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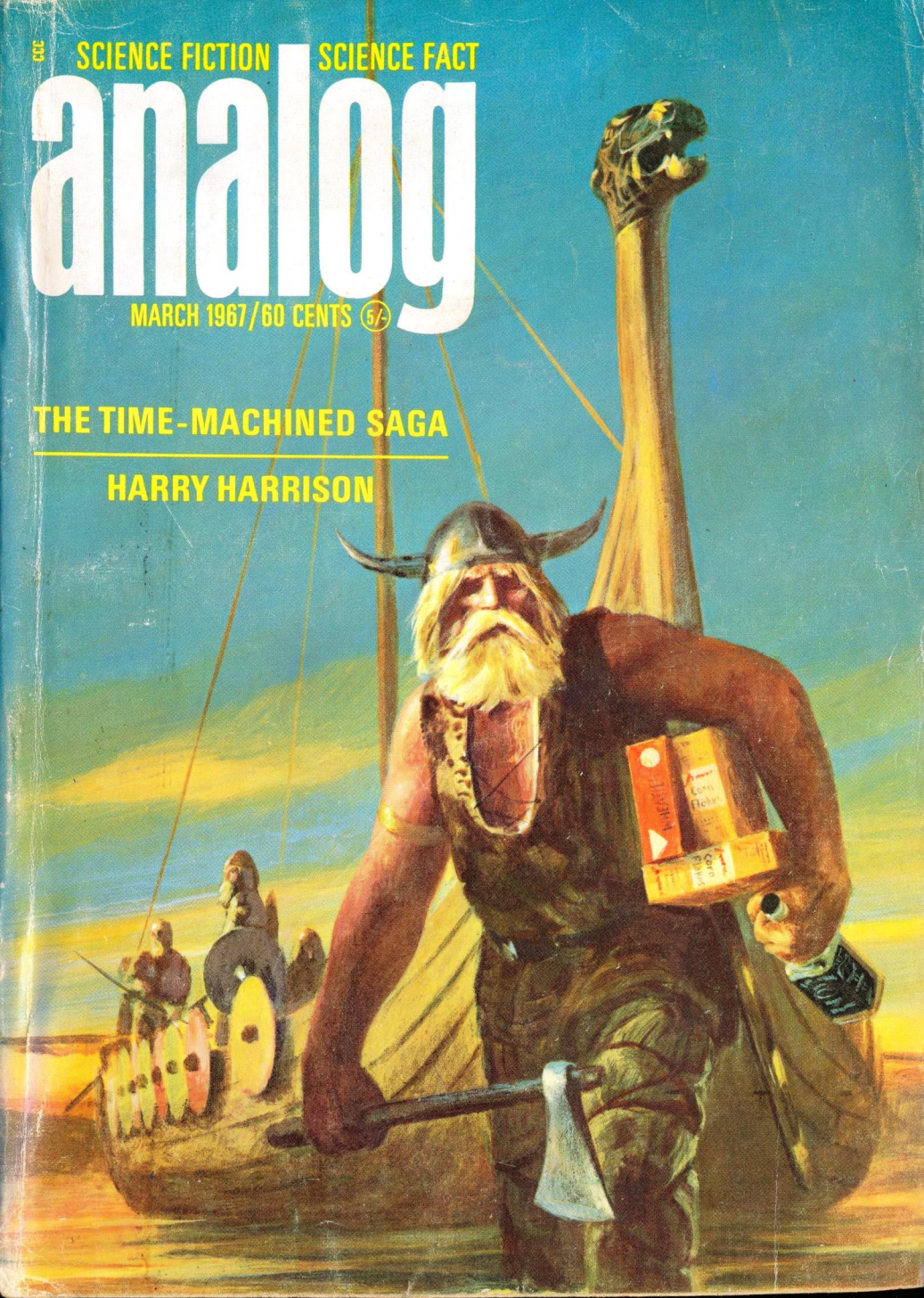
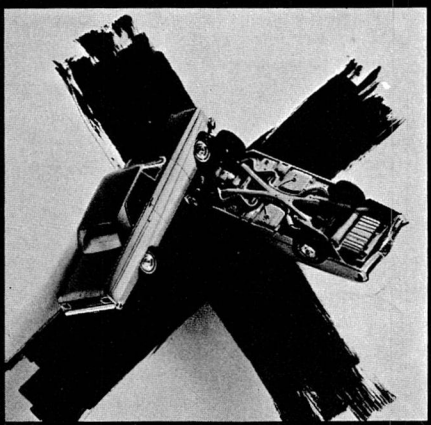
THE TIME-MACHINED SAGA

HARRY HARRISON





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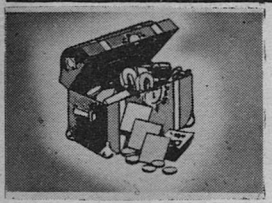

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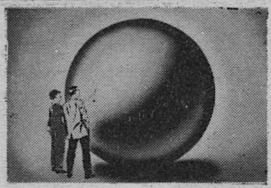

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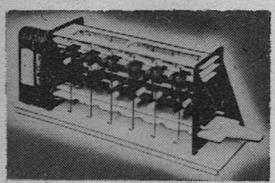

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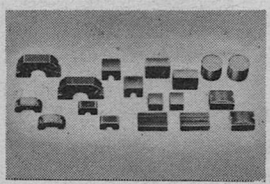

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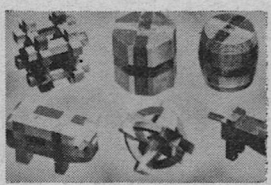

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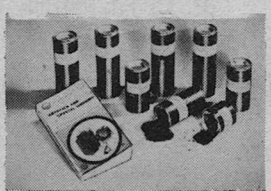

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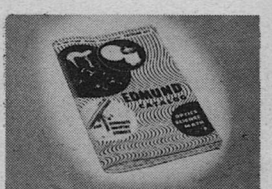

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NEXT ISSUE ON SALE
MARCH 9, 1967
$6.00 per year
in the U.S.A.
60 cents per copy

Cover by
John Schoenherr

Vol. LXXIX, No. 1 March 1967

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SHORT STORIES

SCIENCE FACT

READER'S DEPARTMENTS

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. Patcevitch, 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 one year, $10 for two years, $13 for three years. Elsewhere, $8 for one year, $16 for two years. Payable in advance. 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. POSTMASTER: SEND FORM 3579 TO ANALOG SCIENCE FICTION/SCIENCE FACT, BOULDER, COLORADO 80302.

EDITORIAL AND
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PORTABLE POWER

an editorial by John W. Campbell

The development of electric battery-powered devices has been remarkable since WWII—partly because of WWII uses of battery-powered radio communication devices. The infantry was dependent on the walkie-talkie or its variant equivalents—and they had to be battery-powered. The short service-life of the batteries drove company commanders into a frenzy—and the Signal Corps did a great deal to apply pressure for better batteries.

