decided, must be a treat for them. They ate like troopers. Well, he supposed they were troopers, in a way.

The major began to follow Happy Harrison. She said over her shoulder to Pat, "Go on back to your quarters. We'll let you know."

The check of Guy Thomas's possessions was thorough. Indeed it was carried to the point of the ludicrous. Aside from going over every article of clothing, through every book and pamphlet, toilet articles, personal items of jewelry and such, Lysippe and Clete seemed to have several types of detectors unknown to either Guy or Rex Ravelle. When a bag or trunk was empty, they slowly went over it with their gadgets, seeking out, the two men supposed, secret compartments, hidden devices, or whatever.

While the two Amazonians searched, Rex looked at Guy questioningly. "About this stage of the game, I'd call it quits," he said. "What're you so keen to go to Amazonia for? After they'd given me this amount of guff, I'd stick right on this old kettle and return to Earth."

Guy closed his eyes in anguish, as Clete shuffled through his once neatly packed shirts.

"I can't go back," he said plaintively. "I've got to pull this assignment off. It's the first time I've been able to swing an interplanetary job. You think you spacemen are the only ones with the dream? The rest of us, back on Earth, are just as keen as you are to participate in the big explosion out into the stars.

Nine men out of ten would give their right arms for an interspace job."

"Yeah, I know," Rex nodded, his voice gruff. Although he was talking to Guy, he was eyeing the Amazon Lysippe with appreciation. These girls improved in appearance considerably as you grew used to them. This Lysippe, for example, had a figure beneath her uniform that any mopsy back on Earth would have been proud to display in one of those new bottomless bathing suits, out on the beach.

Guy was saying, "This is my chance. If I pull this off, I'll get other over-space assignments. I've just got to make good."

Clete looked up from her search and growled to Guy, "What's this?"

Guy said, "My tool kit."

"Jetsam! You think I'm a flat?"

"What's the matter?" Guy said plaintively. He and Rex approached.

The girl warrior had opened the kit. She gestured. "That's a shooter. What does a mining engineer, or whatever you're supposed to be, need with a shooter?"

"What's a shooter?" Guy complained. "That?" He pulled it from the case. "Just because it's got a pistol grip? That's a combination drill and cutter."

He flicked a stud and took an edge off the corner of one of the messhall tables. The invisible beam cut through the metal like cheese.

"Hey!" Rex protested. "Next you'll be drilling a hole through the hull."

"All right, all right," Clete growled. "Put it back. What's this?"

Guy said plaintively, "Would you know if I told you? Are you up on the tools we use in assaying and . . ."

"Don't be so stute," she snapped at him. "These look like explosive charges."

He groaned. "I keep telling you. I'm here to check the possibilities of exchanging osmiridium, the native alloy from which iridium is usually extracted, or refined iridium itself, for columbium. I have to assay, in my work, sometimes. How do you extract ores on this planet—with eyebrow tweezers?"

She looked at him coldly.

He went on. "These are mini-charges, for sample blasting, yes. I doubt if I'll have need of them. Confiscate them, if you want. How about my pocket knife? You want that, too?"

"You looking for trouble, Sweetie?" Her eyes were level on his.

"Oh, leave him alone," Lysippe grumbled. "The poor boy's got to have tools, doesn't he? Imagine using a man for a mining engineer." She looked at Guy in honest inquiry. "Doesn't it upset you to get your nice soft hands all dirty?"

Rex chuckled.

"No," Guy said. "Besides, I'm not a mining engineer. I'm an expediter. I . . . oh, Zen. Forget about it. I'll explain when I meet your people down on Amazonia."

Lysippe said interestedly, "You really figure on landing, don't you?"

"Of course," Guy said shortly.

Clete chuckled, as she continued the minute search of his effects. "You better look out for Minythia," she grinned.

"What's Minythia?" Guy said.

"Not what, who," the girl who had demonstrated her knife-throwing prowess laughed. "Our buddy who went back to the pilot boat to report and ask for instructions on you and that Pat O'Gara kid. She hasn't any husband."

Lysippe took Guy in again. "I might take you on myself, Honeybun."

"You've got a couple of men," Clete said.

"Um-m-m. But I kind of like these effeminate types."

"Effeminate!" Guy bleated.

Rex had still been eyeing Lysippe. It came to him that he'd been in space a long time.

He put out a hand experimentally, and ran it along the girl's arm which was bare from where her leatherlike jerkin terminated in a short sleeve, to a trio of heavy golden bracelets on her wrist.

"Just how effeminate do you have to be to . . ." he began.

But her response had been instantaneous. Those heavy bracelets were not mere decoration. In fact, they turned out to be a rare combination of brass knuckles and black-jack when competently used in the manner for which they had obviously been devised.

She backhanded him, sending

him sprawl. She stepped closer, as he tried to stagger to his feet and cut loose with her right hand, the fingers gathered and pointed so as to be spearlike, toward his solar plexus.

"Artemis!" Clete yelled at her. "Easy! You'll hurt the poor boy."

Lysippe pulled her punch, albeit growling.

"Listen," she snapped. "If there's any pawing done around here, I'll do it, understand?"

Rex Ravelle shook his head, for clarity, and slumped into a chair. "Holy Jumping Zen," he complained. "What hit me?"

"What in the name of the Goddess is going on here?" the major said from the entry. Behind her was Captain Buchwald.

"Aw, nothing," Lysippe grumbled. "Sweetie, here, got a little unmanly and I had to tap him."

The major said, "Effeminate cloddy."

Guy cleared his throat. "Uh, Major, I think I've got a solution to this problem of my landing on Amazonia and being subjected to Amazonian law."

"That you would be, Sonny, and you're of marriageable age, too."

"Don't you ever make exceptions to these laws of yours?"

"No," the major said flatly. "Laws you make exceptions to, don't remain laws very long. We don't have many laws, but those we have are not only laws but also religious be-

liefs, unchanging custom, never to be broken except to be punishable with greatest severity. In that manner our laws are observed."

"But look. Why can't I simply base myself at the UP Embassy? Traditionally, an embassy is the soil of the planet being represented. So if I were there, I would be subject to United Planets law, rather than Amazonian."

The major looked at him sourly. "Just one shortcoming to that, Sonny. There is no UP Embassy on Amazonia."

Guy said, "But there has to be. You're a member of United Planets. You have an embassy on Earth. UP must have one here."

"I didn't say we didn't have a UP Embassy. I said there wasn't one on our planet. We make no exceptions to our laws. If UP personnel landed on Amazonia, the men would be subject to our marriage laws. The women, between the ages of eighteen and thirty, would be subject to our military draft. Consequently, it was necessary that the UP Embassy be placed on an artificial satellite orbiting our planet. The personnel seldom, if ever, come down to the surface. We conduct all business by our representatives ferrying up to them."

She looked at Guy thoughtfully. "Could you handle your business from a satellite orbiting Amazonia?"

"I don't think so," he said weakly. "I'm afraid I might have to be



seeing your mines, your smelting facilities, that sort of thing."

Minythyia entered, scowling.

The major said, "Well?"

"Could I speak to you alone, Madam?"

"Come out here into the companionway."

As they left, Minythyia tipped Guy Thomas a wink. The trade expediter groaned softly.

The captain looked at him. "How'd you get yourself into this mess?"

"I volunteered." He looked very unhappy.

Rex Ravelle, who had finally recovered from his brief bout with Lysippe, growled, "You'd think those flats back on Earth would have known better than to send a man. Don't they have any curves they could have given the assignment? You heard what she said. Just like Jerry told you. Go down there and you'll wind up in some muscle-bound mopsy's harem and she'll most likely get drunk every Saturday night and come home and beat you."

"Very funny, Mr. Ravelle," the captain said.

"You think I was kidding?" Rex muttered.

Clete said, "What's the matter with you boys, don't you believe in marriage? I thought a boy didn't really feel fulfilled until a warrior took him under her wing."

Guy Thomas looked at her in agony.

"Easy, Clete," Lysippe said compassionately. "You've embarrassed the poor fella."

The major came in, Minythyia trailing behind looking resentful.

"All right," the Amazon officer said. "This is the way it will be. From your papers, Guy Thomas, you're a single man well into marriageable age. By Paphlagonian law you are subject to be chosen by any citizen whose gynaecium includes less than three husbands."

"You mean I don't have anything to say about it?"

"Of course you have something to say, Cutey," Minythyia told him soothingly. "If some old drunken brawler chooses you and you don't like her, you can always appeal to any other warrior of your choice to take you into her gynaecium. That is, of course, if she has fewer than three husbands." She added, smiling encouragingly at him. "I haven't any at all. Can you kiss the way they do on the Tri-Di shows made on Earth, Cutey?"

"Shut up, Minythyia," the major rapped. "I'll explain this."

"I won't land!" Guy blurted. He shut his mouth stubbornly.

The Amazon officer sighed. "We've got it all figured out," she said. "Obviously, if your job is going to be done, you've not only got to land in Themiscyra but travel about Paphlagonia. And then you've got to return to Avalon and Earth to complete the barter deal. We're not any more interested in

your being married to some semi-pervert who likes off-beat men, such as effeminate types from other planets, than you are."

"Stop calling me effeminate! Why not just pass a rule that I'm unmarriedable?" Guy demanded.

"I told you. On Amazonia, a law is a law and there are no exceptions. The Goddess Artemis would frown on any attempt to subvert her holy marriage laws. But this is what we'll do. We'll seclude you. Clete and Lysippe will guard you."

"How about me?" Minythia said.

"Shut up," the major rapped. "I don't trust you. I don't think your patriotism would stand up under the provocation of being in constant proximity to a cute trick like Guy, here—no matter how badly Paphlagonia needs columbium."

Minythia's face was petulant. "I'm just as human as the next warrior."

Clete chuckled. "That's pretty damn human, since I'm standing next to you. But I've got two men, and they'd probably scratch Guy's eyes out if I brought him home. Besides, he's too feminine for me. I like my men soft and willing." She leered at the Earthling.

"Knock it, you two," the major said. She looked back at Guy Thomas. "We'll hide you and we'll guard you. We'll keep you away from predatory men seekers to the extent we can. You want to take the chance?"

Rex Ravelle chuckled idiotically. The captain glowered at him.

Guy choked out, "I've got to. It's my big chance."

"All right," the major snapped decisively. "Remember, stay away from warriors. Stick to the company of the men we'll quarter you with. Don't ever go out unless Lysippe and Clete are along to run interference. Themiscyra is man short since a Lybian raid we had six months ago; half the newly emerged warriors are on the prowl, looking for somebody to keep up their homes."

Guy Thomas said, an element of plaint in his voice. "I'm missing some things here. What're Themiscyra and Paphlagonia, and what are Lybians?"

Clete grunted disgust. "Don't you know anything about Amazonian affairs back on Earth?"

The major summed it up briefly. "Amazonia is divided into two major continents, Paphlagonia and Lybia. Our capital city is Themiscyra, theirs is Chersonesus." She shrugged under her heavy cloak. "We're often at peace, but just recently relations are, uh, strained due to the raids they've been pulling to capture men."

Rex said, "Don't they have their own men?"

The major looked at him as though the question was too silly to bother answering, but then said, "The Goddess allows each warrior three husbands."

Clete chuckled and said, "The idea is, you have one to take care of the house, one to raise the children, and one . . ."

"Shut up, Clete," the major rapped, "you'll have these boys blushing."

It was two full twenty-four hour periods before Guy Thomas was allowed to land. They had explained to him that they would have to make arrangements for his secretive entry into the land of the Amazons. The government had evidently quickly brushed aside the fact that he was male, although they had been surprised. They wanted niobium and they wanted it both quickly and badly.

Pat O'Gara had returned with the four Amazons on the first trip, saying good-by to the officers and such crew members as she had come in contact with during the trip, rather briefly. She had an air of confusion about her.

"Not quite what you expected, eh?" Rex Ravelle grinned.

"Exactly what I expected," she snapped.

Rex, even as he was shaking hands good-by with the girl, looked over at Guy Thomas who was sitting, hunched over a cup of coffee, staring blankly before him.

"Hey, Guy," Rex called, "if worse comes to worse, and some old mopsy tries to get her hooks into you, you can always look up Pat. Throw yourself on her mercy.

Maybe she'll take you into her . . . what'd'ya call 'em?" The last was directed at Clete, who was standing to one side, waiting for Pat O'Gara to finish her farewells.

"Gynaeceum," Clete said.

Guy Thomas, as though in spite of himself, said, "What's a gynaeceum?"

Rex leered. "I never heard the word before, but ten'll get you only one it's the equivalent of a harem."

"What's a harem?" Clete demanded.

Rex turned his grin to her. "Back on Earth, in the old days, where a man kept his several wives and his kids in seclusion."

"Don't be disgusting," Clete rapped. Her face was dark and involuntarily her hand dropped to her knife hilt.

Pat O'Gara had flushed. "I'm sure you've all got this situation very much confused."

Guy groaned.

Rex said, "You weren't around when they gave us the word, Pat, old girl. From what I understand, shortly, you'll be running up and down the streets yourself, trying to nail any unattached yoke not stute enough to keep himself hidden." He had to laugh at his own attempt at humor.

Nobody else did.

After Patricia O'Gara and the Amazons had left, the *Schirra* remained in orbit, suffering lighters from the planet below to come up and laboriously unload the cargo

destined for the rival Amazonian nations. For, although Guy Thomas had professed unawareness of the nature of the political situation on the woman dominated world, Captain Buchwald's manifests had included shipments for both Lybia and Paphlagonia. The lighters came up separately, never conflicting. Evidently, there was some sort of truce which applied in space.

It made sense, Guy Thomas decided. Obviously, there were some commodities Amazonia needed to import. It wouldn't have done for them to have fouled up interplanetary trade, with their off again, on again, hostilities.

On the third day the major's customs launch reappeared bearing not only that officer, but Clete and Lysippe as well. They had brought some clothing along with them.

Guy stared at it when they laid it out on the table of the lounge.

The major said, "Wipe that look off your face. You can't wear those over-space clothes. Anybody who spotted you would know you were from off planet."

"Maybe they'd think I was already married," Guy said hopefully "How do you know I'm not already married?"

Lysippe looked at him interestedly. "Are there temples on Earth where a warrior and boy can get married?" She looked at Clete. "I didn't know Artemis was worshiped over-space."

Guy said, "She isn't. But there

are other places to be married besides a temple to your Mother Goddess."

"Don't be blasphemous," the major rapped. "We recognize no marriages except those performed before a priestess of Artemis."

Guy said, "You mean, even though I was married back on Earth one of your women could still grab me?" There went his last alibi, if worse got to worse, down below.

He took the new clothing back to his quarters and changed into them, rejecting Clete's leering offer to help. The material was soft and flowing and surprisingly attractive. The styling was another thing. He was reminded somewhat of Scottish kilts, somewhat of the tunic of the ancient Greeks. It wasn't exactly uncomfortable. In fact, he had to admit, it wasn't uncomfortable at all. It was just that, well, it was just that he was used to *trousers*.

The footwear consisted of a sandallike arrangement, the straps of which were obviously meant to encircle his leg, up beyond the ankle.

He looked at himself in the mirror his small cabin refresher provided and winced. He hesitated for a long moment, then shrugged in resignation and made his way back to the salon lounge.

Rex Ravelle had entered while he was dressing. As all turned to face him, the irrepressible second officer gave a long low whistle.

"That will be all, Mr. Ravelle," the captain said. He turned to Guy.

"You're sure of this step, Citizen Thomas? You realize, of course, that if you have any doubts you can remain on board. Frankly, in all the years I have been calling at Amazonia, both as a junior officer and finally as master of my own spaceship, I have never known a man to set down on the planet."

Guy Thomas closed his eyes for a brief moment. He said finally, "I've got to. It's my big opportunity. I've got to make this one good."

"Very well, Citizen. Good luck. I am afraid you will need it." The skipper of the *Schirra* turned on his heel and left.

"O.K. Sweetie, let's go," Clete growled. "You'd think from these cloddies you were heading for a fate worse than death."

She glowered uncomprehendingly as Rex Ravelle burst into raucous laughter.

IV

Somewhat to Guy's surprise, the little space launch which dropped them to the surface of Amazonia was piloted by a man. He was businesslike, efficient, and either shy or intimidated by the uniformed women. He had nodded to the Earthling when the other had slipped through the *Schirra's* small-boat hatch, and had run his eyes up and down Guy's clothes, quickly, and evidently in disappointment. For all purposes, they were identical to his own.

They had disconnected from the over-space freighter and swooped away, the major and her two assistants too blasé to bother looking at the viewing screens. However, Guy stared. Obviously, he had no background in landing in such wise on a new planet.

He said, "Why . . . it's not too different from Earth."

The major was busy with her thoughts and said nothing.

Clete said, "So I understand, Sweetie. Two main land masses, a few large islands, quite a few small ones. What do you call the two land masses on Earth?"

"Well, actually, we think of seven continents."

Lysippe grunted. "Three of them are joined, aren't they, and two of the others only overgrown islands?" Her voice, as their voices usually were when talking to a man, was domineering.

"Why . . . why, I suppose so," Guy said. "Actually, we have the Western Hemisphere, the Americas; and then Europe, Asia and Africa, the Eastern Hemisphere."

"Two continents," Clete grunted. "Like us."

Guy held his peace and continued to stare at the view screen. Actually, the two continents of Amazonia were almost identical in size. Then he remembered that there was conflict between them and wondered of what nature it might be. Here they were using spacecraft, if only to ferry back and

forth to interplanetary freighters. Besides that, they seemed to conduct considerable trade, in spite of the fact that the landing of freight had to be done by lighter. That meant there was no reason to believe the more sophisticated nuclear weapons might not be available to these belligerent female warriors.

They had chosen to land him at night.

The space launch zipped in to come to a halt on the far edge of what was obviously a gigantic airport, sometimes utilized for at least minor spacecraft. It came to a halt but nobody made a motion to disembark. The administration buildings were at least three miles away.

Guy Thomas looked at the major.

She said, "You're coming in incognito, obviously. There'll be a hovercar out shortly."

A hovercar. Guy Thomas had to bring himself up sharply. Why not? They had this modern space launch, didn't they? Why shouldn't they use hovercars? It was just that their uniforms simulated the armor of antiquity to such a point that he wouldn't have been surprised really had they got about on the surface in chariots. But, of course, that was silly.

Shortly, they could make out the landcraft gliding toward them at a breakneck speed. It came to a halt, settled to the ground. There was no driver. Guy Thomas realized he was continuing to be a flat about his an-

ticipations. Obviously, automation was no mystery to Amazonia. Why should it be?

But he stirred unhappily. The technical progress of this world certainly didn't seem to jibe with its social institutions.

He thought about it uncomfortably. Or did it? Was he so chauvinistic, as a male, that he identified an advanced economy with man's domination of the sexes? Why should Amazonia be backward, just because women were in the saddle? He had no reason to so expect. But he still felt uncomfortably unhappy.

"Come along, Sweetie," Clete said. They left the launch's pilot behind to take care of his craft. The four of them got into the hovercar, a large limousine affair, and the major immediately turned a knob. The windows went opaque. She fingered controls and the vehicle rose and got under way.

Guy said, "Can't we even see out the windows?"

The major said, "We don't want anyone to spot you, even though you are in men's clothes now."

Lysippe said, as though unthinking, "Turn it over to polar."

The major looked at her.

Lysippe said, "Well, why not?"

"Shut up," the major said.

Guy said, "You can switch the screen so we can look out but no one can look in?"

The major started to say something, shut her mouth sourly and turned the knob again. They were

passing the administration buildings of the transportation complex and heading out onto what was obviously a major roadway. It was all as modern as anything Guy Thomas could remember having seen.

Nor, for that matter, were the streets of Themiscyra as different as all that from Greater Washington or any of the other larger Earthside cities such as New Copenhagen, Peking or Lagos. Largely, that was due to the fact that for the past half century Earth architecture had been going through an antiquity revival phase which involved exteriors, at least, looking like the buildings of ages past. To Guy's taste, it was all on the far out side, what with a Florentine palace standing cheek to jowl with a Babylonian temple, next in its turn to a Zuni adobe pueblo. A phase, undoubtedly, but the quicker it passed the better, so far as he was concerned.

Actually, he had to admit he preferred Themiscyra. Situated on both banks of a winding river, something like Nouvelle Paris, architecture was based on ancient Greek. Or, at least, a modernized ancient Greek, if that made sense. It occurred to Guy Thomas that present day man knew precious little about Greek architecture save for a few temples and theaters that had come down through the ages. The Parthenon and Theseum in

Athens and the even better preserved Greek temples in Magna Graecia of Southern Italy, and on Sicily. But what had the ancient Greeks themselves lived in? What sort of house did Pericles or Aristotle call home? He didn't know, and he rather doubted that anyone else did, either.

Which hadn't prevented the Amazonians from using their imagination. And their imagination was tasteful—give them that. The city was a planned dream. Wide boulevards, spacious parks and plazas. An unbelievable number of fountains, monuments and statuary. Marble and stone predominated as building materials, especially on the grand boulevards.

It was well into the night and the streets were comparatively free of pedestrians and of motor vehicles. However, Guy, staring in obvious fascination, could make out a few of the citizenry, in spite of the speed at which the major was hurrying them through to their destination. She was obviously pushing to get him under wraps, soonest. Well, considering the circumstances, that was understandable to Guy Thomas.

Those pedestrians he did see, set him back somewhat. He had gained the impression from the major, Clete, Minythia, and Lysippe that all Amazons, or nearly all, were warriors and hence probably garbed in much the same manner as were his guards. To the contrary,

he spied no uniforms whatsoever on the streets, save what were probably some form of police involved with traffic. But what surprised him even more was that at the speed they were traveling, and due partially without doubt to the darkness, he couldn't distinguish woman from man. There didn't seem to be enough difference in dress to differentiate. Every pedestrian he saw in the half-light could have been either man or woman, so far as clothing was concerned.

But then he brought himself up abruptly as a new thought occurred. Possibly all of these citizens he was seeing were women. Was the institution of the gynaeceum so strong that men, particularly married men, were not allowed on the streets at all? Or could it be that they simply were not allowed out after dark? There came back to him some of the things he had read about the Arabian harem, the Turkish seraglio. Could a person really be forced to spend his adult lifetime in the confined quarters of a few rooms? What difference between that and prison?

He got the impression that the major was directing them down back streets, to the extent she could, to whatever their destination might be. But whether or not that was true and for whatever reason, they eventually pulled up before a two-story building of some magnitude which reminded Guy of the reconstructed Agora in Athens.

"What is this place?" he asked.

The major was opening the hovercar's hatch. "One of the bachelor sanctuaries," she said.

He didn't ask what that meant. For one thing, it seemed self-explanatory; for another, he realized he'd soon be finding out the details of keeping an eligible man under cover in Amazon Themiscyra.

"Come along, Sweetie," Clete said.

They hurried him up a walk, through a rather elaborate garden which surrounded the building, and to a door. There was neither doorman nor guards. Somehow, he had expected a guard. Some burly wench, possibly, to keep off the predatory warriors bent on acquiring a husband or two.

Lysippe threw open the door and held it for them. Guy went on through, the major following.

The major looked back over her shoulder and said, "What in the name of the Goddess is the matter with you two?"

Lysippe was embarrassed. "I've never been in one of these places."

"Me either," Clete said.

"It'd be like going into one of the men's beauty parlors," Lysippe said. She squirmed her shoulders under her military cloak.

The major said in disgust. "All right, you two flats. Stay out here. I won't be long. There's nothing to be done tonight." She slammed the door shut behind her. However, Guy Thomas got the impression

that she wasn't any too happy about this atmosphere herself.

He looked about him. The place wasn't as offbeat as all that. It looked like an apartment hotel, minus much in the way of public rooms. Perhaps the public rooms, lounges, reading rooms, restaurant, card rooms and such were tucked away here and there in other parts of the building.

"Where's my luggage?" he demanded. They had taken that down the first day, and he hadn't seen it since.

"Already in your room," the major said. "Where in the name of Artemis is that confounded cloddy?"

A figure came hurrying toward them.

A wrist fluttered. "Oh dear, I am so very sorry, my sweets. I didn't truly, not *truly*, expect you for another half hour or so. Please forgive me, Major. And you, my *dear* boy, I'm sure you're simply exhausted."

Guy Thomas closed his eyes in pain.

He shouldn't have. He opened them again just in time to avoid getting himself kissed on the cheek.

"Zen!" he said, taking a half step backward.

The major bit out, "Citizen Guy Thomas, of Earth; Bachelor Podner Bates." She looked at Guy. "Bachelor Bates is in charge of this sanctuary. He'll take care of you. Clete and Lysippe are stationed in

quarters across the street. Their number is on the vizo-phone table in your room. So is mine. In any emergency, the smallest beginning of emergency, call either or both of us. Don't leave this building alone under any circumstances, understand? The Hippolyte and her council will interview you tomorrow. They wouldn't be at all happy if something happened so that you were unable to complete your mission. Evidently, this need for columbium is much more pressing than I thought. Frankly, I don't know much about mineral matters."

"Oh, it's so lovely to meet you," Podner Bates gushed.

Guy Thomas winced perceptibly again. The other, although approximately of Guy's own weight and build, and, for that matter, dressed almost identically to the Earthling, projected an effeminacy that would have passed for slapstick comedy in a Greater Washington nightspot floorshow. His obviously artificially curled hair was enough alone.

"Thanks," Guy got out. He looked at the major. "Who's the Hippolyte?"

"Who's the Hippolyte! Are you being funny?"

"I wasn't trying to be."

"Don't you cloddies back on Earth know anything at *all* about Amazonia?"

He was embarrassed. "Frankly, I know as little about your institutions as you know about ours."

She glowered at him. "The Hippolyte is the living reincarnation of the Hippolyte!" She spun, so that her cloak billowed out, and snapped over her shoulder. "I'll be here in the morning. Keep your windows barred." She was gone, slamming the door behind her.

Guy looked at Podner Bates.

Podner giggled. "Isn't she *handsome*?" He sighed. "If I could just land one like *that*, goodness!" He fluttered a wrist. "But I suppose I'm getting along now, they're not so gallant anymore." He added archly, "You'd never know that a few years ago I was the beau of Themiscyra. Before those filthy Lybians killed my wife, of course."

Guy Thomas said, "Uh, look, uh, Bachelor Bates . . ."

"Oh, darling, just call me Podner."

Guy scowled at him. "I don't believe I've ever heard that name before."

Podner giggled. "It was my sainted father. Ordinarily, he was very masculine, but he did love to watch the old, old historical Tri-Di tapes, from Earth—the wild, wild West." Bates fluttered a hand. "He did so love a Western. Podner was one of the most popular names used in those old days. So nothing would do but he must name me Podner."

Guy looked at him bitterly.

"You're lucky he didn't call you Stranger," he muttered.

"I beg your pardon, my darling?"

Guy said, "What's the chance of showing me my room?"

"Your *suite*, you mean. Oh, you're quite the honored guest, you know." Podner began to trip along, leading the way. "Oh, dear, it must be so impossibly exciting to have come from far, far Earth. Imagine! I have simply never met a person, not a single person, who has ever been over-space."

Guy fell in step beside the other. He said, "I understand a few of your people get to Earth as diplomatic personnel, and a few more go out on trade missions."

"Oh, yes, but that's women's work, of course. Goodness, I wouldn't dream of being so effeminate as to forget my place and . . ."

Guy looked at him.

"What's the matter, darling?" Podner said. They had reached a door in the hallway on the second floor. The Amazonian bachelor began to push it open.

When they got into the small living room, before looking around, Guy said, "Look. I'll make this brief, but I'd like to try to make it stick. The next person, man, woman or child that makes another crack suggesting I'm effeminate, I'm going to award a very fat lip!"

His guide was taken aback. "A very fat lip?" he wavered.

"A bust in the mouth."

"Oh, dear, you're so unmanly."

Guy Thomas closed his eyes. "I give up," he muttered.

He looked about the room. It was furnished approximately as he would have expected an apartment hotel for bachelor women to be furnished back on Earth. Comfortable enough, but by no stretch of Earthside imagination could it have been called a man's quarters. He shrugged resignation, and walked into the bedroom, which was even more in the way of frills and lace, and then stuck his head into the refresher room.

"How do you like it?" Podner gushed. "I'm truly sorry we couldn't have done better, but the sanctuary is literally overflowing. It's all a boy can do to be out on the streets these days. I do hope that the new raids on the Lybians will release some of the pressure on we bachelor types." He giggled. "It is sort of fun, though. You know what I mean, being so much in"—he giggled again—"demand."

"It's fine," Guy said. "The suite, I mean, not being pursued by bands of panting women. And now, if you don't mind, I have to see the Hippolyte tomorrow, whoever the Hippolyte is. Which reminds me. Who, or what, is an Hippolyte?"

"But the major told you, darling."

Guy looked at him.

Podner said, "Oh, you know. I'm not really superstitious myself, but I do think all these old traditions and all are really very sweet, don't you?"

"What's the Hippolyte?"

"My dear boy, Hippolyte of the Golden Girdle of Ares. Hippolyte of the famous battle-ax. The queen of the Amazons, who was betrayed by Heracles."

Some of it vaguely came back to Guy Thomas from high school mythology. "What's all that got to do with here and now?"

"Oh now, really, darling. Is it different on other planets? So many of the traditions of antiquity are called upon today, simply for the sake of, why, oh dear, I don't know. It's always been so. Remember how in your own Earth history that the name of Caesar and the title of Emperor were used for a thousand and more years after Julius himself died? The German Kaiser, the Russian Czar, the British Emperor Rex."

Guy said, "So the present government of, uh, Paphlagonia has a queen they call Hippolyte. And she's supposed to be a reincarnation of the last Hippolyte, and she of the one before. And, I suppose, all the way back to the mythological Hippolyte who had her belt swiped by Heracles as one of his twelve labors."

Podner giggled. "You make it sound so silly." He fluttered a hand. "But I suppose that's about it. Actually, of course, when the Hippolyte dies, a new one is elected by representatives from each of the families."

"Families?"

Podner looked at him archly.

"Oh, not families in the usual sense. From the clans, darling. The *genos*, as the Greeks called them, or the Roman *gens*."

Guy Thomas was out of his depth. "All right," he said. "So tomorrow I'm to meet the chief of state and her council."

"Good heavens, how exciting. Men so seldom have the opportunity to even see the Hippolyte, not to speak of *talking* with her. She's impatient of masculine chatter, so I'm told. Won't you just be terrified, dear?"

"I hope not," Guy muttered. "But look, I've got to go to bed. Is there anything else?"

"Oh, dear no," Podner fluttered. "Do forgive me for keeping you up so long, dear. When you wish breakfast, just switch on the orderbox and call for it. And now, do get your beauty sleep."

"Good night," Guy said.

When the other was gone, he stood for a long moment in the center of the living room, in thought. He let his eyes go around the apartment. After a time he went to the door and threw the lock. It looked adequate.

He went to the window then, opened it and looked out. It faced on the garden, which completely surrounded the building. He could see down the boulevard, toward the center of town. There was a statue in a plaza not two blocks away. They hadn't passed it in the hover-

car on the way in from the spaceport. A woman, what seemed to be a quiver of arrows on her back, her hand resting on some sort of animal. A dog? No, it looked more like a deer. It came to him. A colossal statue of Diana the Huntress. He sought through his memory and nodded. He knew where he was in the city of Themiscyra.

Hè closed the window. There was a knob to polarize the window glass. He turned it.

He stood in the center of the room again, looking about. Finally he pulled the ring from his finger, took it in his left hand and with the nail of his little finger, activated it by flicking an all but microscopic stud.

He started at the orderbox and the vizo-phone on the table near the bed, passing the ring over and about, slowly, carefully. There was no reaction. Slowly then, he went about the rest of the room, over each piece of furniture, over each decorative device, up and down the walls. And then into the refresher room.

It took him a full half hour. Finally he nodded. The room was either not bugged, or if it was, the device was so sophisticated that his equipment couldn't detect it. He deactivated his sweeper ring, put it back on his finger, and took up the tool kit which Clete had examined so thoroughly on the *Schirra*. He opened it on the center table of the small living room.

He pulled out the cutter drill and twisted it expertly. It fell apart into three separate pieces. He laid the pistol grip to one side and picked up another of the tools. This twisted apart as well, this time into two units. He took one of them and attached it to the pistol grip. Still a third tool divided under his fingers. He added a part of it to the pistol grip which was metamorphosing into an entirely different device from that which it had started out.

He looked at it thoughtfully, reached down into the kit and came up with a medium sized capsule. He slugged it home into the butt, threw the charge lever and then the safety. He stuck the gun into his tunic and under the belt which held his flowing garment together.

He looked around the room again, as though checking, shook his head and returned the various tools which he had strewn about the table to the tool kit and put it into a closet. He turned the lights out and stepped to the windows and threw them open.

The nearest light of any brilliance at all was over on the boulevard. Occasionally a hovercar passed, but there were no pedestrians in sight for the moment.

He swung a leg over the window ledge, lowered himself carefully. His toes, mountain-climber educated, sought protuberances and found them. He had noted earlier that the decorative motif of the

building allowed ample scope for the educated climber. He slowly worked his way down the wall to the garden.

He stood there for a long moment, listening. There was nothing.

He made his way over to the boulevard and openly strode along it. He walked the better part of a kilometer, stopped for a while, scowling, at a crossroad, then decided and turned right. The street was narrower here. Narrower and darker. Evidently, the Amazonians had no particular reason to over-illuminate their capital city during the night hours.

He walked somewhat more rapidly now. What little traffic there had been on the boulevard, both hovercraft and pedestrian, he had not wanted to attract by hurried pace. This was different.

Twenty minutes later, he paused again, then turned to his left, down a way that could have been described more an alley than a street. It was darker still, but his eyes were used to the dimness now.

It came as an utter surprise when bright light flashed from ahead and to one side of him, and a beam reached out, searchingly, missing him by but a fraction. He could hear brick chipping away on the wall behind him.

He flung himself to the side and down, the gun instantly in his hand.

Guy Thomas had been partially blinded, momentarily, by the flash

from the other's weapon, a type of arm he had never come up against before.

He heard a shuffling in the dark before him. His opponent was evidently shifting position before resuming the attack, obviously avoiding a return of fire in the direction

from whence the destructive beam had come.

"Holy Jumping Zen," the Earthman muttered under his breath. "This wasn't in the script!" He thumbed off the safety stud on his gun.

TO BE CONTINUED

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1. Location of known office of Publication is 420 Lexington Avenue, New York, New York 10017.

2. Location of the Headquarters or General Business Offices of the Publishers is 420 Lexington Avenue, New York, New York, 10017.

3. The names and addresses of the publisher, editor, and managing editor are: Publisher, None; Editor, John W. Campbell, 420 Lexington Avenue, New York, New York, 10017; Managing Editor, None.

4. The owner is: The Condé Nast Publications Inc., 420 Lexington Avenue, New York, New York 10017. Stockholders: The Patriot-News Co., Harrisburg, Pennsylvania; Iva S. V.-Patcévitch, 420 Lexington Avenue, New York, New York, 10017; Charles C. Nast, 420 Lexington Avenue, New York, New York, 10017.

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7.	Average No. Copies each issue during preceding 12 months	Single issue nearest to filing date
A. Total No. copies printed	144,616	146,005
B. Paid Circulation		
1. Sales through Dealers and Carriers, Street Vendors and Counter Sales	61,583	60,000
2. Mail Subscriptions	27,245	28,339
C. Total Paid Circulation	88,828	88,339
D. Free Distribution (including samples) By Mail, Carrier or Other Means	1,047	984
E. Total Distribution (Sum of C and D)	89,875	89,323
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I certify that the statements made by me above are correct and complete.