The battery industry had drifted along very lackadaisically for half a century, turning out the Good Old Reliable carbon-zinc-ammonium chloride dry cells. "Dry cell" meant the old Leclanché cell; there wasn't anything else.

The mercury dry cell came during WWII. The hermetically sealed rechargeable Ni-Cd cells came about ten years later. The alkali-manganese cells showed up about 1960.

With hermetically sealed, rechargeable cells of high power-rate, battery-powered tools—not merely children's toys—became possible. Batteries, at last, became portable, reasonably powerful *power* supplies.

And, of course, when that happened, power-consuming devices, from power drills to power-zoom movie-camera lenses could be, and were, developed.

Basically, an industry is conservative; they don't ordinarily start some new program unless the pressure is on and they've got to. WWII demand for batteries that would work those vacuum-tube operated walkie-talkies and other equipment applied the pressure. The mercury cell, with its much greater power-per-ounce, far better shelf life, resistance to heat-and-humidity, and power-per-cubic-inch could have been developed and marketed about 1900—all the basic facts needed for its development were in the literature then. But the established dry cell manufacturers had a good, stable business already—their carbon-zinc batteries worked, so why spend large sums on a mere speculation that possibly a better cell could be made?

The Mallory Company wasn't in the battery business at the time. By the end of WWII their development of the mercury cell had put them in the dry-battery business in a big way—and lighted a fire under the old-line battery companies.

Europe had been using the Jungner Ni-Cd batteries for forty years—and you couldn't even learn they existed in any United States school! "The Chemical Rubber Handbook of Chemistry & Physics," for instance, listed a whole collection of electrochemical batteries, many ancient and long-obsolete types: Grove cells—Bunsen cells—Edison-LeLand cells. But they apparently didn't know that the Ni-Cd cell existed as of 1945! They only knew about the lead-acid, lead-zinc—same as lead-acid save that the negative plate was zinc instead of metallic lead—and the Ni-Fe Edison cells. They were good enough batteries for Grandpaw, and they were good enough for anybody, b'gad!

And for the more than forty years Europe had been using the excellent Ni-Cd cells, they hadn't done a thing about improving them or modifying them appreciably from the original 1898 Jungner design.

When American companies finally did get around to making Ni-Cd cells—an Army colonel who'd seen Ni-Cd batteries in military vehicles over in Europe during WWII start-

TABLE I

HIGH-ENERGY BATTERIES

(Standard lead-acid storage batteries yield about 10 to 15 watt-hours per pound)

Battery type	Theoretical maximum of the electrode reaction. Watt-hours/pound	Expected engineering in practical cells
Goulton Lithium-Nickel Chloride	437	100+
Ford Sodium-Sulfur	340	150
General Dynamics Zinc-air	400	50
Goulton Lithium-Nickel Fluoride	620	Not developed yet.

The difference between theoretical watt-hours per pound and engineering achievable is that practical cells must have cases, connectors, structural components, as well as chemicals. The Zn-air cell requires electrolyte pump, filter, and reservoir, and an air pump and plumbing.

ed the U.S. production of the batteries under the obvious trade name of Nicad—the Americans had no traditions on How To Make Ni-Cd Batteries. So they experimented—and came up with the sintered-plate, hermetically sealed Ni-Cd cells that are standard, now, in cordless tools and space vehicles.

Then the Europeans who'd sat contentedly on the Jungner type Ni-Cd for forty years accepted the new idea—under pressure from the Americans' successful production.

Now the demand for superior batteries is beginning to produce some real movement in the glacially slow battery-development field. Cordless power tools demand real power. Space vehicles need power-supplies that supply *power*.

And, finally, Detroit is getting into the act at last—under pressure of anti-smog-and-pollution legislation.

The battery-operated electric automobile failed—despite its obvious inherent advantages—solely because the batteries available were incompetent. They've remained failures since because of the continued incompetence of batteries.

As of now, the lead-acid battery is still the most practical electric-power-storage device we have—and this despite the fact that lead, with its high atomic weight, is about the worst imaginable electrochemical fuel and oxidizer!

Of the now-on-the-market storage batteries, the maximum energy-per-pound and energy-per-cubic-inch can be stored in a silver-zinc battery—which is why they are used in some of the space vehicles. They're utterly impractical for any commercial, ordinary use, because of the high price of silver, the high cost of the complex and delicate manufacturing process, and the unfortunate fact that zinc won't plate out of solution in the same place it originally came from. Instead of going into solution in the electrolyte when current is drawn, and then plating back out where it came from on recharge—it plates out in dendritic crystals—little trees—which can build up long, sharp-pointed fingers that puncture the separators and short-circuit the cell. This makes the Ag-Zn cell unreliable for more than about half a dozen recharge cycles.

Silver-cadmium cells—essentially the same electrochemical mechanism as the Ni-Cd cell, save for using silver oxide instead of nickel oxide—don't have that problem, because as the Cd is consumed electrically, it forms a totally insoluble $Cd(OH)_2$ which stays exactly where the Cd metal was, and when electrolyzed back to Cd metal during charge, is still in the same spot. The life of the Ag-Cd cell is much longer than the Ag-Zn. Unfortunately, Cd isn't as high-energy a fuel as Zn, and the Ag-Cd doesn't yield as high voltage. Hence, lower power per pound and per cubic inch.

continued on page 168

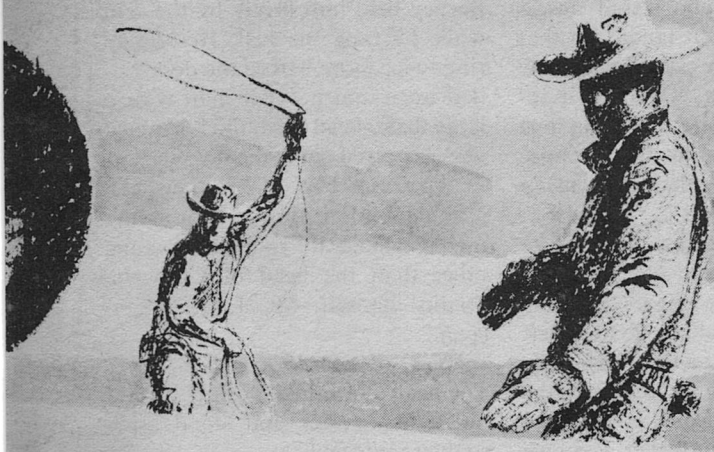
Part One of Three Parts.

What did a mere bankrupt movie maker, a seven-foot Viking, a time-machine inventor and Hollywood's latest sex pot have in common? Nothing . . . until they get snarled up in the machinations of the time-machined saga.

Illustrated by John Schoenherr

The Time-Machined Saga

HARRY HARRISON



I

"What am I doing here? How did I let myself be talked into this?" L. M. Greenspan groaned as dinner scraped at his ulcer.

"You are here L.M. because you are a far-sighted, quick-thinking executive. Or to put it another way you have to grasp at any straw handy, because if you don't do something fast Climactic Studios will sink without a trace." Barney Hendrickson puffed spasmodically at the cigarette he clutched between yellowed fingers and stared unseeingly at the canyon landscape that rushed soundlessly past the window of the Rolls-Royce. "Or to put it another way, you are investing one hour of your time in the examination of a project that may mean Climactic's salvation."

L.M. gave all of his attention to the delicate project of lighting a smuggled Havana cigar: clipping the end with his gold pocket clipper, licking the truncated tip, waving the wooden match about until all the chemicals had burned away, then gently puffing the slender greenish form to life. The car slid over to the curb with the ponderous ease of an hydraulic ram and the chauffeur rushed around to open the door. L.M. stared out suspiciously without moving.

"A dump. What could there be in a dump like that that could possibly save the studio?"

Barney pushed unsuccessfully at the unmoving and solid form. "Don't prejudge, L.M. After all who could have predicted that a poor kid from the East Side slums would one day be head of the largest film company in the world?"

"Are you getting personal—?"

"Let's not get sidetracked," Barney insisted. "Let's first go inside and see what Hewett has to offer and then make a decision."

Reluctantly, L.M. allowed himself to be urged up the cracked flagstone walk to the front door of the run-down stucco house, and Barney held him firmly by the arm while he rang the bell. He had to ring twice more before the door rattled open and a small man with a large bald head and thick-rimmed glasses peered out at them.

"Professor Hewett," Barney said, pushing L.M. forward, "this is the man I talked to you about, none other than the head of Climactic Studios himself, Mr. L.M. Greenspan."

"Yes, of course, come in . . ." The professor blinked fishily behind his round glasses and stood aside so they could enter.

Once the door was closed behind his back L.M. sighed and surrendered, allowing himself to be led down a flight of squeaking stairs into the basement. He halted abruptly when he caught sight of the banks of electrical equipment, the festooned wires and humming apparatus.

"What is this? It looks like an old set for Frankenstein."

"Let the professor explain." Barney urged him forward.

"This is my life work," Hewett said, waving his hand roughly in the direction of the toilet.

"What kind of life work is *that*?"

"He means the machines and apparatus, he's just not pointing very well."

Professor Hewett did not hear them, he was busy making adjustments at a control board. A thin whining rose in pitch and sparks began to fall from a hulking mass of machinery.

"There!" he said, pointing dramatically—and with considerably more accuracy this time—at a metal platform set on thick insulators. "That is the heart of the vremeatron, where the displacement takes place. I will not attempt to explain the mathematics to you, you could not possibly understand them, or go into the complex details of the machine's construction. I feel that a demonstration of the vremeatron in operation will be wisest at this point." He bent and groped under a table and brought out a dusty beer bottle that he put on the metal platform.

"What is a vremeatron?" L.M. asked suspiciously.

"This is. I shall now demonstrate. I have placed a simple object in the field which I shall now activate. Watch closely."

Hewett threw a switch and electricity arced from the transformer in the corner, the mechanical howl turned to a scream while banks of tubes flashed brilliantly and the air filled with the smell of ozone.

The beer bottle flickered briefly and the roar of the apparatus died away.

"Did you see the displacement? Dramatic, wasn't it?" The professor glowed with self-appreciation and pulled a length of paper marked with squiggles of ink out of a recording machine. "Here it is, on the record. That bottle traveled back seven microseconds in time then returned to the present. In spite of what my enemies say the machine is a success. My vremeatron—from vreme, the Serbo-Croatian for 'time,' in honor of my maternal grandmother who was from Mali Losinj—is a workable time machine . . ."

L.M. sighed and turned to the stairs. "A nut," he said.

"Hear him out, L.M., the professor has some ideas. It is only because he has been turned down by all the foundations in his requests for funds that he will even consider working with us. All he needs is some finance to jazz his machine up."

"There's one born every minute. Let's go."

"Just listen to him," Barney pleaded. "Let him show you the one where he sends the beer bottle into the future. This is too impressive to ignore."

"There is a temporal barrier in any motion towards the future, I must explain that carefully. Displacement towards the future requires infinitely more energy than displacement into the past. However, the effect still operates—if you will watch the bottle closely."

Once again the miracle of electronic technology clashed with the forces of time and the air crackled with the discharge. The beer bottle flickered, ever so slightly.

"So long." L.M. started up the stairs. "And P.S., Barney, you're fired."

"You can't leave yet—you haven't given Hewett a chance to prove his point, or even to let me explain." Barney was angry, angry at himself, at the dying company that employed him, at the blindness of man, at the futility of man, at the fact he was overdrawn in the bank. He raced up behind L.M. and whipped the smoking Havana from his chops. "We'll have a real demonstration, something you can appreciate!"

"They cost two bucks apiece! Give it back—"

"You'll have it back, but watch this first." He hurled the beer bottle to the floor and put the cigar on the platform. "Which one of these gadgets is the power control?" he asked Hewett.

"This rheostat controls the input, but why? You cannot raise the temporal displacement level without burning out the equipment—*stop!*"

"You can buy new equipment, but if you don't convince L.M., you're on the rocks and you know it. Shoot for the moon!"

Barney held the protesting professor off with one hand while he spun the power to full on and slammed the operation switch shut. This time the results were far more spectacular. The scream rose to a banshee wail that hurt the ear, the tubes glowed with all the fires of hell, brighter and brighter, while static charges played over the metal frames and their hair stood straight up from their heads and gave off sparks.

"I'm electrocuted!" L.M. shouted as with a last burst of energy all the tubes glared and exploded and the lights went out.

"There—look there!" Barney shouted as he thumbed his Ronson to life and held the flame out. The metal platform was empty.

"You owe me two bucks."

"Look, gone! two seconds at least, three . . . four . . . five . . . six . . . seven . . ."

The cigar suddenly reappeared on the platform, still smoking and L.M. grabbed it up and took a deep drag.

"All right, so it's a time machine, so I believe you. But what has this got to do with making films, or keeping Climactic from having trouble with the banks."

"Let me explain . . ."

II

There were six men in the office, grouped in a semicircle in front of L.M.'s desk.

"Lock the door and cut the phone wires," he ordered.

"It's three in the morning," Barney protested, "we can't be overheard."

"If the banks get wind of this I am ruined for life, and maybe longer. Cut the wires."

"Let me take care of it," Amory Blestead said, standing and taking an insulated screwdriver from his breast pocket: he was the head of Climactic Studios' technical department. "The mystery is at last solved. For a year now my boys have been repairing these cut wires on the average of twice a week." He worked quickly, taking the tops off the junction boxes and disconnecting the seven telephones, the intercom, the closed circuit television and the Muzak wire. L.M. Greenspan watched him closely and did not talk again until he had personally seen all ten wires dangling freely.