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The Weathermakers

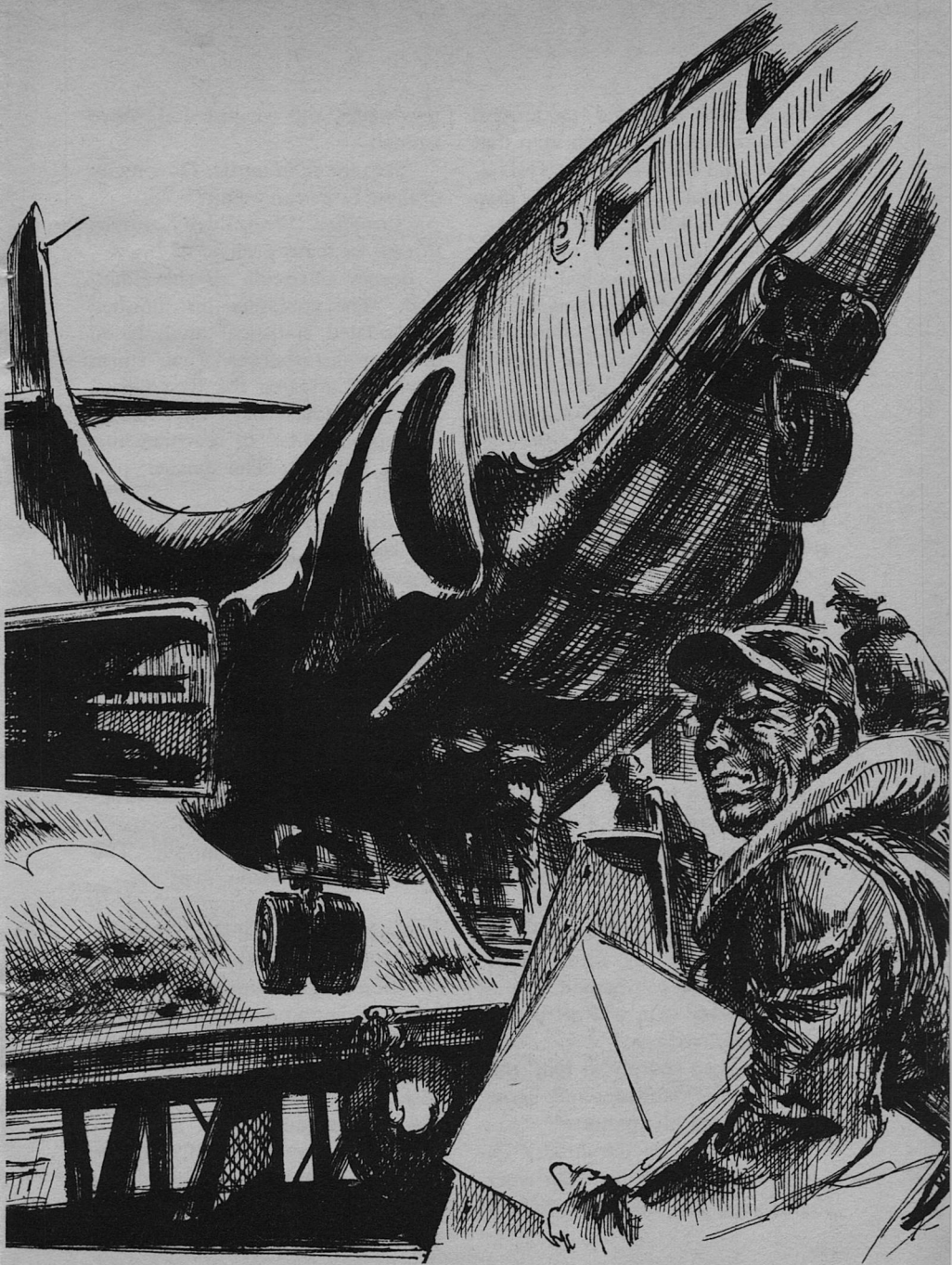
*Some things you can pick up a little piece at a time—
but some are whole-entity things;
you have to take on the whole job—or leave it alone.
And weather doesn't come in pieces. . .*

BEN BOVA

Illustrated by Leo Summers



*"The Weathermakers": From a forthcoming book
to be published by Holt, Rinehart & Winston, Inc.*



Ted Marrett gathered us around the mammoth viewscreen map that loomed over his desk in the THUNDER control center. The map showed a full-fledged hurricane—Nora—howling up the mid-Atlantic. Four more tropical disturbances, marked by red danger symbols, were strung out along the fifteenth parallel from the Antilles Islands to the Cape Verde's.

"There's the story," Ted told us, prowling impatiently along the foot of the viewscreen. He moved his tall, powerful body with the feline grace of a professional athlete. His stubborn red hair and rough-hewn face made him look more like a football gladiator than "the whiz-kid boss of Project THUNDER," as the news magazines had called him.

Gesturing toward the map, Ted said, "Nora's no problem, she'll stay out at sea. Won't even bother Bermuda much. But these four Lows'll bug us."

Tuli Noyon, Ted's closest buddy and chief of the Air Chemistry Section, said in his calm Oriental way, "This is the day we have all been dreading. There are more disturbances than we can handle. One of them, possibly two, will get past us and form hurricanes."

Ted looked sharply at him, then turned to me. "How about it, Jerry? What's the logistics picture?"

"Tuli's right," I admitted. "The planes and crews have been working around the clock for the past

few weeks and we just don't have enough . . ."

"Skip the flute music. How many of these Lows can we hit?"

I shrugged. "Two, I'd say. Maybe three if we really push it."

Barney—Priscilla Barneveldt—said, "The computer just finished an updated statistical analysis on the four disturbances. Their storm tracks all threaten the East Coast. The two closest ones have point-eight probabilities of reaching hurricane strength. The farther pair are only point-five."

"Fifty-fifty," Ted muttered, "for the last two. But they've got the longest time to develop. Chances'll be better for 'em by tomorrow."

Barney was slim and blond as a Dutch jonquil, and had a true Hollander's stubborn spirit. "It's those two closest disturbances that are the most dangerous," she insisted. "They each have an eighty percent chance of turning into hurricanes that will hit the East Coast."

"We can't stop them all," Tuli said. "What will we do, Ted?"

Project THUNDER: Threatening Hurricane Neutralization, Destruction and Recording. Maybe we were young and daring and slightly fanatical, as the newsmen had said of us. But it took more than knowledge and skill. THUNDER was Ted Marrett's creation, the result of nearly four years of his single-minded determination. None of us would have dared it, even if there

were a hundred more of us, without Ted to lead the way. He had brought the Project into being, practically with his own strong hands.

Yet it wasn't enough, not for Ted Marrett. He wasn't satisfied with an experimental program to modify potential hurricanes. Ted wanted to control the weather, fully. Nothing less. To him THUNDER was only a small shadow of what could be done toward controlling the weather. He had said as much to the press, and now the world expected us to prevent all hurricanes from striking the islands of the Caribbean and the North American mainland.

It was an impossible task.

"Where's the analysis?" Ted asked Barney. "I want to go over the numbers."

She looked around absently. "I must have left it on my desk. I'll go get it."

Ted's phone buzzed. He leaned across the desk and flicked the switch. "Dr. Weis calling from Washington," the operator said.

He made a sour face. "O.K., put him on." Sliding into his desk chair, Ted waved us away as Dr. Weis' tanned, well-creased face came on the phone viewscreen.

"I've just seen this morning's weather map," the President's Science Advisor said, with no preliminaries. "It looks to me as though you're in trouble."

"Got our hands full," Ted said.

I started back for my own cubicle. I could hear Dr. Weis' nasal voice, a little edgier than usual, saying, "The opposition has turned Project THUNDER into a political issue, with only six weeks to the election. If you hadn't made the newsmen think that you could stop every hurricane . . ."

The rest was lost in the chatter and bustle of the control room. THUNDER's nerve center filled the entire second floor of our Miami bayfront building. It was a frenetic conglomeration of people, desks, calculating machines, plotting boards, map printers, cabinets, teletypes, phones, viewscreens and endless piles of paper. Over it all hung Ted's giant electronic plotting screen, showing our battlefield—all of North America and the North Atlantic Ocean. I made my way across the cluttered, windowless room and stepped into my glass-walled cubicle.

It was quiet inside, with the door closed. Phone screens lined the walls, and half my desk was covered with a private switchboard that put me in direct contact with a network of THUNDER support stations ranging from New Orleans to ships off the coast of Africa to the Atlantic Satellite Station, in synchronous orbit 23,000 miles above the mouth of the Amazon River.

I looked across the control center again, and saw Ted still talking earnestly into the phone. Dr. Weis

called every day. THUNDER was important to him, and to the President. If we failed . . . I didn't like to think of the consequences.

There was work to be done. I began alerting the Navy and Air Force bases that were supporting THUNDER, trying to get ready to hit those hurricane threats as hard and fast as we could.

While I worked, I watched Barney and Ted plowing through the thick sheaf of computer printout sheets that contained the detailed analysis of the storm threats. They made a good-looking couple, and everyone assumed that she was Ted's girl. Including Ted himself. But he never bothered to ask Barney about it. Or me.

As soon as I could, I went down and joined them.

"O.K.," he was saying, "if we leave those two farther-out Lows alone, they'll develop into hurricanes overnight. We can knock 'em out now without much sweat, but by tomorrow they'll be too much for us."

"The same applies to the second disturbance," Barney said, "only more so. It's already better developed than the two farther Lows."

"We'll have to skip the second one. The first one—off the Leewards—is too close to ignore. So we'll hit Number One, skip the second, and hit Three and Four."

Barney took her glasses off. "That won't work, Ted," she said firmly. "If we don't stop the sec-

ond one today it certainly will develop into . . ."

"A walloping big hurricane. I know." He shrugged. "But if we throw enough planes at Number Two to smother it, we'll have to leave Three and Four alone. Then they'll both develop and we'll have *two* brutes on our hands."

"But this one . . ."

"There's a chance that if we knock out the closest Low, Number Two'll change its track and head out to sea."

"That's a terribly slim chance. The numbers show . . ."

"O.K., it's a slim chance. But it's all we've got to work with. Got any better ideas?"

"Isn't there anything we can do?" she asked. "If a hurricane strikes the coast . . ."

"Weis is already looking through his mail for my resignation," Ted said. "O.K., we're in trouble. Best we can do is hit Number One, skip Two, and wipe out Three and Four before they get strong enough to make waves."

Barney stared at the numbers on the computer sheets. "That means we're going to have a full-grown hurricane heading for Florida within twenty-four hours."

"Look," Ted snapped, "we can sit around here debating 'til they *all* turn into hurricanes. Let's scramble. Jerry, you heard the word. Get the planes up."

I headed back to my cubicle and sent out the orders. A few minutes

later, Barney came by. Standing dejectedly in the doorway, she asked herself out loud:

"Why did he agree to take on this Project? He knows it's not the best way to handle hurricanes. It's too chancy, too expensive, we're working ourselves to death . . ."

"So are the aircrews," I answered. "And the season's just starting to hit its peak."

"Then why did he have to make the newsmen think we could run up a perfect score the first year?"

"Because he's Ted Marrett. He not only thinks he can control the weather, he thinks he *owns* it."

"There's no room in him for failure," she said. "If this storm does hit, if the Project is cancelled . . . what will it do to him?"

"What will it do to you?" I asked her.

She shook her head. "I don't know, Jerry. But I'm afraid we're going to find out in another day or two."

Tropical storms are built on seemingly slight differences of air temperature. A half-dozen degrees of difference over an area a hundred miles in diameter can power the giant heat engine of a hurricane. Ted's method of smothering tropical disturbances before they reached hurricane strength was to smooth out the temperature difference between the core of the disturbance and its outer fringes.

The nearest disturbance was de-

veloping quickly. It had already passed over the Leeward Islands and entered the Caribbean by the time our first planes reached it. The core of the disturbance was a column of warm, rising air, shooting upward from the sea's surface to the tropopause, some ten miles high. Swirling around this warm column was cooler air sliding down from the north into the low-pressure trough created by the warm column.

If the disturbance were left to itself, it would soak up moisture from the warm sea and condense it into raindrops. The heat released by the condensation would power winds of ever-mounting intensity. A cycle would be established: winds bring in moisture, the water vapor condenses into rain, the heat released builds the winds' power. Finally the core would switch over into a cold, clear column of downward-rushing air—the eye of a full-grown hurricane. A thousand megatons of energy would be loose, unstoppable, even by Project THUNDER.

Our job was to prevent that cycle from establishing itself. We had to warm up the air flowing into the disturbance and chill down its core until air temperatures throughout the disturbance were practically the same. A heat engine that has all its parts at the same temperature—or close to it—simply won't work.

We had been doing that job successfully since July. But now, in

mid-September, with the hurricane season nearing its peak, there were more disturbances than we could handle simultaneously.

As I started giving out the orders for three missions at once, Tuli stuck his head into my cubicle.

"I'm off to see the dragon firsthand." He was grinning excitedly. "Which one?"

"Number One dragon; it's in the Caribbean now."

"I know. Good luck. Kill it dead."

He nodded, a round-faced, brown-skinned St. George working against the most destructive menace man had ever faced.

As I parceled out orders over my phones, a battery of gigajoule lasers aboard the Atlantic Station began pumping their energy into the northern peripheries of the storms. The lasers were part of our project. Similar to the military type mounted in the missile-defense satellites, they had been put aboard the Atlantic Station at Ted's request, and with the personal backing of Dr. Weis and the White House. Only carefully-selected Air Force personnel were allowed near them. The entire section of the satellite Station where they were installed was under armed guard, much to the discomfort of the civilians aboard.

Planes from a dozen airfields were circling the northern edges of the disturbances, sowing the air with rain-producing crystals.

"Got to seed for hours at a time," Ted once told me. "That's a mistake the early experimenters made—never stayed on the job long enough to force an effect on the weather."

And thanks to chemical wizards like Tuli, we had a wide assortment of seeding materials that could squeeze rain from almost any type of air mass. Producing the tonnages of crystals we needed had been a problem, but the Army's Edgewood Arsenal had stepped in with their mass-production facilities to help us.

I was watching the disturbance in the Caribbean. That was the closest threat, and the best-developed of all the four disturbances. Radar plots, mapped on Ted's giant view-screen, showed rainclouds expanding and showering precipitation over an ever-widening area. As the water vapor in the seeded air condensed into raindrops, the air temperature rose slightly. The satellite-borne lasers were also helping to heat the air feeding into the disturbance.

It looked as though we were just making the disturbance bigger. But Ted and the other technical staff people had figured out the energy balances in the storm. They knew what they were doing . . . but I still found myself frowning worriedly.

Tuli was in an Air Force bomber, part of two squadrons of planes

flying at staggered altitudes. From nearly sea level to fifty thousand feet, they roared into the central column of warm air in precise formation and began dumping tons of liquid nitrogen into the rising tropical air.

The effect was spectacular. The TV screen alongside the big plotting screen, showed what the planes saw: tremendous plumes of white sprang out behind each plane as the cryogenic liquid flash-froze the water vapor in the warm column. It looked as though some cosmic wind had suddenly spewed its frigid breath through the air. The nitrogen quickly evaporated, soaking up enormous amounts of heat. Most of the frozen vapor simply evaporated again, although radar plots showed that some condensation and actual rainfall occurred.

I made my way to Ted's desk to see the results of the core freezing.

"Looks good," he was saying into a phone.

I checked the teletype chugging nearby. It was printing a report from the observation planes that followed the bombers.

Ted stepped over to me. "Broke up the core O.K. Now if she doesn't re-form, we can scratch Number One off the map."

It was early evening before we could tell for sure. The disturbance's source of energy, the differing temperatures of the air masses it contained, had been taken away from it. The plotting screen showed

a large swatch of concentric, irregular isobars, like a lopsided bull's-eye, with a sullen red "L" marking its center, just north of Jamaica. The numbers of the screen showed a central pressure of 991 millibars, nowhere near a typical hurricane's. Windspeeds had peaked at fifty-two knots and were dying off now. Kingston and Guantanamo were reporting moderate-to-heavy rain, but at Santo Domingo, six hundred miles to the east, it was already clearing.

The disturbance was just another small tropical storm, and a rapidly weakening one at that. The two farther disturbances, halfway out across the ocean, had been completely wiped out. The planes were on their way home. The laser crews aboard the Atlantic Station were recharging their energy storage coils.

"Shall I see if the planes can reload and fly another mission tonight?" I asked Ted. "Maybe we can still hit the second disturbance."

He shook his head. "Won't do any good. Look at her," he said, pointing toward the plotting map. "By the time the planes get to her, she'll be a full-grown hurricane. There's nothing we can do about it now."

So we didn't sleep that night. We stayed at the control center and watched the storm develop on the TV picture being beamed from the Atlantic Station. At night they had to use infrared cameras, of course,

but we could still see—in the ghostly IR images—a broad spiral of clouds stretching across four hundred miles of open ocean.

Practically no one had left the control center, but the big room was deathly quiet. Even the chattering calculating machines and teletypes seemed to have stopped. The numbers on the plotting screen steadily worsened. Barometric pressure sank to 980, 965, 950 millibars. Wind velocity mounted to 50 knots, 60, 80. She was a full-grown hurricane by midnight.

Ted leaned across his desk and tapped out a name for the storm on the viewscreen's keyboard: *Omega*.

"One way or the other, she's the end of THUNDER," he murmured.

The letters glowed out at the top of the plotting screen. Across the vast room, one of the girls broke into sobs.

Through the early hours of the morning, Hurricane Omega grew steadily in size and strength. An immense band of clouds towered from the sea to some sixty thousand feet, pouring two inches of rain per hour over an area of nearly 300,000 square miles. The pressure at her core had plummeted to 942 millibars and central windspeeds were gusting at better than 100 knots, and still rising.

"It's almost as though she's alive," Tuli whispered as we watched the viewscreen intently.

"She grows, she feeds, she moves."

By 2:00 a.m. Miami time, dawn was breaking over Hurricane Omega. Six trillion tons of air packing the energy of a hundred hydrogen bombs, a mammoth, mindless heat engine turned loose, aiming for civilization, for us.

Waves lashed by Omega's fury were spreading all across the Atlantic and would show up as dangerous surf on the beaches of four continents. Seabirds were sucked into the storm against their every exertion, to be drenched and battered to exhaustion; their only hope was to make it to the eye, where the air was calm and clear. A tramp steamer on the New York to Capetown run, five hundred miles from Omega's center, was calling frantically for help as mountainous waves overpowered the ship's puny pumps.

Omega churned onward, releasing every fifteen minutes as much energy as a ten megaton bomb.

We watched, we listened, fascinated. The face of our enemy, and it made all of us—even Ted—feel completely helpless. At first Omega's eye, as seen from the satellite cameras, was vague and shifting, covered over by cirrus clouds. But finally it steadied and opened up, a strong column of downward-flowing air, the mighty central pillar of the hurricane, the pivotal anchor around which her furious winds wailed their primeval song of violence and terror.

Barney, Tuli and I sat around Ted's desk, watching his face sink deeper into a scowl as the storm worsened.

We didn't realize it was daylight once more until Dr. Weis phoned again. He looked haggard on the tiny desktop viewscreen.

"I've been watching the storm all night," he said. "The President called me a few minutes ago and asked me what you were going to do about it."

Ted rubbed his eyes. "Can't knock her out, if that's what you

mean. Too big now; be like trying to stop a forest fire with a blanket."

"Well, you've got to do something!" Weis snapped. "All our reputations hang on that storm. Do you understand? Yours, mine, even the President's! To say nothing of the future for weather control work in this country, if that means anything to you."

He might just as easily have asked Beethoven if he cared about music.

"Told you back in Washington when we started this game," Ted



countered, "that THUNDER was definitely the wrong way to tackle hurricanes . . ."

"Yes, and then you announced to the press that no hurricanes would strike the United States! So now, instead of being an act of nature, hurricanes are a political issue."

Ted shook his head. "We've done all we can do."

"No you haven't. You can try to steer the hurricane . . . change its path so that it won't strike the coast."

"Won't work."

"You haven't tried it!"

"We could throw everything we've got into it and maybe budge it a few degrees. It'll still wind up hitting the coast somewhere. All we'll be doing is fouling up its track so we won't know for sure where it'll hit."

"Well, we've got to do something. We can't just sit here and let it happen to us. Ted, I haven't tried to tell you how to run THUNDER, but now I'm giving an order. You've got to make an attempt to steer the storm away from the coast. If we fail, at least we'll go down fighting. Maybe we can salvage something from this mess."

"Waste of time," Ted muttered.

Dr. Weis' shoulders moved as though he were wringing his hands, off camera. "Try it anyway. It might work. We might just be lucky . . ."

"O.K.," Ted said, shrugging. "You're the boss."

The screen went dark. Ted looked up at us. "You heard the man. We're going to play Pied Piper."

"But we can't do it," Tuli said. "It can't be done."

"Doesn't matter. Weis is trying to save face. You ought to understand that, buddy."

Barney looked up at the plotting screen. Omega was northeast of Puerto Rico and boring in toward Florida. Toward us.

"Why didn't you tell him the truth?" she asked Ted. "Why didn't you tell him that the only way to stop the storm is to control the weather across the whole East Coast."

"Been all through this half a million times," Ted grumbled, slouching back in his chair wearily. "Weis won't buy weather control. Hurricane-killing is what he wants."

"But we can't kill Omega. THUNDER has failed, Ted. You shouldn't have . . ."

"Shouldn't have what?" he snapped. "Shouldn't have taken THUNDER when Weis offered to let us try it? Think I didn't argue with him? Think I didn't fight it out, right in the White House? I know THUNDER's a shaky way to fight hurricanes. But it's all I could get. I had to take what they were willing to give us."

Barney shook her head. "And what has it got you? A disaster."

"Listen," he said, sitting up erect now and pressing his big

hands on the desk. "I spelled it out to the President and to Weis. I told 'em both that chasing tropical disturbances and trying to smother hurricanes before they develop is doing things the hard way. Showed 'em how we could control the weather over the whole country. They wouldn't take the chance. Too risky. Think the President wants to get blamed for every cloudy day in Arizona, or every rainfall in California, or every chill in Chicago?"

He stood up and began pacing. "They wanted something spectacular but safe. So they settled on killing hurricanes—very spectacular. But only by making weather mods out at sea, where nobody would complain about 'em—that's safe, see? I told 'em it was the hard way to do the job. But that's what they wanted. And that's what I took. Because I'd rather do *something*, even if it's not the best something. I wanted to show 'em that we can kill hurricanes. If we had gone through this year O.K., maybe they would've tried real weather control next year."

"Then why," she asked, very softly, "did you tell the newsmen that we would stop every hurricane threat? You knew we couldn't do it."

"Why? How should I know? Maybe because Weis was sitting there in front of the cameras looking so blasted sure of himself. Safe and serene. Maybe I was crazy enough to think we could really

sneak through a whole hurricane season O.K. Maybe I'm just crazy, period. I don't know."

"But what do we do now?" I asked.

He cocked an eye at the plotting screen. "Try to steer Omega. Try saving Weis' precious face." Pointing to a symbol on the map several hundred miles north of the storm, he said, "This's a Navy sonar picket, isn't it? I'm going to buzz out there, see if I can get a firsthand look at this monster."

"That could be dangerous," Barney countered.

He shrugged.

"Ted, you haven't thought this out," I said. "You can't run the operation from the middle of the ocean."

"Picket's in a good spot to see the storm . . . at least, the edge of it. Maybe I can wangle a plane ride through it. Been fighting hurricanes all season without seeing one. Besides, the ship's part of the Navy's antisubmarine warning net; loaded with communications gear. Be in touch with you every minute, don't worry."

"But if the storm comes that way . . ."

"Let it come," he snapped. "It's going to finish us anyway." He turned and strode off, leaving us to watch him.

Barney turned to me. "Jerry, he thinks we blame him for everything. We've got to stop him."

"No one can stop him. You

know that. Once he gets his mind set on something . . .”

“Then I’ll go with him.” She got up from her chair. I took her arm.

“No, Jerry,” she said. “I can’t let him go alone.”

“Is it the danger you’re afraid of, or the fact that he’s leaving?”

“Jerry, in the mood he’s in now . . . he’s reckless . . .”

“All right,” I said, trying to calm her. “All right. I’ll go with him. I’ll make sure he keeps his feet dry.”

“I don’t want either one of you in danger!”

“I know. I’ll take care of him.”

She looked at me with those misty-gray-green eyes. “Jerry . . . you won’t let him do anything foolish, will you?”

“You know me,” I said. “I’m no hero.”

“Yes, you are,” she said. And I felt my insides do a handspring.

I left her there with Tuli and hurried out to the parking lot. The bright sunshine outdoors was a painful surprise. It was hot and muggy, even though the day was only an hour or so old.

Ted was getting into one of the Project staff cars when I caught up with him.

“A landlubber like you shouldn’t be loose on the ocean by himself,” I said.

He grinned. “Hop aboard, salt.”

The day was sultry. The usual tempering sea breezes had died off. As we drove along the Miami bayfront, the air was oppressive, omi-

nous. The sky was brazen, the water calm. The old-timers along the fishing docks were squinting out at the horizon to the south and nodding to each other. It was coming.

The color of the sea, the shape of the clouds, the sighting of a shark near the coast, the way the seabirds were perching—all these became omens.

It was coming.

We slept for most of the flight out to the sonar picket. The Navy jet landed smoothly in the calm sea and a helicopter from the picket brought us aboard. The ship was similar in style to the deep-sea mining dredges my father operated out in the Pacific. For antisubmarine work, though, the dredging equipment was replaced by a fantastic array of radar and communications antenna.

“Below decks are out of bounds to visitors, I’m afraid,” the chunky lieutenant who welcomed us to his ship told us as we walked from the helicopter landing pad toward the bridge. “This bucket’s a floating sonar station. Everything below decks is classified except the galley, and the cook won’t let even me in there.”

He laughed at his own joke. He was a pleasant-faced type, about our own age, square jawed, solidly built, the kind that stayed in the Navy for life.

We clambered up a ladder to the bridge.

“We’re anchored here,” the lieu-

tenant said, "with special bottom gear and arresting cables. So the bridge isn't used for navigation as much as a communications center."

Looking around, we could see what he meant. The bridge's aft bulkhead was literally covered with viewscreens, maps, autoplotters, and electronics controls.

"I think you'll be able to keep track of your hurricane without much trouble." The lieutenant nodded proudly toward the communications setup.

"If we can't," Ted said, "it won't be your fault."

The lieutenant introduced us to the chief communications technician, a scrappy little sailor who had just received his engineering degree and was putting in two Navy years. Within minutes, we were talking to Tuli back in THUNDER headquarters.

"Omega seems to have slowed down quite a bit," he told us, his face impassive. "She's almost stopped dead in her tracks, about halfway between your position and Puerto Rico."

"Gathering strength," Ted muttered.

They fed the information from Ted's big plotting screen in Miami to the picket's autoplotter, and soon we had a miniature version of the giant map to work with.

Ted studied the map, mumbling to himself. "If we could feed her some warm water . . . give her a

shortcut to the outbound leg of the Gulf Stream . . . then maybe she'd stay off the coast."

The lieutenant watched us from a jumpseat that folded out of the port bulkhead.

"Just wishful thinking," Ted muttered on. "Fastest way to move her is to set up a low-pressure cell to the north . . . make her swing more northerly, maybe bypass the coast."

He talked it over with Tuli for the better part of an hour, perching on a swivel chair set into the deck next to the chart table. Their conversation was punctuated with equations and aerodynamics jargon that no one else on the bridge could understand.

"Are they talking about weather?" the ship's executive officer asked the lieutenant. "I know as much about meteorology as most of us do, and I can't make out what they're saying."

I walked over to them. "Standard meteorology is only part of Ted's game. They're looking at the hurricane as an aerodynamics problem—turbulent boundary layer theory, I think they call it."

"Oh." The expression on their faces showed that they heard it, but didn't understand it, or even necessarily believe me.

The cook popped through the bridge's starboard hatch with a tray of sandwiches and coffee. Ted absently took a sandwich and mug, still locked in talk with Tuli Noyon.

Finally he said to the viewscreen,

"O.K., then we deepen this trough off Long Island and try to make a real storm cell out of it."

Tuli nodded, but he was clearly unhappy.

"Get Barney to run it through the computer as fast as she can, but you'd better get the planes out right now. Don't wait for the computer run. Got to hit while she's still sitting around. Otherwise . . ." His voice trailed off.

"All right," Tuli said. "But we're striking blindly."

"I know. Got any better ideas?"

Tuli shrugged.

"Then let's scramble the planes."

He turned to me. "Jerry, we've got a battle plan figured out. Tuli'll give you the details."

Now it was my turn. I spent the better part of the afternoon getting the right planes with the right payloads off to the exact places where their work had to be done. Through it all, I was calling myself an idiot for tracking out to this midocean exile. It took twice as long to process the orders as it would have back at headquarters.

"Don't bother saying it," Ted said when I finished. "So it was kinky coming out here. O.K. Just had to get away from that place before I went over the hill."

"But what good are you going to do here?" I asked.

He gripped the bridge's rail and looked out past the ship's prow to the softly billowing sea and clear horizon.

"We can run the show from here just as well . . . maybe a little tougher than back in Miami, but we can do it. If everything goes O.K., we'll get brushed by the storm's edge. I'd like to see that . . . want to feel her, see what she can do. Better than sitting in that windowless cocoon back there."

"And if things don't go well?" I asked. "If the storm doesn't move the way you want it to?"

He turned away. "Probably she won't."

"Then we might miss the whole show."

"Maybe. Or she might march right down here and blow down our throats."

"Omega might . . . we might be caught in the middle of it?"

"Could be," he said easily. "Better get some sleep while you can. Going to be busy later on."

The exec showed us to a tiny stateroom with two bunks in it. Part of the picket's crew was on shore leave, and they had a spare compartment for us. I tried to sleep, but spent most of the late afternoon hours squirming nervously. Around dusk, Ted got up and went to the bridge. I followed him.

"See those clouds, off the southern horizon?" he was saying to the lieutenant. "That's her. Just her outer fringes."

I checked back with THUNDER headquarters. The planes had seeded the low-pressure trough off Long

Island without incident. Weather stations along the coast, and automated observation equipment on satellites and planes were reporting a small storm cell developing.

Barney's face appeared on the viewscreen. She looked very worried. "Is Ted there?"

"Right here," he said, stepping into view.

"The computer run's just finished," she said, pushing a strand of hair from her face. "Omega's going to turn northward, but only temporarily. She'll head inland again late tomorrow. In about forty-eight hours she'll strike the coast somewhere between Cape Hatteras and Washington."

Ted let out a low whistle.

"But that's not all," she continued. "The storm track crosses right over the ship you're on. You're going to be in the center of it!"

"We'll have to get off here right away," I said.

"No rush," Ted said. "We can spend the night here. I want to see her develop firsthand."

Barney said, "Ted, don't be foolish. It's going to be dangerous."

He grinned at her. "Jealous? Don't worry, I just want to get a look at her, then I'll come flying back to you."

"You stubborn . . ." The blond curl popped back over her eyes again and she pushed it away angrily. "Ted, it's time you stopped acting like a little boy. You bet I'm jealous. I'm tired of competing

against the whole twirling atmosphere! You've got responsibilities, and if you don't want to live up to them . . . well, you'd better, that's all!"

"O.K., O.K. We'll be back tomorrow morning. Be safer traveling in daylight anyway. Omega's still moving slowly; we'll have plenty of time."

"Not if she starts moving faster. This computer run was just a first-order look at the problem. The storm could move faster than we think."

"We'll get to Miami O.K., don't worry."

"No, why should I worry? You're only six hundred miles out at sea with a hurricane bearing down on you."

"Just an hour away. Get some sleep. We'll fly over in the morning."

The wind was picking up as I went back to my bunk, and the ship was starting to rock in the deepening sea. I had sailboated through storms and slept in worse weather than this. It wasn't the conditions of the moment that bothered me. It was the knowledge of what was coming.

Ted stayed out on the bridge, watching the southern skies darken with the deathly fascination of a general observing the approach of a much stronger army. I dropped off to sleep, telling myself that I'd get Ted off this ship as soon as a plane

could pick us up, even if I had to have the sailors wrap him in anchor chains.

By morning, it was raining hard and the ship was bucking severely in the heavy waves. It was an effort to push through the narrow passageway to the bridge, with the deck bobbing beneath my feet and the ship tossing hard enough to slam me into the bulkheads.

Up on the bridge they were wearing slickers and life vests. The wind was already howling evilly. One of the sailors handed me a slicker and vest. As I turned to tug them on, I saw that the helicopter pad out on the stern was empty.

"Chopper took most of the crew out about an hour ago," the sailor hollered into my ear. "Went to meet the seaplane out west of here, where it ain't so rough. When it comes back we're all pulling out."

I nodded and thanked him.

"She's a beauty, isn't she?" Ted shouted at me. "Moving up a lot faster than we thought."

I grabbed a handhold between him and the lieutenant. To the south of us was a solid wall of black. Waves were breaking over the bows and the rain was a battering force against our faces.

"Will the helicopter be able to get back to us?" I asked the lieutenant.

"Certainly," he yelled back. "We've had worse blows than this . . . but I wouldn't want to hang around for another hour or so!"

The communications tech staggered across the bridge to us. "Chopper's on the way, sir. Ought to be here in ten-fifteen minutes."

The lieutenant nodded. "I'll have to go aft and see that the helicopter's dogged down properly when she lands. You be ready to hop on when the word goes out."

"We'll be ready," I said.

As the lieutenant left the bridge, I asked Ted, "Well, is this doing you any good? Frankly, I would've been just as happy in Miami . . ."

"She's a real brute," he shouted. "This is a lot different from watching a map."

"But why . . ."

"This is the enemy, Jerry. This is what we're trying to kill. Think how much better you're going to feel after we've learned how to stop hurricanes."

"If we live long enough to learn how!"

The helicopter struggled into view, leaning heavily into the raging wind. I watched, equally fascinated and terrified, as it worked its way to the landing pad, tried to come down, got blown backwards by a terrific gust, fought towards the pad again, and finally touched down on the heaving deck. A team of sailors scrambled across the wet square to attach heavy lines to the landing gear, even before the rotor blades started to slow down. A wave smashed across the ship's stern and one of the sailors went

sprawling. Only then did I notice that each man had a stout lifeline around his middle. They finally got the 'copter secured.

I turned back to Ted. "Let's go before it's too late."

We started down the slippery ladder to the main deck. As we inched back toward the stern, a tremendous wave caught the picket amidships and slued her around broadside. The little ship shuddered violently and the deck seemed to drop out from under us. I sagged to my knees.

Ted pulled me up. "Come on, buddy, Omega's breathing down our necks."

Another wave smashed across us. I grabbed for a handhold and as my eyes cleared, saw the helicopter pitching crazily over to one side, the moorings on her landing gear flapping loosely in the wind.

"It's broken away!"

The deck heaved again and the 'copter careened over on its side, its rotors smashing against the pad. Another wave caught us. The ship bucked terribly. The helicopter slid backwards along its side and then, lifted by a solid wall of foaming green, smashed through the gunwale and into the sea.

Groping senselessly on my hands and knees, soaking wet, battered like an overmatched prizefighter, I watched our only link to safety disappear into the raging sea.

From somewhere behind me I heard Ted shouting, "Four years!

Four years of killing ourselves and it has to end like this!"

I clambered to my feet on the slippery deck of the Navy picket. The ship shuddered again and slued around. A wave hit the other side and washed across, putting us knee-deep in foaming water until the deck lurched upward again and cleared the waves temporarily.

"Omega's won," Ted roared in my ear, over the screaming wind. "The 'copter's washed overboard. We're trapped."

We stood there, hanging onto the handholds. The sea was impossible to describe—a furious tangle of waves, with no sense or pattern to them, their tops ripped off by the wind, spray mixing with the blinding rain.

The lieutenant groped by, edging along hand-over-hand on the lifeline that ran along the superstructure bulkhead.

"Are you two all right?"

"No broken bones, if that's what you mean."

"You'd better come back up to the bridge," he shouted. We were face-to-face, close enough to nearly touch noses, yet we could hardly hear him. "I've given orders to cast off the anchors and get up steam. We've got to try to ride out this blow under power. If we just sit here, we'll be swamped."

"Is there anything we can do?" I asked.

"Sure. Next time you tinker with

a hurricane, make it when I'm on shore leave!"

We followed the lieutenant up to the bridge. I nearly fell off the rain-slicked ladder, but Ted grabbed me with one of his powerful paws.

The bridge was sloshing from the monstrous waves and spray that were drenching the decks. The communications panels seemed to be intact, though. We could see the map that Ted had set up on the autoplotter screen; it was still alight. Omega spread across the screen like an engulfing demon. The tiny pinpoint of light marking the ship's location was well inside the hurricane's swirl.

The lieutenant fought his way to the ship's intercom while Ted and I grabbed for handholds.

"All the horses you've got, Chief," I heard the lieutenant bellop into the intercom mike. "I'll get every available man on the pumps. Keep those engines going. If we lose power we're sunk!"

I realized he meant it literally.

The lieutenant crossed over toward us and hung on to the chart table.

"Is that map accurate?" he yelled at Ted.

The big redhead nodded. "Up to the minute. Why?"

"I'm trying to figure a course that'll take us out of this blow. We can't stand much more of this battering. She's taking on more water than the pumps can handle. Engine room's getting swamped."

"Head southwest then," Ted said at the top of his lungs. "Get out of her quickest that way."

"We can't! I've got to keep the sea on our bows or else we'll capsize!"

"What?"

"He's got to point her into the wind," I yelled. "Just about straight into the waves."

"Right!" The lieutenant agreed.

"But you'll be riding along with the storm. Never get out that way. She'll just carry us along all day!"

"How do you know which way the storm's going to go? She might change course."

"Not a chance." Ted pointed to the plotting screen. "She's heading northwesterly now and she'll stay on that course the rest of the day. Best bet is heading for the eye."

"Towards the center? We'd never make it!"

Ted shook his head. "Never get out of it if you keep heading straight into the wind. But if you can make five knots or so, we can spiral into the eye. Be calm there."

The lieutenant stared at the screen. "Are you sure? Do you know exactly where the storm's moving and how fast she's going to go?"

"We can check it out."

So we called THUNDER headquarters, transmitting up to the Atlantic Station satellite for relay to Miami. Barney was nearly frantic, but we got her off the line quickly.

Tuli answered our questions and gave us the exact predictions for Omega's direction and speed.

Ted went inside with a soggy handful of notes to put the information into the ship's course computer. Barney pushed her way onto the viewscreen.

"Jerry . . . are you all right?"

"I've been better, but we'll get through it O.K. The ship's in no real trouble," I lied.

"You're sure."

"Certainly. Ted's working out a course with the skipper. We'll be back in Miami in a few hours."

"It looks . . . it looks awful out there."

Another mammoth wave broke across the bow and drenched the bridge with spray.