"Report," he said, stabbing his finger at Barney Hendrickson.

"Things are ready to roll at last, L.M. All of the essential machinery for the vremeatron has been built on the set for 'The Creature's Son Marries the Thing's Daughter' and the expenses have been covered by the budget for this picture. In fact the professor's machines cost less than the usual props . . ."

"Don't digress!"

"Right. Well, the last laboratory scenes for the monster picture were shot this afternoon, yesterday afternoon I mean, so we got some grips in later on overtime and cleaned all the machinery out. As soon as they were gone the rest of us here mounted it in the back of an Army truck from the set of 'The PFC From Brooklyn' and the Prof has hooked it up and tested everything. It's ready to go."

"I don't like the truck—it'll be missed."

"No it won't, L.M., everything has been taken care of. It was government surplus in the first place and was going to be disposed of in the second. It was sold legally through our usual outlet and bought by Tex here. I told you—we're in the clear."

"Tex, Tex . . . who is he? Who are all these people?" L.M. complained, darting suspicious glances around the circle. "I thought I told you to keep this thing small, hold it down until we saw how it works, if the banks get wind . . ."

"This operation is as small as it could possibly be. There is myself and the Prof, whom you know, and Blestead, who is your own technical chief and has been with you for thirty years . . ."

"I know, I know . . . but what about those three?" He waved a finger at two dark and silent men dressed in levis and leather jackets, and at a tall, nervous man with red-

dish blond hair. Barney introduced them.

"The two in the front are Tex Antonelli and Dallas Levy, they're stunt men . . ."

"*Stunt men!* What kind of a stunt you pulling bringing in two phony Bronx cowboys?"

"Will you kindly relax, L.M. We need help on this project, trustworthy men who can keep quiet and who know their way around in case of any trouble. Dallas was in the combat infantry, then on the rodeo circuit before he came here. Tex was thirteen years in the Marines and an instructor in unarmed combat."

"And the other guy?"

"That's Dr. Jens Lyn from U.C.L.A., a philologist." The tall man rose nervously and made a quick bow towards the desk. "He specializes in German languages, or something like that, and is going to do our translating for us."

"Do you all realize the importance of this project now that you are members of the team?" L.M. asked.

"I'm getting paid my salary," Tex said, "and I keep my mouth shut." Dallas nodded in silent agreement.

"This is a wonderful opportunity," Lyn said rapidly, with a slight Danish accent. "I have taken my sabbatical, I would accompany you even without the generous honorarium as a technical adviser, we know so little of spoken Old Norse . . ."

"All right, all right," L.M. lifted his hand, satisfied for the moment. "Now what is the plan? Fill me in on the details."

"We have to make a trial run," Barney said. "See if the Prof's gadget really does work . . ."

"I assure you . . . !"

". . . And, if it does work, we set up a team, work out a script, then go out and shoot it on location. And what a location! All of history is open to us on wide screen! We can film it all, record it . . ."

"And save this studio from bankruptcy. No salary for extras, no sets to be built, no trouble with the unions . . ."

"Watch it!" Dallas said, scowling.

"Not *your* union, of course," L.M. apologized. "All of the crew from here will be employed at scale and above, with bonuses; I was just thinking of the savings at the other end. Go now, Barney, while I am still enthusiastic, and do not come back until you have good news for me."

Their footsteps echoed from the cement path between the giant sound stages and their shadows stretched first in back, then in front of them as they walked through the pools of light under the widely spaced lamps. In the stillness and loneliness of the deserted studios they had sudden thoughts about the magnitude of what they were attempting and they moved, unconsciously, closer together as they

walked. There was a studio guard outside the building who saluted as they approached and his voice broke the morbid spell.

"Tight as a drum, sir, and no disturbances at all."

"Fine," Barney told him. "We'll probably be here the rest of the night, classified work, so see that no one gets near this area."

"I've already told the captain and he's passed the word to the boys."

Barney locked the door behind them and the lights flared from the rafters above. The warehouse was almost empty, except for a few dusty flats leaning against the back wall and an olive drab truck with the white Army star on its door and canvas turtleback.

"The batteries and accumulators are charged," Professor Hewett announced, clambering into the back of the truck and tapping on a number of dials. He unhooked the heavy cables that ran to the junction box in the wall and handed them out. "You may board, gentlemen, the experiment can begin any time now."

"Would you call it something else besides experiment?" Amory Blestead asked nervously, suddenly beginning to regret his involvement.

"I'm getting into the cab," Tex Antonelli said. "I'll feel more comfortable there. I drove a six-by like this all through the Marianas."

One by one they followed the professor into the rear of the truck and Dallas locked up the tailgate. The banks of electronic machinery and the gasoline powered motor-generator filled most of the space and they had to sit on the boxes of equipment and supplies.

"I am ready," the professor announced. "Perhaps for the first trial we might take a look in on the year 1500 A.D.?"

"No." Barney was firm. "Set 1000 A.D. on your dials just as we decided and pull the switch."

"But the power expenditure would be less, the risk even . . ."

"Don't chicken out now, Professor. We want to get as far back as possible so that no one will be able to recognize the machinery as machinery and cause us any trouble. Plus the fact that the decision has been made to do a Viking picture not a re-make of 'The Hunchback of Notre Dame.' "

"That would not be in the Sixteenth Century," Jens Lyn said. "I would date the setting in medieval Paris rather earlier, about . . ."

"Geronimo!" Dallas growled. "If we're gonna go, let's stop jawing and go. It spoils the troops if you horse around and waste time before going into combat."

"That is true, Mr. Levy," the professor said, his fingers moving over the controls. "1000 anno Domini it is—and here we go!" He cursed and fumbled at the controls. "So many of the switches and dials are dummies that I get confused," he complained.

"We had to make the machines

so they could be used in the horror film," Blestead said, talking too fast. There was a fine beading of sweat on his face. "The machines had to look realistic."

"So you make them unrealistic, bah!" Professor Hewett muttered angrily as he made some final adjustments and threw home a large multi-poled switch.

The throbbing of the motor-generator changed as the sudden load came on, and a crackling discharge filled the air above the apparatus: sparks of cold fire played over all the exposed surfaces and they felt the hair on their heads rising straight up.

"Something's gone wrong!" Jens Lyn gasped.

"By no means," Professor Hewett said calmly, making a delicate adjustment. "Just a secondary phenomenon, a static discharge of no importance. The field is building up now, I think you can feel it."

They could feel something, a distinctly unpleasant sensation that gripped their bodies solidly, a growing awareness of tension.

"I feel like somebody stuck a big key in my belly button and was winding up my guts," Dallas said.

"I would not phrase it in exactly that manner," Lyn agreed, "but I share the symptoms."

"Locked on to automatic," the professor said, pushing home a button and stepping away from the controls. "At the microsecond of maximum power the selenium rectifiers will trip automatically. You can monitor it here, on this dial. When it reaches zero . . ."