"It's not picnic weather," I admitted. "But we're not worried, so don't you go getting upset." *No, we're not worried*, I added silently. *We're scared white*.

Reluctantly, the lieutenant agreed to head for the storm's eye. It was either that or face a battering that would split the ship within a few hours. We told Tuli to send a plane to the eye, to try to pick us up.

Time lost all meaning. We just hung on, drenched to the skin, plunging through a wild, watery inferno, the wind shrieking evilly at us, the seas absolutely chaotic. No one remained on the bridge except the lieutenant, Ted and me. The rest of the ship's skeleton crew were

below decks, working every pump on board as hard as they could be run. The ship's autopilot and computer-run guidance system kept us heading on the course Ted and Tuli had figured.

Passing into the hurricane's eye was like stepping through a door from bedlam to a peaceful garden. One minute we were being pounded by mountainous waves and merciless winds, the rain and spray making it hard to see even as far as the bow. Then the sun broke through and the wind abruptly died. We limped out into the open, with nothing but a deep swell to mar a tranquil sea.

Towering clouds rose all about us, but this patch of ocean was safe. A vertijet was circling high overhead, sent out by Tuli. The plane made a tight pass over us, then descended onto the helicopter landing pad on the ship's fantail. Her landing gear barely touched the deck, and her tail stuck out over the smashed railing where the helicopter had broken through.

We had to duck under the plane's nose and enter from a hatch in her belly because the outer wing jets were still blazing, but the plane took us all aboard. As we huddled in the cramped passenger compartment, the plane hoisted straight up. The jetpods swiveled back for horizontal flight and the wings slid to supersonic sweep. We climbed steeply and headed up for the sky.

As I looked down at the fast-

shrinking little picket, I realized the lieutenant was also craning his neck at the port for a last look.

"I'm sorry you had to lose your ship."

"So am I," he said. "But headquarters gave permission to abandon her. We couldn't have stayed in the eye indefinitely, and another hour or so in those seas would have finished us."

"You did a darned good job to get us through," Ted said.

The lieutenant smiled wearily. "We couldn't have done it without your information on the storm. Good thing your numbers were right."

Barney was waiting for us at the Navy airport with dry clothes, the latest charts and forecasts on Omega, and a large share of feminine emotion. I'll never forget the sight of her running toward us as we stepped down from the vertijet's main hatch. She threw her arms around Ted's neck, then around mine, and then around Ted again.

"You had me so worried, the two of you!"

Ted laughed. "We were kind of ruffled ourselves."

It took more than an hour to get out of the Navy's grasp. Debriefing officers, brass hats, press corps men, photographers—they all wanted to hear how Ted and the lieutenant described the situation. We finally got to change our clothes in an officer's wardroom and then battled our way

out to the car Barney had come in, leaving the lieutenant and his crew to tell their story in detail.

"Dr. Weis has been on the phone all day," Barney said as the driver pulled out for the main highway leading to the Miami bayfront and THUNDER headquarters.

Ted frowned and spread the reports on Omega across his lap.

Sitting between the two of us, she pointed to the latest chart. "Here's the storm track . . . ninety per cent reliability, plus-or-minus two per cent."

Ted whistled. "Right smack into Washington and then up the coast. She's going to damage more than reputations."

"I told Dr. Weis you'd phone him as soon as you could."

"O.K.," he said reluctantly. "Let's get it over with."

I punched out the Science Advisor's private number on the phone set into the car's forward seat. After a brief word with a secretary, Dr. Weis appeared on the viewscreen.

"You're safe," Dr. Weis said flatly. He looked wearier than we felt.

"Disappointed?" Ted quipped.

"The way this hurricane is coming at us, we could use a martyr or two."

"Steering didn't work. Only thing left to try is what we should've done in the first place . . ."

"Weather control? Absolutely not! Being hit with a hurricane is bad enough, but if you try tinkering with the weather all across the

country, we'll have every farmer, every vacationist, every mayor and governor and traffic cop on our necks!"

Ted fumed. "What else are you going to do? Sit there and take it? Weather control's the only way to stop this beast . . ."

"Marrett, I'm almost ready to believe that you set up this storm purposely to force us into letting you try your pet idea!"

"If I could do that, I wouldn't be sitting here arguing with you."

"Possibly not. But you listen to me. Weather control is out. If we have to take a hurricane, that's what we'll do. We'll have to admit that THUNDER was too ambitious a project for the first time around. We'll have to back off a little. We'll try something like THUNDER again next year, but without all the publicity. You may have to lead a very quiet life for a year or two, but we'll at least be able to keep going . . ."

"Why back down when you can go ahead and stop this hurricane?" Ted insisted hotly. "We can push Omega out to sea, I know we can!"

"The way you steered her? That certainly boomeranged on you."

"We tried moving six trillion tons of air with a featherduster! I'm talking about real control of the weather patterns across the whole continent. It'll work!"

"You can't guarantee that it will, and even if you did I wouldn't believe you. Marrett, I want you to go

back to THUNDER headquarters and sit there quietly. You can operate on any new disturbances that show up. But you are to leave Omega strictly alone. Is that clear? If you try to touch that storm in any way, I'll see to it that you're finished. For good."

Dr. Weis snapped off the connection. The viewscreen went dark, almost as dark as the scowl on Ted's face. For the rest of the ride back to the Project headquarters he said nothing. He simply sat there, slouched over, pulled in on himself, his eyes blazing.

When the car stopped he looked up at me.

"What would you do if I gave the word to push Omega off the coast?"

"But Dr. Weis said . . ."

"I don't care what he said, or what he does afterward. We can stop Omega."

Barney turned and looked at me.

"Ted . . . I can always go back to Hawaii and help my father make his twelfth million. But what about you? Weis can finish your career permanently. And what about Barney and the rest of the Project personnel?"

"It's my responsibility. Weis won't care about the rest of 'em. And I don't care what he does to me . . . I can't sit here like a dumb ape and let that hurricane have its own way. I've got a score to settle with that storm."

"Regardless of what it's going to cost you?"

He nodded gravely. "Regardless of everything. Are you with me?"

"I guess I'm as crazy as you are," I heard myself say. "Let's go do it."

We piled out of the car and strode up to the control center. As people started to cluster around us, Ted raised his arms for silence. Then he said loudly:

"Listen: Project THUNDER is over. We've got a job of weather-making to do. We're going to push that hurricane out to sea."

Then he started rattling off orders as though he had been rehearsing for this moment all his life.

As I started for my glass-walled office, Barney touched my sleeve. "Jerry, whatever happens later, thanks for helping him."

"We're accomplices," I said. "Before, after, and during the fact."

"Do you think you could ever look at a cloud in the sky again if you hadn't agreed to help him try this?"

Before I could think of an answer she turned and started toward the computer section.

We had roughly thirty-six hours before Omega would strike the Virginia coast and then head up Chesapeake Bay for Washington. Thirty-six hours to manipulate the existing weather pattern over the entire North American continent.

Within three hours Ted had us around his desk, a thick pack of notes clenched in his right hand. "Not as bad as it could've been," he told us, waving the notes toward the

plotting screen. "This big High sitting near the Great Lakes—good cold, dry air that can make a shield over the East Coast if we can swing it into position. Tuli, that's your job."

Tuli nodded, bright-eyed with excitement.

"Barney, we'll need pinpoint forecasts for every part of the country, even if it takes every computer in the Weather Bureau to wring 'em out."

"Right, Ted."

"Jerry, communications're the key. Got to keep in touch with the whole blinking country. And we're going to need planes, rockets, even slingshots maybe. Get the ball rolling before Weis finds out what we're up to."

"What about the Canadians? You'll be affecting their weather, too."

"Get that liaison guy from the State Department and tell him to have the Canadian Weather Bureau check with us. Don't spill the beans to him, though."

"It's only a matter of time until Washington catches on," I said.

"Most of what we've got to do has to be done tonight. By the time they wake up tomorrow, we'll be on our way."

Omega's central windspeeds had climbed to 120 knots by evening, and were still increasing. As she trundled along toward the coast, her howling fury was nearly matched by the uproar of action at

our control center. We didn't eat, we didn't sleep. We worked!

A half-dozen military satellites armed with anti-ICBM lasers started pumping streams of energy into areas pinpointed by Ted's orders. Their crews had been alerted weeks earlier to cooperate with requests from Project THUNDER, and Ted and others from our technical staff had briefed them before the hurricane season began. They didn't question our messages. Squadrons of planes flew out to dump chemicals and seeding materials just off Long Island, where we had created a weak storm cell in the vain attempt to steer Omega. Ted wanted that Low deepened, intensified—a low-pressure trough into which that High on the Great Lakes could slide.

"Intensifying the Low will let Omega come in faster, too," Tuli pointed out.

"Know it," Ted answered. "But the numbers're on our side, I think. Besides, the faster Omega moves, the less chance she gets to build up higher wind velocities."

By ten o'clock we had asked for and received a special analysis from the National Meteorological Center in Suitland, Maryland. It showed that we would have to deflect the jetstream slightly, since it controlled the upper-air flow patterns across the country. But how do you divert a river of air that's three hundred miles wide, four miles thick, and

racing at better than three hundred miles per hour?

"It would take a hundred megaton bomb," Barney said, "exploded about fifteen miles up, just over Salt Lake City."

"Forget it!" Ted snapped. "The UN would need a month just to get it on the agenda. Not to mention the sovereign citizens of Utah and points east."

"Then how do we do it?"

Ted grabbed the coffeepot standing on his desk and poured a mug of steaming black liquid. "Jetstream's a shear layer between the polar and mid-latitude tropopauses," he muttered, more to himself than any of us. "If you reinforce a polar air mass, it can nudge the stream southward . . ."

He took a cautious sip of the hot coffee. "Tuli, we're already moving a High southward from the Great Lakes. Take a couple of your best people—and Barney, give him top priority on the computers. See if we can drag down a bigger polar air mass from Canada and push the jetstream enough to help us."

"We don't have enough time or equipment to operate in Canada," I said. "And we'd need permission from Ottawa."

"What about reversing the procedure?" Tuli asked. "We could expand the desert High over Arizona and New Mexico until it pushes the jetstream from the south."

Ted raised his eyebrows. "Think you can do it?"

"I'll have to make some calculations."

"O.K., scramble."

In Boston, people who had gone to bed with a weather forecast of "warm, partly cloudy," awoke to a chilly, driving northeast rain. The Low we had intensified during the night had surprised the local forecasters. The Boston Weather Bureau office issued corrected predictions through the morning as the little rainstorm moved out, the Great Lakes High slid in and caused a flurry of frontal squalls, and finally the sun broke through. The cool, dry air of the High dropped local temperatures more than ten degrees within an hour. To the unknowing New Englanders it was just another day, slightly more bewildering than most.

Dr. Weis was on the phone at seven-thirty that morning.

"Marrett, have you lost your mind? What do you think you're doing? I told you . . ."

"Can't talk now, we're busy," Ted shot back.

"I'll have your hide for this!"

"Tomorrow you can have my hide. I'll bring it up myself. But first I'm going to find out if I'm right or wrong about this."

The President's Science Advisor turned purple. "I'm going to send out an order to all Government installations to stop . . ."

"Better not. Then we'll never find out if it worked. Besides, most of the mods've already been made.

Damage's done. Let's see what good it does."

Barney rushed up with a ream of computer printout sheets as Ted cut the phone connection.

"There's going to be a freeze in the central plains and northern Rockies," she said, pushing back her tousled hair. "There'll be some snow. We haven't fixed the exact amount yet."

A harvest-time freeze. Crops ruined, cities paralyzed by unexpected snow, weekend holidays ruined, and in the mountains deaths from exertion and exposure.

"Get the forecast out on the main Weather Bureau network," Ted ordered. "Warn 'em fast."

The plotting screen showed the battle clearly. Omega, with central windspeeds of 175 knots now, was still pushing toward Virginia. But her forward progress was slowing, ever so slightly, as the Great Lakes High moved southeastward past Pittsburgh.

By noontime, Ted was staring at the screen and muttering, "Won't be enough. Not unless the jetstream comes around a couple degrees."

It was raining in Washington now, and snow was beginning to fall in Winnipeg. I was trying to handle three phone calls at once when I heard an ear-splitting whoop from Ted. I looked at the plotting screen. There was a slight bend in the jetstream west of the Mississippi that hadn't been there before.

As soon as I could, I collared Tuli for an explanation.

"We used the lasers from the Atlantic Station and every plane and ounce of exothermic catalysts I could find. The effect isn't very spectacular, no noticeable weather change. But the desert High has expanded slightly and pushed the jetstream a little northward, temporarily."

"Will it be enough?" I asked.

He shrugged.

Through the afternoon we watched that little curl travel along the length of the jetstream's course, like a wave snaking down the length of a long, taut rope. Meanwhile the former Great Lakes High was covering all of Maryland and pushing into Virginia. Its northern extension shielded the coast well into New England.

"But she'll blast right through it," Ted grumbled, watching Omega's glowering system of closely-packed isobars, "unless the jetstream helps to push 'er off."

I asked Barney, "How does the timing look? Which will arrive first, the jetstream change, or the storm?"

She shook her head. "The machines have taken it down to four decimal places and there's still no sure answer."

Norfolk was being drenched with a torrential downpour; gale-force winds were snapping power lines and knocking down trees. Washington was a darkened, wind-swept city. Most of the Federal offices had

closed early, and traffic was inching along the rain-slicked streets.

Boatmen from Hatteras to the fishhook angle of Cape Cod—week-end sailors and professionals alike—were making fast extra lines, setting out double anchors, or pulling their craft out of the water altogether. Commercial air lines were juggling their schedules around the storm and whole squadrons of military planes were winging westward, away from the danger, like great flocks of migrating birds. Storm tides were piling up all along the coast, and flood warnings were flashing from Civil Defense centers in a dozen states. The highways were filling up with people moving inland before the approaching fury.

And Omega was still a hundred miles out to sea.

Then she faltered.

You could feel the electricity crackle through our control center. The mammoth hurricane hovered off the coast as the jetstream deflection finally arrived. We all held our breaths. Omega stood off the coast uncertainly for an hour, then turned to the northeast. She began to head out to sea.

We shouted our foolish heads off.

When the furor died down, Ted hopped up on his desk. "Hold on, heroes. Job's not finished yet. We've got a freeze in the midwest to modify. And I want to throw everything we've got into Omega, weaken her as much as possible. Now *scramble!*"

It was nearly midnight before Ted let us call it quits. Our Project people—real weathermakers now—had weakened Hurricane Omega to the point where she was only a tropical storm, fast losing her punch over the cold waters off the north Atlantic. A light snow was sprinkling much of the upper mid-west, but our warning forecasts had been in time, and the weathermakers were able to take most of the snap out of the cold front. The local weather stations were reporting only minor problems from the unexpected freeze, and Barney's final computer run showed that the snow would be less than an inch.

Most of the Project people had left for sleep. There was only a skeleton crew left in the control center. Barney, Tuli and I gravitated to Ted's desk. He had commandeered a typewriter, and was pecking on the keys.

"How do you spell 'resignation'?" he asked me.

Before I could answer, the phone buzzed. It was Dr. Weis.

"You didn't have to call," Ted said. "Game's over. I know it."

Dr. Weis looked utterly exhausted, as though he had personally been battling the storm. "I had a long talk with the President tonight, Marrett. You've put him in a difficult position, and me in an impossible one. To the general public, you're a hero. But I wouldn't trust you as far as I could throw a cyclotron."

"Guess I don't blame you," Ted answered calmly. "Don't worry, you won't have to fire me. I'm resigning. You'll be off the hook."

"You can't quit," Dr. Weis said. "You're a national resource, as far as the President's concerned. He spent the night comparing you to nuclear energy: you've got to be tamed and harnessed."

"Harnessed? For weather control?"

Weis nodded wordlessly.

"The President wants to really work on weather control?" Ted broke into a huge grin. "That's a harness I've been trying to get into for four years."

"You're lucky, Marrett. Very lucky. If the weather patterns had been slightly different, if things hadn't worked out so well . . ."

Ted's grin vanished. "Wasn't luck. It was work, a lot of people's work, and brains, and guts. That's where weather control—*real* weather control—wins for you. It doesn't matter what the weather patterns are if you're going to change all of them to suit your needs. You don't need luck, just time and sweat. You can *make* the weather you want. That's what we did. That's why it's got to work, if you just do it on a big enough scale."

"All right, you've won," Dr. Weis said. "Luck or skill or guts, it doesn't matter. Not now. The President wants to see you."

"How about tomorrow . . . I mean later this morning?"

"Fine," Dr. Weis said, although his face was still sullen.

"We've won," Tuli said as Ted shut off the phone. "We've actually won."

Barney sank into the nearest chair. "It's too much happening all at once. I don't think I can believe it all."

"It's real," Ted answered quietly. "Weather control is a fact now. Nobody can say it doesn't work, or it can't have any important effect on the country."

"So you're seeing the President tomorrow," I said.

"Later today," he corrected, "and I want you three guys with me."

"Guys," Barney echoed.

"Hey, that's right. You're a girl. Come on, Girl, I'll take you home. Looks like you won't have to be playing second fiddle to hurricanes anymore." He took her arm and started for the door. "Think you can stand being the center of my attention?"

Barney looked back at me. I got up and took her other arm. "If you don't mind, she's going to be the center of my attention, too."

Tuli shook his head as he joined us. "You barbarians. No wonder you're nervous wrecks. You never know who's going to marry whom. I've got my future wife all picked out; our families agreed on the match when we were both four."

"That's why you're here in the States," Ted joked.

Barney said, "Tuli, don't do any-

thing to make them change their minds. I haven't had this much attention since I was four."

Down the main stairway we went, and out into the street. The sidewalks were puddled from rain, a side-effect of Omega, but overhead the stars were shining through tattered, scudding clouds.

"Today the world's going to wake up and discover that man can control the weather," Ted said.

"Not really," Tuli cautioned. "We've only made a beginning. We still have years of learning ahead. Decades. Maybe centuries."

Ted nodded, a contented smile on his face. "Maybe. But we've started, that's the important thing."

"And the political problems this is going to cause?" I asked. "The social and economic changes that weather control will bring? What about them?"

He laughed. "That's for administrators like you and the President to worry about. I've got enough to keep me busy: six quadrillion tons of air . . . and one mathematician."

It was more than a year later, in October, when the United Nations convened an extraordinary session in Washington to hear an address by the President.

The delegates met at a special outdoor pavilion, built along the banks of the Potomac for their meeting. Ted, Barney, Tuli—most of the key people from the Weather

Bureau and Congress and Government were in the audience. Beyond the seats set on the grass for the UN delegates and invited guests, a huge thronging crowd looked on, and listened to the President.

"... For mankind's technology," he was saying, "is both a constant danger and a constant opportunity. Through technology, man has attained the power to destroy himself, or the power to unite this planet in peace and freedom—freedom from war, from hunger, from ignorance.

"Today we meet to mark a new step in the peaceful use of man's growing technical knowledge: the establishment of the United Nations

Commission for Planetary Weather Control . . ."

Like Ted's victory over Hurricane Omega, this was only a first step. Total control of the weather, and total solution of the human problems involved, was still a long way off. But we were started along the right road.

As we sat listening to the President, a gentle breeze wafted by, tossing the flame-colored trees, and tempering the warmth of the sun. It was a crisp, golden October day; bright blue sky, beaming sun, occasional puffs of cottonball cumulus clouds. A perfect day for an outdoor ceremony.

Of course. ■

In Times To Come

Next month's issue features our Christmas Star cover—which isn't what it started out to be, but it just happened that way.

Poul Anderson and Chesley Bonestell—tops in their respective science-fiction fields—collaborated on a story and a painting. The story's "Supernova," by Poul, and the cover is, of course, Supernova by Bonestell.

The story has to do with what happens to a planet only about one parsec away from an exploding supernova—a bit closer than Alpha Centauri is to Earth. Surprisingly, it isn't the light or heat that's a calamity—there are other things about an exploding supernova that are a darned sight worse!

The last Bonestell cover we ran—also a collaboration with Poul—was on "The Ancient Gods." It brought a lot of requests for reprint copies for framing including one request from one of the astronauts. After the magazine's been printed, we found, copies would cost about \$15 each.

This time we're having reprints, *without lettering*, made before the magazine is printed—and we can offer them for one tenth that price. For \$1.50 each, we'll have two hundred copies of Bonestell's painting of a supernova exploding in the sky above a burning power plant, while men seek to repair it. It's the magnetic storm shock from an exploding star that would really wreck things on a planet!

The picture is the same size as our cover, suitable for mounting. And it just happens to be ready at Christmas time. This is a gamble, so we've printed up only two hundred copies—that's about one for every sixty readers. *The Editor*

It's only in the last few years that work has revealed a totally new knowledge of a separate, non-Mendelian method of genetic inheritance—cytoplasmic genetics. The genes of the cell nucleus, it now appears, are less than half the story of inheritance—and, therefore, of mutation. That the ovum of the female, simply because it's larger, is more important than the male sperm—and that there's a reason why knowledge can be infectious!

CARL A. LARSON

Cytoplasmic Inheritance

All cells of the human body have intricate jobs to do, and these manifold tasks of energy conversion and protein synthesis are programmed in a way we are now beginning to understand. Master molecules reside in the nucleus, the walled capital of the cell; their importance has been understood well in advance of intimate knowledge of structural details. Outside the ring fence of the nucleus the cytoplasm waits for orders, but it holds its own master molecules as well. These centers for cytoplasmic self-government are now in the focus of nascent interest.

Cytoplasmic genetics, or the study of extra-nuclear determiners, spans from practical applications such as the production of hybrid corn to subtle approaches to the

problems of virus infection and the origin of cancer. Our cells as well as those of plants and animals are links in a long chain of life, and so determiners of vital processes within the cell become identical with the carriers of information from parent cell to daughter cell, of inheritance from cave dweller to commuter.

This double function of master molecules, to hold and bequeath sway, accounts for the keen attacks on their secrets. Chemists, students of microbiology and genetics have approached the problems of cell replication and protein synthesis, each contributing their tools, skill and knowledge. It was the nuclear master molecules that first yielded their secrets to joint attack.

Why not the cytoplasmic determiners? The answer takes us back to

Mendel, who showed that genes, or factors of inheritance, occur in duplicate. He also demonstrated that his rather abstract genes parted company with their doubles when entering sex cells. Soon students of the cell nucleus found that its chromosomes also occur in duplicate and part with their pendants when mature sex cells are formed. Then Morgan observed patterns of inheritance which excluded cytoplasmic genes. Some determiners of eye color and other readily recognizable properties in the fruit fly reside in the X chromosome; other genes, as Morgan and his co-workers soon found, lie in the autosomes—that is to say chromosomes other than sex chromosomes. Decades of research gained intimate knowledge of chromosomal genes.

While the precise and clear patterns of inheritance due to chromosomal genes were intensely studied, cytoplasmic inheritance remained in the shadow. Some biologists more or less accepted an old idea that all really important genes inhered in the cytoplasm, but this cytoplasmic inheritance showed no variation and thus could not be studied. Chromosomal genes might give you brown eyes, but your cytoplasmic genes make you a vertebrate, according to this view.

Another difficulty was the lack of beautiful parallels between inherited structures and inherited properties or functional patterns when cytoplasmic inheritance was com-

pared to transmission via nuclear genes.

At this stage we shall take heed of the obstacles to a clear concept of cytoplasmic inheritance and see if they are real or imaginary. The cell replicates, it doesn't divide like a flapjack cut in two. First the nucleus copies itself faithfully, chromosome for chromosome, handing down its genes through thousands of cell generations. Then a cell wall ropes a portion of cytoplasm for each new nucleus. A variety of cytoplasmic bodies may or may not replicate on time.

In the latter instance all cytoplasmic particles of a given kind may carry the same gene; then lack of punctuality doesn't matter for no differences and no inheritance will be seen in the offspring of a cell. If, on the other hand, some particles carry another gene lacking synchronization in replication this may by chance lead to losses of one of the genes. If the plane is on time your heirs get their lot; if not, not. A rather chancy way to hand down values.

The thought that nature sometimes puts all her eggs in one basket may not appeal to us, but that is exactly what happens in *Euglena gracilis*, a unicellular denizen of stagnant waters. Fed broth it replicates so fast that it runs away from its green cytoplasmic granules or chloroplasts. When chloroplast replication lags behind cell replication, a decreasing number of these cyto-

plasmic bodies are left and finally a cell with only one chloroplast has to leave one of her daughters without a dot.

This situation is not unique, in other organisms cytoplasmic particles are subject to haphazard losses though compensatory increase in the reproduction rate of the particles prevents them from total disappearance. Some vital cytoplasmic structures replicate, however, with a precise synchronization. By and large, the risk of random losses in the cytoplasm may indeed make chromosomal delivery of vital genes necessary.

There is no doubt that cytoplasmic inheritance has a hand in the forming of a number of well studied plants and animals. Sometimes, as in variegation in plants, chromosomal and cytoplasmic genes cause much the same structural and chemical results. But competence is for the most part divided between cytoplasmic and chromosomal genes.

Such division of competence applies to both functions of genes: to handing down information to the next generation and to the management of events within the cell. A chromosomal gene first shapes molecules, then fathers a new gene; a cytoplasmic gene fulfills the same double functions.

Chromosomal genes direct the production of specific substances and thereby the life and work of the cell. Thus the nucleus rules the cell; as shown by Jacob and Monod,

Nobel Prize winners in 1965, the chromosomal rule is mainly exerted by executive departments called operator genes. They activate bureaus called structural genes, together with their supervising operator gene a series of structural genes constitute an operon.

Cytoplasmic influence is felt apart from that exerted by extrachromosomal genes, by polls taken in the following way. Independent agencies of the chromosomal government, tagged regulatory genes, send into the cytoplasm repressor substances. If the cytoplasm needs operon products, the repressor substance is blocked; then the operator gene is released and triggers off a sequence of RNA syntheses by means of its structural genes.

If, to the contrary, the operon has made too much enzyme, then a signal substance (aporepressor) from a regulator gene is activated. It signals to the operator gene: "No go!" Then the executive department tells its subordinate bureaus, the structural genes, to lie dead. An expedient way, indeed, for a governmental department to put right the effects of its zeal.

In this way the cytoplasm exerts its ample share of influence. The nucleus rules, but with the consent of the ruled. Some instances are known where chromosomal genes meet an outright veto from the cytoplasm. Such is the case with genes for pollen sterility in flax. They are without effect in their own cytoplasm

but wreak havoc abroad, in foreign cytoplasm.

When the whole gamut of chromosomal genes in a species is considered, one is forced to conclude that the potential inventiveness of the nuclear government is indeed terrific. Each of several thousand genes can and does change, mutate. And even if we consider unicellular organisms, which we may have learned to look upon as primitive, their present gene setup is so nicely balanced that practically any change means derangement.

This is not to say that a chromosomal mutation may not confer an advantage under specific environmental conditions, but it is easy to see that an organism is well served by cytoplasmic brakes against such perverted chromosomal commands as orders to stop reproducing sexually.

In other instances, one of them is the formation of filaments called paraphyses in mosses, both chromosomal and cytoplasmic genes contribute their share to the definite form. The cytoplasm has not only a veto, temporary or definitive, it also partakes actively in designing structures.

The master molecules of the cell nucleus just tell the cytoplasm what to do. Chromosomal genes, identical with specific sites of the DNA (deoxyribonucleic acid) molecule, depend on the cytoplasm for their own replication. The cytoplasm affords the material and the catalysts.

As far as we can see right now cytoplasmic genes behave similarly. The identity of cytoplasmic master molecules has been revealed in some instances, but as was originally the case with chromosomal genes the cytoplasmic counterparts have largely been observed by their effects and their mode of transmission. The essential point is, however, that the cytoplasm can exert its influence not only by supplying and withholding material and services, but also by issuing orders from centers of command similar to those of the nucleus.

Then egg cells, rich in cytoplasm, would determine embryonal development to a greater extent than the cytoplasm-poor sperm. This is indeed the case in many carefully studied instances. A chromosomal gene works out the same character whether it comes from the male or the female parent. When this pattern fails to show up several possibilities suggest themselves, when an observed trait regularly seems to come from the mother one of them is cytoplasmic inheritance.

Another possibility accounting for maternal transmission is a roundabout manifestation of the mother's chromosomal genes. Some meal moth larvae lack a chromosomal gene necessary for kynurenine formation. If their mother is pigmented, young larvae still have some color in spite of the genetic defect; kynurenine is an amino acid

necessary for pigment formation. The mother does not provide the gene; she provides the kynurenine.

It is obvious that maternal influences of various kinds may affect, for instance, the mammalian fetus, but inheritance in a strict sense is absent when such influences do not persist in subsequent generations. Master molecules inherited via the cytoplasm of the egg cell do persist, however, and their effects are seen in generation after generation.

Thus some strains of the fruit fly, *Drosophila melanogaster*, are sensitive to carbon dioxide. Females from such strains have, with resistant males, CO_2 -sensitive offspring. The daughters have in turn always sensitive progeny with resistant males. Conversely, resistant females crossed with sensitive males have both types of offspring in irregular proportions not to be expected in chromosomal inheritance.

While extra-chromosomal inheritance does not mean transmission exclusively through the female, the larger female sex cell as a rule provides the bulk of cytoplasmic genes. It is clear enough that the danger of gene loss, manifest in some rapidly replicating unicellular organisms, is still greater in the transmission of cytoplasmic genes mainly through one parent found in higher organisms.

For this reason chromosomal inheritance makes sense; both parents transmit the DNA information vitally necessary for normal form

and function. When it comes to the managerial job that genes have to do, the presence of genes is not enough. Their arrangement in orderly sequences is a prerequisite for normal control of the many events in the living cell. Thus they cannot swim about freely in the cytoplasm, a fixed arrangement is necessary. We need the chromosomes both as transmitters of inheritance and as moderators of life processes.

Using the time machine we all could take such splendid advantage of, we would find that the forebears of creatures now inhabiting the earth often had chromosomal genes arranged in sequences different from those of current rule. It is hard to guess whether or not some chromosomal genes once existed as cytoplasmic DNA, but there is good reason to think that this was the case. Going sufficiently far back, to structures rather unlike the unicellular organisms of today, we would meet nucleic acid molecules trying to get organized and to mastermind cytoplasmic processes. Some of them are now part of chromosomes, others remain in the cytoplasm.

It is, in a way, easy to use the time machine but not so easy to fit hard-earned facts into a pattern of origin for cellular organization. Today master molecules are transmitted by inheritance, by conjugation or fertilization, and by infection. CO_2 -sensitive fruit flies do not infect normal flies in the general sense of the word, but it is possible

artificially to make resistant fruit flies CO₂-sensitive by injecting material from sensitive flies. Recently E. L. Tatum at the Rockefeller University and his co-workers transferred, by microinjection, cytoplasm responsible for an inheritable anomaly in the bread mold *Neurospora crassa*. This is not infection as we catch it from fellow passengers in the bus or subway.

But a number of situations, similar to those in flies and molds, strongly point to parallels with virus and whenever cytoplasmic inheritance is discussed these days virus comes into the picture. At this point, let us remember that viruses consist of a nucleic acid core: DNA in chicken pox and many animal viruses, RNA (ribonucleic acid) in influenza virus and several viruses causing disease in man and animal, and in plant viruses. A virus particle also has a coat, consisting of protein. Then it has nothing. It clings to the cell surface, injects its nucleic acid into the victim and uses the cell's enzymes, amino acids and energy to get itself a new coat, and additional cell material to replicate virus nucleic acid. Both procedures are devised by the intruding DNA or RNA.

This is infection, of course, and the existence of any well studied disease-provoking virus in a cell is outright parasitic. Such viruses are well adapted to their hosts; nucleic acid, that instructs for quick kill or low contagiousness, has selection

work against it and becomes eliminated. It is nice to have the victim go about at least for some time, spreading infection, before knocking him out flat. Nice for the virus, that is.

As cytoplasmic inheritance in organisms living today hinges upon master molecules formed by selective forces, we may well ask what molecules started the evolution toward finished nucleic acid, accepted by the cell in the form of virus or residing there permanently to mold protein molecules.

First, that still somewhat rare breed of scientists called exobiologists have reconstructed the path by which the building stones of DNA and RNA could have arisen on earth before the dawn of life. We do not use the time machine now, but a basis for a hypothesis exists: Self-reproductive molecules acting as templates for protein synthesis could be present when and where amino acids arose. Artificial nucleic acids start, in a suitable surrounding, organizing protein molecules out of chemical necessity.

Suitable conditions for such work are found in living cells now. It is indeed little wonder that nucleic acids of widely different shape and origin act as master molecules once they have entered a cell. And before cells as we know them existed, coallescent droplets formed by wind and brackish water caught photons and CO₂ with the aid of simple

catalysts. After a few hundred megayears of trial and error, making every possible molecule, the primitive cells were equipped with composite catalysts and embarked upon the adventure of forming longer chains of molecules. First, the nucleotide sequences of short master molecules were repeated, then mutations in these sequences were kept when of value for survival, finally links in the partly new chains were rearranged to fit actual needs. Our human enzymes today carry whole sequences of amino acids that reflect very old, firmly held lengths of DNA chains.

Thus human and bacterial cells make use of molecules older than life. Many of these molecules have been produced in the exobiologists laboratories under conditions imitating those of primitive earth. Utilizing preformed master molecules, primitive cells take only the next step on an old track. It is sometimes a moot point whether such ready-made master molecules shall be looked upon as native cytoplasmic bodies, parasites or symbionts.

Some strains of the unicellular organism *Paramecium aurelia* have among them killer animals which do away with sensitive animals of their own kind by methods some of which seem rather atrocious. One breed, called mate-killers, cannot kill free-swimming animals, they lure sensitive animals to conjugate with them and then slay them. Others excrete poison into the culture

fluid, where sensitive animals start spinning backwards in a deadly dance.

The killers have in their cytoplasm DNA-containing particles, called kappa, with a long and obscure past. There are several types of them, varying in killing effect, multiplication rate, antigenic properties, temperature range and infectivity. Kappa particles from smashed killers can pass to sensitive animals, which are in this way turned killers.

Regularly, the kappa particles are inherited. When the paramecium replicates the bodies copied in its cytoplasm are distributed in the resulting cells. Not evenly, kappa-carrying paramecium shares with chloroplast-carrying euglena a desire to run away from its cytoplasmic bodies in rapid cell replication.

So far kappa has not been cultivated outside cells and in a way it is certainly at home in the paramecium cytoplasm, though only in a number of strains of this species. Kappa particles do no harm to their permanent host, on the contrary they immunize it against paramycin, the killer substance. It can, of course, be held that this is a blessing dependent upon the presence of kappa-carrying killers. The situation is somewhat similar to that of the hunting party host, who had thirty-eight shot pellets removed from a fleshy part of his trunk by his guest, a physician who had placed them

there. He, of course, did not fail to stress the usefulness of having a competent surgeon at hand when hunting.

One has every right to speculate on the origin of kappa and when called a symbiont it doesn't protest. In the cell government it has its own agencies, or specific chromosomal genes. This means that the paramecia regularly carrying kappa have carried them for such a long time that changes in nuclear DNA have safely established themselves.

The infective and parasitic origin and character of several other self-replicating cytoplasmic particles have long been discussed. Modern cells borrow master molecules in such instances as transduction, or transfer of chromosomal genes from one bacterium to another by a virus. Such bacterial viruses, or phages, can also serve to explain borrowed DNA that makes itself thoroughly at home in the bacterial cell. Some phages even hitch their DNA to a specific spot of the chromosomal DNA and faithfully follow its replication.

Phages also spend part of their existence in the cytoplasm, reorganizing its metabolic events and replicating phages in great quantity. In common with phages is the F factor; concerned with conjugation in *Escherichia coli*—the common colon bacterium. It plays an active and important part in the life of the bacterial cell and, though it can be transferred from cell to cell,

it is not by any means a foreigner.

One of several missions the F factor is equipped for is that of preparing the surface of the male cell for contact with the smooth female cell. Male bacteria have; female lack the F factor. The definition of maleness in bacteria lies in giving of DNA, females receive it from males. In addition to chromosomal DNA the female colon bacterium receives the F factor and turns male. Several variants occur on this theme; replication of F occurs with or without intimate contact with the chromosome.

Several other instances are known where bacteria carry cytoplasmic agents which direct chemical activities not ordered by the chromosomal cell government. Some recently observed cytoplasmic agents are real benefactors to disease provoking bacteria, rendering them resistant against antibiotics.

Though much important and indeed trail-blazing work with transferred master molecules in the last decade has been made with bacteria, there is no reason to think that other cells have no need for cytoplasmic self-governing bodies. Several definite structures, necessary for energy conversion and for the life of the normal cell, are known to replicate independently of the chromosomes. The recent observations by Tatum's group of transmission of cytoplasmic organizers in *Neurospora crassa* widen the field

of inherited characters associated with mitochondria, DNA-containing organelles with several functions, among them conversion and storing of energy.

The recent lane of advance in cell genetics very distinctly points to definite structures, tangible molecules as seats of cytoplasmic self-government. And, when we have to deal with molecules that can replicate themselves and that act as templates, we can expect to find them performing those tricks even when they are transmitted by injection or by any of the practical jokes living organisms play on each other. The presence of master molecules is essential to cytoplasmic events, not their mode of arrival.