"Twelve," Barney said, peering at the instrument, then turning away.

"Nine," the professor read. "The charge is building up. Eight . . . seven . . . six . . ."

"Do we get combat pay for this?" Dallas asked, but no one as much as smiled.

"Five . . . four . . . three . . ."

The tension was physical, part of the machine, part of them. No one could move. They stared at the advancing red hand and the professor said:

"Two . . . one . . ."

They did not hear *zero* because for that fraction of eternity even sound was suspended. Something happened to them, something indefinable and so far outside of the normal sensations of life that an instant later they could not remember what it had been or how it had felt. At that same moment the lights in the warehouse outside vanished, and the only illumination came from the dim glow of the instruments on the tiered panels. Behind the open end of the truck, where an instant before had been the brightly lit room, there was now only a formless, toneless gray nothing that hurt the eyes when you looked at it.

"Eureka!" the professor shouted.

"Anyone want a drink?" Dallas asked, producing a quart of rye

from behind the crate he was sitting on, and accepting his own invitation to the marked detriment of the bottle's liquid contents. It passed quickly from hand to hand, even Tex reached in from the cab for a slug, and all of them, with the exception of the professor, drew courage from it. He was too busy at his instruments, babbling happily to himself.

"Yes—definitely—definitely displacing towards the past . . . an easily measured rate . . . now physical displacement as well . . . wouldn't do to end up in interstellar space or in the middle of the Pacific . . . oh dear no!" He glanced into a hooded screen and made more precise adjustments. "I suggest you hold securely to something, gentlemen, I have made as good an approximation as possible to the local ground level, but I am afraid to be too precise. I do not wish us to emerge underground, so there may be a drop of a few inches—are you ready?" He pulled the master switch open.

The back wheels hit first and an instant later the front of the truck jarred to the ground with a mighty crash, knocking them about. Bright sunlight flooded in through the open rear making them blink, and a fresh breeze brought the sound of distant breakers.

"Well I'll be double-damned!" Amory Blestead said.

The grayness was gone and in its place, framed by the canvas top of the truck like a giant picture window, was a view down a rocky beach to the ocean where great waves were breaking. Gulls swooped low and screamed while two frightened seals snorted and splashed off into the water.

"This is no part of California I know," Barney said.

"This is the Old World, not the New," Professor Hewett said proudly. "To be precise, the Orkney Islands, where there were many settlements of the Northmen in the Eleventh Century, in the year 1003. It undoubtedly surprises you that the vremeatron is capable of physical, as well as temporal, displacement, but this is a factor . . ."

"Nothing has surprised me since Hoover was elected," Barney said, feeling more in control of himself and affairs now that they had actually arrived somewhere—or somewhen. "Let's get the operation moving. Dallas, roll up the front of the tarp so we can see where we're going."

With the front end of the canvas cover out of the way a rocky beach was disclosed, a narrow strand between water and rounded cliffs. About a half mile away a headland jutted out and cut off any further view.

"Start her up," Barney called in through the rear of the cab, "and let's see what there is farther along the beach."

"Right," Tex said, pulling the

starter. The engine ground over and burst into life. He kicked it into gear and they rumbled slowly down the rocky shingle.

"You want this?" Dallas asked, holding out a holstered revolver on a gunbelt. Barney looked at it distastefully.

"Keep it. I'd probably shoot myself if I tried to play around with one of those things. Give the other one to Tex and hold onto the rifle yourself."

"Aren't we going to be armed just in case, for our own protection?" Amory Blestead asked. "I can handle a rifle."

"Not professionally, and we work to union rules around here. Your job is to help the professor, Amory, the vremeatron is the most important thing here. Tex and Dallas will take care of the armaments—that way we can be sure that there won't be any accidents."

"Alt for Satan! Look at that, so beautiful, that I should be seeing this with my own eyes!" Jens Lyn burbled and pointed ahead.

The truck had churned its way around the headland and a small bay opened up before them. A crude, blackened rowboat was pulled up onto the shore and just above the beach was a miserable looking building made of clumsily piled turf and stone and covered with a seaweed thatched roof. There was no one in sight, though smoke was curling up from the chimney hole at one end.

"Where is everybody?" Barney asked.

"It is understandable that the sight and sound of this truck have frightened them and that they have taken refuge in the house," Lyn said.

"Kill the engine, Tex. Maybe we should have brought some beads or something to trade with the natives?"

"I am afraid that these are not that kind of natives . . ."

The rough door of the house crashed open as if to emphasize his words and a man leaped out, howling terribly and waving a broad-bladed ax over his head. He jumped into the air, clashed the ax against a large shield he carried on his left arm, then thundered down the slope towards them. As he approached them with immense bounds they could see the black, horned helmet on his head, and his flowing blond beard and wide moustache. Still roaring indistinctly he began to chew the edge of the shield: foam formed on his lips.

"You can see that he's obviously afraid, but a Viking hero cannot reveal his fear before the thralls and housecarls, who are undoubtedly watching from concealment in the building. So he works up a berserk rage . . ."

"Save the lecture, will you, Doc? Dallas, can you and Tex take this guy on, maybe slow him down before he breaks something?"

"Putting a bullet through him will slow him down a lot."

"No! Positively not. This studio does not indulge in murder, even for self-defense."

"All right if that's the way you want it—but this goes under the personal jeopardy bonus in the contract."

"I know! Get out there before . . ."

Barney was interrupted by a thud and tinkling crash followed by even louder howls of victory.

"I can understand what he is saying!" Jens Lyn chortled happily. "He is bragging that he has taken out the monster's eye . . ."

"The big slob has chopped off one of the headlights!" Dallas shouted. "Keep him busy, Tex, I'll be right with you. Draw him away from here."

Tex Antonelli slid out of the cab and ran down the beach away from the truck, where he was seen by the berserk axman who instantly began to pursue him. At about fifty yards distance Tex stopped and picked up two fist-sized stones, well rounded by the sea, and bounced one of them in his palm like a baseball, waiting calmly until his raging attacker was closer. At five yards he let fly at the man's head and, as soon as the shield had been swung up to intercept the stone, he hurled the other at the Viking's middle. Both stones were in the air at the same time and even as the first one was bounding away from the shield the second caught the man in the pit of the stomach: he sat down with a loud *woosh*. Tex moved a few feet farther away and picked up two more stones.

"Bleyda!" * the downed man gasped, shaking his ax.

"Yeah, and you're one, too. C'mon buddy, the bigger they are, the harder the splat."

"Let's wrap him up," Dallas said, coming out from behind the truck and spinning a loop of rope around his head. "The Prof is getting jittery about his gadgets and wants to go back."

"O.K., I'll set him up for you."