We speak of inheritance when the master molecules arrive from a parent or a parental cell, and when we can connect definite, observable properties with this sort of inheritance it is just fine. The fertilizing influence of classical genetics on every branch of biology has much to do with genes being connected with definite structures, visible in the microscope. Everybody should be grateful for organelles, granules and molecules that can be shown to carry cytoplasmic genes, but we all know there was another side to classical genetics. What about the inheritance analyzed with the aid of visible characters, the Mendelian approach without which chromosomes would have remained curios-

ities? What about the study of mutations, that helped so much in classical genetics and makes clear to us why we look different from our crocodile-like forebears?

Apparently the Mendelian approach yields valuable information when it fails. Observations of irregular inheritance in several plant species belong to the early groundwork for the study of cytoplasmic inheritance. As chromosomal genes follow the laws of inheritance discovered by Mendel, disagreement with these laws may signify extra-chromosomal inheritance. Further, positive pointers to cytoplasmic genes may be obtained if mother and offspring are like and father and offspring unlike.

In many instances the latter type of differences, though distinct, is a matter of proportions rather than presence and absence of traits. This type of non-Mendelian distribution of characters is to be expected when male sex cells transmit a few and female sex cells many determiners. Thus the herb *Pelargonium zonale* reveals different ratios of white-margined, variegated and green plants among the progeny of white-margined mother plants as compared to progeny of green mother plants when the paternal plants in both cases are of the other kind. It is noteworthy that paternal transmission of cytoplasmic genes exists, sometimes as a rather exceptional occurrence, because such instances make possible genetic analyses not

applicable to monotonously maternal transmission.

As for mutant extra-chromosomal genes, the relative scarcity of their observed effects long prevented any resemblance of analysis in this field to that of chromosomal inheritance. Mutations cause deviations from normal appearance, through such deviations we observe inheritance. If we have a sufficient number of mutations we can make a specific kind of prediction. If two chromosomal genes segregate independently in crosses, they are carried by different chromosomes, or they are at least not close neighbors on the same chromosome. Genes occupying adjacent chromosomal sites separate rarely in crosses; more remote neighbors on the same chromosome frequently part company but still tend to go together. By observing many linked genes, or rather their visible expressions in crosses, the student of nuclear inheritance can draw maps of chromosomes he may never have seen. If there is a disturbance in the linear arrangement of genes, he can predict the site on the chromosome where an abnormality is to be found.

Such mapping of extra-chromosomal gene carriers has only recently moved within the borders of the possible. In the bread mold *Neurospora crassa* linked genes carried by an extra-chromosomal structure seem to exist, but the scarcity of such observations is striking. A sufficient number of mutant genes

to establish linkage groups can, theoretically, be obtained by artificial means serving to increase the rate of naturally occurring mutations.

While such treatments were highly successful in the study of chromosomal mutations, where radiation and chemical manipulations in great number caused a variety of changes, extra-chromosomal genes came late to the masquerade. The patient accumulation of observations on extra-chromosomal inheritance, through five decades shadowed by classical genetics, cashed in on spontaneous mutations. When finally artificially provoked mutations in cytoplasmic genes became operational in the laboratories the yield was sometimes greater than asked for. In yeast spontaneous mutations now and then give rise to variants called petite. Treated with acriflavin dyes yeast cells produce petite colonies in up to one hundred percent. Various types of radiation, streptomycin, ethylmethanesulfonate and other alkylating agents have been used to produce an increasing number of changes in cytoplasmic master molecules.

With the aid of mutant genes analysis of such master molecules can now be carried out to see what they do, how they behave during cell replication and what degree of independence they reveal of chromosomal genes. Much recent work in this field has been done by Ruth

Sager at Columbia University, with an imposing battery of extra-chromosomal mutations and refined analysis of the apparently allelic behavior of cytoplasmic genes. Allelic means acting as partners much in the same way that blood group genes A and B behave.

Such approaches greatly contribute to what can be considered a new era of cytoplasmic genetics. An earlier period reaped, however, valuable practical results with the methods available at the time. To mention one example, knowledge acquired in the study of cytoplasmic inheritance has long been applied to the production of hybrid corn.

Today hybrid corn is a major crop, owing to the uniformity of high-level performance in hybrid plants compared to that of their parental plants. As the seed from hybrid plants lacks this advantage, it is necessary to produce new seed from crosses, in fact double crosses, between inbred lines each year. Corn bears male and female flowers in different parts of the same plant; when the immature tassel with the male flowers at the top of the stalk is pulled out the plant is emasculated and can only produce cross-pollinated seed. Thus one block of detasseled plants can be grown next to a block of plants of the other line, which then provide the pollen. All seed becomes hybrid.

But seed producers do not get their man-hours that cheap, and now thousands of acres that would

otherwise have to be detasseled are sown with cytoplasmically male-sterile corn.

Similarly, hybrid seed for a commercial onion crop is produced by the use of male sterility, in this instance resulting from interaction between a cytoplasmic factor and a chromosomal gene present in double dose.

It is reasonable to think that such and other instances of useful mutations in cytoplasmic genes will be multiplied when methods of manipulating the master molecules have been perfected. Right now it looks like unmapped and fertile land in the cytoplasm, its recently observed DNA molecules of different types and localization seem to play a more important part in cell government than was suspected.

Could there be any advantage in directing practically aimed research toward mutations in cytoplasmic master molecules, DNA and possibly conservative-type RNA, compared to chromosomal mutations? It is hard to say what comes out of an entirely new opportunity, but at least some mutable cytoplasmic molecules do jobs that nuclear molecules cannot handle. To be specific, the acriflavine provoked petite colonies of yeast readily breathe an atmosphere containing hydrocyanic acid. This has to do with the lack of a series of sensitive enzymes carried by the mitochondria of normal yeast cells. The minor part of respiration

not sensitive to cyanides is intact.

The mitochondria of petite yeast reveal structural abnormalities when examined with the electron microscope. Their DNA transmits the mutant information to any number of new generations. Thus it is possible to induce, with a remarkable regularity, a specific mutation in a self-replicating cytoplasmic organelle. At least a dozen different yeast species behave just the same.

When it comes to the practical applications we should, perhaps, not spin too much on the theme of prussic acid, at least not when our friend the fanciful brewer is present. But we have some reasons to believe that this investment of specific competences in cytoplasmic centers of command is not limited to mitochondria in yeasts. We are just witnessing the dawn of a new light on cellular government.

There are still many well documented relationships between nucleus and cytoplasmic agencies that are perfectly veiled as to function and origin. When cytoplasmic genes are engineered it might sometimes be the best idea to hit, with a mutational force, a nuclear gene which in turn makes the cytoplasmic gene mutate. A number of such instances are already known and an X-ray hit of a chromosomal gene has indeed caused a cytoplasmic mutation in this roundabout way.

To get the best performance from a sensitive registering instrument it may not always be a good idea to

place it on a firm foundation, a slight dither will help cancel inertia. At present, when it is still possible to believe many things, it seems that some observations can be interpreted in a similar way when it comes to changes in the cytoplasmic self-governing bodies: Various influences put them into a state of readiness, it may be that these influences do not cause mutations but prepare cytoplasmic genes for mutation. Long ago several observers described the effects of chromosomal genes producing large numbers of diversified mutants in the fruit fly, a few mutator genes made a whole gamut of other chromosomal genes ready to mutate. In an unknown way mutator genes make master molecules dither. We have yet to learn about other similar and subtle influences the central, nuclear, cell government exerts upon cytoplasmic local governments.

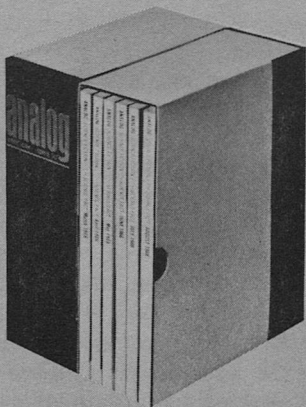
Can cytoplasmic master molecules be rigged to suit specific, human purposes? They very likely can. But their identity is barely beginning to be revealed. A number of DNA molecules identified in the cytoplasm are likely candidates for the jobs as wielders of local power, but few of the genetic facts so far gathered can be firmly knit to those newly detected molecules.

As for RNA, it is well known to play important parts in cell government as a messenger and handyman for carrying out the orders of the nuclear government. The chem-

ical job is done in and by the cytoplasm, using RNA blueprints from the DNA office. While many facts fit the idea of RNA molecules as temporary and expendable tools for protein synthesis and carrying the translated DNA message into the cytoplasmic workshops, some situations exist where RNA molecules live long and work hard. In the sea urchin egg maternal RNA, present before fertilization, seems to be responsible for protein synthesis during the early stages of development.

A great number of viruses, capable of changing the chemical events in cells invaded by their nucleic acid, carry a RNA core; to them belong such well-known pets as the viruses of influenza, mumps, measles and polio. One RNA virus, that of tobacco mosaic, has been modified by artificial replacement of coding units in its RNA core, profoundly changing the properties of the virus protein. Recently the possibilities have widened when it comes to handling natural and synthetic nucleic acids and it is conceivable that cells can be influenced in a goal-directed way by such means.

To the cytoplasmic activities directed by the virus nucleic acid belongs the replication of the infectious nucleic acid itself. Details of this replication have been studied for several reasons, they take on an especial interest with increasing knowledge of cancerous processes caused by invading nucleic acid.



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So far no cancer cure has come out of these studies, but it seems reasonable to calculate with a deeper insight into the command system of the mutinous cell as an important step to victory over cancer.

An earlier era thought of viral diseases as infectious, and neoplastic processes as noninfectious. Now an increasing number of viruses have revealed their ability to cause cell mutiny in plants and animals. The tumor-provoking virus gives the cell a new goal, and somehow descendants of the invaded cell keep steering toward this goal long after the virus nucleic acid has got lost, as studied with current methods. The new goal is uninhibited replication.

It is known that some viral invaders can long keep quiet in the cell nucleus, some of them even use very specific chromosomal sites; phages can serve to illustrate this point. To a rapidly replicating cell it would grant safety of continued programming for malignant growth if the tiny bit of information needed were nailed to a chromosome, replicating with the nucleus.

For virus replication in general, however, such tricks involving the nucleus are not necessary. In some instances, and rapid replication belongs to them, cytoplasmic inheritance may look like an unsafe method to hand down information vital to the cell, if deadly to the whole body as in the case of cancer.

But forthcoming information points to the possibility that cytoplasmic genes, nobody knows exactly how, may succeed in quantifying the information they hand down in replication. That cells get glaringly unequal shares in some instances of replication is true, but it may not be the general truth.

We all have inborn potentials, some inherited skills, others acquired. It has long been a tenet of biology that acquired properties are not inherited. But acquired nucleic acid molecules are transmitted in cell inheritance. They nail the cell's rudder for a new course, ruthless replication in the many forms of virus-provoked cancer, new metabolic patterns in phage-infected bacteria. Little is known about normal cell memory, but in the nervous system RNA molecules seem to store new information for a considerable time. In experiments that some have found difficult to reproduce but agree with observations in worms, DNA from trained rats has been found to transfer learning to untrained rats.

Cytoplasmic inheritance is now studied with new tools, with the ultra centrifuge and the electron microscope. With new knowledge of the master molecules will go an improved understanding of the jobs they do. They may not be very malleable today, but once these extra-nuclear master molecules may have been trial balloons in the long process of adaption and survival. ●

The Blue-Penciled Throop

Kelvin Throop discovered again!

But no longer is his pen dipped in boiling acid;

now he seems to be using lox!

BY L. EDEY

Dear Dr. Gantz:

In reply to your inquiry as to why your paper "Tertiary Infections of the Papules in Measles" was omitted from the monograph "New Progress in Childhood Diseases," the explanation is as follows:

1. You were given two generous deadlines for submission of your manuscript, each of which you ignored.

2. When your manuscript finally arrived, each of your twenty-three illustrations was unsuitable for reproduction in print, and your twelve-page reference section was a complete shambles.

3. You ignored three successive deadlines for submission of a revised reference section and illustrations.

4. When I tried to get in touch with you by phone, your secretary

forgot to cover the mouthpiece, or push the "hold" button or whatever, and I distinctly heard you tell her to brush me off.

5. By the time we finally received the revisions—which were not much of an improvement on the originals—we were already reading page proofs for the monograph.

So that's the way the measles mottle.

Your obed't servant,
Oswald Lempe

Dear Dr. Ross:

Thank you for your letter of last week, in which you asked what is expected of you as consulting editor of the forthcoming monograph on hard-vacuum technology.

I am enclosing a copy of the Society's booklet "Instructions to Authors and Consulting Editors"

which explains in detail the "functions" to which "the consulting editor shall be confined." I offer you my sincere personal apologies for the patronizing and insulting manner in which the instructions to consulting editors are written, and I trust it will not prejudice our working together to publish this important monograph.

Thanking you in advance for your interest and valuable help, I am, sir,

Very sincerely yours,
Oswald Lempe,
Editor-in-Chief

Dear Mr. MacKenzie:

After examining the résumé you submitted, I am pleased to tell you that you seem very well-qualified for an editorial position with the Society.

As luck would have it, we shall have an opening for an associate editor within the next few weeks. If you are still interested, please call me and we'll arrange an interview.

However, in all fairness to you, I feel honor-bound to tell you a few things in advance:

1. The Society's starting salary for associate editors is just about enough to make ends meet if you live in the YMCA and eat nothing but hamburgers.

2. Every employee of the Society, from the assistant executive director on down, punches a time clock and gets docked for every

quarter-hour he misses. Also, there is no sick leave. If you come down with a forty-eight hour virus, you lose two days' pay.

3. Theoretically, salaries are reviewed and merit raises are given annually. Actually, we've had some damn fine people here who've gone two years without a raise.

In short, I'm certain that a man with your excellent qualifications can get a much better deal from the greedy capitalists.

Very sincerely yours,
Oswald Lempe

Dear Sir:

The monograph in which Dr. McCaffrey's paper is to be published will not come out until next October, and I must, therefore, deny you the permission you requested to print certain of his illustrations in the June issue of *Science for Everybody Monthly*.

It's time somebody clued you in that organizations like the Society customarily grant permission to reprint material from their publications, not preprint it. Furthermore, if you actually should succeed in remembering the name of the person here who allegedly "told you over the phone it would be O.K." to print those figures, you might get him in trouble, but it wouldn't help you any.

I realize that this might pose a problem, since you have probably forged vigorously ahead with the production of your June issue. If

you don't have a few appropriate house ads on hand to fill the space, a picture of a dog is always good.

Very truly yours,
Oswald Lempe

Dear Dr. Sorensen:

I should like to extend to you and your colleagues a cordial invitation to become charter members of a new organization for which I have high hopes, namely SAFEBAGEL (Scientists Against Far-out, Expensive and Burdensome Abbreviations Getting Entrenched in the Literature).

There are no initiation fees, membership cards, dues or meetings. The SAFEBAGEL scientist merely pledges himself to do his share toward making the Information Explosion more manageable by avoiding the use of unnecessarily complicated and typographically difficult abbreviations in his published work, and by exhorting others to do the same.

We would be happy to welcome you to the ranks of SAFEBAGEL if in your paper you would permit us to change the abbreviation $T^{\circ}H_2O$, which means *reabsorption of free water*, to RFW. Or, if this is unsatisfactory, perhaps you could suggest one that doesn't involve ultrasubscripts or sub-subscripts.

Yours sincerely,
Oswald Lempe

Dear Dr. Axelrod:

We have received the text of the

talk you gave at the Society's recent symposium on the biological actions of RASR. We are honored to have you as one of the contributors to the symposium and the resulting monograph.

Certainly the monograph would not have been complete without a statement of the government's responsibilities in a free society to the public interest with regard to a powerful drug of this nature. It is encouraging to know that the Commission, of which you are vice chairman, never fails in its duty. It is also heartening to know that, as you pointed out in your talk and illustrated with many meaningful statistics, the number of new drugs approved for the market has increased and not decreased since the Commission's stricter regulations went into effect a few years ago.

I should like to suggest that your contribution could be made better still if you would include some information as to why the Commission has banned further research on RASR in humans, and under what conditions the ban might be lifted.

If you are agreeable to this, there is still ample time for you to revise your text accordingly.

Yours for progress,
Oswald Lempe

Dear Sir:

Although your letter to me concerning equal employment opportunities was actually addressed to the wrong person, I fully agree with you

and your committee that twelve is the exact number of colored employees that the Society should have on its payroll for the sake of absolute equity.

Our personnel director, to whom I showed your letter, also agrees. He has asked me to assure you that the last three colored people he hired will accordingly be discharged immediately.

Very sincerely yours,
Oswald Lempe

Dear Dr. Carlisle:

What a shame that the manuscript of your paper, submitted for the monograph on medical and biological uses of computers, and rejected with our deepest regrets, has become lost. I am glad you wrote to me about it, for someday I intend to write a treatise about the amazing manner in which lost manuscripts suddenly acquire great value, and your case will certainly be included.

In the meantime, perhaps the enclosed document will help to narrow down your field of search. It is a Xerox duplicate of a return receipt for registered mail, bearing your signature and dated six days after the consulting editor of that monograph advised us that your paper was unsuitable for publication in *Science for Everybody Monthly*, let alone a scholarly journal.

The original receipt, together with many others like it, is under heavy guard in the strongest vault of our deepest subbasement. We

consider this measure to be fully worth the expense it entails since it occasionally enables us to write a letter like this one.

Next time, make a carbon copy.

Yours sincerely,
Oswald Lempe

Dear Dr. Engler:

We have your letter listing the numerous Federal, State and municipal grants to be acknowledged in your paper on air pollution. Please be assured that the acknowledgments will be included when your paper is published.

I wonder if you would be good enough to help me with a certain point concerning your paper: Figure 5 consists of an outline map of the continental United States upon which are traced a number of wavy lines, something like a weather map. Your caption for this figure says only: "Effects of large buildings upon air currents." The text of the paper gives no further explanation.

Could you possibly rewrite the caption in more detail, lest some tax-paying layman in his ignorance think the wavy lines were drawn at random?

Thank you.

Yours sincerely,
Oswald Lempe

Dear Maxie:

In reply to your question concerning my corrections on the Monthly Program, the word *stet* is Latin for "Let it stand." It is also the

conventional proofreader's symbol to leave something in that had previously been marked for deletion.

I'd like to take this chance to ask a favor of you: I'm getting rather tired of answering calls from authors who want to know why they haven't received their reprints of papers that were published six months ago. Maybe if you'd spend more time working at your job as foreman of the print shop and less time sniffing around that little tart in Accounting, the situation would be alleviated somewhat.

O. Lempe

Dear Dr. Stoner:

I don't care how much Federal money you can put your hooks on. I don't care if the President of the United States has ordered the Bureau of Printing & Engraving to run you off as much money as you need to have the electronmicrographs accompanying your paper printed on glossy stock.

I have already assured you a dozen times that our printer's offset lithography produces every bit as good resolution on rough paper as on glossy. I have shown you samples to prove it. Therefore, from your continued insistence that the illustrations must be printed on glossy stock if your paper is to be published at all, I must deduce that the glossy stock is the purpose of your work, rather than vice versa, and that your sole interest is to have an expensive professional status sym-

bol to show off to your colleagues.

If you wish to withdraw your paper from the monograph, I will be glad to oblige you.

Sincerely,
O. Lempe

Dear Madam:

I couldn't agree with you more sincerely that those pictures of disemboweled rats in the April number of the *Proceedings* were atrocious, outrageous and barbarous. I further agree that scientists, instead of torturing and killing animals, should be seeking ways to help them.

It gives me profound satisfaction to inform you that some scientists, at least, are doing precisely that. A certain research group, headed by a good friend of mine, is presently working on the problem of a certain very nasty disease in rats. Their valiant perseverance has been rewarded with substantial and significant progress, but much yet remains to be done. In particular, many experimental studies in human subjects will be needed.

When I received your letter, I took the liberty of sending your name to my friend as a volunteer. I will not conceal from you the fact that the risks involved are great, but I am certain that you will not shrink from your humanitarian duty. And if the worst should happen, you would be assured of the eternal gratitude of rats the world over.

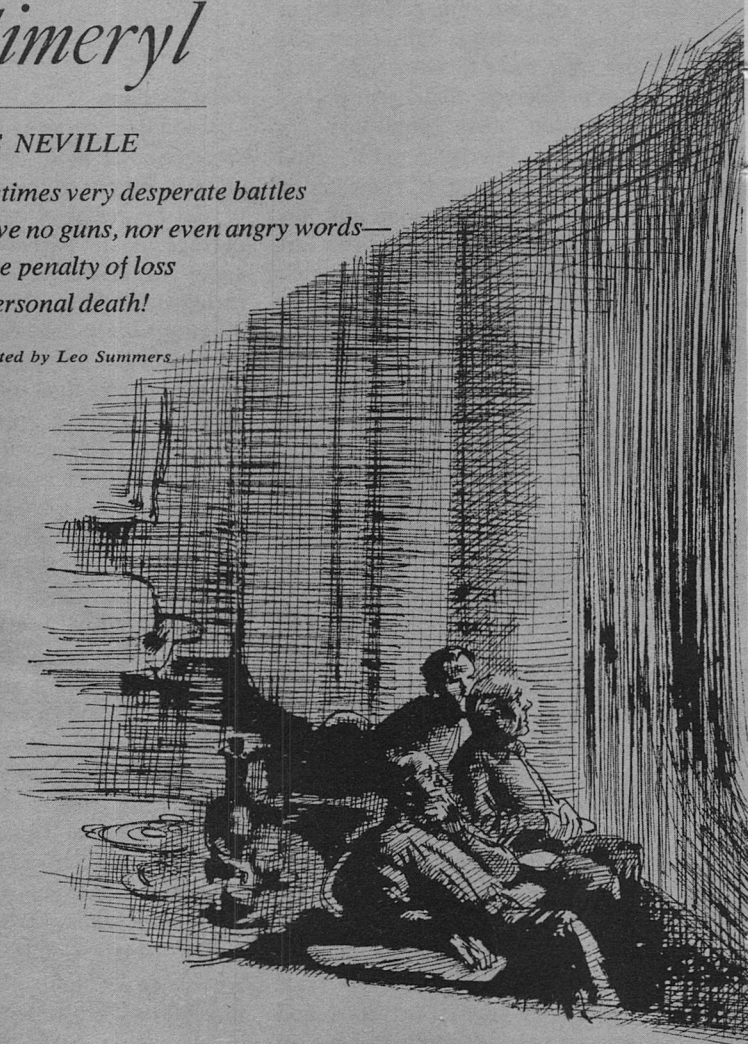
Yours most sincerely,
Oswald Lempe

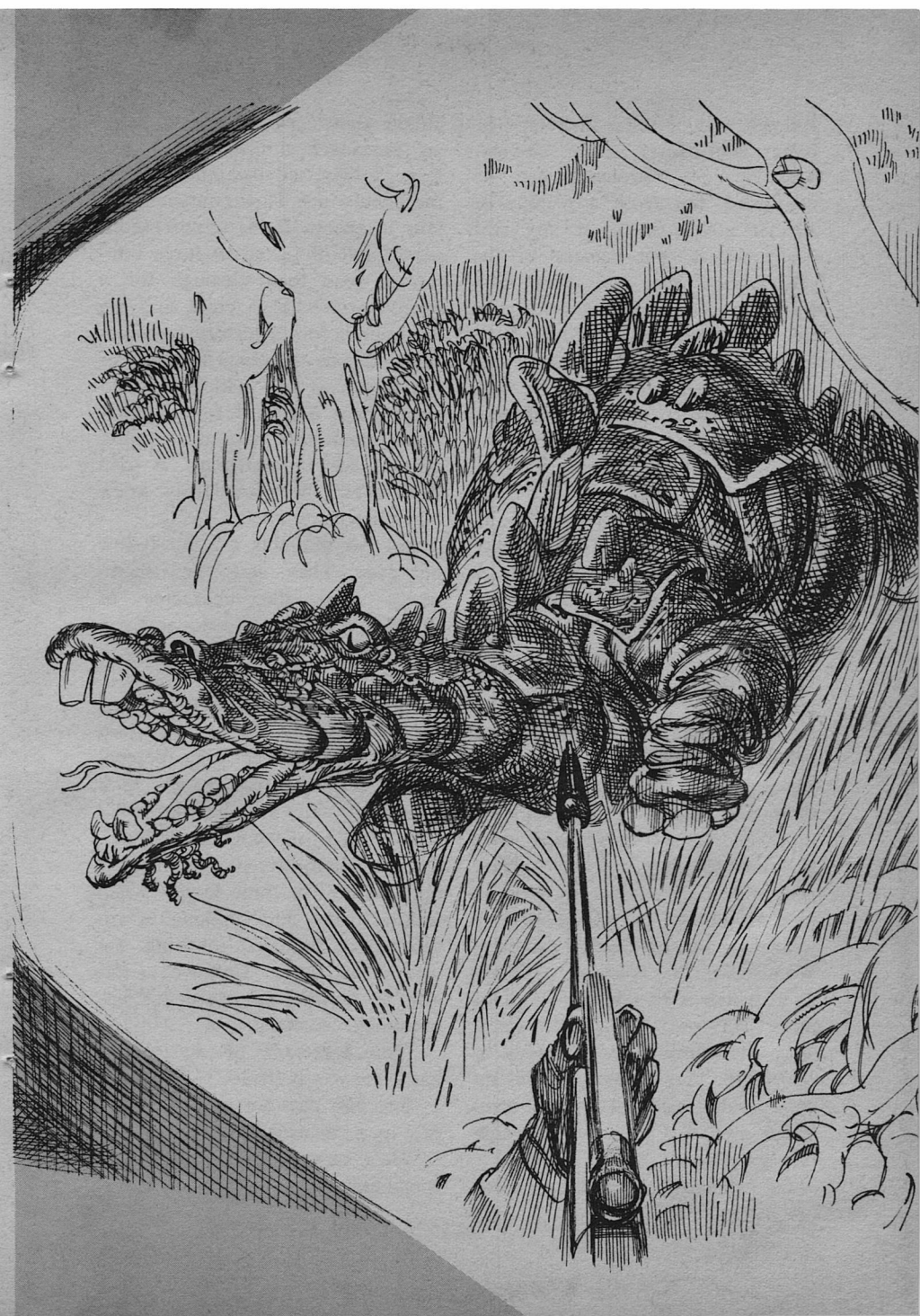
The of Price Simeryl

KRIS NEVILLE

*Sometimes very desperate battles
involve no guns, nor even angry words—
yet the penalty of loss
is a personal death!*

Illustrated by Leo Summers





Raleigh was a third Secretary of State with forty years service. Past normal retirement age, he continued, not from any hope of further advancement or any real desire for it, but because of the satisfactions the job gave him. Basically, there were two: the one, the satisfaction he obtained from knowing he was doing a job as well as could be done and that he was, while not indispensable, highly valued. The other was this: power over the lives of men, power to shape the destiny of civilizations.

The central government, as always, was concerned with large designs rather than details. Raleigh was the detail man. The president of the Secretariat knew his name and respected his reputation. The first secretary of state knew Raleigh well in an official capacity and had dined alone with him on occasion. The first secretary trusted his judgment to a greater degree than the judgment of younger, more energetic and perhaps more imaginative employees of higher rank. Thus, when Raleigh was on field assignment, he spoke not only with the voice of the first secretary but also with the voice of the President, which is to say, Raleigh, cast upon his own judgment, spoke with the authority of the Federation of the Star Systems—a not inconsiderable authority when compared with that of a single planetary government.

On planet-fall, which required

almost eight hours to keep G-loads on passenger shuttles below 1.2, Raleigh reviewed the official briefing documents. They contained details in excess of his requirements, yet he felt obligated to force himself to read them through for a second time—like a child studying the hour before a history examination, anxious to retain a wealth of trivia. It was expected of him to know these details if for no other reason than that they were unimportant and uninteresting. A man who knew them obviously knew much more.

But his thoughts did not follow his eyes. They concerned themselves with the character of Elanth's president, President Lyon S. Houston.

President Houston was informed that Raleigh had boarded the passenger shuttle. The long descent would be tiring, particularly to a man sixty-four who had probably rested badly the whole of the flight. The president, fifty-six, had already been awake for three hours—sleep leaving early and refusing to return, since five that morning. He was at his desk. "Can we cancel any of these?" he asked his appointment secretary.

"The Secretary of Agriculture has to see you at 10:30."

"Let him pass for a day. What's this man, Hanson?"

"He's one of Senator Farley's constituents."

"Send in his file, I'll have to see him. Any other really important ones? Let's see. Cancel Robertson: I know what he wants. Tell him I'll have something for him in about a week, and make a note for me to call him then. I suppose I'll have to attend the tea for Union Wives, but pass the word I want to cut it short. I'd say cancel the rest, unless I'm overlooking something."

When the appointment secretary had gone, the president looked at his desk clock: Hanson would be in at 9:30, give him five minutes, ten at the outside. The tea was at 2:00—twenty minutes there, say. This would allow him plenty of rest. He intended, from the first, to dominate the man eight years his senior; he would exhaust Raleigh, wear the man down physically the first two days, bring him to the point where he would be tractable on the matter of Coelanth guns.

The president removed the file on Raleigh from his desk drawer; a career man, but a good one. Shame there weren't more than two pages on him. An idle thought crossed his mind and was hastily suppressed; it was beneath the dignity of a president to hire call girls for visitors. Also, Raleigh was too important a man for that approach, and one of unknown predilections, so that the proper introduction of the subject, delicate under the best of circumstances, could not be undertaken without the possibility, and perhaps the

strong possibility of creating the opposite of the desired impression.

Nothing in the file but age gave the president a clue. He would make do with what he had. Yet, something about the file was definitely wrong. This annoyed him. Something was wrong with this file. He started to call in his private secretary and demand an explanation, but for what he could not say.

Let it pass. It would come to him. Back to Raleigh. The visit would be tiring for Raleigh, but it would be a physical ordeal for himself, too, and his body protested the prospect. Glancing at the mirror across the room for reassurance, he saw the heaviness at his eyes, the increased lines in his face. A man's insane, he told himself, without believing it, to take a job like this.

He remembered what was wrong with the file. "Damn it!" he said aloud. "Percy!" he snapped into the intercom. "Get in here! What do you mean by using this expensive stationery on these inter-office reports? You know damned well I'm trying to save money!"

Hanson came at the appointed time. He represented Farm Zone D, outside Lephong: the second colony city on the planet, two hundred land miles, roughly, from the capital, York. Lephong had two of the seven senators, neither of whom was favorable to the administration.

President Houston greeted him warmly by his first name and drew him physically to the chair before the president's desk. "Sit yourself, Larry. Care for a smoke? No? I quit, myself, filthy, expensive habit. Visitors have ruined more than one rug for me. It runs to an expense. I hate to see a good rug with a hole in it. Hate it. Completely unnecessary waste—which I oppose." The president seated himself on the corner of the desk, towering over the seated farm representative.

"I've only been able to squeeze in five minutes for you this morning. I'd like to explain the policy briefly, so we can have some common basis for discussion. See if you agree. I think first, we must remember this: Elanth is legally obligated to pay for the Simeryl. It's an intergovernment, not a commercial, transfer. It was synthesized especially for us. The very integrity of the government of Elanth rests on this point. No matter how the purchase came about in the first place, whether it was right or wrong, is not the question—we are obligated to pay. I'll grant you the minimum quantity order was high, but the government agreed to the terms. It's a legitimate debt, and we can't escape it."

"The main problem, as I see it," Hanson began.

"I'll just take another second or two," the president said. "I want us to agree on at least one thing: our legal obligation to pay for the

Simeryl. Now that we've agreed on that, the question becomes, simply, how? On this point, I welcome your advice. I think it can be fairly said that I have explored all the possible alternatives. There's no other known use for it. What would you suggest?"

"Bury the stuff somewhere," said Hanson.

"You know that's not practical," said the president. "I'm with you, Larry, I wish we could do that. There's nothing I, personally, would like more than to do that. It's just not practical." Glancing at the clock, the president said, "I'm afraid our time is up." Rising, he extended his hand and when Hanson took it, lifted him partly from the chair so that he had no alternative but to stand. The hand went to his shoulder to turn him toward the door.

"Now, you come back and see me anytime," he said. "I want you to think this thing through from my position. Look at it through the eyes of the man who has the final responsibility, not through the eyes of some critic who can afford to be irresponsible. Write it all down and send me a copy of your analysis. I promise I'll read it. I'll go further. If you can come up with a practical solution to this thing, by God, that's what we'll do, I promise you. I don't care how wild the idea is, if it's workable, we'll do it. I need more people like you, thinking about the problem. We'll come up

with something. Fundamentally, I'm not worried. Every day I wait for that perfect idea. Maybe you're the one to have it, Larry. Think it over. Write it down. Send it to me."

Hanson was at the door, then into the hall, then alone with the president's appointment secretary.

"How did it go?"

"I wanted to talk about my Labor problems, and *he* wants to talk about all that Simeryl he bought," said Hanson.

At 11:00, the president had the papers sent in. He liked to spend the hour before lunch with the press. The headline on the *York Times* read: GIANT COE-LANTH ATTACKS NATIVE VILLAGE.

He turned, as he had become accustomed to doing recently, to Jack Felton's report. Better get the bad news out of the way first.

Damn! Felton was still in Farm Zone C. I wish they'd get him out of there.

The president skipped the first half of the report. Experience taught him the meat of the report would be in the last few paragraphs. There were usually enough typographical errors in the first paragraphs to dissuade all but the hardest reader, and it was exasperating to wade through them. The president asked himself if that were intentional on the part of the paper. It was something to be grateful for, in any event.

The last two paragraphs read:

Farm Personnel Director Loisé has refused to disclose the number of Elanthians who have defected to the countryside. Officially, the excuse is that the figures, of themselves, are misleading. In the course of any month, the labor force is also supplemented by Elanthians coming from the countryside to the Farm Zone, but because of considerable seasonal variation, statistics for any given period are misleading. Loisé also told the *Times* in confidence that release of the figures at this time would tend to stimulate defections on the remaining two nonconsuming farms, thus doing irreparable damage to President Houston's policy.

To this reporter, Loisé begs the central question—which is the freedom of the press and the freedom of the public to have the full facts of the situation; These being essential to informed decisions. The question, properly put, is: Do the Citizens have the right to a full disclosure of the facts, no matter how unpleasant? I will address myself in greater detail to this question in my next report from Elanthian Barracks #17 in Farm Zone C.

The president turned to the editorial page. Why, he asked himself, couldn't they have cut those last two paragraphs? They always waste a lot of space on Felton.

On the editorial page, he found the expected support for his policy. Here was an interesting article by one of his favorite columnists. It presented documented evidence that Simeryl was only mildly addictive and that reports from Farm Zone A, the consuming farm, to the contrary were wildly exaggerated. The president made a note to phone Joseph as soon as possible and congratulate him for a fine column.

When they reached level flight, Raleigh roused himself to the self-admission that he was getting too old for such trips. The natural life expectancy of a man being between ninety and one hundred and ten, depending on genetic factors, he was two thirds through, give or take a few years. His energy was less, his powers of recuperation had slowed. But the mind—that was the important thing. It had a vitality of its own.

The steward came by with the *Evening Standard*, reproduced on the shuttle's facsimile machine, the print still glossy and fresh on the reusable polyolefin. Raleigh paid for a copy.

There were four other passengers, one of whom he had made the trip with from Coueril, the headquarters planet of the Federation. The three others had boarded the orbital station from *The Starfield*, making the ten-planet run. One was from Motherearth; the other two,

potential colonists apparently, were from the long-settled Hyperion and spoke with a peculiar accent.

Raleigh had conversed with the Motherearth woman. She was an article writer. She was working on a piece on the sex life of teen-age Elanthians. Sending someone all the way to Elanth to do an article on alien sex practices was characteristic of Motherearth. Motherearth, still the most populous of planets, was obsessed with sex as with all other aspects of population control. The spawning of colonies, the settling of planets, the generation of the galactic civilization were all, perhaps, no more than Motherearth's bland and futile response to the pressure of population.

The others did not interest Raleigh. The man from Coueril hoped to establish a new religion. Thought waves emanating from Elanth indicated the time was propitious. Less metaphysically, he had read reports about the increasing difficulties being experienced by Citizens on Elanth and attributed this to their failure to love the Machine Behind the Universe. The two Hyperions, man and wife, came with few possessions and probably less money to start life on a genuine frontier planet, where civilization had been established less than one hundred years ago, with no realization that the planet was in difficulty.

Raleigh turned to the *Evening Standard* and the black headline:

WOUNDED COELANTH
MAIMS CITIZEN

The details of this encounter holding no interest for him, Raleigh moved to the inner pages, passed the announcement of his own forthcoming arrival, to the story:

PRESIDENT AT UW TEA
HITS EXAGGERATION
OF LABOR PROBLEM
*Reassures Union Wives No
Draft Contemplated by Ad-
ministration*

This story he read in detail. After a brief glance at the editorials, he refolded the paper and sat with it until the steward passed, then returned it for erasure and storage.

II

President Houston arrived at the spacefield seven minutes before the passenger shuttle was scheduled to land. Tea with the Union wives was an hour and a half in the past, and he was still exhilarated by his triumph over the ladies. Prepared remarks out of the way, he overstayed his allotted time to assume the role of husband, struggling with the daily domestic problems at the side of his loyal wife; a touch of humor, broad, expressive gestures with hands going often to mold the face, pensive looks—an excellent performance. “What about prices, Mr. President?” a militant lady demanded. The impropriety of the

question on a social occasion brought shocked silence. He had not been unprepared, having told himself in advance that one of them, lacking respect for the Office, would be sure to ask that question. He was grateful not to be disappointed, and he gave them an extra five minutes; it was the cue he was waiting for.

There was another role to play: that of the father concerned by the irresponsible behavior of his children; he played it. “If you wives wouldn’t spend so much money right now, if you would practice a little selective buying, if you would just refuse to pay these high food prices, well, the middlemen would just have to shave their profits a little, and you wouldn’t have to ask the Government to stick its nose into things like this. My wife and I go through these things like the partners we are, and she tells me we’re going to have to make do with maybe some cheaper produce and stop buying these things that are too expensive. That’s the way it should be; we’re doing what we can, in our small way, to bring the prices into line, and if you will help us, I think the lady, Mrs. . . . yes, Hardling, thank you . . . Mrs. Hardling’s question, I think, will be answered. Don’t you, Mrs. Hardling?” And the confused and flattered lady consented enthusiastically.

When the passenger shuttle came screaming in from the west, the

president turned to the Mayor of York, at his side, to whom succession would pass in the event of Presidential inability. "This is your day," said the president. "I'll stay in the background." An ex-mayor, himself, the president appreciated Mayor Hurly's position: one of abject dependency on presidential favors, a water boy, a stalking horse, a puppet. The resentment that seethed in the mayor's breast, hidden from all, manifesting itself as pointless rages against family and associates, the president knew well. "I'll get him out," the president said. "Then you take over in front of the cameras." "Right, Chief!" said the mayor crisply, clutching his remarks, which had been prepared by the president's staff.

When the ramp came down, the president bounded up it. Within seconds he was inside the ship, where the steward was soothing the other passengers, forced to wait disembarkation until the dignity was disposed of. "Secretary Raleigh!" cried the president, grasping a hand and pumping it vigorously between both of his. "How pleased I am they sent you."

A moment later, the two of them were framed in the doorway at the top of the ramp, Raleigh seemingly reduced to helplessness by the president's arm over his shoulder, blinking into the bright lights. The TV cameras saw the president speak but did not catch the words:

"Your luggage is already at the hotel; the G-9 rocket came down six hours ago.

"We've got a few people to meet here," said the president as they descended the ramp. "I'd like you to meet my Secretary of Agriculture. Secretary Hayes, Secretary Raleigh."

Raleigh nodded to Secretary Hayes. "Mayor Hurly, Secretary Raleigh." The mayor touched Raleigh briefly with a sore hand, smiling. "There are some welcoming ceremonies, and we'll be right through them so you can get forty-five minutes rest for the banquet at six."

Raleigh calculated, amid the swirl and confusion around him, that perhaps sixty-five percent of the quarter million citizens of Elanth would be watching: 162,500 people—a not inconsiderable number, but as audiences on long settled planets went, small enough. A comparable audience on Motherearth would be nearly four billion. It was the best the planet could offer, and Raleigh enjoyed himself in the glare of publicity which would not be worth even ten seconds of time on Coueril.

After the mayor's speech, as they walked to the land car, Raleigh asked, "Why the Security Guards?" Half the side arms on the planet appeared to be present.

"We've got some nuts running loose," the president said. "We've got some serious problems, but our

main problem is a lot of ill-informed, well-meaning people stirring up trouble, and that sort of thing brings out the nuts. It's just a precaution." The president handed Raleigh into the car and entered after him. "O.K.," he said to the chauffeur.

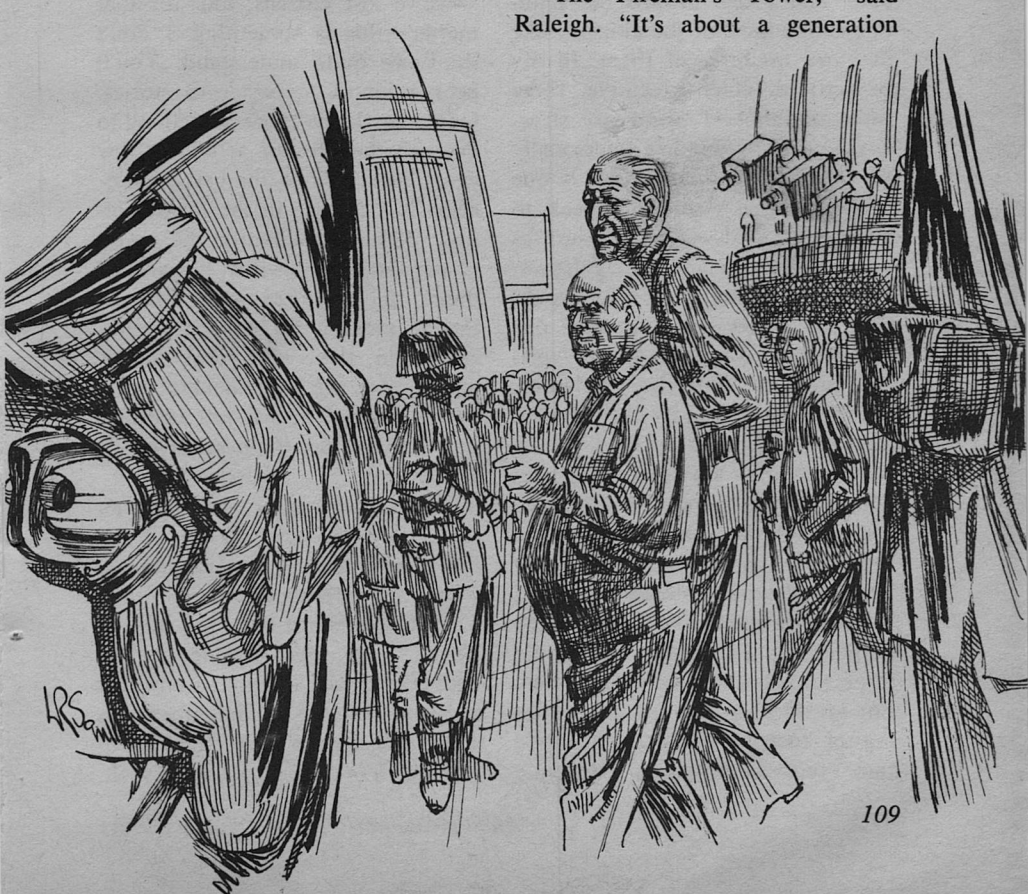
The car exited from the field and turned onto a broad highway. Few other cars were abroad, rush hour having passed. "This is the Minygo Highway," said the president, "de-

signed for an optimum York population of 750,000. We're still quite a way short of that."

"Built by the Elanthians for you," said Raleigh.

"Our engineers," said the president. "It's been down almost seventy-five years and damned little repair work needed. The whole city is planned like that. I should have had Hurly ride with us, but I thought we needed a few minutes alone to get acquainted. I'll point some things out to you. Up here—"

"The Fireman's Tower," said Raleigh. "It's about a generation



old, isn't it? Last of the Elanthian constructions? Really a lovely work, too. I think they put a lot of themselves into that one."

The president was silent for a moment. Somebody had done homework for Raleigh. Be circumspect!

"Yes, in the beginning, they were very helpful. The Elanthians are a surprising people when you get to know them; perhaps the only genuinely unselfish race in the Universe. I was born and raised here, and I feel toward the Elanthians like most of the citizens, like the vast majority of them. In my capacity as chief executive, there isn't anything—I want to stress *anything*—I wouldn't personally do for the Elanthians. This is one of the things I wanted to speak to you about, and maybe it's just as well to have it come up right now. As you may know, as you would certainly know if you read our newspapers, we have a very serious problem with the Coelanth. Hardly a week goes by but there's a reported attack of some kind by them—usually on the Elanthian villages in the boondocks. I want to go into this problem with you in detail."

"You have a biologist or two, I imagine, in either York University or Solley in Lephong, who should brief me on the Coelanth, then. I'm afraid I've just got a smattering of facts. I hadn't understood they represented any particular

menace. As little as twenty-five years ago, I understand, there was some concern lest they die out."

"You're likely to hear some things I wouldn't believe, if I were you," said the president. "You know how things get started. As a matter of fact, the outbreaks are comparatively recent. We've always known the Coelanth were potentially savage beasts; they're naturally carnivorous, with long, dreadful-looking teeth. As to what turned them against the Elanthians—we've lost citizens, too, for that matter—this is something I don't think we quite understand. You'll hear a lot of preposterous stories. One man claims it has something to do with the sunspot activity a few years back, I think the best explanation is a change in the local ecology, perhaps indirectly the result of our settlement, which has altered their feeding habits. Perhaps they're picking up some new substance in their diet that affects whatever is the equivalent of their adrenal gland. This is just one theory. Believe me, there are a lot of wilder ones."

"Do arrange a briefing for me, then," said Raleigh. "I'd also like to talk with some of the Elanthians. Can that be arranged?"

"I don't believe there are any in York," said the president. "Of course, this won't cause us any real problem. They're still helping us on the farms. I hadn't scheduled a trip outside York. But if you wish.

However, let's look over the schedule for the next couple of days, see if we can fit it in. I've made an extra copy for you." The president removed the papers from his inner pocket. They had a crisp parchment feel. Top quality, imported paper, expensive.

Raleigh was oblivious of the paper, itself. The printing on it held him, and he began slowly to read.

"If we had to," the president said, "we could eliminate the trip through our land car factory tomorrow, but then by the time we got back from the farm, it would be too late for the luncheon, and the invitations are sent out on it. There would be a lot of disappointed people. But we'll work something out." He was intensely occupied with the details, frowning, seeking alternatives, weighing choices as though they were the most weighty matters of State.

Raleigh folded the paper. "I'll keep this," he said. "But I'm afraid you must have thought me a much younger man. You better check the people that brief you; I'm sixty-four."

III

The president called in the Secretary of Agriculture the following morning.

"I'm going to have trouble with that Raleigh," he announced. "and I wish you wouldn't smoke. That's why I had the ash trays taken out.

I've had two cigarette burns in the rugs in the last month. Seven hundred and fifty dollars it's cost me."

Secretary Hayes looked around uncertain of how to dispose of the cigarette. He moistened a finger, dabbed at the glowing coal on the end, felt uncomfortable. Houston was going to take it out on him today. He cringed inwardly and hated himself for not speaking out.

"You saw him with the wife last night, at the banquet?" the president demanded. "Well, he was too smart for my wife, and that's going some. All he wanted to talk about was the farms. And he canceled the schedule out, for the next two days, like that! He's over at The Harrison, up in his suite, reading the papers this morning. I understand he's having back issues sent in. Damn that Felton! Can't we get the *Times* to do something about him? Next he'll be on the Coelanths, writing on them, out in the gook villages, reporting God knows what kind of irresponsible rumors. You can find somebody to say anything. And he'll report it, too, if he thinks it will hurt me. What is that man trying to do to me? He knows I'm doing the best I can in this job. Listen. I've had him in here—sitting right there where you are. I don't know what else I can do. And he still won't cooperate—"

Secretary Hayes dabbed again at the tip of the cigarette, tasting ashes from his forefinger. He had vis-

ions of limp paper splitting to spill the tobacco across his lap. He embraced the offending cigarette in a damp, concealing palm, where it seemed to melt to grainy coarseness.

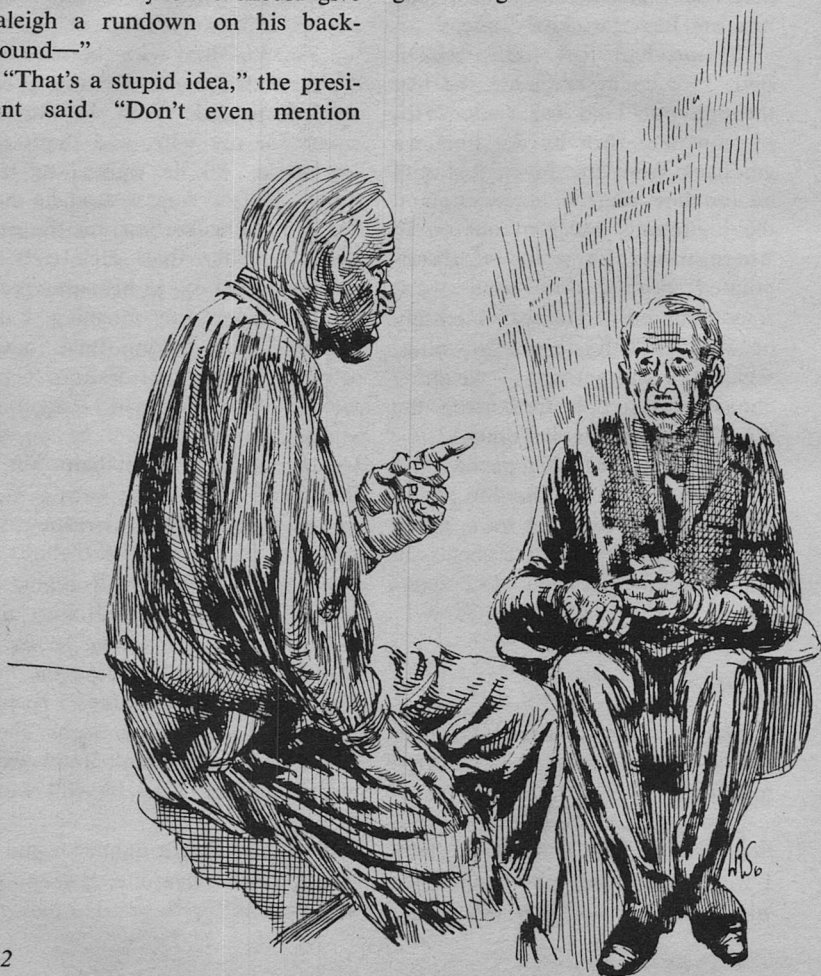
"Felton's a troublemaker," the secretary said. "No one pays any attention to him. They recognize the source. Maybe we should give Raleigh a rundown on his background—"

"That's a stupid idea," the president said. "Don't even mention

him to Raleigh. Hayes, your problem is, what do you plan to tell him about the farms?"

"Am I supposed to brief him?" The cigarette was crumbling.

"Are you supposed to brief him? Now, what purpose do you think I called you in for this morning? To make small talk? Somebody's got to get through to him. He wants to



talk about Coelanth with a biologist. Who can I send him? I don't trust Cavanaugh. Who else is there? Johnson? Who'll buy him as our best expert on the Coelanth? You better brief him; I've got to send somebody in there to look good."

"I'll get the staff right on it."

"You and that staff. Don't you ever do any of your own work, Hayes? What would happen to me if I depended on this idiot staff of mine? I can't even get them to turn the lights out at night; and they don't care two whoops in hell about phone bills—you should see how much they cost me in just phone bills, phoning everywhere on private business. How can I trust them with anything big? The only man around here I can count on is Rosy. If it weren't for him, the whole place would come to pieces. I should let him do that briefing, if I want it done right. How would that make you look? Damned bad, wouldn't it? What would you tell Mrs. Hayes? So don't talk to me about the staff. I want you to dig into this thing yourself—and I want a run-through with charts and everything at 2:30."

After the Secretary of Agriculture had made his exit, the president felt a twinge of remorse. Why had he humiliated the man? Not because it gave him a sense of power—that was ridiculous. He was already the most powerful man on the planet. The main reason was anger,

not at Hayes, who was a nice guy, but at the impossible frustrations of the job. Hayes must know this, too, to put up with it as long as he had. Hayes respected him and forgave him these outbursts.

I hate to do it, the president thought.

But damn it, beyond the emotional level, he had to see that things were done right. It was his responsibility to see that things were done right. Every mistake was his mistake, not some minor secretary's mistake. Those idiots didn't understand that. Well, by God, he'd pound it into them, he'd make them sweat, he'd make them work harder than they believed possible. The only way to get perfection was to insist on it.

And try to get good men; it was impossible. There were no good men. They were out somewhere making money. Try to get the good ones to work for you—just you try! Except for Rosy. All the rest, they might stay a month, two months, then in would come their letters of resignation—health, personal affairs, irresistible offers—those were the excuses they gave. In private, in confidence, they would tell you: We can't afford working for you; it doesn't pay enough money.

Money, that's all they thought of. So the Senate is prevailed upon to increase the appropriations for the staff. And it still isn't enough. So you wind up overpaying incompetents.

The president was well off, himself, by most standards: not rich, certainly. There were many richer people in York, even in Lephong. His wife had a good head for investments: land, small businesses. It was natural, a trait that ran in her family. One big mistake she had made, and he told her so when she made it, was in not buying the *York Times* when it was up for sale ten years ago. She could have got her father to underwrite it. If she'd have done what I told her then, I wouldn't have all this trouble with Felton today.

Hell, he thought. I, personally, don't know anything about money but its color. Many's the time we didn't know where the next meal was coming from when I was a kid. I suffered in college, too, when the kids with rich parents were taking girls out every night. I don't know anything about money, but I'm not wasteful. Some people even call me tight.

The following morning, Secretary Hayes presented himself at the appointed hour to brief Raleigh on the agricultural problems of Elanth. He had worked over the presentation until long after midnight, polishing it, committing statistics to memory. He was terrified that he would forget them. Secretary Hayes was no Rosy MacDonald when it came to this aspect of public relations. Important figures would leave him at the critical mo-

ment or come out garbled to prove exactly the opposite of what he intended to prove. This insecurity, coupled with loss of sleep, did nothing for the secretary's confidence. With him was an assistant carrying a chart board and briefing charts. In extreme necessity, the assistant would be ready to supply the missing figures that eluded the secretary's memory.

The two secretaries exchanged pleasantries while the board was set up and the charts installed.

"I'm very glad," said Hayes, "for the opportunity of this private briefing. It's a much better plan, this one of yours, than our own—which was to have a full staff presentation in the Agriculture Auditorium."

The assistant, having completed arrangements, stepped back and viewed the results. "Ready any time, Mr. Secretary," he said.

"I suppose he may as well go," said Raleigh.

The assistant, who was under orders to report the conversation in detail to President Houston, was reluctant to leave.

"You do have all the information yourself?" asked Raleigh. "I did ask for a private briefing; by that I meant, just you and I. To hit an informal note. I find there is less constraint when talks are held, not as diplomatic things, but just discussions between two interested people."

"Quite right," said Hayes.

"Please go, Reg. I'll let you know when we finish, so you can pick the charts up." Secretary Hayes's palms were moist already and he was filled with undefined fear and acute nervousness.

"You have a very responsible position in the government," said Raleigh when the assistant was at the door. "You have been on the presidential staff for some time, I take it."

"Since he was Mayor of York, sir," said Hayes.

"What sort of a fellow is he?"

"The president?" said Hayes. "One of the most exceptional people it has ever been my privilege to know. President Houston is a very complicated man, but a very fine man. He's made enemies, as most of us have; but he is solidly backed in the latest polls by almost seventy percent of the electorate. I think that proves the point right there. What little real opposition there is to him comes from Lephong, and it's politically motivated. You know how such things are, sir."

"I should say that seventy percent is an excellent popularity rating," said Raleigh. "By the way, would it be possible for me to see copies of these polls you spoke about? The types of questions asked, things like that. I take it you're referring to some private polls?"

"I didn't bring them with me this morning," said Hayes. "As a matter of fact, I haven't actually seen them

myself. He read us some excerpts at a recent cabinet meeting."

Raleigh settled back. "No reason I shouldn't see them, is there? You did bring the subject up. There wouldn't be any reason not to let me see them, would there?"

Hayes, trapped by the question, sought escape. What would the president say about releasing the polls? Hayes could see no harm in it, but God alone knew how Houston would react to the request. Suppose, in fact, there was actually something wrong with the polls, suppose they really didn't prove what the president said they had. Then they'd all be in a pretty pickle. Why had he ever brought that subject up in the first place? "I'm sure there wouldn't be any objection, sir. If you were to ask him for them—"

"Would you mind doing that for me?" Raleigh asked. "Next time you see him, which I imagine will be right after this briefing, just ask him to send them over to me."

"It's a little out of my own special field of responsibility," said Hayes, hedging as best he could. He was not anxious to bring the request to the president's attention.

"There isn't any reason why you shouldn't ask him, is there? You're a top member of his administration. Unless there's some reason I shouldn't see the polls—"

"Oh, I'm sure it's nothing like that."

"I can't imagine what it would be," finished Raleigh.

"We have nothing to hide," continued Hayes. He had got himself, inexplicably, deeper into a predicament with consequences that he was not sure he understood. "Everything we have, all you need to do is ask for it. I want to assure you of that, sir, of our complete, one hundred percent cooperation."

"I didn't mean to suggest that you would deliberately try to hide anything from me." Raleigh stood and went to the window. The silence lengthened. Raleigh now had Hayes sufficiently uncertain and uncomfortable to proceed with the interview. He had also learned that Hayes was afraid of Houston: a yes man, sent on an errand, as far removed from policy as the second moon. Well, now to tear him apart, politely, piece by piece. Without letting Hayes in on the secret of what was being done to him, of course. Find out what he really knows.

"I suppose the polls aren't important," Raleigh said after a minute. "Please go on with your briefing, Mr. Secretary. I'll listen quietly, maybe ask a question now and then. If I detect you're a little nervous, please don't be. This is just routine, to give me some insight into the overall economy. I'm not trying to trip you up or embarrass you. Please go on."

Secretary Hayes, shaken, went to the briefing charts. His mind was blank.

Raleigh, rather than seating himself, roamed the room. "I like to move about," he explained, "while I listen. I don't get much exercise. It won't bother you, will it? If it bothers you, just say so."

It was driving Hayes to distraction. "Do whatever you wish, sir," he said. "I'll just start in here. Chart I, as you can see, shows the increase in farm produce, selected farm produce, actually, for the past thirty years. You'll notice some plateaus and the little dip right here at the end." Raleigh was not looking. "Right here," Hayes said. "Well, we can explain this little dip by reference to Chart II, which concerns production of a typical zone, in this case, Farm Zone A." Hayes dropped the first briefing chart as he attempted to remove it. He bent to recover the chart from the carpet and murmured an apology: "Staff was supposed to have made these on flip cards—"

"Why don't we just ignore the charts?" said Raleigh. "I think you find them distracting. I know I do. Suppose we just sit here and talk."

The last thing in Elanth Hayes wanted was to be divorced from the reassuring security of the carefully prepared presentation and especially from the multitude of statistics on the charts. Without them, and without the assistant, he was entirely at a loss. Now he was being forced back on his own memory completely. "I'll get collected in just a minute, sir," he said.

"Please don't be nervous. I see nothing at all to be nervous about. Here, you just sit down here. Would you like a drink? No? Feel free to smoke if you wish. I see, from your fingers, you smoke a lot. I used to be a nervous smoker, myself, a few years ago. I finally gave it up." Raleigh maneuvered Hayes to a comfortable chair. "You just sit there. I'll sit over here."

For the next five minutes, Raleigh diverted the conversation into social channels. He talked about the trivia of his own daily life and solicited family details from Hayes. When the man was quite relaxed, Raleigh said casually:

"I've read that farm production, overall, is down some six percent. Farm Zone A is holding its own, or just about, whereas in the other three Zones, the decline is running to eight percent, or maybe a shade more. That's an almost ten percent drop, there, and I find it hard to see the reason for it."

"Once you take the seasonal factors into account," said Hayes, "it runs quite a bit less, sir."

"I was reading," said Raleigh, "in a column by a man named Fenton . . . Felton . . . some name like that, that the problem is becoming rather critical in Farm Zone C. As I understand it, the Elanthian volunteer workers are defecting at a quite high rate. That's something to be worried about, isn't it?"

"I wouldn't believe anything Jack

Felton writes," said Hayes. "That man is a notorious malcontent and the most unreliable reporter I have ever read. They shouldn't even let people like that be a reporter. That man hates the president. Hates him, literally and violently. And there's no reason for it at all. I wouldn't be at all surprised to find that that man is being paid to write what he does—paid by political opponents of the president. He should be investigated, and he just shouldn't be allowed to write those columns like he does."

"Oh? I'm very surprised to hear you say that. I just trustingly assumed, naïvely assumed, that because the *Times* printed him—well, I guess that just goes to show you that you can't believe anything. You don't suspect he has something on the management of the *Times*, do you? Maybe he knows where a skeleton is buried?"

"I wouldn't be at all surprised," said Hayes. "The president has often wondered why a paper like the *Times*, one of his most vigorous supporters, would run that man's column. You're probably right. I'll go along with that."

Raleigh was evidently pleased to have rooted out an unreliable source of information. "Then, of course, we can just ignore what Mr. Felton says. There really aren't any massive defections."

"As a matter of fact," said Hayes, growing more confident, "I prepared some of those charts over

there for the purpose of giving lie to that kind of rumor. I have all the statistical data which proves conclusively that the mass defections, so called, are nothing but a figment of spiteful imagination."

"I appreciate having that information, but I don't think we need waste our valuable time going into it further. I'm satisfied on this point. Let's turn to something else that's bothered me. It does seem to me you're beginning to get caught in some kind of a mild inflation."

The major point of the briefing having been so easily and yet so magnificently accomplished, Hayes felt elation: Felton's credibility was destroyed. I told the President we should meet the issue head-on and discredit the man.

"Inflation," said Hayes, "is a rather strong word, Mr. Secretary." He was glad to get agriculture out of the way entirely. The ordeal was nearing an end, was actually becoming enjoyable. "Prices on the index went up last month only about seven-tenths of one percent, less than a penny on the dollar. Selective factors accounted for it. We've had a long history of price stability, and this minor increase is no cause for concern. I can assure you, Mr. Secretary, Elanth is as stable as a rock, economically."

"I assume the seven-tenths of a percent includes not only increases in agricultural prices, but also increases in things like housing, office

equipment, machine tools, services, transportation—"

"Yes, sir. That's the total increase we're talking about, including everything."

"So," said Raleigh, "food prices have gone up, say, fifteen to twenty percent and the rest of the prices have stayed pretty steady."

Hayes sought desperately for some way to avoid that damning admission. He was instantly alert, perspiring. His hand went for a cigarette and while he lighted it, he practiced frantic thinking. "I don't have the latest breakdown, just the overall figures. Food prices have gone up a little bit, but I'm sure nothing like the figures you mention, nothing at all like that."

"Mrs. Hayes hasn't mentioned that things are more expensive in the stores—things like, oh, milk, eggs, meat, produce? Not a word to you, eh?"

Hayes was squirming uncomfortably. He could hardly lie on this point with professional ease; Mrs. Hayes had indeed discussed the food budget with him. Repeatedly.

"I think most housewives feel some adjustment is actually required," Secretary Hayes said. "Now there may be a few people who don't understand the situation, but the average consumer is a pretty intelligent person. The president gets a lot of letters from housewives on this point. And you would be surprised, yes, surprised, at the number of them who agree with his

policies and who come right out and say that they don't mind paying a penny or two more in the store, if that means they support his policies. It's not the problem, at all, that you're trying to read into it."

Raleigh walked over to the window and looked out on the city. "I'm sure it isn't the problem right now. Obviously, a minor concern all around. I was just trying to get a general feel for the economy. I'll take it up with the president, just to clarify my own thinking." He turned and returned to his chair. Secretary Hayes, having escaped, relaxed warily.

"It just seemed to me," Raleigh continued, "that labor people might, oh, make outrageous demands for wage increases just because of this little temporary adjustment—say if the price index went up another point or two. That would constitute a real inflationary threat, wouldn't it? Then you'd be in real trouble, wouldn't you? But this isn't your field. We were talking about the reasons for agriculture prices going up so sharply. Perhaps there have been a few Elanthian volunteers who just got tired of helping out and just quit. That would account for it, wouldn't it?"

"We do have a minor problem," Secretary Hayes admitted; an admission he had not really intended to make and which he feared he could not sell as being due solely to seasonal variations.

"As I understand it," said Ra-

leigh, "the Elanthians, when the first settlers arrived, really pitched in and helped you build both York and Lephong."

"You must understand," said Hayes, "that they are a very backward culture. They did, in fact, help us—they were a tremendous help, in fact. Of course, they have no engineering talent at all. You wouldn't expect that."

"You wouldn't?" asked Raleigh mildly.

"What I mean is, the culture is very primitive. They just aren't interested in things like that. They're perhaps a hundred thousand years behind us, culturally. Some people say they're actually decadent, and our archaeologists have found rather fantastic buried ruins, very old—But whatever it is, the Elanthians are a long, long way behind us now. So you wouldn't expect them to be much good with engineering and machinery. They did the manual labor. They did it, I think, really for the reason they always give, that they genuinely enjoyed helping us. Now, when the cities were built, our own labor people took over: running the machines, maintaining them. The Elanthians weren't interested at all in that aspect of it. But they still wanted to help us. So we let them help out on the farm—in non-skilled, stoop labor categories, as it were."

As Raleigh listened, he thought with satisfaction that once you

could get a man talking, all you needed to do was listen. He would talk on and on in hopes of forestalling embarrassing questions.

"This accounts," continued Hayes, "for the fact we've been slow to produce agricultural machinery. It's freed our factory personnel and our engineers and designers for the production of some of the amenities of life. I'm not saying, now, that the very short work week we've presently got, or the somewhat pampered labor force, which doesn't know what hard work means, is all to the good. Far from that. It would present us with a very serious problem if we'd have to draft some of those people for these long-hour, stoop-labor jobs. Of course, there's no thought of that. We've still plenty of Elanthian volunteers who like nothing better than to help us. It's almost a basic part of their psychology or their, I guess you might say, philosophy or their religion. And, of course, there is just nothing we wouldn't do for them in return. Absolutely nothing.

"I sometimes wish they weren't so self-sufficient; I sometimes wish there was something really important and worthwhile we could do for them. But they're stuck with their stone-age culture and they just don't seem to want to change. I'll admit, too, that we'd be in a pretty pickle to get in agricultural machinery after all these years. We'd have to import it. We're just not tooled

up for that kind of production and retooling would disrupt the whole economy. Importing it would be the only practical solution. But that would put an awful strain on our balance of payments, coming now on top of our other commitments—no, we'd be in a pretty pickle. So we are worried about this slight decline in the volunteer Elanthians, particularly in Farm Zone C, where we've been hit the hardest, so far. We keep our eye on the situation."

Raleigh nodded sympathetically. "I don't envy President Houston his job," he said.

"I don't really think many people appreciate what the president puts up with. He's a difficult man to work for, and he's short-tempered, and he can be really nasty, and a slave driver when he wants to be. But you learn to take it if you want to work for him. He's got the whole planet, the welfare of the whole planet, on his mind. We all take that into account."

"I'm sure you do," said Raleigh. "Now, about the defectors."

"We really don't like that term," said Hayes. "What has happened is this: For some reason, the Coelanth population has got out of hand recently. I frankly don't understand why this should be. These animals represent a real menace to the Elanthians, and a lot of the goo-goo . . . Elanthians are returning to their villages to help fight the Coelanth. Those animals are at the root of our whole farm problem."

Raleigh arose and extended his hand. "Secretary Hayes," he said, "I do want, so much, to thank you for your time. This has been an excellent and informative briefing. Perhaps even better than you now realize. I do hope I will see you again, socially, before my little tour here is over. Please give my best regards to your wife. She must be a lovely woman. How long did you say you'd been married? Twenty-three years. That must be some kind of a record—living with someone that long."

Secretary Hayes, pleased beyond measure in spite of a couple of bad moments, responded in kind. He concluded by saying, "I'll have my assistant come in and pick up these briefing charts we never got around to; I'll see he won't bother you. And I'll personally ask the president to send over the results of that poll I was telling you about."

Within half an hour, the Secretary of Agriculture was enthusing to the president:

"He's really the most wonderful man. I felt as if I really got to know him. He's levelheaded, no nonsense: nobody's going to fool him. He's out for the unvarnished facts. He's no rumor monger. Oh, did I do a job on him! I don't think I've ever made a better, or a more convincing, presentation. It was a good meeting. You should have been there. While we were talking, the question of your own popularity came up,

and I sold him on that point. Now, you remember that poll you were telling us about recently? He said he'd really like to have a copy of that for his files."

The president sat back in his chair. Possibly he'd misjudged Raleigh. Maybe he was getting too suspicious of people. Hayes wasn't the smartest man in the world, but he wasn't a complete fool, either. Obviously he felt Raleigh was really on the president's side; and he must have had some pretty strong objective evidence of that fact.

About the poll: certainly there would be no harm in sending that over. Hayes was clever to bring it up. Sixty-eight percent was damned good backing any way you want to cut it. Let's see: it would probably be a good idea to rephrase a few of the interview questions a little bit so they wouldn't seem to be quite so leading . . .

Actually, thought the president, things seem to be going much better than I hoped. Secretary Hayes wandered on verbally about his triumph.

IV

Raleigh had made no further appointments for the day. The president received reports that the third secretary had left The Harrison after lunch, presumably to look over the city unaccompanied and to strike up conversations with a random selection of citizens. This de-

velopment was not entirely to the president's liking. Raleigh, in all likelihood, would overhear a number of derogatory references to the Elanthians—the speech of the citizens being somewhat coarse and vulgar in this regard. It would be bound to create an unfavorable impression, difficult to counteract directly.

Still, it was nothing more than talk. It expressed less overt hostility than a kind of well-meaning, if crude, paternalism. Raleigh should be able to look beyond the words to the substance—if he were, indeed, as Hayes had found him to be.

Raleigh's schedule for tomorrow was open. He had politely rejected the itinerary proposed. Aside from the briefing by Hayes, he had requested nothing directly from the government in advance of the formal conference with the president scheduled for Friday, three days from now.

In view of the excellent impression the Secretary of Agriculture had created, it seemed difficult to imagine that Raleigh would reject the suggestion of a similar briefing tomorrow. And at that briefing, the president could employ his top man—sole figure in the Cabinet whose competence the president was unalterably convinced of—Secretary of Domestic Affairs, Rosy MacDonald.

MacDonald created an image in depth of efficiency and order. It was impossible to imagine him in a

position where he was not the total, cold, and unemotional master. The image was complete, from the ordered, almost computer-like mind, to his physical appearance. Nothing about him, not a hair on the head, not the tying of a shoelace, was out of character with this image.

The physical appearance of MacDonald fascinated President Houston. The president, after his morning shower and shave, dressed in whatever his wife laid out for him, and wore it all day. The battered hat, which was his trademark in politics—and of which he maintained a stock of an even two dozen, especially made for him—completed the process. MacDonald, on the other hand, had a manicurist on his staff and a personal barber who came at least twice a week. Before lunch, there would be a complete change of clothing, with appropriate items pressed with exact care and skill under supervision of his valet. MacDonald shaved again in the late afternoon, showered, and changed clothes. There would be another change later for dinner. This indicated no fixation on clothing, or cleanliness. It was merely a calculated part of the crisp image he always presented. The president had seen him, at a late night conference, appear to be as fresh and dynamic as at an early morning one.

The president bent to his intercom on the desk. "Get me Rosy," he said. The call was completed in less than thirty seconds; MacDonald's

staff, a finely tuned machine, operated efficiently to locate their boss.

"Yes, Mr. President?"

"Rosy, could you come over to the office for a little conference?"

"Right away, Mr. President."

As he waited, the president wondered what MacDonald had been doing and marveled that he was always available, twenty-four hours each day, never distracted by emergencies, always able to leave the operation of his own department to the staff, a collection of nameless, faceless people. The president fell to idle speculation about MacDonald's sex life. Was this conducted, too, with crisp efficiency?

Within five minutes he was there, appearing not yet to have sat down or otherwise ruffled by movement his gray summer suit. The tie was squarely in the center of his shirt, anchored there in some unseen manner against any possibility of movement from the vertical. The knot was tied with exquisite professionalism. The president made a mental note to have MacDonald teach him how to tie a tie some day.

"Sit down, Rosy. I'm glad you could come right on over. I'm not going to waste your time, I know how valuable it is. I'd like you to do me a little favor."

"Certainly, Mr. President."

The president imagined the mind at work. Steady gray eyes behind rimless glasses turned inward to review the catalog of jobs he was pre-

pared to undertake as part of his role as Secretary of Domestic Affairs.

"This morning Secretary Hayes gave Secretary Raleigh of the Federation an extremely successful briefing. This was requested by Raleigh; I could hardly have sent you, although I would have preferred to. In thinking it over, I thought perhaps you might find time to present a similar briefing tomorrow morning."

"What subject should the briefing be on?"

"We ought," the president said, "to bring out the true story on Simeryl for him; in case he's heard, oh, you know, rumors which have distorted the actual situation. You know the kind of vicious rumors I mean."

The secretary nodded crisply. "I think I see what you want. May I use the phone a moment?"

The president passed it over.

MacDonald got through to one of his faceless staff within fifteen seconds by the clock on the president's desk. "Sorry to have to interrupt your call," MacDonald said crisply. "I am at the president's office. I need some briefing material for a full scale presentation. Can you have the File No. 13-7-b sent out, please? I will expect it as soon as a messenger can get over here." He cradled the phone.