Tex shouted some Marine Corps insults, but they did not penetrate the linguistic barrier. He then resorted to the Latin language of gesture that he had learned as a youth and with rapid movements of fingers and hands called the Viking a cuckold, a gelding, ascribed some filthy personal habits to him and ended up with the Ultimate Insult, left hand slapped to right bicep causing the right fist to be jerked up into the air. One—or more—of these obviously had antecedents that predated the Eleventh Century because the Viking roared with rage and staggered to his feet.

Tex calmly stood his ground, though he looked like a pygmy before the charging giant. The ax swung up and Dallas's spinning lasso shot out and caught it, while at the same moment Tex put out his foot and tripped him.

*"Coward!"

As the Viking hit the ground with a crash both men were on him, Tex paralyzing him with an arm-lock while Dallas hog-tied him with rapid bights of rope. In a few instants he was helpless with his arms tied to his legs behind his back and roaring with frustration as they dragged him through the pebbles back to the truck. Tex had the ax and Dallas the shield.

"I have to talk to him," Jens Lyn insisted. "It is a rare opportunity."

"We must leave instantly," the professor urged, making a delicate adjustment on the verniers.

"We're being attacked!" Amory Blestead squealed, pointing with palsied finger at the house. A ragged horde of shock-haired men armed with a variety of swords, spears and axes were rushing down the hill towards them.

"We're getting out of here," Barney ordered. "Throw that prehistoric lumberjack in the back and let's get going. You can have plenty of time to talk to him after we get back, Doc."

Tex jumped into the cab and grabbed up his revolver from the seat. He fired it out to sea until all the chambers were empty, raced the engine, flashed the remaining headlight and blew the horn. The shouts of the attackers turned to wails of fear as they dropped their weapons and fled back into the house. The truck made a U-turn and started back down the beach. When they came to the sharp curve around the headland a horn blared from the other side of the rocks and Tex just had time to jerk the wheel to the right, until the tires were in the rush of breaking waves, as another olive-drab truck tore around the headland and roared by them.

"Sunday driver!" Tex shouted out the window and kicked the truck forward again.

Barney Hendrickson glanced up as the other truck went by, swinging into their wheel tracks, and was almost petrified as he looked into the open rear. He saw himself standing there, swaying as the truck lurched over the rocks and grinning wickedly. At the last moment, before the second truck vanished from sight, the other Barney Hendrickson in the back raised his thumb to his nose and wiggled his fingers at his duplicate. Barney dropped back onto a box as the rock wall intervened.

"Did you see that?" he gasped. "What happened?"

"Most interesting," Professor Hewett said, pressing the starter on the motor-generator. "Time is more plastic than I had ever imagined; it allows for the doubling of world lines, perhaps even for trebling, or even an infinite number of coils. The possibilities are incredible . . ."

"Will you stop babbling and tell me what I saw," Barney snapped, lowering the almost empty whiskey bottle.

"You saw yourself, or we saw us who will be . . . I'm afraid Eng-

lish grammar is not capable of accurately describing a situation like this. Perhaps it would be better to say you saw this same truck with yourself in it as it will be at a later date, that is simple enough to understand."

Barney groaned and emptied the bottle, then shouted with pain as the Viking managed to wriggle around on the floor and bit him in the leg.

"Better keep your feet up on the boxes," Dallas warned. "He's still frothing."

The truck slowed and Tex called back to them. "We're coming to the spot where we landed, I can see where the tire tracks begin just ahead. What's next?"

"Stop as close to the original position of arrival as you can, it makes the adjustments simpler. Prepare yourselves, gentlemen, we begin our return journey through time."

"Tröll taki ydr öll!" * the Viking roared.

III

"What went wrong?" L.M. asked suspiciously as they trooped tiredly into his office, dropping into the same chairs they had left eighteen centuries before. "What happened —you walk out of the office ten minutes ago and now ten minutes later you walk in?"

"Ten minutes to you, L.M.," Barney said, "but it's been hours for us. The machine is O.K., so we're over the first and biggest hurdle. We know now that Professor Hewett's vremeatron works even better than we had hoped. The way is open to take a company back in time and film an accurate, full length, wide screen, realistic, low budget, high-quality historical. Our next problem is a simple one."

"A story."

"Right as always, L.M. And it so happens we have a story, a true-to-life story, and what is more a patriotic story. If I was to ask you who discovered America, what would you say?"

"Christopher Columbus, 1492."

"That's what most people think, but it was the Vikings who did the job first."

"Was Columbus a Viking—I thought he was Jewish?"

"Let us please drop Columbus. Five hundred years before Columbus was born Viking ships had sailed from Greenland and discovered what they called Vinland, which has since been proven to be part of North America. The first expedition was led by Eric the Red . . ."

"Kill that idea! You want to get us blacklisted with a commie picture?"

"Just hold on for a bit, please L.M. After Eric found the place it was colonized, Vikings came and lived there and built houses and

* "May the trolls take you all!" (a pre-Christian equivalent of "Damn you!"

farmed, and this was all organized by the legendary hero, Thorfinn Karlsefni . . ."

"These names! He's got to go, too. I can already hear the big romance scene . . . kiss me my dearest Thorfinn Karlsefni she whispers. Out. You're not doing so hot, Barney."

"You can't rewrite history, L.M."

"What else have we ever done? This is no time to go soft on me, Barney Hendrickson, you who were at one time my best producer and director before the lousy moron-box ruined us all. Get a grip on yourself. The motion pictures are not primarily an educational medium. We are selling entertainment, and if it doesn't entertain it doesn't sell. I see it this way. We got this Viking, you call him Benny, or Carlo, or some other good Viking name, and you do a saga of his adventures . . ."

"That's just the word for it, L.M."

". . . Like one day fighting, and winning of course, restless, he's that kind. He goes off and finds America then comes back and says I have found America! So they make him the king. Then there is this girl, with long, blond wig hair, who keeps waving to him every time he sails away and promises to return. Only now he is older with a little gray above the ears and some scars, he has suffered, and this time instead of going away he takes the girl with him and together they sail into the sunset to a new life as the first pioneers at Plymouth Rock. Well?"

"Great, as always, L.M. You haven't lost the touch." Barney sighed tiredly. Dr. Jens Lyn—whose eyes had been getting wider—made a strangling noise.

"B-but . . . it is not that way, it is in the records. Even Mr. Hendrickson is not completely correct, it was Leif Ericson, the son of Eric the Red who is generally credited with the discovery of Vinland. There are two versions of the chronicle, one in the *Hauksbok* and the other in the *Flateyjarbok* . . ."

"Enough!" L.M. grumbled. "You see what I mean, Barney? Even the history books can't agree, so with a little bringing together here and there and some touching up we got a story. Who were you thinking of for the leads?"

"If we can get him, Ruf Hawk would be perfect for the Viking. And someone who is really stacked for a girl."

"Slithey Tove. She's available and between pictures and for two weeks her crumb of an agent has been in and out of here with deals so I know she is broke and we can get her cheap. Next you will need a writer and for that use Charley Chang, we have him on contract. He's a specialist."