"Perhaps," he continued, almost without pause, "if I give you the briefing, Mr. President, you could

play the Devil's Advocate. That way, when we hit a really difficult question, I can pick up enough pointers from you on how to handle it that I'll be able to field it satisfactorily tomorrow." MacDonald's thin lips had not yet smiled. "Could you tell me something, while we wait, about the material Secretary Hayes covered, and the general approach he used, so I can tailor my remarks to what Secretary Raleigh already knows and present a united administration front?"

This was Rosy, thought the president. There probably was not a man alive who was a match for him. He was a machine, a computer. If Raleigh had been impressed by Hayes, he could not help but be overawed by the Secretary of Domestic Affairs. Rosy could walk into a cage of wild beasts and calmly reason them into domestication in the time it would take a normal man to collect his thoughts on an impromptu appeal for a charitable organization. It would be worth money to the president to be able to sit in on the briefing tomorrow.

MacDonald listened without comment as the president repeated what he had been told by Hayes. Occasionally he nodded to indicate understanding of a particularly subtle point. Otherwise, he was relaxed and motionless, listening for meanings below the surface of the words. It was said that MacDonald read Jack Felton in the *Times* so closely that he knew who had edited the

copy on any particular day by the types of spelling errors left in and knew, too, the exact number of drinks Felton had taken before writing it.

As the president watched, Secretary MacDonald smoothly and efficiently set up his own demonstration. The president prepared to enjoy the next sixty minutes. The breather from official business allowed him by Raleigh in canceling out the rigorous schedule was appreciated. He would be rested for the Friday conference, at which it would be completely essential to the continued well being of Elanth that two major decisions be favorably arrived at—the one, additional interstellar credit be advanced to Elanth; and the other, that weapons shipments be approved.

"I'll jab you from time to time," the president said heartily. "I'll give you a rougher time than Raleigh would ever dream of doing." Here, in the play atmosphere they were creating between them, the president could really let himself go without risk of offending the secretary. Both understood comments would be designed to test the ability of MacDonald to field difficult questions and would not express the president's true feelings toward his secretary.

MacDonald stepped back from the equipment. "I'll use both the briefing chart and some colored slides. I have prepared some slides

to illustrate various features of my formal presentation. First, however, it would be helpful to introduce some background on the relationship of the Elanthians to our total economy. As you know from Secretary Hayes's briefing yesterday, there are four Farm Zones on the planet. Two of these—here's a typical shot of farm activity—are satellites of Lephong; two, satellites of York. The current total farm population of citizens is approximately fifteen thousand, roughly divided equally between the four zones. Total acreage under cultivation varies from twenty thousand acres in Farm Zone A—here's an aerial view of that zone—to just less than nine thousand acres in Farm Zone B. A typical production from the various zones is indicated on this first chart. As you see, we consume, on the average, more than two hundred eighty head of cattle a day for a per capita average consumption of beef that is just slightly less than one half pound. Here we see the production figures for other meat animals, including the so-called island skew—which I might mention is not a highly regarded item of diet for most citizens except those from the Seven Planet Sector, of which it is native. Turning now to produce—"

The briefing, with statistics, continued for five more minutes—each new figure springing from MacDonald's tongue in mint-fresh, current condition.

The broad picture sketched in, MacDonald turned to the Elanthian volunteers. "Here we see an Elanthian farm barracks in Zone D. Each barrack accommodates approximately one hundred twenty Elanthians. There are four hundred and three such units at full or partial occupancy at the present time. This is the figure for all four zones. As you can see, farming on Elanth is a substantial enterprise, based in large measure on the nonautomated labor of the Elanthian volunteers.

"Several years ago, at the request of the Elanthians, we conducted biochemical research into the metabolism of the Coelanth with an aim to increasing the fertility of the animals, then—but not now unfortunately—apparently in some danger of extinction. One by-product, in fact the only useful research to come out of this, was a chemical subsequently named Simeryl, which proved ineffective with the Coelanth, but our chemists felt it might have interesting physiological properties as far as the Elanthians were concerned. A number of volunteers were given the material in carefully controlled experiments. As a result of these, it was found that the Simeryl, which, incidentally is highly toxic to the metabolism of citizens, produced a euphoric effect upon seventy-three percent of the Elanthians and a less pronounced, but subjectively pleasurable reaction in another twenty-five percent. No adverse side reactions were observed

by any of the experimental workers. Research quantities of the material were then synthesized at considerable cost and effort in view of the raw materials required, and further testing and experimentation were continued. This was done at the request of the Elanthian subjects themselves.

"The interest of the Government then was primarily to explore in greater detail the metabolic responses of the Elanthians to this synthetic alkaloid—in terms of effect upon various physiological factors including rate of respiration, pulse, gross motor activity, visual perception, et cetera. Out of the research grew the conviction, subsequently documented, that higher dosage rates of Simeryl acted not only as an anesthetic but also as a pain killer. This represented the first positive contribution the citizens of Elanth had been able to make to the Elanthians, themselves. Elanthians, as you know, are generally well satisfied with their own culture, such as it is, and are independent of the citizens. This latter is not surprising when you consider that they are completely acclimated to the planet and actually developed necessary accommodations to it well before our arrival. Obviously, with the discovery of Simeryl and in view of our heavy debt of gratitude to the Elanthians, we were under a moral obligation to insure continuity of supply of the material for medicinal purposes."

"I've heard that it is awfully addictive," said the president.

"I was going to come to that point in a moment," said MacDonald. "Now that you've brought it up, we should face it squarely right now before we go on with the briefing. That the material is psychologically addictive is probably true. Most will concede this, except for a few medical people. Whether or not there is physiological addiction, coupled with dependency and other characteristic symptoms, is a broader question and has not been resolved to everyone's satisfaction as yet. The question of addiction, *per se*, is secondary to the benefits we can demonstrate by the controlled use of the material for specific medical purposes. Nothing we know of can be said to be completely, one hundred per cent safe."

"I understand," said the president cheerfully, "that stupid people like you have succeeded in making a whole farm full of addicts."

"I won't attempt to say we couldn't have handled the whole affair rather better than we did. There were some mistakes made in the very beginning. Because of what must be termed side effects of the drug—small doses produce something equivalent to a mildly intoxicated state in the Elanthians—there was a somewhat larger demand for it than we originally anticipated. In response to this demand, the Government of Elanth, recognizing its moral obligation to

the Elanthians, obtained, with interstellar credit . . . you should realize the significance of this; we really went into debt, no questions asked . . . to get a quantity of Simeryl sufficient to insure that the Elanthians' nominal requirements could be met."

"I understand you ordered enough to keep the whole gook population hopped up for two generations," said the president.

"That's an exaggeration for effect," said MacDonald, undis-mayed. "The actual amount of material I have right here. Yes, this chart. Three hundred and forty-two thousand pounds. Here we have the estimated Elanthian population together with what we believe to be the average daily usage of the so-called addict. As you can see, we have nowhere near the quantity of Simeryl you have suggested. In buying the consignment originally, we had to take into account the most favorable terms, prices, and conditions. Of the seven suppliers which quoted at all on the material, only three could meet the required delivery schedule. By guaranteeing a production quantity of the drug—I understand its toxic nature posed special handling concerns—we were able to obtain the listed amount from supplier C at only a slightly increased cost over quotations for one fifth that quantity from suppliers A and B."

MacDonald paused to let the

point saturate his auditor's thoughts. "Now," he continued, "there is a great deal of ill-informed opinion on this particular aspect of the so-called Simeryl controversy. We can keep our thoughts straight on this matter if we do not just ignore the following three points: *Fact One.* Simeryl was developed with humanitarian motives and as a modest reward for the Elanthians who have immeasurably contributed to the development of this planet. *Fact Two.* Increasing supplies of Simeryl were made available at the request of the Elanthians themselves and at great cost to us. *Fact Three.* In view of the recent reports as to its addictive nature—if only psychological—the President of Elanth has ordered strict efforts to be applied to limit distribution of Simeryl to present users and to its use for legitimate medical purposes."

The president said: "The whole gook population of Zone A is supposed to be hooked."

"There is," admitted MacDonald, "a higher so-called addict ratio in Farm Zone A than in the other three zones. The other three have really cooperated with the president in keeping it down."

"I've not read this in print," said the president, "but I understand there are some people who say that nuts like you talked the president into dumping it into their water supply in Zone A."

MacDonald nodded sympatheti-

cally. "That's a rumor you sometimes hear. I think we can easily dismiss it—as, of course, we can dismiss the suggestion that it has been added to the Elanthian food. In the first place, the water supplies are used by both the citizens and the Elanthians. I have here a slide that illustrates the point. It shows Elanthians in Farm Zone C watching one of the citizens drink a cup of water from the common supply. As you can see, he would not dare do this if it contained the, to him, highly toxic Simeryl. About food: this is prepared and distributed solely by the Elanthians themselves, and they will not permit us to involve ourselves in the operation even if we were inclined to, which, of course, we are not. The user problem, to the extent that you can call it an actual problem, is largely confined to Farm Zone A, thanks in large part to our own efforts."

"I've also heard it said," said the president, "that Simeryl was introduced to counteract a decline in Elanthian volunteers. I guess, meaning, that a population of addicts could be prevailed on to continue working, even though they had basically lost interest in it. How do you answer that charge?"

"It's a difficult charge to refute directly," said MacDonald. "Against the background as I have outlined it, there is nothing to suggest that this is actually the case. One would expect, if it were true,

that the Elanthians would respond with massive defections, and, of course, that isn't the case at all. There are plenty of Elanthians on the so-called nonconsuming farms."

"You got them all in Farm Zone A before they knew what happened to them. Now you're holding that whole population as hostage."

"Again," said MacDonald, "A difficult charge to refute directly. Logically, however, it doesn't hold up. There is no possibility of the Elanthians in Farm Zone A doing the work required by all four zones. But if the charge were true, I would suggest that the Elanthians in the other zones would be forced to continue working for us whether or not they wanted to. And this we know not to be the case—as proved by the recent slight increase in returnees to the village. And this, of course, is definitely the result of the Coelanth problem and has no relationship, even indirectly, to the Simeryl question."

"What about the reports that you've tried to use addicts from Farm Zone A to hook other sections of the gook population? Some of these seem to be very reliable."

MacDonald for the first time smiled. "Well, I'd say that if that were in fact true, we haven't been very successful, have we? At the present rate of increase, it would take approximately eighty-nine years to addict the total Elanthian population. So, if that's what we really have in mind, I'd say we're

a failure at it. I'd say we're not very efficient at all or the Elanthians are much smarter than anybody gives them credit for. But more than that, the president has made very clear and unequivocal policy statements time and time again on this very point. It is not the policy of our government to increase consumption of Simeryl by the Elanthians—just the reverse, in fact. President Houston, time after time, has said our policy is to limit consumption of Simeryl to present users and never to sanction its use otherwise except under strict supervision and then only for sound medical reasons. I don't see how anything can possibly be clearer than that."

V

That evening the president personally entered his call to Secretary Raleigh. After introducing himself, he said, "Secretary Hayes tells me the briefing went rather well this morning."

"I was very impressed by it," said Raleigh. "I had a few questions in my mind that were most satisfactorily answered by Mr. Hayes. I do want to thank you for your cooperation."

"Anything we can do for you," assured the president. "I'm sending over the public opinion poll for your files first thing tomorrow."

Raleigh spoke again: "I'd like to talk to the biologist you promised

me, say in the morning? Then Thursday, if your staff could prevail on one of your labor leaders to give me a few minutes, I don't think I'll have to trouble you further. I'll have all I need for our little conference Friday."

"Well, Mr. Secretary," said the president, "whatever you wish, of course. I have made some tentative arrangements which I hope won't conflict with your own schedule. Our Secretary of Domestic Affairs would like very much to make an informal presentation on certain matters."

Raleigh said: "I appreciate your thoughtfulness, Mr. President. But I know we're both anxious to wind this up as quickly as we can. In view of the excellent job Secretary Hayes did, and the tightness of the schedule, and all, it would be very nice if I had the time. But I've got things pretty clear in my mind."

They chatted for a few minutes longer, and the president said good-bye, after one more futile effort to arrange the MacDonald briefing.

The president's disappointment was acute. MacDonald's careful preparation was for nothing. High expectations were dashed. Beyond that, the president felt he had somehow made a fool of himself, not only in front of Raleigh, but also in front of MacDonald, earlier. How could he apologize to Rosy? Why hadn't he set up the briefing *before* he had called Rosy in? Over-

confidence had betrayed him and he favored the room with an outburst of profanity.

And then to get a biologist. Raleigh had sprung the request on him at the last minute—or had merely let him know that he, Raleigh, had not forgotten the conversation in the car? Which? Damn!

How can you brief someone like Johnson, who doesn't know which end is up about anything?

Professor Johnson arrived at Secretary Raleigh's suite the following morning—the foremost authority on Coelanth. He was greeted warmly and offered breakfast coffee.

Over the coffee, Raleigh said, "It was kind of you to take the day off, Professor. I guess you've been given a little background on my visit? Briefly, certain requests have been made to the Federation by President Houston and they sent me out just to sort of check into things a little. Audit the books, you might say, since a substantial amount of interstellar credit is involved. It's a cut and dried routine procedure. I did want to ask a few questions on the Coelanth. I understand you're the planetary expert?"

"It's one of my specialties," said Johnson. "I do have some information on the subject. I've also made a considerable study of the planet's flora. Combining both subjects, I've given thirty-seven papers

in that general area. Coelanth, until recently, have been a sideline with most of the people at the University. Some work has been done specifically on them at Solley—that's the University of Lephong. Professor Cavanaugh, there, knows a bit on the animals. I reviewed the whole file after the president called last evening. I think I can answer your questions, unless, of course, you really want to get into detailed chemistry, or things like that." Johnson wondered how he would be able to get the conversation around to the native grasses, with particular emphasis on those varieties suitable for use as fodder.

"That's not the sort of thing I had in mind," said Raleigh, sipping coffee. "Whatever chemistry I had was forty years ago or more; we'll just talk generally. But I wonder if you'd do me a favor, Professor? I have to leave on Saturday if I want to catch the weekly ship out. I'm pressed for time, and I have a full schedule tomorrow and the next day. If you could find time to chauffeur me around today, we can chat as we go along and accomplish two things at once. I'd very much like to see one of the farms before I leave. I understand we can get out to Farm Zone B in about an hour by land car. Would it be possible for you to accompany me?"

An hour and a half later, they were approaching the outskirts of

the farm. During the drive, Raleigh had chatted pleasantly with the professor without touching on the Coelanth. Johnson was grateful for this and managed to work in several segments of his standard lectures on native plant forms.

They drew up to the gate of the farm. "I haven't been out here for years," Johnson said. "It's changed around a lot. There's a little city up here where the citizens handle the processing and packaging machinery." He drove through the gate. "Over here to the left you see a gang of the Elanthians. There are quite a few thousand of them, all told, on the farm. I'm afraid it's not a very efficient arrangement. But they also raise their own food, you know, and it works. God knows what we'd do without them."

"No danger of that," said Raleigh.

Johnson bobbed his head. "There was talk," he said, "at one time of the Elanthians all going back to the villages, but apparently they've decided to continue to help out. Strange people, the Elanthians. I suppose you know all about them? Ignorant brutes, but physically very strong and marvelously adapted to physical labor. Their helping us has something to do with their religion—the only civilized thing about them."

"I looked through a book on the Elanthians," said Raleigh.

"Not a recent one?" said the

professor. "We haven't published much on them recently. The Elanthians have become like the landscape, *he-he*. This is unfortunate, and I try to stimulate my classes to take a greater interest in them. I guess they feel it's all been done. There isn't much real academic interest in the subject. I've often thought there should be, but, when you come down to it, they fundamentally aren't very interesting. They are self-sufficient, they have a static, a very rigid, stone-age culture. And frankly, they're not too interested in changing."

The land car was approaching the farm city.

"Are those Elanthian barracks over there?" asked Raleigh. "Do you suppose we could just drive by one?"

"Certainly."

At the barracks, bright in the hot sunlight, Raleigh said, "Let's see if there's anyone inside."

The professor drew the car to a halt. "I guess it will be all right."

"I'm sure it will be," said Raleigh, getting out. "Let me just run in for a minute and look around. You want to come along or wait?"

"I'll sit here," Johnson said. The thought of confronting the Elanthians left him queasy. There was little contact between the two races except as citizen necessity dictated. For himself, he always felt nervous in their presence. He certainly wasn't the type for farm work.

"I'll be right back," said Raleigh.

Inside the barracks, it was cool and orderly with rows of bunks and lockers. There was a shower room and what appeared to be a recreation area. An Elanthian came from the darkness toward Raleigh, who was framed in the bright doorway. The Elanthian's face showed no emotion that Raleigh could read.

The Elanthian was short and powerful with hard muscles under orange skin flecked with green: probably mutated protective coloration inherited from a long forgotten racial ancestor.

"You . . . are . . . lost," said the Elanthian. His voice was musical, but, since he groped for words, the effect was discordant. In his own language he might sing the words and the music together giving both sense and emotional content. But without the smooth musical flow, the words were somehow divorced from real meaning. The Elanthian was both polite and disinterested.

Raleigh recognized that he would have difficulties with the interview. Could he actually get to understand the man, really understand him, in even a month of continuous conversation—or was the Elanthian forever too alien for his understanding?

"I am not a citizen of Elanth," he said.

"This . . . is . . . It is ob-obvious," said the Elanthian.

"May I ask you a few questions?"

"May I . . . prevent . . . stop . . . you?"

"You don't have to answer. Your religion, I believe, tells you to help the citizens. Beyond some point might this helpfulness not be harmful to the citizens?"

The Elanthian, expressionless, did not immediately answer. Perhaps he did not fully understand. "Our religion . . . is own. Is ours. Our religion is."

"I understand that."

"We Elanthians . . . are one Elanthian. All of us. This is . . . good . . . true . . . necessary? Your words . . . I am sorry . . . I speak not do. . . I do not speak? . . . You understand? Your words, I mean. A few I have . . . is all."

"Yes," Raleigh said. Perhaps he could bring the interview off after all. "There will come a time," he said, "when you must save yourselves . . . when you must save *yourself*, is this not necessary?"

"I do not understand," said the Elanthian, looking away. "I have work . . . it is . . . I must do this work . . . It waits, this work."

"You have killed a Coelanth?"

"Do not . . . We, I, do not do that thing. No."

"The Coelanth kills you."

The Elanthian struggled with his thoughts. He held out one hand, fingers bunched together to hold the idea. "It is not their . . . meaning? *Nature!* Nature. It is not their

nature. They . . . are not Coelanth. Were Coelanth, then, not . . . now."

"They have learned to kill," said Raleigh.

The Elanthian was visibly nervous. "No! No! I do not understand! They have not . . . learned. No! It could not . . . be that. Something . . . Something . . . We kill Coelanth, we learn to kill. Citizens ask us . . . want us . . . They want us . . . to kill animals, their animals . . . food animals . . . for them. I say no! No! Elanthians, I . . . must not learn to kill! Elanthians must not!" He stood erect, suddenly trembling with emotion. "I say we . . . We have . . . forgot. Yes, forgot, you understand? Not learn again. No! We . . . not learn again. You see. No talk . . . this way. Not with Elanthians. We never talk this. Never! Never! Lies! We never talk! Never! Never!"

"Thank you," said Raleigh. "I won't keep you from your work any longer."

Raleigh departed, leaving the powerful Elanthian, shaken with emotion, behind him in the cool darkness of the barrack. To Johnson at the car, he said, "Hope I wasn't too long? They sure keep neat barracks, don't they?"

"I've never been in one," Johnson confessed.

The following afternoon, the president and MacDonald sat in

the former's office waiting for Mr. Strickland.

"You talked to the professor, what do you think?" the president asked.

MacDonald's eyes were fixed on his carefully manicured hands. "I'm beginning to think Secretary Raleigh is probably about what he seems: an unimaginative bureaucrat going through the motions of conducting an investigation. Hayes pretty well sold him and now he's killing time, getting a little first-hand material for his final report. He's already made up his mind to go along. Otherwise, he'd be giving us trouble."

"That's what I figure," said the president. "I don't think I'm going to have any problems tomorrow. It looks locked up. I want you to sit in, though, if you will. It looks good, very good. But. Well . . . let's see what Strickland says. What gets me, what doesn't somehow ring true, is that he apparently didn't ask Johnson one damned question about the Coelanth. And why do you suppose he stopped in at the gook barracks?"

"He had," said MacDonald, "to check it out personally and be sure that the Elanthians weren't actually being mistreated. To someone off-planet, it must seem a little fantastic, the fact that their religion tells them to help us. He probably wanted to see for himself."

"Let's see what Strickland says—"

When Strickland, Chief Committeeman of the Transportation Workers, came in, the president stood and extended a hand. "Mr. Strickland, how good of you!"

Strickland seated himself, upon invitation, and nodded to MacDonald. He had just finished doing the president a favor; he expected one in return.

"Mr. President," he said, "I've taken the day away from pressing Union business to brief Secretary Raleigh for you."

"An act of highest patriotism, in the best interest of all the citizens of Elanth," said the president.

"The members know I'm in here talking to you," said Strickland. "I'm going to have to have some sort of an announcement when I leave. We ought to get that out of the way, work on that first."

MacDonald studied the man with firm, unwavering attention. "Mr. Strickland, the president very much appreciates your services. I do not look on it, however, as having served the man—rather, as having served the planet as a whole. In a very short time, as time is reckoned, the citizens' population has increased from three thousand original settlers to the present figure. We will live, you and I, to see a population of one million on the planet. In sixty years, it will be twice that; in one hundred years, there will be eight million citizens on Elanth. These are the people we're talking about now. We have

reached a critical juncture in our whole civilization here. If our interstellar credit, already heavily burdened by the Simeryl purchase, is wrecked by the Federation—if we cannot obtain additional commodities, in particular the necessary supply of weapons and ammunition, for control of the Coelanth—I don't think I need tell you what will happen to us. If we have to throw citizens into farm work, at this late date in our growth, our whole economy will be wrecked. There will be no more immigrants bringing interstellar credit. No one would want to come here. We'll be too busy feeding ourselves to export enough products to regain solvency from our present debt. Men and women, three and four generation citizens, will take their possessions, their money, and migrate to another frontier. The whole planetary civilization will be a shambles. And I don't need to tell you, Mr. Strickland, that that is by no means the worst that could happen to us. I think you know what I mean."

"What Rosy is saying," said the president, "is that we have some very serious problems. Unless Raleigh proves himself a reasonable man, sympathetic to our aims, I'm afraid we're not going to have the ten or fifteen years we desperately need to stabilize this economy and put it on a sound, businesslike, and predictable basis."

Mr. Strickland stood up and

turned his back on the two seated officials. He ran his hand through his hair and began to pace. "I don't need you to tell me these things," he said. "The credit is going to go through. It's got to. There's no point in thinking about what will happen if it doesn't go through. We're damned well going to need those guns, and you know it. We're dead . . . dead! . . . without them. I can't even consider that possibility. I have to take a practical view. Either you, Mr. President, slap on food rationing and roll these prices back, or my membership is going to demand, in no uncertain terms, that their wages go up. And there's nothing I can do about it. They'll tie the whole damned city of York in knots. Nothing will move. I'll have to go along with them. If I don't go along, they'll find someone who will, and I'll be on the outside of the Union looking in. These are the facts I'm talking about—the bread and butter facts of the here and now."

"Mr. Strickland, I need time right now, I desperately need time," said the president.

"Time's run out on me," Strickland said. "My membership is ready to move. We have an emergency meeting of the membership tomorrow night. I've got to have something more than promises for them. They can't eat promises. I've got to have some sort of firm commitment from the president."

"Please sit down, Mr. Strick-

land," MacDonald said. "We can work something out. I think the president would be willing, as a temporary, noninflationary measure, to allow an increase pegged to the cost of living index."

"My people," Strickland said, "are worried about food prices. Do you know, or do you care, that thirty-seven percent of the average Transportation Worker's weekly budget goes to the purchase of food? Food's up twenty percent: *their* cost of living is up seven percent."

"Well," said the president, "You don't have to tell them that! Now, damn it, you know, Strickland, and I know you know, that you can sell the package Rosy proposed. You've got me in a bind, but I've got to have a little cooperation from you. You're trying to pull down the whole economy. What do you hope to gain from that?"

Strickland stopped pacing and turned. "What if I do sell that package? I'm sticking out my own neck. You don't know the mood of my members."

"You sell it," the president said. "I'll guarantee . . . and my word is good, you know that . . . I'll guarantee to slap on controls, with the necessary roll-back, if the announcement of new interstellar credit doesn't, of its own accord, put the break on. But I can't, just now. I don't want Raleigh to learn what a real bind we're in. How's that?"

Strickland considered for perhaps ten seconds. "All right. I'll try to sell the package." He returned to his seat.

"How deeply did Raleigh go into these matters with you?" asked MacDonald.

"That's the funny part," said Strickland. "He's one of the nicest guys I've ever met. Hell, he wasn't interested in the economy. I don't think he even said ten words about it. We chatted for maybe a couple of hours, socially, like, about family, kids—that sort of thing. The only thing he asked me about that's remotely connected with his mission here was the Coelanth's."

"Coelanth's?" said MacDonald.

"He asked me if I'd heard that we had found some sort of fertility drug, while we were developing the Simeryl, that worked on them to make them multiply to the point where their normal food supply was no longer enough for them, so that they've now turned hungry, mean, and wild."

"What did you tell him?" asked the president, leaning forward intently.

"I told him hell yes, I'd heard it. All lies spread by a few warped malcontents. I told him we have a lot of nuts running around loose trying to undermine our whole society with lies like that, and worse; and that people like that should be taken out and shot. He was glad to have me clear that point up for him."

Friday morning, after a very poor night's sleep, the president prepared himself for the forthcoming conference. He examined his collection of hats, selecting one carefully, and descended to breakfast. MacDonald came, punctually to the minute, as the president poured himself a cup of coffee. "I've cut cream out," he explained to the secretary, "to economize a little. You don't mind milk?"

"Use it all the time," said MacDonald. "Helps keep the weight down, too."

The two ate.

At issue, in the conversation, was whether or not protocol would dictate that MacDonald accompany the president to pick up Secretary Raleigh, or whether he should be introduced upon return from The Harrison.

"I'd rather you come along, Rosy." The president knew MacDonald would save him from possible mistakes. And if MacDonald were present from the start, it would be difficult for Raleigh to reject him.

"Won't it look rather unusual, us calling together to pick him up?"

"He hasn't met you yet," said the president. "I think it would be a nice touch, for you to come along. I want to be sure, too, that you're in on it all the way."

MacDonald shrugged up his sleeve to expose the watch. "If

your security people are ready, I guess we ought to go then."

As they were riding in the car to The Harrison, the president asked, "Rosy, one of my people reports that someone from your department shot a Coelanth yesterday. I'm not trying to check up or anything, I just accidentally got the report. I hope that's not true. We can't afford to waste ammunition."

"It took only one shot, Mr. President. I had one of my best men on the gun. Our last requisition, if you remember, claimed an expenditure of two hundred and four rounds of ammunition on Coelanth. If they accept that figure, we'll have"—his voice dropped to a whisper—"two thousand seventy-three rounds off the books."

"I hoped it was more," said the president. "It was almost eighteen hundred a month ago."

"They audit us too carefully. I'm afraid to try for more. I tried to get a replacement on a single gun; I had to send in the damaged article. The Federation doesn't kid around on arms control."

The president said, "If they found out about the ammunition off the books, I'm afraid they'd at least slap a total blockade on us. We sure can't afford anything like that right now. Are you absolutely sure we're safe? That's the one thing that really worries me, gives me fits at night. If Raleigh found out about that, things could blow up in all our faces."

"That's why I had the Coelanth shot yesterday. I wanted to have a film for you, with a dummy track that carries the sound of eight shots being fired. I screened it last night at midnight, and I didn't like the cutting. It looked phony. They reprocessed it for me and this morning it looked better, but I think a practiced eye might still spot the sound dubbing. We can't afford to take a chance on something like that. I have my best man on it. If he can get it down to the point where it looks *right*, all around, I'll be able to screen it for Raleigh this afternoon. I didn't want to get your hopes up until I was sure I could deliver."

"Very good, Rosy. Very good indeed."

An hour later, the three men occupied the Gold Conference Room of the Presidential Mansion. Coffee was sent for. They were seated around a huge, polished table, both the president and MacDonald with stacks of documents.

"I'm very impressed by what I've heard so far," Raleigh said. "It has made quite an impression on me. The State dinner will be at eight, tonight? If we hold the lunch break down, we can clean up business well before that, I'm sure. I think there are really two matters before us. The first is the Simeryl debt and the requested additional credits. We can handle this as one matter."

"That's fine," said the president. "It's the equivalent of three hundred million dollars, I believe. Is that not correct, Secretary MacDonald?"

"Yes, sir," said MacDonald. "That would be the total requested figure. Of which, including transportation fees and research costs, the Simeryl debt stands at exactly one hundred nineteen million, three hundred thousand. That doesn't take into account interest, the loan being interest only for the first twenty years. It's a standard Area Development Loan in that respect."

"The total amount, then, is about twelve hundred dollars per capita?"

"On maturity," said MacDonald. "When we negotiate principal repayment terms, the total amount will probably be less than six hundred dollars per capita, depending, of course, somewhat on how effective the immigration policy is. A figure that's quite manageable."

"I don't think that it should really overextend you. Now, I should wish to make my own position clear. As you know, I am merely a third secretary. From this, you can see what kind of weight my own recommendations will carry."

"I'm sure they will count very heavily, if not decisively," said the president.

Secretary Raleigh massaged the bridge of his nose, shutting his eyes tightly a second. He shook his head. "Forgive me. I seem to have

a little headache this morning. You have to do a lot of reading on a job like this. It's a little eyestrain."

Standing, MacDonald said, "Let me hurry them up with the coffee. Can I get you a pill for the headache?"

"That won't be necessary; I have something. I'll take it with the coffee."

MacDonald departed.

"My most efficient man," the president said.

"I'm genuinely sorry I had to cancel his briefing," said Raleigh. "I can see he's a very good man; you should do all you can to keep him. Well, back to the credit matter. Let us suppose that my superiors want to make the loan but they feel the additional, let's see, one hundred eighty million seven hundred thousand dollars is stretching you a bit thin. Particularly if you have to come back to us in the next few years. Candidly, now, how much can you shave it when you sharpen your pencil? This is a question I have to be prepared to answer, if they give the loan the go-ahead. I don't want to say they won't necessarily go the full amount. It's merely an outside contingency I have to cover. You understand that?"

The president said, "I have a detailed breakdown. It's a rather thick volume."

"You may find this hard to believe," Raleigh said, "but these little details are a part of the job I

really enjoy. I got my start as an accountant, which may explain it. I'd like a copy of this breakdown; if you could send it over tonight. Meanwhile, let's go over all the figures, just so I can dot the *i*'s and cross the *t*'s. You can never be absolutely sure what your superiors will decide, and you have to be prepared for all sorts of questions, whether they actually come up or not."

"I can see you are a very efficient man," said the president.

"I've been around government quite a few years," said Raleigh.

"Well. If you ever are looking for a job," said the president, "be sure to keep us in mind. I think we could find a very responsible job for a man like you."

MacDonald returned with the coffee. His solicitous inquiry was met with reassurance: "The headache's about gone, now. I'll hold off on the pill. I don't like to use medication unless I need it."

The three men, until lunch, dissected the figures for the loan.

After lunch, discussion turned to the request for weapons.

Raleigh sat back, folded his hands across his stomach in appreciation of the meal. "This gets us into a little different matter, now. One, frankly, which is not quite as straightforward as it might be. The Federation takes its responsibility on arms control very seriously, and there're quite a few

million in your proposal for buying these things from us on Coueril. This may require some pretty convincing documentation. Let's see if we can get it. As I understand, these additional weapons and ammunition are required for Coelanth control. Secretary MacDonald, do you have figures on the Coelanth population and on the percentage increase in that population for the last few years? Professor Johnson didn't seem to have them with him' yesterday. Have you considered alternate control methods?"

"I have some figures," said the Secretary of Domestic Affairs. "I'm not entirely sure they are completely accurate, but they are accurate enough to be quite alarming. As to alternate methods, my people tell me they present unusual difficulties. The basic ecology prevents us from using the so-called biological controls. It would be too damaging to the Elanthians, who fundamentally coexist with the Coelanth. Now, there's always an outside possibility our people have overlooked something, but the way we've been working on the problem, I honestly don't think so."

Raleigh leaned forward, placing his hands on the table. So far he had taken no notes. "Well, let's see what you have to give me."

For the next two hours, Secretary MacDonald and Secretary Raleigh went into details on the Coelanth. The president, largely ignored, offered an occasional

comment in support of his secretary. As always, he was astounded at the wealth of facts and statistics that came from the computerlike mind of MacDonald. No objection by Raleigh went unanswered.

At the conclusion, MacDonald said, "With your permission, sir, we have prepared a film especially for you of a typical Coelanth hunt. It's only just under twelve minutes long. I think you'll get a much better feel for the problem if you actually see what sort of savage beasts we're up against."

"I think that's an excellent suggestion," said Raleigh.

The film showed a Coelanth from a distance, looking up toward the camera. Its mouth opened to expose rows of blue teeth. The sound of the Coelanth came from the track. A close-up put the viewer virtually into the opened mouth. The front teeth, needle-sharp, gleamed dully; the back teeth, for crushing and grinding, contained food particles. The camera held. Then: a few frames of blackness, flickering, and the camera was looking down into the wilderness of northern Eland.

"Elanthians and Coelanth," said MacDonald, "live in this forest area. All the other land masses, islands, really, have less developed fauna. Notice how dense the vegetation is. You will see occasional movement, and we'll show you several herds of animals."

Looking down into the multi-colored reality of the jungle, the camera showed the great beasts ranging in their natural habitat. But for the absence of wings, the Coelanth generally resembled the mythical dragons of Motherearth. Many were from thirty to forty feet long. The camera caught a single herd which contained perhaps twenty of the animals. Flickering blackness came again.

"Here's a kill," said MacDonald.

The camera was at ground level, peering into the grasslands. The Coelanth, having scented human presence, came forward. It was still at a distance, when a rifle barrel bounced, close up. Snap! came the sound. The Coelanth came on, gaining speed for the charge. Its sounds of anger came to the screen. Snap! Snap! Snap! three off-camera shots. The Coelanth hesitated, throwing its head about, as if sensing new danger.

"One of those shots," MacDonald said, "gave him something to think about."

The camera went to a close-up of the Coelanth's feet. The feet were in motion. Snap! Snap! The feet stumbled. The film jumped to the rifleman, standing from a crouch. A smile came to his face.

"They slowed him down," said MacDonald, "but he came back."

Patterns of blackness on the screen. The Coelanth, nearer now, was snarling, trampling grass, eyes blazing fury.

"Hard to drop them," said MacDonald.

A wide view, now: showing both the Coelanth and the rifleman. Snap! went the rifle. The Coelanth stumbled, staggered, and sprawled forward. The camera caught the fall in a close-up, the huge animal plunging heavily into the ground. Snap! went the sound track for the final shot. The Coelanth lay writhing.

"Eight shots," said the president. "How many hits?"

"Five," said MacDonald.

The Coelanth was still. The projector clicked off.

"Good film," said Raleigh. "Very, very good coverage. You must have had at least five cameras in on the charge sequence." He arose and glanced at his watch. "We've been at it for some six and a half hours pretty steadily. I've about had it. How about you gentlemen? Have we overlooked anything? I think most everything got covered pretty well."

"It's been a very rewarding meeting for me," said MacDonald. "For our part, I hope we've answered all your questions." Standing, he began to put the papers before him in order.

The president, still seated, felt an opportunity was passing beyond recall. Words which would serve to clinch decisions had somehow remained unsaid. Surely there must be something more than this? He,

too, stood. More needed to be said.

"How does it look to you, over all?" the president asked. "I don't think we're being unreasonable, are we? What're our chances?"

Raleigh turned to the president, smiling. "I'm just the third secretary. All I can do is file my report, make my recommendations. You never know for sure what action will be taken. Experience has taught me not to try to commit the Federation in the field. You'll be hearing in about two weeks, after my superiors have had a chance to go over everything with me. That's all I can tell you right now."

"We're not being unreasonable?" the president asked again. "Everything seems O.K. to you?"

Raleigh, still smiling, said, "I was very impressed by the complete details you provided me today to document your requests; very impressed, indeed. I don't think I can really say anything more than that at this time."

The president saw MacDonald, over Raleigh's shoulder, make an O-sign with thumb and forefinger—symbol of confident victory.

Tension departed. The president's face relaxed into a smile. Everything was going to be all right. He wanted to laugh for joy and relief.

"It has certainly been nice knowing you, Secretary Raleigh," said the president. "I'd like to give you a little token, a little memo, of your trip here." His hand went to the

battered hat on the table. "I'd like to give you this hat here, this hat of mine, as a memento of your stay here. Something to remind you of Elanth."

Secretary Raleigh looked toward the hat. "I would very much appreciate having the hat," he said.

The president beamed. "I hoped you would accept it. I wanted to give it to you today, rather than at the field tomorrow, so we could get it packed for shipment. I'll see it's all packed up nice and that it makes your flight tomorrow."

"Very considerate of you, very thoughtful," said Raleigh, still smiling, looking at his watch.

MacDonald said, "I'll have the car sent right around."

"No sense in bothering your Security Guards, Mr. President," said Raleigh. "Just have your chauffeur drop me off."

"I wouldn't think of not riding over with you," said the president, dropping a huge hand over Raleigh's shoulder. "Now you remember, for sure now, we can always make a good job in this administration for a man like you. I'm serious. If you ever think of giving up your present job, I want you to promise me we'll have first chance at you."

VII

Saturday, after takeoff, Raleigh relaxed for the first time in a week. Fatigue sat heavily upon his body,

reminding him again that he was no longer young. His stay on Elanth had constituted a physical ordeal of some dimension. He had read omnivorously and wished now never to see another book, magazine, or newspaper. This would, of course, pass.

Thoughts turned to his wife. She would be glad he had held his self-imposed schedule. Ten days out, this time. He could have let her come along. You never know, though, on these assignments. Next time.

He closed his eyes. It was good to settle back, rest. Glad the ceremony at the field was over. It seemed to go on forever. He must have looked like a fool, smiling, accepting that damned hat for the second time. Houston must have quite a supply of them: the one packed with the luggage. The one at the field—what happened to it? There was one on Houston's head. He probably gave one to MacDonald at some time or other. That would be worth seeing, worth having a photograph of, MacDonald in one of Houston's hats.

The whole experience was melting away into memory and perspective. It was strange to think of them: Houston, Hayes, MacDonald, Johnson, Strickland, going about their business still. They were changing, always changing, as people everywhere are always changing, for better or for worse. Yet, to Raleigh, all of them were

tacked in memory as they once were, cut-out figures on the bulletin board of his mind—motionless and devoid of life.

And that damned formal statement, jointly issued. Houston's draft, sprung on him at the banquet, had been totally unacceptable. Until two o'clock this morning, I stayed up working on that damned thing; then on the way to the field, practically arguing with MacDonald on some of the words. Imagine being trapped in a Christian Hell with MacDonald: the two of us debating three short paragraphs for eternity as if the words really mattered a damn.

Words. How to handle the report? Couple of days to knock it out. Recommendations are written in my head. Now, to document them. Used to have to go into details, details, details, until everything got washed out of perspective and lost: now, a twenty, twenty-five page summary, and they won't even read that. Will anybody actually read the report at all? Or is everything simply decided over lunch?

Back on Coueril, the first secretary was not immediately available. The appointment—a luncheon appointment, as Raleigh had expected—was set up for the third day. The report was in rough draft.

Over cocktails, Raleigh said, "Anything important happen while I was gone?"

"The petition from the Reiwelie has come up again. Nobody can seem to quite make up his mind. I honestly don't know what to do about it myself. And to top it off, of course, half the file seems either to be lost or misplaced. How was it on Elanth, though? Did you have a good trip?"

"The food seems to have improved on the Culter Lines. I had one of their ships going out. Coming in, it was *Stellar Queen 27*. The food on it was just as bad as I remembered it. On the way out, I was saddled with a religious nut from here. I've had better trips."

"Situation on Elanth about what we expected?" asked the first secretary.

"Considerably worse. I won't bore you with all the details." Raleigh sipped his cocktail. "The Elanthians, those are the helpful indigenous population, the ones we found so puzzling, are probably about ready to revolt. If they do, I'm reasonably sure they'll wipe out all the citizens. Fortunately, this is not our concern. No question at all that we couldn't possibly approve the weapons requisition. They definitely want them in case the Elanthians do revolt."

"Obviously then," said the first secretary, "we can't let them have the weapons. And if there is going to be a revolt, somebody will catch hell for approving the purchase of that drug—"

"Simeryl," Raleigh supplied.

"Simeryl. They'll never be able to pay for that."

"You may as well write that off to experience—revolt or no revolt. Their economy is going to blow up in their face. That's one hundred nineteen million three hundred thousand dollars up the tubes."

"Win one, lose one," said the first secretary. "I'll tell Rothman we'll have to turn the whole package down, then. Is there anything constructive we can do?"

"I'm going to cost us some money here," Raleigh said, toying with his remaining drink. "I hate to come back and recommend we spend money on a lost cause, as far as the Federation is concerned, but that's what I've got to do in this case."

The first secretary looked up from his drink, a combination of surprise and displeasure on his face. These emotions passed. He relaxed again. "O.K., John, let's have the bad news. How much is it going to cost us?"

"I have no idea," said Raleigh. "There's a rather large group of Elanthians they've addicted to Simeryl. I don't see how we can escape at least the moral responsibility for that. We're going to need something that reverses that addiction."

"That kind of research is expensive."

"Money's got to be spent," said Raleigh. "I want to see us drop the counter-drug in there at the first possible moment. That will be a job

for Tenth Corps. Better let an R&D contract the sooner the better. I'd say, since this is pressing, commit us to a synthesis contract to the same firm, right from the beginning. Let's not bargain hunt."

"Well," said the first secretary, "If it's got to be done, it's got to be. That's that. Thanks a lot, John . . . Better give me some documentation to look over, in case I need it, just so I can sell Rothman on it."

"My report's in rough draft. It'll be about twenty minutes reading. I'll get it over to you day after tomorrow."

The first secretary picked up the menu. "Special's good today. Tell me, John, what fundamentally seems to have gone wrong out there with the settlers?"

Raleigh finished his drink. "They bumped into a superior culture in the Elanthians and this gave them a horrible inferiority complex. It just permeates their whole society today, it just infects everything." Raleigh picked up the menu and studied it. "The special, you say? I don't care much for skew, unless it's fixed just right. I think I'll try the steak; that's usually pretty good."

"I eat so damned many steaks," said the first secretary.

"You people with inside jobs," said Raleigh. "A pretty soft life." He put the menu down. "About the citizens of Elanth," he said, "I'd say as high as seventy per cent of them, and maybe more, are certifiably insane." ■



Leo Summers

Under the Dragon's Tail

PHILIP LATHAM

*Ever wish "They" would just
leave you alone, so you could get things
straightened out? Wish for it long enough,
wish for it strong enough . . .
and you'll start seeing the constellations too!*

All that hot Tuesday morning on the way over to the planetarium Gil Hubbard had been hoping that for once—just once—there might be something interesting waiting for him in his mailbox. But when he arrived there was only the same old junk: some advertisements, a couple of fan letters, and the usual crank stuff. He was perusing a folder offering him an exceptional opportunity to invest in a burial plot in Rolling Meadows, when the planetarium's one and only secretary came rushing from her office.

"Something the matter, Clara?" he inquired.

"Oh, Dr. Hubbard, the Axholme man is coming!"

The Grand Inquisitor has arrived!

Jack Ketch is on the phone!

Attila the Hun is parked outside!

Axholme Associates was the seemingly innocent title of a powerful efficiency organization which the county had hired at great expense in an effort to reduce expenses. Department heads trembled, assistant department heads grew ghastly wan and weak, at sound of those dread words "The Ax Man is coming!"

Gil, caught off guard, was unable to conceal his dismay.

"Did he say when?"

"I only talked to some girl. She wanted to know if one o'clock Thursday would be convenient."

"Would it be convenient?" Gil laughed. He felt like Shakespeare's Barnardine in "Measure for Meas-

ure" who found it inconvenient to have his head cut off.

"Tell her Thursday at one will be fine. Tell her we'll be counting the hours."

He tried to get away to his office but escape was not so easy.

"This woman wants you to call her," Clara said, handing him a pink memo slip.

Gil took it without enthusiasm and headed for his office. He had been left in charge while the Director was away on vacation, which meant everybody was coming to him with their troubles, as if he didn't have enough of his own.

The building when empty had all the cozy atmosphere of a mausoleum. Your footsteps went echoing down its marble halls. Shadowy niches housed exhibits that at the touch of a button sprang to life like animated corpses. Directly opposite Gil's office was the Cosmochron, Clock of the Ages, which depicted successive stages in the history of the Earth, with a commentary by the voice of a lecturer who had died some ten years ago. Once the Cosmochron had got stalled on the anthropoid apes, and for ten minutes continued insisting ". . . the gorilla is really a peaceful animal, subsisting largely upon a diet of wild celery and bananas . . . the gorilla is really . . ." But the building was closed now and the voice of the Cosmochron mercifully hushed.

Gil glanced hurriedly through his

mail. Most of the letters he knew by heart from long experience:

June 7, 1968

Dear Professor Hubbard:

Herewith please find enclosed full account of my Heliomagnetic Vortex Theory (copyrighted), completely overthrowing theories by the impostors, Newton and Einstein . . .

Then there were the lunatics,

June 8, 1968

Dear Sir:

Tell me right away. Have you been looking at the moon? I'm sure it's out of its orbit. . .

He decided he might as well call the number and get it over with. The trouble with working for the county was that you had to be so damned nice to everybody, since practically everybody was a taxpayer. He got the number easily enough, but had difficulty getting through to the right party.

Finally a strangled voice gasped, "Oh, Doctor, is it true?"

"Is what true?"

"It's the woman upstairs. She says this planet is going to hit us."

"What planet?"

"Icar . . . Ic . . ."

"You mean Icarus?"

"That's it!"

"Oh, I wouldn't worry if I were you," Gill told her.

"But the woman upstairs—"

"Tell the woman upstairs people get hit by automobiles every day. So far nobody's ever been hit by a planet."

Gil's curiosity was aroused. What was the Icarus situation anyhow? As a graduate student he had done some work on the orbit of Icarus and now he couldn't even remember its catalog number. 1066? No, that was the Battle of Hastings. Here was the file—(1566) Icarus. Together with a fairly recent summary, too.

"When on the night of June 26, 1949, Walter Baade found a long, faint trail on a plate of a region in Scorpio, he recognized it as the signature of a faint object traveling at an excessive speed. From Baade's observations of June 26, 28, and 30, 1949, Nicholson and Richardson of Mount Wilson and Palomar Observatories calculated a preliminary orbit, which brought to light its unique character."*

What surprised Gil was that no observations and hence no corrections to the orbit had been made since 1960. Closest approach always occurred at the descending node, which Icarus was scheduled to reach next Saturday, June 15th. What was the node doing? Regressing probably, but apparently no one had taken the trouble to find out. It was incredible!

Somebody should get busy on Icarus! Naturally it was a job for a big computer. Poor little Icarus had evidently been forgotten in all this Rush to beat Russia to the Moon nonsense. Why not tackle the job

*"Icarus and the Space Age," by Maud W. Makemson, Leaflet No. 397, Publ. Astron. Soc. Pacific.

himself? With luck he might be able to knock out an approximate answer anyhow.

What a monstrous joke it would be if the node had been regressing at such a rate that Icarus *would* hit the Earth! Think of being the ONLY person in the world who possessed that knowledge. Why, it would be almost . . .

He would do it!

Once resolved he was tingling all over to get started. But mustn't get excited. Keep under control.

He was copying down the orbital elements when Clara buzzed him. "KQHX wants to know about some planet. Can you take it on Line Two?"

Instantly he was all alert. So it had started already! Be very careful now.

"Hello," he said "Observatory."

"Dr. Hubbard, this is Larry Judson at KQHX. We've received several reports about a possible collision with an asteroid—Icarus. Do you have any information on this?"

"Why, yes, a little," Gil ventured.

"Would you be willing to give us your comments on a recorded interview? We can do it right now on the telephone."

"All right. Go ahead."

There was a brief delay; then the announcer continued more formally. "Dr. Hubbard, we hear that an asteroid named Icarus is scheduled to make a very close call on the Earth this coming Saturday. In your

opinion, is there a possibility of a collision on this date?"

"Well, I'm not losing any sleep over it," Gil answered easily. "It's true Icarus is coming close. But hardly close enough to give cause for alarm."

"Exactly *how* close?"

"It's impossible to say *exactly*. I'd estimate not closer than four million miles."

"That's quite a few miles, isn't it?"

"Indeed it is."

"Dr. Hubbard, what can you tell us about the size of Icarus?"

"It's very doubtful if it can exceed a mile in diameter."

"What would be the consequences of a collision with a body of that dimension?"

"Extremely serious if it landed in a densely populated area. Much worse than the devastation from the explosion of many thermonuclear weapons."

"Dr. Hubbard, when will some definite information be available on this close approach?"

"Some work I have in progress now—the nature of which I do not care to disclose—should tell us the answer soon."

"Let us hope it's a miss. Friends, that was Dr. Hubbard, noted astronomer, speaking to you directly . . ."

Afterward, reviewing his remarks, Gil congratulated himself on having hit just the right note. Not too reassuring. Not too alarm-

ing. But just uncertain enough to raise a doubt.

One o'clock.

The great iron doors of the planetarium clanked open and the crowd on the steps came surging in, like a bunch of motion-picture extras storming the palace gates. Gil hastened to close and lock his own door. Otherwise some woman was sure to wander in looking for the Ladies Rest Room.

Suddenly it struck him: he had to give the 1:30 and 3:00 o'clock shows and he wasn't even set up yet.

He entered the planetarium theater through a side door, groped his way to the console, and began setting the various scenic effects to the positions he wished to display later. His eyes were already pretty well dark adapted, so he had little trouble seeing. First he sent the sun scurrying along the ecliptic to the current date, 1968 June 11th. Moving the sun so fast turned the moon into a white streak racing around the sky, and the planets into ping-pong balls weaving among the stars. When the instrument was set at the proper date, he turned the whole celestial sphere westward until the disk of the sun was just below the horizon. Was the Sunset working? He touched a switch that set the western sky flaming with red and gold. Now check the Dome White and Dome Blue . . . all O.K.

Were the constellation outlines working? These were white lines tracing the various mythological figures in the sky, such as Orion, the Big Bear, et cetera. Each constellation figure was put in the sky by an individual projector. People often worried because they were unable to see these figures which the ancients had placed among the stars, fearing there must be something abnormal about their eyesight or themselves. Actually it was the other way around. It was an old joke at the planetarium that anybody who boasted he *could* see these figures among the stars was either crazy—or *going* crazy.

Gil had given the summer constellation show so many times it was hard for him to put much enthusiasm into it anymore. He had got through the Sunset, First Night, and demonstrated the annual eastward motion of the sun and the phases of the moon. Gil never tired of putting the celestial bodies through their paces. It was thrilling to have the heavens at your fingertips. For a brief hour you were superior to ordinary mortals. He had become so used to moving the stars and planets in the planetarium sky that often he felt the real heavens were his to command as well. Somewhere there must be a switch that would make the moon and Mars leap at his bidding—if only he could find it.

He had worked around to showing the constellations now.

"This is the way you would see the stars if you were looking at them about nine o'clock tonight. Overhead we see Boötes, the Bear Driver, who chases the lazy bears around the pole." (He hit the switch that put the dissipated figure of Boötes on the planetarium ceiling.) "A line curving along the tail of the Big Bear leads us south to the beautiful lady, Virgo the Virgin." (The appearance of Virgo the Virgin drew several wolf whistles from various small fry in the audience.) "And here is Draco the Dragon twined around the northern pole. When its teeth were sowed in a field armed men sprang up and slew one another. Hence our old expression for the evils arising from our misdeeds 'sowing dragon's teeth.'"

And so on and on to the end of the ghostly parade.

As soon as the crowd was out of the theater he set up for the three o'clock show, then hurried to his office for a quick cup of coffee and a cigarette. There was a young man waiting for him by his desk. Gil eyed him suspiciously.

"Sorry to bother you," the young man apologized. "One of the guides let me in. My law firm sent me here on a traffic case we're handling."

"That so?" Gil said.

"The plaintiff contends he was blinded by the setting sun. Our client maintains the sun had already set."

"Just when did this happen?"

The young man consulted some notes.

"Last January 7th out in Azusa." He looked up at Gil expectantly. "When did the sun set on that date?"

"I'm sure I don't know when the sun set in Azusa on January 7th."

"I thought astronomers could tell those things."

"They can tell when the sun sets over the clear horizon. But how can anyone tell offhand when the sun goes down behind some crag in the San Gabriel Mountains?"

"Not being an astronomer I wouldn't know."

"You don't have to be an astronomer to know a thing like that!" Gil exploded. "Your common sense ought to tell you."

"Well, could you state when the sun set behind the clear horizon then?"

"Yes, I suppose so," Gil muttered. It was observatory policy to grant such requests. He inserted a sheet of their official stationery in his typewriter. "To whom should this be addressed?"

"Er . . . would you mind making it out in triplicate?"

"No, I wouldn't mind!" Gil tore the sheet from his typewriter, crumpled it into a ball, and hurled it on the floor. He glanced at his wristwatch—three o'clock already! He should be starting his lecture right this minute. He consulted a calendar issued by the local Bank

of America for the time of sunset on January 7th, then typed out a curt statement, signed it, and shoved it across the desk.

"Well . . . thanks," the young man said.

Gil strode from the room without a word. He was raging, seething inside. How he hated these visitors! Hated them! Hated them!! Hated them!!! They took advantage of you, browbeat you in every miserable little way they could. And you were powerless to strike back.

When he began lecturing he was still so mad it was hard to control his voice. It was impossible to concentrate on what he was saying. His mind kept going back over the incident in his office. Fortunately he had given the show so many times he knew it by rote. His only slip was when he began pointing out the constellations without bothering to turn on their outlines, but the guide caught that one for him. Finally it was over. The next lecturer came in to set up for the 4:30 show, and Gil was through for the afternoon. Thank God tomorrow was Wednesday and his day off.

He had planned to work on Icarus but there was a conspiracy against it. First the ticket office ran short of change so he had to dash up on the roof and extract some dimes from the coin telescopes. Then a car caught fire out in the parking lot. People complained the drinking fountains weren't delivering any water. A new guide pulled

the switch that killed all the lights in the building, including those in the theater where the lecture was in progress. The final blow came when a woman marched into his office at the head of a girls' Elf Troop and demanded that he immediately scour the countryside in search of some perverted old guy who had leaped out at them from behind a clump of cactus. (The girls unanimously agreed it was the best field trip they had ever had.) When he had disposed of the Elf Woman, Gil stuffed Icarus into his briefcase and headed for home.

Gil lived alone in a cottage in Verdugo Heights which faced north toward the mountains. The best feature about the location was its inaccessibility. To reach it you had to pick your way along a winding network of roads apparently laid out by the same individual who designed the labyrinth at Crete. Gil had lived there five years and never made any effort to improve the place. He had no TV set or record player. For him it was simply a place to eat and sleep and work.

It had been stifling hot, with the sky veiled by a thin layer of cirrus haze, and not a breath of wind stirring: the kind of day the inhabitants of southern California describe as "good earthquake weather." After opening up the house, Gil stripped to his shorts and went out on the patio with a can of beer. The valley was obscured by smoke from a brushfire that had broken

out that afternoon above Montrose. By sundown the fire itself became visible, an irregular line of flame gnawing at the hillside.

Gil was utterly drained. He finished his beer, dragged some bedclothes out on the patio, and threw himself face down on the pillow. Instantly he was wide awake, his mind racing. His thoughts persisted in dwelling upon the details of all the humiliations and defeats he had suffered since childhood. He tossed for an hour then went in the house for some more beer. At length the golden liquid began to exert its euphoric effect. Later he could recall returning to the patio and looking over toward the fire but that was as far as he went. Afterward there was only a blank.

He awoke . . . another person in another world. Stars were shining in a clear sky. The air felt positively chilly. The fire had died down to a few dull spots of red. Gil felt as if he had slept for hours yet it was only one o'clock. All his fatigue had vanished. His mind was alert, his nerves calm. And he knew exactly what he had to do.

He went to work on Icarus. Never had his brain functioned so well. He did not pressure himself but proceeded deliberately, making sure each block of computation was correct before going to the next.

The columns of figures grew under his pencil point. Toward dawn he went outside and filled his lungs

with the fresh cool air. Alpha Cygni had displaced Arcturus and Queen Cassiopeia was climbing toward the meridian. He could still make out a few of the stars of Draco. Gil never saw Draco without thinking of the Bastard's line from "King Lear": "My father compounded with my mother under the dragon's tail . . ."

Gil had scarcely set foot inside the building when Clara hailed him.

"Oh, Dr. Hubbard, Mr. MacBride has been trying to get you all morning."

Clara was very sensitive to status. She pronounced "MacBride" with just the proper degree of emphasis and awe that should be accorded the head of the Department of Culture and Relaxation, of which the planetarium was a part.

Gil sifted through his mail. "What does he want?"

"He wants the complete financial statements for February, March and April, including the money from the coin telescopes and hamburger stand."

"He's already got 'em."

"That's what I told him but he says they're not in his office."

"Tell him to go take another look."

"Oh, Dr. Hubbard, you can't tell the head of the department—" Her line buzzed. She raced back to the switchboard, then gave Gil an agonized look. "It's Mr. MacBride!"

"I'll take it in my office," he said.

He sauntered into his office and picked up the phone. "Hello," he said quietly.

"MacBride speaking. Look, Hubbard, I've been trying to get hold of you all morning."

"Sorry," Gil said. "I just got here."

"But it's eleven o'clock!"

"Must be nearly midnight in Pakistan."

"What was that?"

"I said they don't have any time in Greenland; makes business so much simpler there."

"Er . . . yes. Hubbard, this is important. I'm going before the Council at two this afternoon. I must have your financial reports for February, March, and April."

"You've already got 'em."

"They're not here in my office."

"Well, we mailed them all right."

"Are you sure?"

"Of course I'm sure!" Gil roared.

"Look here, MacBride, are you accusing me of—"

"No, no, I'm not accusing you of anything," MacBride hastened to assure him. "I'm just trying to locate those statements."

"Well, keep plugging."

"I'll look again. Thanks. Sorry to have bothered you."

Gil sat for a while staring gloomily at the photograph of the Andromeda galaxy on the opposite wall. It was the first time he had ever noticed that its outer spiral arms were turning brown. Presently he gathered his letters into a neat

pile, slipped a band around them, and dropped them in the wastebasket.

Suddenly the Cosmochron came to life.

"Many aeons ago," it bellowed, "before Man walked the surface of the planet Earth . . ."

Somebody must have inadvertently thrown the main switch in the lower depths, Gil reflected. He went across the hall to a panel set in the wall, unlocked it, exposing an array of fuses and relays. After carefully studying the wiring diagram for several minutes he extracted a small vital part of the mechanism and tossed it behind the moon model. Having thus silenced the Cosmochron for many hours he returned to his office to answer the telephone.

"Man on Line Three wants to know something about something," Clara said.

Gil punched Line Three. "Hello, may I help you?" he inquired.

"Is this the county observatory?" said a rasping voice.

"Yes, it is."

"Who is this speaking?"

"Why, I'm the Assistant Director—"

"I want to talk to the Director—the head man."

"Well, I'm afraid that's going to be rather difficult to do," Gil replied. "You see, the Director's somewhere in Australia right now."

"What's your name?"

"Bruno," Gil said.

"Bruno who?"

"Giordano—Giordano Bruno."

"Mr. Bruno, I've got a new explanation for that advance in the orbit of Mercury."

"Congratulations," Gil murmured. "I thought it was already explained by general relativity."

"Relativity's got nothing to do with it." He waited a while for this to sink in. "It's all due to a little planet in back of the sun. You can't see it. But it's always right there back of the sun."

"Well . . . ?"

"You don't believe it?" the voice demanded.

"I'd like more time to think it over."

"Nothing to think about! You couldn't see it, could you?"

"It would certainly be extremely difficult," Gil admitted.

"Then why couldn't she be there? Just tell me why."

"I'm afraid I *can't* tell you why," Gil said, choosing his words very carefully.

"You're supposed to be an astronomer livin' off us taxpayers—"

"I can't tell you why," Gil continued, "because this idea of yours is far too big for a person like myself to handle." Suddenly he became very businesslike. "You were right. You want to go to the top. Got paper and pencil handy?"

"Er . . . yep."

"Write down a long detailed description of your theory of Mer-

cury's motion. Better single-space it. Then send it to Washington."

"You mean . . . to the President?"

"I mean to the United States Naval Observatory, Washington 25, D.C. The staff of the Naval Observatory is in charge of all the planets. They are the ones to advise you."

"Well, I'll sure get busy—"

"And not a word to anyone about this," Gil warned. "The boys at the U.S.N.O. might not like it."

These paranoid personalities! Gil sighed. Once they get a delusion about something there's no shaking them loose from it. Dangerous, too. Never can tell what they might do.

His line buzzed. Now what?

"Oh, Dr. Hubbard—"

"Yes, Clara?"

"The Ax Man— Oh, dear! I mean Mr. Tucker from Axholme Associates is here."

"Good. Tell him I'll be right over."

Mr. Tucker had many questions to ask which Gil answered without hesitation. When he had finished with the questions they sat and chatted for a while. The interview stretched on toward three o'clock.

"Dr. Hubbard, this has certainly been a pleasure," Mr. Tucker said, when he finally rose to go. "We realize most people aren't exactly enraptured to see us. Not that I blame them a bit. But after all, we're only here to help."

"That's the way I look at it," Gil said.

"You know, Dr. Hubbard, it's not often we run across a man as frank and forthright as yourself. Most people are either scared stiff or try to hand us a line. I don't mind telling you that I intend to put in a few words in your behalf at headquarters when I write this up."

"That's very kind of you, Mr. Tucker."

They shook hands cordially at the door.

Gil strolled back to his office. He still had ten minutes to kill. His line buzzed.

"Dr. Hubbard . . . Judson from KQHX again. Have you got anything definite you can give us on Icarus yet?"

"Yes, it's definite now," Gil told him, throwing one leg over the corner of his desk.

"What's the situation?"

"Icarus is going to hit us."

"Would you mind repeating—"

"It's a hit."

"A hit!"

"Icarus will hit the Earth on Friday, June 14th, at ten p.m., Pacific Daylight Time."

There was a moment's silence.

"Dr. Hubbard, this is mighty hot news. Before we can put this on the air . . . may I ask . . . have you got confirmation from the Smithsonian Astrophysical Observatory, or Space Technology? Have you

checked with anybody over at the Jet Propulsion Lab?"

"I don't need to check with anybody at JPL. This thing is mine—all mine!"

"I see," Judson said slowly. "Well . . . where is Icarus scheduled to land?"

"Contact will occur in the Hollywood-Beverly Hills area."

"That's pretty close to home."

"We're right on target," Gil said happily.

There was only a small crowd in the planetarium theater that afternoon when Gil took his place at the console. But it was the kind of crowd he liked best, quiet, attentive, and appreciative. And he gave them the best he had. Never before had he felt so serenely confident. Words flowed from his lips with no effort at all. He was witty . . . he was eloquent . . . he surpassed himself. As he worked into his lecture he felt possessed by a strange sense of exhilaration, impelling him to rush on, to speak faster and faster. He showed them the constellations, Boötes the Bear Driver . . . Virgo the Virgin . . . Draco the Dragon in the northern sky. The guide kept trying to tell him to turn on their figures, but he brushed him aside. Why bother with the constellation projectors? When the constellations were so easy to see . . . when it was hard *not* to see them? ■

THE REFERENCE LIBRARY

P. Schuyler Miller

OPEN PRIMARY

It would be easy, by enlarging on comments from readers who contributed to our poll, to keep this department going for the next six months. However, I doubt that John Campbell—or you—would stand for that, so I'll try to wind it up here.

There is no room, with Analog's present format, to publish the "best books" lists from 1952, 1956 and 1966 in parallel columns, as several of you asked. I doubt that John could get in even the 1956 and 1966 lists. However, with his permission—which means that he leaves this sentence in the copy—I'll supply photocopies of the lists to any fanzine editors who ask for them. I no longer have the full results for the older polls, but I can extend the current vote to the top fifty.

There was no "best authors" poll in either 1952 or 1956, though I tried various unsatisfactory ways of rating the authors whose books you selected. Just how unsatisfactory those makeshift tallies were, our present poll showed up. This time we had a real open primary.

The most important result was that you recognized good authors who may never write a spectacular book like "Slan," or "The Demolished Man," or "Childhood's End," but who hold up the general high level of modern science fiction by its bootstraps. To quote one of several interesting letters on the same theme: "his work is distinguished by a consistently high level of craftsmanship, but . . . none of his novels stand out as one of the

greatest." The writer was referring to Murray Leinster, who tied with "Doc" Smith for tenth place in your vote, but precisely the same argument earned Poul Anderson his fifth place, made Andre Norton number eleven, and piled up votes—though not quite enough—for writers like John Brunner, Lester Del Rey, Philip K. Dick, Gordon Dickson, Edmond Hamilton, Keith Laumer, Fritz Leiber, H. Beam Piper, James H. Schmitz, "Cordwainer Smith," Jack Vance—and John W. Campbell.

American and Canadian tastes in books and authors paralleled each other. Readers overseas, on the other hand, seem to take their science fiction more seriously and voted for books and writers with more literary quality and more serious ideas, and less for books that are simply good fun to read. ("Cordwainer Smith" rated sixth among the overseas readers, and Alfred Bester was up in tenth place.) A partial reason may be that the overseas readers were older: I'd say that about half of the U.S./Canadian votes were from young people in high school and college . . . but their lists were far from immature. (One, I will admit, seems to have simply listed every title that was in his corner drug-store at the time.) Twenty-three colleges were represented by students and faculty members, and adult voters included attorneys, scientists, physicians, librarians, high-

school teachers and some of the top science-fiction writers themselves.

Although I didn't ask for a club vote this time, I got it. Six science-fiction societies turned in composite lists, made up after a discussion and vote of the members at a meeting. (Baltimore said that a poll had been taken, but the list never reached me.) I was rather tickled to find the Oxford University Speculative Fiction Group among them.

A few real veterans responded—one said he had been reading science fiction regularly for sixty-five years, since the days of the "Frank Reade" boys stories, and another contributed a list that was almost all pre-1920. A retired chemist, born in Austria and now living in Michigan, offered his choice of great German and French works.

And I was particularly happy to hear from a French scientist who at the time of our first poll, fourteen years ago, was a young geologist and who is now one of the world's foremost prehistorians, Francois Bordes. His thoroughly international list does not include his own books, but it does offer three French titles which I commend to the paperback publishers who can find a good translator:

"Autres Vies, Autres Mondes" by J. H. Rosny aîné (an omnibus comprising *"Les Xipehuz," "La Mort de la Terre,"* and part of *"La Force Mystérieuse"*).

Rosny's *"La Guerre du Feu"* (which this authority on prehistory

calls "the best prehistoric novel of all times").

"Les Hommes Frénétiques," by E. Pérochon (apparently a one-book author).

And from Sweden, a nomination for a book by a living author who, our reader says, is comparable with the best in English-language science fiction: Niels E. Nielsen's "To Sole Stod Op" (meaning, I don't know what: Poul Anderson, please investigate).

THE BEST BOOKS

1956

1. Healey & McComas, ADVENTURES IN TIME AND SPACE (FAMOUS SCIENCE FICTION STORIES)
2. Simak, CITY
3. Heinlein, THE GREEN HILLS OF EARTH
4. Heinlein, THE MAN WHO SOLD THE MOON
5. Bester, THE DEMOLISHED MAN
6. van Vogt, SLAN
- †7. Conklin, BEST OF SCIENCE FICTION
8. van Vogt, THE WORLD OF NULLA
- †9. Campbell, WHO GOES THERE?
10. SEVEN FAMOUS NOVELS OF H. G. WELLS
11. Bradbury, THE MARTIAN CHRONICLES

12. Sturgeon, MORE THAN HUMAN
- †13. Campbell, ASTOUNDING SCIENCE FICTION ANTHOLOGY
- †14. de Camp, LEST DARKNESS FALL
- †15. Hubbard, FINAL BLACK-OUT
16. Clarke, THE CITY AND THE STARS
- †17. Heinlein, BEYOND THIS HORIZON
- †18. Williamson, THE HUMANOIDS
19. Asimov, FOUNDATION
20. Stapledon, TO THE END OF TIME
- †21. Huxley, BRAVE NEW WORLD
- †22. Bradbury, THE ILLUSTRATED MAN
23. Pohl & Kornbluth, THE SPACE MERCHANTS
- †24. Moore, BRING THE JUBILEE
- †25. Weinbaum, A MARTIAN ODYSSEY
26. Clement, MISSION OF GRAVITY

† Not in 1966 list.

1966

1. Asimov, FOUNDATION TRILOGY
2. SEVEN FAMOUS NOVELS OF H. G. WELLS
3. van Vogt, SLAN
- *4. Asimov, THE REST OF THE ROBOTS
5. Bester, THE DEMOLISHED MAN

6. Clarke, CHILDHOOD'S
END
7. Clarke, THE CITY AND
THE STARS (AGAINST
THE FALL OF NIGHT)
8. Bradbury, THE MARTIAN
CHRONICLES
9. Simak, CITY
- *10. Miller, A CANTICLE FOR
LEIBOWITZ
- *11. Heinlein, STARSHIP
TROOPERS
12. Asimov, I, ROBOT
13. Stapledon, TO THE END OF
TIME
14. Heinlein, THE MAN WHO
SOLD THE MOON
15. Clement, MISSION OF
GRAVITY
- *16. Bester, THE STARS MY
DESTINATION
- *17. Heinlein, STRANGER IN A
STRANGE LAND
18. van Vogt, WORLD OF NULL
A
19. Sturgeon, MORE THAN HU-
MAN
20. Healy & McComas, AD-
VENTURES IN TIME
AND SPACE
- *21. Herbert, DUNE
22. Pohl & Kornbluth, THE
SPACE MERCHANTS
- *23. Wyndham, RE-BIRTH
- *24. Heinlein, WALDO & MAG-
IC, INC.
- *25. van Vogt, THE WEAPON
SHOPS OF ISHER
- *26. Heinlein, METHUSELAH'S
CHILDREN
- *27. Simak, WAY STATION

* Not in either previous list.

The Reference Library

MATTERS OF MORDOR

Because of my own comments here, and those of others in "Brass Tacks," about the rival paperback editions of J. R. R. Tolkien's heroic "Lord of the Rings" fantasy, I have been asked to clarify the present situation as far as I know it.

First: it seems clear that the source of the whole hassle lay in the carelessness of the publisher of the original American hardback edition. The U.S. copyright law—which various people have characterized as designed to protect American printers rather than American authors—provides that American copyright of a foreign book is voided if more than a certain number of copies (I believe 1,500) of the foreign edition are imported. The maximum was exceeded, and the books were consequently thrown into the public domain. Anybody was then entitled to reprint them without the consent of the author, publisher, or anyone else.

Ace Books did so, and brought out the 75-cent edition of the trilogy that I first reported here. Meanwhile, Ballantine had contracted with the author for a paperback edition—the somewhat revised, "authorized" edition which you find on the stands at ninety-five cents. Ace has now made a gentlemen's agreement and is paying the author back royalties. The Ace editions are still

on the newsstands, but there has been no clear statement as to whether they will be reprinted when the present edition is exhausted.

Tolkien's books are pure fantasy, and would never have been mentioned here if they had not been exceptional. As you may know, they are achieving cult status in colleges. Two bits of information are worth passing on, since the subject is before us.

Ballantine has just brought out "The Tolkien Reader" (No. U-7038; 95¢) which contains the texts of three small earlier books that were highly overpriced in their American editions: the verses in "The Adventures of Tom Bombadil," the fairy story of "Farmer Giles of Ham," and the essay and tale in "Tree and Leaf." To these are added an appreciation of Tolkien's books by Peter Beagle (from *Holiday* magazine) and a short play based on an old Anglo-Saxon poem. This is strictly for the Tolkien fan; if your drugstores don't have it, your college bookstores probably do.

A Simon & Schuster representative has pointed out something that Ballantine hasn't mentioned in its publicity, as far as I know. The covers of the three Ballantine paperbacks of the "Lord of the Rings" trilogy constitute a triptych—or, perhaps more properly, three sections of one continuous painting that follows the action of the story from the quiet vales of the Shire on Part One through the growing hor-

rors of the journey to the final battles on Part Three.

Tolkien, by the way, received seven votes as one of the ten best authors, though fantasy was explicitly excluded from our poll. The trilogy got twenty-eight votes.

ANALOG 4

Edited by John W. Campbell • Doubleday & Co., Garden City, N.Y. • 1966 • 224 pp. • \$4.50

In our recent poll there were a scattering of votes for the previous "Analog" anthologies, but 14.3% of the voters listed John Campbell's old "Astounding Science Fiction Anthology." With this fourth Analog collection, the new series is hitting its stride.

Best of the seven stories, to my taste, are a pair of "hard" science-fiction yarns: Dean McLaughlin's "The Permanent Implosion" and Poul Anderson's "Sunjammer." (The latter appears on the jacket as by Winston P. Sanders, so another pen name is out.) The first of these extrapolates the technology of the oil fields to cope with the problem of a "hole" in the space-time continuum, through which the Earth's atmosphere is leaking into the void. The second—and don't confuse it with Arthur C. Clarke's nice little yarn about the technology of racing sunjammers—sets the crew of a space-sailing ship the problem of getting a dangerous cargo safely away from Earth before a solar storm explodes it. Both will take

you back to the "Good Old Days" of George O. Smith's "Venus Equilateral" and Jack Williamson's "See-tee" stories.

Norman Spinrad opens the book with "Subjectivity," a gimmick story on the question: "What is reality?" R. A. J. Phillips, with "A Day in the Life of Kelvin Throop," joyously allows his hero to escape from behind his official image and answer letters as they deserve to be answered. Mack Reynolds, in "Genus Traitor," has a go at another question: "What is a traitor?" . . . though he rather loads the dice for his hero.