"On Bible stories, maybe, not historicals," Barney said doubtful-

ly. "And frankly I didn't think much of 'Down From the Cross.' or the other thing, 'Walking the Red Sea Waters.' "

"Ruined by censorship, that's all, I O.K.'d the scripts myself and they were great . . ." He broke off suddenly as a bellowing cry sounded through the wall. "Did you hear that?"

"It's the Viking," Tex said. "He was still aching for a fight so we slugged him and chained him to the shower in the executives' head."

"What's this?" L.M. scowled.

"An informant," Barney told him. "One of the locals. He attacked the truck so we brought him along so that Dr. Lyn could talk to him."

"Get him in here. He's just the man we need, someone with local knowledge to answer some questions on production problems. You got to have a local who knows his way around when you are shooting on location."

Tex and Dallas went out and, after a few minutes of chain rattling and two loud thuds, they returned with the slightly glassy-eyed Viking. He stopped in the door when he saw the men waiting in the room and they had their first clear look at him.

He was big, even without the horned helmet he was almost seven feet tall, and hairy as a bear. Matted blond hair hung below his shoulders, and his flowing moustache vanished into the waves of beard that fell to his chest. His clothing consisted of coarsely woven blouse and breeks held in place by a varied assortment of thick leather straps and they exuded a rich odor of fish, stale sweat and tar, yet the heavy gold bracelet around his arm did not seem out of place. His eyes were a light, almost transparent blue, and glared at them from under beetling brows. He was battered and chained, but obviously uncowed and unbeaten, with his chin held high and his shoulders back.

"Welcome to Hollywood," L.M. said. "Sit down—give him a drink, Barney—and make yourself comfortable. What did you say your name was . . . ?"

"He doesn't speak any English, L.M."

L. M. Greenspan's face fell. "I can't say I approve of that, Barney. I don't like working through interpreters, too slow, not reliable. Allright Lyn, do your stuff, ask him his name."

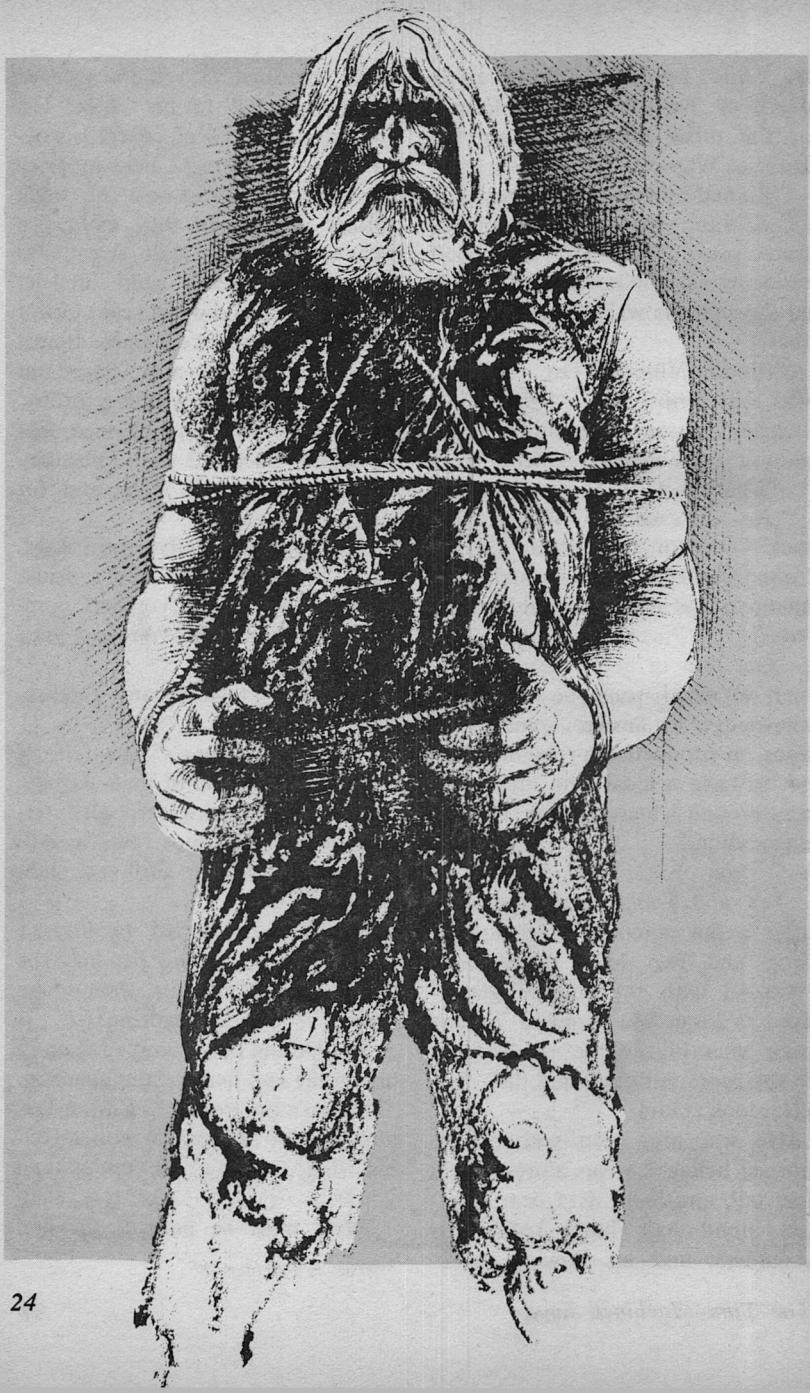
Jens Lyn mumbled to himself for a moment, going through the Old Norse verb forms, then spoke aloud. "Hvat heitir madrinn?" *

The Viking only rumbled deep in his throat and ignored the question.

"What's the trouble?" L.M. asked impatiently. "I thought you talked his lingo? Can't he understand you?"

"You must be patient, sir. Old

*"What is your name?"



Norse has been a dead language for almost a thousand years and we know of it only through the written word. Icelandic is the modern language that most closely resembles it so I am using the Icelandic intonation and pronunciation . . ."

"All right, all right. Lectures I don't need. Make him comfortable and oil him up with a few drinks and let's get rolling."

Tex pushed a chair against the back of his legs and the Viking sat down, glaring. Barney took a bottle of Jack Daniels from the bar concealed by the fake Rembrandt and poured a highball glass half full. But when he held it out to the Viking the man jerked his head away and rattled the chains that bound his wrists.

"Eitr!"* he snarled.

"He thinks that you are trying to poison him," Lyn said.

"That's easy to take care of," Barney said and raised the glass and took a long drink. This time the Viking allowed the glass to be put to his lips and began to drink, his eyes opening wider and wider as he drained it to the last drop.

"Odinn ok Frigg!"** he bellowed happily and shook the tears from his eyes.

"He should like it at seven twenty-five a bottle, plus tax," L.M. said. "You can bet they don't have that kind of stuff where he comes from—nor Lifebuoy. Ask him again about the name."