You have, I hope, been reading Randall Garrett's stories about an alternate Earth in which Richard the Lion-Hearted lived for twenty years longer, John was never king, and science never got a chance to destroy magic. "A Case of Identity" was the second of the adventures of Lord Darcy and Magister Sean. Read and enjoy . . . or read again. Then finish off with Frank Herbert's slight little "The Mary Celeste Move." I didn't much care for it at first, but it's been growing on me in a nasty way. Do you suppose. . . ?

PANDEMONIUM ON THE POTOMAC

By William C. Andersen • Crown Publishers, N.Y. • 1966 • 245 pp. • \$4.95

Crown evidently doesn't consider William C. Anderson's books science fiction—at least, they don't

send copies to science-fiction reviewers as they do the rather dreadful Arcadia publications. But if you've ever wondered what Thorne Smith's peculiar talents might have produced if wedded to science-fiction themes rather than fantasy, here's the answer.

I'll have to admit, too, that Mr. Anderson hasn't matched his maiden book, "Penelope," but his second and third best should be good enough for most of us. Penelope, the porpoise with the Deep South accent and peach-blossom personality, and Adam M-1, the cyborg with a woman-chasing test pilot in its brain case, are followed in this book by an enticing father-and-daughter team from Venus, the Dickensian Homer Centurion and his green-eyed offspring Dianne.

The Centurions arrive in Washington in a flying saucer that converts into a Volkswagen. Dianne sets out to make friends and influence officials as a government girl. Homer heads straight for the President. What's more, he gets there.

Predictably, our Venusian neighbors—apologies to Philip N. Bridges, who insists on "Venustian"—are concerned over our atomic tests, which they feel will disturb the delicate balance of the solar system or the galaxy or both. Homer's chore is to persuade us to disarm . . . which he does by devious means. Only Russia, while piously destroying all bombs in the

Soviet homeland, fails to mention four that have been smuggled into the United States and are ticking contentedly away under American cities, waiting for a big bang on May Day. Meanwhile Homer and Dianne, bound home to Venus, have supposedly been destroyed by a solar flare.

The author was still an Air Force Lieutenant Colonel when he wrote "Penelope," his first and hilariously best yarn. His science is a bit rocky this time, but anybody who can think of blackmailing the coffee-drinking Pentagon first with green coffee, then with the threat of a Kidney Exciter—28,000 employees headed for the john at once—can't be all-bad. We again meet Major Cornelius Catastrophe Callaghan, coffin tycoon and Air Force P.R. officer, but he is somewhat subdued. Colonel Buck Walker takes over as hero and keeps Dianne out of Pentagon circles rather more efficiently than is desirable in an Anderson book.

There's just one sensible reaction to both Anderson and Thorne Smith: "Hooboy!"

EARTHWORKS

By Brian W. Aldiss • Doubleday & Co., Garden City, N.Y. • 1966 • 154 pp. • \$3.50

Recently Brian Aldiss has been forsaking the florid themes and settings of such books as "Hothouse" and "The Dark Light Years" for projections into the planetary de-

bacle of our more immediate future. Here we have the specter of an overpopulated world in which only the underdeveloped nations of our own time still have resources enough to live reasonably well.

Knowle Noland, on the other hand, brought up in the urban stew of England is first sold into the serfdom of the land's great mechanized farms, escapes briefly to the roving outlawry of a Traveller band, and sells them to the authority for the sake of his own neck. As reward he is allowed to serve on an automated freighter, shuttling sand from the Skeleton Coast of Southwest Africa, where the story proper begins.

Wrecking his ship on New Angola, Noland escapes to Walvis Bay and is presently involved in a plot to start a new world war that will destroy enough of mankind to ease the population burden and restore food and comfort for all. This part of the book is almost conventional aside from bits of detail; the best is in the flashbacks to Noland's grim life in England. Coincidence is outrageously twisted until it screams, for no obvious good reason and with the result of weakening whatever logic Aldiss has built into his plot. Too bad.

THE MOON IS A HARSH MISTRESS

By Robert A. Heinlein • G. P. Putnam's Sons, New York • 1966 • 383 pp. • \$5.95

The early voting in our poll made very clear that Robert A. Heinlein is one of the favorite authors of Analog readers, although he hasn't had a story here in nine years. His annual book is an event, and several readers took the chance that his current serial in *If* would be out in hard covers before the voting ended. It was, and here it is.

By coincidence, at just about the time "The Moon Is a Hard Mistress" was showing up in my mail, the New York Times reported an article by Professor E. Kolman of the Soviet Academy of Sciences, urging that the other planets be exploited as a source of food and a safety valve for Earth's exploding population. Heinlein's new book is the story of the Moon's revolt against just this kind of exploitation, masterminded by the supercomputer Mycroft Holmes, alias Mike, alias Adam Selene.

Since it is a Heinlein book, it is several other things as well. To quote the author, speaking through Mike's circuits, fiction should give a gestalt—an integrated comprehension and impression—of the life it describes. No science-fiction writer does this better than Heinlein, but he is less successful or at least more obtrusive in "Harsh Mistress," because he has the secondary purpose of spelling out the political philosophy that his spokesman, Professor Bernardo de la Paz, makes the credo of the revolution: rational anarchy, in which only the individ-

ual can be held responsible for what happens to him. In terms of the lunar slogan: "TANSTAAFL" . . . "There ain't no such thing as a free lunch."

The Moon of the book is a penal colony, forced to support itself and to produce a surplus to feed the overcrowded Earth. It is a concentrated, intensified, speeded up version of the Australian Botany Bay, ruthlessly controlled by a greedy Authority but nonetheless ruthlessly regulating its own life through a web of strange and cruel institutions. Mike is the master computer through which everything is coordinated and operated; the narrator is Manuel Garcia O'Kelly, free citizen who is on the Moon to sell his ability as a troubleshooter, and who discovers Mike's personality and enlists his aid.

For its gestalt of life in the airless, underground lunar colony, the book is right up in the top rank with anything Heinlein has done. But the plot *per se* degenerates into a dramatization of the mechanism of revolution. It is more an anniversary pageant than a war of liberation. The reader becomes interested in how the revolt will be carried on, but is rarely concerned with what will happen next. But then, did Nineteenth Century readers really identify with the hero of Bellamy's "Looking Backward"? The book was tremendously influential, whether they did or not, but I'm afraid this one won't be.

brass tacks brass tacks brass tacks brass tacks

Dear Mr. Campbell:

Our local High School Science Club was intensely interested in the FASEG experiment described in your November issue, and at once began a series of experiments of our own. We, however, modified the original conditions slightly.

In accordance with our recent experiments in the production of anti-matter through sympathetic magic, we purposefully left the untenable positions (Sin and Lechery) sufficiently porous to allow the formation of the anti-matter equivalent of the Godmother (i.e., the Wicked Witch). This "coherent" state of anti-matter materialized between lattices of Goodness and Honesty thoughtfully provided, and immediately vanished in an explosion producing intense radiation.

One of our teachers was accidentally exposed to this hard radiation and was excited into the Frog state, apparently *Gigantorana goliath*.

All of our research into this matter indicates that further excitement into a higher state (the

Prince) is possible, but this is neither practicable nor desirable. Further data is not available, and we anxiously await any correspondence from Messrs. Janier and Kantor.

A. RUSSELL WODELL

723 9th Street S.,
Cranbrook, B.C., Canada.

I would have expected an implosion with intense anti-radiation, producing a pervasive, cold, clammy effect.

Dear John:

In May's Brass Tacks you have only two letters, both of which are extremely interesting. From England, Arthur Kemsley details the "levitation" experiment wherein two people press their hands alternately (and very hard) on the head of a seated individual, then quickly lift him with only one finger (the index) of each hand under an armpit and beneath the bent knee.

It works several ways. I've seen an extremely hefty lady sail upward as though she were a feather; it really doesn't matter about the weight of the person being lifted. It's in one of those 19th Century English books on magic. A variation is to have *four* people instead of two try lifting someone; each takes an armpit or the crook of a knee and quickly learns he (or she) cannot budge the seated one. Then, in counterclockwise fashion, No. 1 places his/her hand about one inch *above* the subject's head; No. 2 follows suit, then Nos. 3 and 4, fol-

lowed by No. 1 again.

The result is a pile of hands not touching anything at all, but in mid-air about one inch equidistant. They remain there until the subject "feels" something (in every case, the experimenters feel something other than the warmth of the others' hands), which takes from 30 to 60 seconds on the average. Then they try lifting just as they did before.

Better try it outside or in an old house with a high ceiling. I've never seen the latter done, but have several reports on it; either way, it's pure Psi.

Now about the second letter—from Jennifer Banker in Ontario, Canada concerning the "Black Pall" of 1950 (and many preceding dates). It happens by an odd coincidence that astrologers for some time have used some "mythical" mathematical points in horoscopes—and some of them work rather well. One of those is probably derived from ancient Arabic astronomical work, but is called the "Dark Moon Lilith." This point has been calculated with great exactitude, and, in fact, an ephemeris for it was published by American astrologer Ivy Jacobson Goldstein. Two years ago, an article in *Sky and Telescope* (and another in *Science*) reported that NASA's satellite tracking radar stations had discovered a swarm of meteors or asteroids—said mass being highly significant in explaining the heretofore

unexplainable perturbations of the Moon. The meteoric swarm moves in a lunar orbit along the ecliptic at a fixed angle of about 60° from Luna.

Here's the kicker: checking back on every report of dark days, I have found a surprising tendency for the "Dark Moon" of the astrologers (and the meteoric swarm of the astronomers) to cross the Lunar nodes while passing between the Earth and Sun. But of greater importance is the fact that the two coincide—one being very ancient.

JOSEPH F. GOODAVAGE

The meteor swarm in the "Lunar Trojan Position" is extremely sparse—but it is there. It's barely observable under optimum conditions.

Dear John:

Since you have seen fit to speak authoritatively on auto safety in the July issue by denouncing the Corvair design—easy isn't it—I pass on some truths that you overlooked. The fact that the rear wheels on most swing axle cars "tuck under" under in violent cornering has been well known for about twenty years, as well as the propensity for oversteer. However in the Corvair, this is a terminal condition—just before the crash—caused by John Q. Klott being conditioned to driving "understeering" cars. Not being inclined to find out in advance what his car does under extreme conditions, and sublimely convinced of his own skill, it doesn't really matter

which end of the thing leaves the road first under John, because he's gonna blame the car anyway. So Chevrolet finds out the hard way that not only are 95% of the American drivers not going to learn a damn thing after they pass their parking tests, but that they will not keep the suspension and tires on their i.r.s. cars up to snuff either.

I am willing however to drive my wife's '62 four-door Corvair—with air conditioning—around any number of turns of any kind you want right behind whatever it is you drive, provided you are willing to follow me around Osceola Airport in a similar manner. But then we put on good tires and brakes, and keep the suspension adjusted, so that's sorta cheating.

If you don't understand some of the terms I used, consult any basic book on automotive suspension design. The nut location is still behind the wheel, no matter where the engine is, and even magazine editors goof, like when they make the thing the wrong size.

Keep your needle sharp,

JON P. RAMER

7219 Ravenna Av.

Orlando, Fla.

An undesirable function that can be designed out that has been known for twenty years; simply shouldn't be designed in!

Dear Mr. Campbell:

Undoubtedly you've followed the news on the medical-engineering

development of an artificial left ventricular heart.

A recent article about the operation in *Life* magazine suggests the system controlling output of the artificial ventricle was not coupled to the needs of the rest of the system.

Initially, output of the unit was too great, causing distension of the right auricle, and a need for supplementation of the cardiac-respiratory function by a heart-lung machine. At this time, output of the ventricle was reduced.

Operation of the unit was satisfactory for the four subsequent days, at which time the patient died of a burst trachea.

The latter occurrence would suggest respiratory insufficiency, due to either insufficient air transport to the lung, or insufficient blood flow. Both are essential to supply the body oxygen requirements.

For a coal miner, respiratory disease is not unknown, and a weakened respiratory system is to be expected. This could easily lead to a delicate balance between cardiac output and ventilation rate, especially if the system is laboring under the added constraint of an artificial heart valve. Include an artificial supplemental pump, with rate control external to the system, and control problems become unavoidable.

The human heart is truly remarkable in checks and balances that allow it to maintain continuous operation under widely varied conditions throughout a lifetime. Optimally,

the artificial organ should derive its rate, and hence output, control from the organism mechanisms, as did the original unit. Otherwise, the artificial organ may force a drift to operating conditions demanding outputs of the rest of the system surpassing their range of adaptability, and cease all function.

STANLEY J. PENKALA
4109 Baltimore Ave.
Phila., Pa. 19104

Part of the problem is that when developing one of these devices, the experimental work done on animals is done with an animal in general good health—but when tried on human patients, they normally start trying on some individual in such condition that he's hopeless if this extreme technique doesn't work. That usually means that the entire organism is near breakdown, not just the one organ being substituted.

If they develop an artificial liver, the first human patient it will be tried on will probably be suffering from collapse of liver function and impaired kidneys, bad heart, pernicious anemia, and faulty lung function.

It's all very well to talk of deriving its rate control from the organism controls as the original unit did—provided those controls are functioning properly themselves! But when the original unit is in a deplorable condition it suggests the organism's controls system may not be very reliable either!

The ideal patient for testing an

Poul Anderson's newest S-F

Dominic Flandry—the James Bond of outer space—is pitched into a war between two non-human races and must sleuth out the reasons why mankind's rivals started the trouble . . .

ENSIGN FLANDRY

\$4.50, now at your bookstore



CHILTON BOOKS

artificial heart would perhaps be a soldier who has suffered a heart wound—a man in excellent physical condition, young, resilient, with strong will-to-live. A man who has one and only one damaged organ—the heart itself.

Replacing the heart, however, has a very tricky problem; De Rudder died because of blood clots, both in his brain and lungs—and it's known that plastic gadgets tend to cause serious blood-clot problems. It's not known whether the clots, in this case, were "home made" or machine made, because the patient had been having clots in dangerous numbers beforehand. The De Baakey heart-machine sought to handle the problem on a basis of "We will have

clots; O.K., the thing to do is anchor them in place so they don't drift around and plug up arteries—and will produce a natural-to-the-body surface covering the plastic." The artificial heart-lining was, therefore, designed so that clots would be anchored immovably by thousands of little nylon loops.

Another approach, now under development, depends on chemically bonding heparin—a protein material normally found in blood-vessel lining—to plastic, so that the lining of the artificial device is a nonreactive substance natural to the body.

Dear Mr. Campbell:

In the September, *Analog*, there was a story by Gordon R. Dickson entitled "Computers Don't Argue." A few days ago, I came across the enclosed newspaper article in the *Stars And Stripes*. I read it and the first thing I thought of was the story, so I am sending the article to you. I hope you enjoy it as much as I did.

2 States Harass Wrong Man

LAW ALMOST CRACKS GLASS

DULUTH, Minn., Jan. 31 (UPI) Earl Glass said it was like talking to a machine.

Last Sept. 13 someone was involved in an accident at Oliver, Wis.

Four months ago Glass, a railroad mechanic, received a letter from the Wisconsin Motor Vehicle Department reminding him that he had

not made out an accident report for the Oliver, Wisconsin, mishap.

Glass replied by letter saying he had not been involved in any such accident.

He received another letter from the Wisconsin department, warning him he must prove financial responsibility. It threatened him with prosecution for failure to fill out an accident report.

Glass showed the second letter to Sheriff Walter Liggett of Wisconsin's Douglas County. Liggett wrote the Wisconsin Motor Vehicle Department to inform it that Glass was the wrong man.

Wisconsin authorities notified Minnesota's Motor Vehicle Department of Glass's refusal to fill out an accident report.

Minnesota ordered Glass to turn in his driver's license. Glass refused.

Minnesota again ordered the license surrender, and Glass complied. But he went to County Atty. Robert Brown to complain about having to walk to work in 30-below-zero cold.

Brown suggested that Glass file a Wisconsin accident report saying, "I have not been in any accident." Glass agreed.

Wisconsin returned his report with a letter saying he failed to describe the accident.

Glass notified both Minnesota and Wisconsin twice about his insurance coverage but it did no good.

Finally, on Friday, Glass received notice from Wisconsin that his li-

cense suspension was being lifted and he could resume driving. Wisconsin said Glass' insurance company notified the state that Glass was covered and "that's all we need."

MARTIN F. MASSOGLIA, II
Enough said.

Dear Mr. Campbell:

Hunting for pen and paper upon finding a discrepancy in a magazine is not something I usually do, but after spending over two years in Army Aviation I'm afraid I couldn't overlook the fact that Mr. Freas' drawing for Robin S. Scott's story, "Who Needs Insurance," had a UH-1 helicopter, while the aircraft involved in the story was an H-34. Also in Mr. Scott's story in one place he refers to the aircraft as a Hu-34 while I believe the correct designation would be CH-34.

Harold N. Becker
Rt 2, Box 294,
Scappoose, Oregon
Maybe Kelly was trying to offset the author's error?

Dear Mr. Campbell:

I've just completed the Draft Deferment Test, and found one question which I think Analog's readers may find interesting.

"Many . . . ideas have come down to us about the Moon. For example, the belief that the Moon controls the weather; this, of course, is absurd. (a) detailed (b) erroneous (c) scientific (d) difficult (e) valuable. Fill in the blank."

I don't promise the words are exact, but the essence is there. A little more evidence on the difficulties of objectivity? Most everything seems to reflect more on the observer than the observed. I think I should add for my own protection, that the above information was recorded only in neurons, not on paper.

RONALD O'DOR
2715 Channing
Berkeley, California
This is a perfect example of "The way to pass an examination is to give the expected answer—not necessarily the right one!"

It is now known as a scientific fact that the Moon does influence our weather; therefore, the question as asked has no proper answer, since the "question" is itself a false statement.

A friend of mine encountered on an IQ test for Superior Adults, "What planet is nearest the Earth?" He assumed they didn't mean what they said, because few people have a handy Ephemeris for determining the moment-to-moment positions of the planets; presumably they meant "What planet's orbit comes closest to Earth's orbit?" He answered correctly—and scored down because he knew more astronomy than the men who made up the test—they thought Mars' orbit was closest!

If you know more than your examiners, you'll get a lower score than someone who exactly matches them in ignorance.

EDITORIAL

continued from page 9

the flow of electrons through copper wires. But as of Edison's time, no one knew what electricity was, or why it did the things it did. One of the most annoying, unnecessary confusions in modern physics is the fact that they had a fifty-fifty chance of guessing which polarity to name "positive" and which "negative"—and guessed wrong, with the result that "the current flows from positive to negative, but the electrons are flowing from negative to positive, of course." "The current" being one of those scientific abstractions that was handy for discussion, but old Ben Franklin guessed wrong and so everything's got twisted around. The electron flow wasn't known, of course, in Edison's day—that came years after his electric lights were spreading through the world.

Moreover, Edison had to invent electrical engineering; the General Electric Company arose from Edison's need for things like generators, electric cable, insulators, overload fuses and relays, switches, and the thousand and one theretofore non-existent gadgets it takes to make power, conduct it to where it's needed, and connect it to lamps. Remember, there *weren't* any light switches before Edison; there wasn't any household power, and no convenience outlets to get at it.

Edison had no understanding of

whys whatever; nevertheless he founded an immense industry *that* worked.

He bumbled around in his unscientific way—the engineering way of "it's important that it works; understanding why is merely helpful." And the Scientists of the time proved mathematically it couldn't.*

The first proto-human beings, now estimated to have been here on Earth some 2,000,000 years ago, appear to have discovered and used fire. They were not scientists—but they were engineers, technologists. They very evidently learned *how* to use fire, *how* to keep it going, without having the faintest notion of rapid, self-sustaining chain-reaction of oxidation of carbonaceous fuels.

But Fire was a very sacred thing to them; they knew how to use it—

*The British scientists who proved it couldn't be done had been asked to analyze the problem by the then-flourishing gas companies, who were concerned for their gas-lighting business, which would have been threatened seriously if an electric-lighting system could be developed. The scientists made as honest an appraisal of the situation as they could—but made one false assumption. They accepted a then-standard belief that the maximum efficiency of energy transfer from an electric generator to a load required that the resistance of the generator device equal the resistance of the load. If this were true, then one half the electricity generated would be dissipated as heat in the generator coils. Then if you had a city consuming a million watts of electric power, the generator would have a million watts of heat generated inside its own coils—and it would be impossible to cool it. It would melt itself into scrap copper.

Edison didn't understand why that was true; he built generators of nearly zero internal resistance, used high-resistance lamps, and found it worked just fine. The generators didn't heat particularly, because of their extremely low resistance.

The scientist's goof on that was similar, basically, to the goof on the bumblebee; their proof depended on assuming the bumblebee was a fixed-wing device, like an airplane, whereas the bee is a moving-wing device, akin to a helicopter.

but didn't know how to generate it. That came untold myriads of years later, when some engineering genius—he couldn't have been a scientist; understanding of fire came only with Lavoisier some half a megayear later—discovered that a bow-drill, or a hard-rubbed stick, got hot, began smoking, and with a little technique, could be made to burst into flame.

He was *not* a scientist, because he didn't know why. He was an engineer, because he worked out a technology that worked.

The Romans never worked out the technique of stress analysis and force vectors—but they were mighty good engineers. They developed the Roman arch, and techniques for building huge, self-supporting domes that were sort of three-dimensional arches, and allowed large roofed structures without impeding pillars.

The difference I want to bring out as sharply as possible is this: The Scientist lives by theory, and logical structure based on theoretical *sincerely held beliefs*.

The Engineer has rules of thumb, based solely on the criterion *that it works*.

The Scientist can't feel he "knows" anything, unless he can feel it fits logically into the structure of his world-picture.

The Engineer feels he "knows" something *if he knows how to use it predictably*. He feels no compulsion to understand why it works.

Now in this argument I'm trying to present the Other Side of The Story. In our present culture, the Scientist has sold the proposition that he, and he alone, can judge the truth and worth and value of something—and he's done a remarkable job of salesmanship. Partly because all our school science courses from the grade-school courses in General Science up through college sophomore-level science courses, are designed, built, and written by the Scientist type minds, with the Scientist orientation. Therefore, practically every member of the culture has learned-as-a-fact that Science and Scientists have brought about all the great changes in our daily lives.

They haven't. They're professionally, and by specific orientation, disinterested in bringing about practical changes in our daily lives; Joseph Henry specifically objected to making Science a mere messenger for mankind—it took a practical-minded portrait painter to do that.

It's the Engineer—the man oriented to hold that *making it work* is what is important—that has brought those changes.

The Scientist is internally satisfied when he achieves a logical-mathematical explanation of a phenomenon; he, by reason of his nature and his orientation, feels no pressure to make it useful.

The Engineer cannot satisfy himself—because of his orientation—with an elegant mathematical-logi-

cal demonstration that his idea is correct. He feels a compulsion to demonstrate with hardware that it is not merely correct—it'll *work*.

The Scientist's orientation makes him a strategist; the engineer is a tactician. The Scientist doesn't *need* the hardware proof that his idea is valid; he's proved it to his own satisfaction and the satisfaction of other scientists when he develops a sound mathematical-logical argument.

The tactician-engineer, on the other hand, has to fight a battle with the enemy—the hard and unforgiving world of real matter and force—and win before he can be satisfied.

Ugh, the Neolithic caveman, 100,000 years ago had developed a technology based on flint tools; he had a deeply held conviction that he could cut down trees with his highly developed stone ax. (It had been under engineering R & D for some 300,000 years already, and had reached a high state of development.) Moreover, Ugh could demonstrate that his belief was valid; he cut down trees by the thousands, using that polished-stone ax. (Modern experimenters have duplicated Ugh's ax, tested it, and found that—surprisingly—it will cut green wood just about as fast as will a modern double-bitted steel ax! But it won't cut seasoned wood.)

If Ugh were hauled up via time machine, and faced with modern technology, he would quickly learn a *new* thing—that steel can be pro-

duced from certain ores, by certain technology, and that steel axes are markedly superior to stone axes.

But he would not have to give up his idea that stone axes will work.

Ugh also had a lot of theoretical beliefs concerning gods, demons, spirits, ghosts and the like, and concerning the evil spirits that entered into a man and made him sick, demons that could be driven out only by magical rituals and incantations. In the theoretical department of his life, Ugh would have some very painful emotional upsets in store.

Any engineering technique *works*—or it isn't an engineering technique. An engineer doesn't have to give up anything he believes in, in the sense of learning "it wasn't true." It *was*; it worked—which is the only truth there is in the engineering orientation. Edison's original carbon-filament electric lamp still works. Sure—the modern descendant of his original General Electric Company has tungsten-filament lamps working in quartz housings, with a bit of iodine vapor that are almost three orders of magnitude more effective as lamps—but Edison's lamp still works. It wasn't *wrong*.

The Scientists who proved his system couldn't work, on the other hand, were *wrong*. It was an emotionally painful shock for them to be forced to unlearn something they had deeply and honestly believed in.

The astronomer-astrologers of Galileo's time were forced to swallow the bitter dose of learning they

were *wrong* in believing in the Ptolemaic system. That was slavery in the most bitter sense—being compelled-driven against your deeply entrenched desires—to accept that you must give up your convictions because they are *wrong*.

That is the underlying reason why scientists—the theoreticians of a culture, whether they be what we know as scientists, or witch-doctors, High Priests, Party Members or what, *any theoretician*—always have, do now, and always will resist anything that makes them *unlearn* something they know. It's slavery of the real kind, not mere legal slavery which can, in fact, be highly prized by the slave. (Legal slavery has, time and again throughout history, meant cradle-to-grave security for the slave, at a job he knows how to do, and likes doing. Complete with old-age pension and security!) The most bitterly painful kind of martyrdom—being compelled to surrender your theoretical convictions!

The essence of Russian brainwashing that has been so thoroughly loathed throughout the world is, simply, that it is a technique that forces a man to give up his deeply held beliefs, and accept beliefs he does not choose.

Any theoretician forced to give up his life-long beliefs is being brainwashed, and will fight it most painfully.

Distinguish carefully between two things, however; it is not acutely

painful to be forced to add new knowledge—that can rate as a Grade A #1 damn nuisance, because there are other things you very much want to be doing. Ask any twelve-year-old boy! Or any scientist who has to take time out from his research to learn about a new technique of electronics that he needs for his biological experiments.

The very different and acutely painful thing is to learn that *your basic beliefs are wrong*. Whereas new learning simply adds—this forces you to tear out of your deep personality the wired-in, solidly anchored beliefs much of your world-picture is built on. *That hurts*. In a way, it's analogous to the high school class president who comes home one day to learn that her father has just been shown to be the executive head of the local vice, dope and murder-for-hire organization. It's a kind of new knowledge that forces her to give up a belief in an ideal, and in her own worth.

The engineer, who is not a theoretician, does not run that risk. There may, indeed, be new and better techniques—but it can never be shown that his techniques don't work. They're not *wrong*. The engineer has a fundamental security in that which the scientist-orientation can not have.

However—and herein lieth the weakness of the engineering orientation!—the engineering orientation tends, by reason of that, to a high degree of conservatism. Ugh's stone

ax worked; one consequence was that it took some 300,000 years to do the R & D work that went from the crudest chipped flint axes which would just barely work on cutting trees—though they were first-rate tools for cracking skulls—to the highly developed, beautifully shaped and balanced stone ax of the late Neolithic workers.

The Pure Engineer, like the Pure Scientist, is something of an artificial concept with respect to modern technology—but not with respect to the earliest civilizations.

The earliest fire-users could maintain, but could not start, fire; the preservation of fire was, for them, overwhelmingly important. They had a technique that, they knew, worked; it would maintain a fire. They were not about to start messing around trying new ways—the easily-killed entity, fire, was too precious to take chances.

The earliest technologies were all the result of centuries of patient, and costly, hard-won development; the engineers of that time were *pure* engineers; they did things the way centuries of trial and error had proven would work, and no variations wanted!

The development of Science with explanations of *why* things worked, made experimental variations possible. The trials could, thereafter, be something other than simple random trials, with 99.99% error. Science, and the labors of the scientists, made it possible for engineers

to make meaningful estimates of what changes might be useful—to make extrapolations from the known into unknown areas.

The teamwork of Science and Engineering produced results that Science alone didn't choose to bother with, and Engineering alone wouldn't dare risk.

The Greek logicians rejected *doing*, making experiments, as illogical. (It is; argument by experimental demonstration is precisely equivalent to proving your point with a club. It is *not* a logical argument; you're using material reality to force your opponent to agree with a conclusion he rejects. It's a *rational* method of reaching right answers, but don't mistake "rational" and "logical" as being equivalent terms. A paranoid schizophrenic psychotic, completely insane, can be highly intelligent, and far more logical than any sane man. "He's locked up not because he's stupid, but because he's nuts." Such a man can be logical, but completely irrational.)

And the Greek logicians originated many great concepts.

The Romans, on the other hand, were the greatest engineers the world had produced; we still use not only their strictly rule-of-thumb engineering techniques in Civil Engineering, but also in Law—for the Roman legal code was based on precisely the same hard-headed, non-theoretical approach to social engineering. Their legal code wasn't based on any remote concept like

Justice; it was based strictly on the proposition "This way of doing things makes a cultural group *work*; it maintains orderly relationships."

Neither group achieved what the two could have by combining their talents—and they never did learn to combine them.

Modern technical culture stems from a workable integration of the two basic approaches; what we know as "Modern Science" is neither pure Science nor pure Engineering.

But currently, the Strategists, the Scientists, have acquired too much domination over the Tacticians, the Engineers. Too many Chiefs and not enough Indians. Not so much in numbers, but in attitude, in status and approach to problems. The culture is being dominated by the Scientist type orientation—largely, as I said, by the fact that it's the Scientist-type orientation that writes all the General Science textbooks, and the science texts for most college students. Only when students of specialized engineering courses get into the texts of their specialties do they get books and instructions oriented primarily on the "this way it *works*" basis.

The Engineer tends to be over-conservative with a technique that works. But—the Scientist is enormously rigid in rejecting new data which will not fit his theories.

The Scientist will happily accept a *new theory* that explains something new, or explains some fringe data that has been giving him more

and more acute mental dyspepsia. The concept that radioactivity was the result of transmutation of the elements was a new, very upsetting concept when Rutherford introduced it—but highly acceptable, because it resolved a dilemma that was acutely annoying to the world's major scientists. This was new theory to be *added* to previous knowledge; it didn't require throwing out major areas of previous conviction. (The "transmutation of elements is impossible" concept underwent a minor modification; it remained true that *men* couldn't change the elements, that all the familiar elements were immutable, and that only a very few, very peculiar elements *naturally* transmuted.)

Einstein's relativity gave a logical-mathematical relationship between some very bothersome fringe observations, without throwing out any of the long-held convictions. Highly acceptable.

Galileo's type of new concept, however, forced the abandonment of huge areas of long-held beliefs. This was acutely upsetting—it was brainwashing; it was bitterly painful slavery. The next generation of scholars had no great trouble with it, of course, because they didn't have the old ideas as a long-held and honest belief. Forcing a well-brought up Victorian maiden to appear on the beach in a bikini would have been a most horribly violent and emotionally painful—and injurious, very literally—experience for

her. It's a hideous experience for her granddaughter only if said granddaughter has a figure of the kind that should be seen only in private.

Equally disturbing to the Scientist is having to accept *data* that does not fit into his theory structure. Data he knows will, if accepted, force him to recognize his theories are *wrong*.

One of the strongest opponents of Rutherford's transmutation explanation of radioactivity was Lord Kelvin—who had proven the Earth could not be more than 50,000,000 years old, because of the rate of heat-flow from the deep interior. If the Earth were ten or more times that old, all the heat would have leaked away, and the interior of the Earth would be cold, not hot as volcanoes and the deepest mines showed it was.

Radioactive energy would force him to acknowledge he was *wrong*—that his whole theoretical structure was based on a false postulate. That he was wrong, because he did *not* have all the relevant data, as he was convinced he did have.

The mining engineers didn't mind—they didn't care whether those deep mines were hot because of original internal heat still leaking from the Earth's core, or because of radioactive energy being released as heat in Earth's crustal rocks. They were far more interested in the new, developing technology of artificial refrigeration that made it possible to cool those deep mines so

miners could work in them. They had no emotional brainwashing problem in accepting either theory; it was the heat, not the cause, that worried them.

The result of that is that the engineer and the scientist can—if they will!—team up in another way which tends to be strongly resented and rejected by the scientist. He doesn't like being brainwashed by the hard, observational data that the engineers report. Hard, nasty observational data that make hash out of his deeply-held convictions of the Laws of Science. (Which are fine—so long as they actually conform fairly well with the real Laws of the Universe!)

If you have any notion that that problem is long since gone—that we don't do things that way any more—check for yourself. Remember this; the Scientist has enormous social status now, and when he says "That is impossible nonsense!" his statement will be given overwhelming pressure-of-acceptance. One result is that very little contrary-to-theory data reaches your view; it gets screened out. The contrary-to-theory reporter is declared subject to delusions, hallucinations, misinterpretation of observation, or a crackpot wanting attention. Therefore, you will be shielded from most contra-theoretical data—or that which does get through, will be heavily loaded with authoritative opprobrium. The most effective damning labels are "supersti-

tion" and "folklore." Declare anything "folklore," and that *proves* it's nonsense . . . doesn't it?

It does for most people today.

Like the "old superstitious folklore" that the Moon's phases influenced Earth's weather. It took over a hundred years for meteorological observers who *did* observe the facts, and were howled down by the Scientists of the field, to demonstrate that that "old superstitious folklore" happened to dead-center on the nose *fact*. It took an electronic computer and some 12,000 observational records of some fifty years over the entire United States to beat the Authoritative Opposition into submission. (See—a completely nonlogical argument was used; facts and data, not a sound, mathematical-logical explanation of *why* the Moon influences the weather. The scientists were clubbed into slavery to an unwanted realization by a mass of nonlogical *data*. There is, as of now, no known reason, no *why*, of that data. And the facts are so hideously distasteful that the U.S. Weather Bureau in its predictions still isn't *using* that fact.)

For years, Scientists have declared that ball lightning was "old folklore" and "superstitious nonsense." The observational data came in from all sorts of observers, over periods of centuries—and was roundly rejected because it could be demonstrated that bumblebees can't—er, I mean that electric field forces couldn't possibly produce

any such phenomenon. A true scientist, when encountering an observational report of the phenomenon, immediately exercised his highly trained wits to explain it away completely—no matter how many observers, of what qualifications, might report the data. And no matter what lengths of ingenuity had to be resorted to. (I still think the all-time high in mistaken ingenuity was the scientist who explained away two hundred and eight careful accounts of ball lightning, including several which he attributed to the Luminous Owl Effect. Observed ball lightning seen at night, he declared, was really just an owl which had spent the day in a hollow tree infested with luminous bacteria; coming out and flying about at night, it gave the observed effect. The UFO-explainers haven't caught up with that one yet—they're still stuck with marsh gas.)

Recently some Westinghouse Electric Company engineers, with the aid of an electronic computer, have succeeded in working out a mathematical-logical model that explains *why* ball lightning exists. The phenomenon is now accepted in full, and at last is in good scientific standing—but please . . . it's *kugelblitz* now. It isn't polite to remind them that "ball lightning" turned out to be another valid observation of the folk, and not "just folklore". *Kugelblitz* is the German term for the phenomenon.

The scientist is driven, by his

theoretical orientation, to deny the existence of observational data that doesn't and can't exist in his theoretical world-picture. This can jam the works of progress pretty thoroughly.

The engineer, on the other hand, isn't concerned with *why* and theory—save as a *useful* tool to getting something built or accomplished.

The engineer alone would tend to stop progress by being too conservative, by sticking to something he already knows will work, and can depend on. Marine engineers, for instance, go on using enormously massive engine structures, because they can load immense weight into ships, and still have 'em float. The aeronautical engineer couldn't load his planes that way—so he developed engine structures of far greater power, and far less weight. And the modern jet engine has proven to be so economical and so reliable and so powerful that they are now being used in industrial power plants for driving generators on a year-in-year-out basis. The marine engineers go on using immensely massive steam and Diesel engine systems; they've used 'em for years, and they know they work, so why change?

But because the engineer doesn't give a hoot about what a fact does to a theory, he's perfectly willing to use a technique that's theoretically "superstitious nonsense—old folklore" if he observes it works.

Major construction engineering

companies pay for astrological weather forecasts to determine when to start moving their heavy equipment in to start the job. (They don't like having the equipment bogged down in a sea of mud due to late spring rains, while a crew of 3,000 or so men stand by waiting for the ground to become workable.) It may be a lot of superstitious folklore—but it works better than the Weather Bureau's long-range forecasts.

Utility field crews use dowsing rods to find underground pipes they need to locate. They certainly don't know *why* such a trick should work—that's not an engineer's business anyway—but they know *how*, and they know by observational test that it *works*. So they do, and will continue to, use the rods because they save time, money and effort digging. Some day no doubt someone will work out the laws of the Universe that underlie the working of dowsing; in the meantime the engineers will use 'em, just as the Roman engineers used mortar, although some 2,000 years passed before anybody could explain *why* that sloppy mush hardened up as it does—and always has.

In that respect, the engineers will progress, and eventually brainwash some poor scientist, beating him over the intellect with masses of hard facts, into figuring out *why*.

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The Editor.

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