The Viking frowned with concentration while he listened to the question repeated in a variety of ways, and answered readily enough once he understood.

"Ottar," he said.

"Now we're getting some place," L.M. said and looked at the clock on his desk. "We're also getting onto four o'clock in the morning and I want to get things settled. Ask this Ottar about the rate of exchange—what kind of money do they have, Lyn?"

"Well . . . they barter mostly, but mention is made of the silver mark . . ."

"That's what we want to know. How many marks to the dollar, and tell him not to give me any fancy bank figures. I want the free market price, we've been had this way before, and I'll buy the marks in Tangier if I have to . . ."

Ottar bellowed and hurled himself out of the chair, knocking Barney into a row of potted plants which collapsed under him, and grabbed up the bourbon bottle. He had it raised to his mouth when Tex hit him with the sap and he slumped unconscious to the floor.

"What's this?" L.M. shouted. "Murder in my own office? Crazy men I got enough of in the organization so take this one back where he came from and find one that speaks English; I don't want any translators next time."

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* "Poison!"
** "Odin and Frigg." (King and Queen of the Norse gods.)

"But none of them speak English," Barney said crossly, pulling fragments of cactus from his sleeve.

"Then teach one—but no more crazy men."

IV

Barney Hendrickson suppressed a groan, and the hand that raised the carton of black coffee to his lips tremored ever so slightly. He had forgotten how many hours—or centuries—it had been since he had had any sleep. One difficulty had followed another through the night until the dawn of a new day brought its own problems. Dallas Levy's voice buzzed in the earpiece of the phone like an irritated wasp while Barney sipped his coffee.

"I agree, I agree, Dallas," he rasped in answer, his vocal cords eroded by three chain-smoked packs of cigarettes. "Just stick by him and keep him quiet, no one ever goes near those old storerooms . . . well you've been on double-time the last three hours . . . all right then, treble-time now, I'll O.K. the vouchers. Just keep him locked up and quiet until we decide what to do with him. And tell Dr. Lyn to get up here as soon as he has finished talking to B.O. Plenty."

Barney hung up the phone and tried to concentrate on the budget sheet before him. So far most of the entries were followed by penciled question marks; this was going to be a hard picture to cost. And what would happen if the police got wind of the Viking locked up down below? Could he be charged with kidnapping someone who had been dead almost a thousand years? "The mind reels," he mumbled, and reached for the coffee again.

Professor Hewett, still apparently as fresh as ever, paced back and forth the length of the office spinning a pocket calculator and scribbling the results in a notebook.

"Any results yet, Prof?" Barney asked. "Can we send anything bigger than that truck back in time?"

"Patience, you must learn patience. Nature yields up her secrets only with the greatest reluctance and a misplaced decimal point can make disclosure impossible. There are many factors that enter the equations other than the accepted four dimensions of physical measurement and time. We must consider three additional dimensions, those of displacement in space, mass, a cumulative error which I am of the opinion is caused by entropy . . ."

"Spare me the details, just the answer, that's all I want." His intercom buzzed and he told his secretary to show Dr. Lyn in. Lyn refused a cigarette and folded his long form into a chair.

"Out with the bad news," Barney said, "unless that is your normal expression. No luck with the Viking?"

"As you say, no luck. There is a communication problem, you realize, since my command of Old Norse is far from perfect, which must be coupled with the fact that Ottar has little or no interest in what I am trying to discuss with him. However I do feel that with the proper encouragement he could be convinced that he should learn English."

"Encouragement . . .?"

"Money, or the Eleventh Century equivalent. Like most Vikings he is very mercenary and will do almost anything to gain status and wealth, though, of course, he prefers to get it by battle and killing."

"Of course. We can pay him for his language lessons, bookkeeping has worked out a rate of exchange and it's all in our favor, but what about the time factor? Can you have him speaking English in two weeks?"

"Impossible! With a cooperative student this might be done, but not with Ottar. He is reluctant at best, in addition to the not considerable factor that he refuses to do anything until he is released."

"Not considerable!" Barney said, and had the sudden desire to tug at a fistful of his own hair. "I can just see that hairy nut with his meat ax on the corner of Hollywood and Vine. That's out!"

"If I might offer a suggestion," Professor Hewett said, stopping his pacing in front of Barney's desk. "If Dr. Lyn were to return with this aborigine to his own time there would be ample opportunity to teach him English in his own environment, which would both reassure and calm him."

"It would not reassure or calm me, Professor," Lyn said coldly. "Life in that particular era tends to be both brutish and short."

"I'm sure precautionary measures can be taken, Doctor," said Hewett, giving his computer a quick spin. "I would think that the philological opportunities would far outweigh the personal factor . . ."

"There is, of course, that," Lyn agreed, his unfocused eyes staring at nouns, root, cases and genders long buried by time.

". . . Plus the important point that in this manner the time factor can be altered to suit our needs. Gentlemen, we can collapse or stretch time as we will! Dr. Lyn can have ten days, or ten months or ten years to teach the language to Ottar, and between the moment when we leave him in the Viking era and the moment when we see him again but a few minutes need have passed from our point of view."

"Two months will be adequate," Lynn snapped, "if you wish to have *my* point of view."

"It's agreed then," Barney said. "Lyn will go back with the Viking and teach him English, and we'll arrive with the company two months later Viking-time to start the production rolling."

"I have not agreed," Lyn persisted. "There are dangers . . ."

"I wonder what it would feel like to be the world's single greatest authority on Old Norse?" Barney asked, having had some experience with the academic mind, and the wide-eyed expression on Lyn's face revealed that his shaft had sunk home. "Right. We'll work out the details later. Why don't you go see if you can explain this to Ottar? Mention money. We'll get him to sign a completion and penalties contract so you'll be safe enough as long as he wants his pay."

"It might be possible," Lyn agreed, and Barney knew that he was hooked.

"Right then. You get down to Ottar and put the deal to him, and while you're getting his O.K. I'll have the contract department draw up one of their barely-legal, lifetime-at-hard-labor contracts." He flipped on the intercom. "Put me through to contracts, will you, Betty? Where is the Benzedrine?"

"I called the Dispensary an hour ago," the intercom squeaked.

"Well call them again if you expect me to live past noon."

As Jens Lyn went out, a slight Oriental wearing pink slacks, a cerise shirt, a Harris Tweed sports jacket and a sour expression entered.

"Well, Charley Chang," Barney boomed, sticking out his hand, "long time no see."

"It's been too long, Barney," Charley said, grinning widely and shaking the outstretched hand. "Good to work with you again."

They disliked each other intensely and as soon as their hands separated Barney lit a cigarette, and the smile vanished into the unhappy folds of Chang's normal expression. "What's cooking, Barney?" he asked.

"A wide screen, three hour, big budget film—and you're the only man who can write it."

"We're running out of books, Barney, but I've always thought that there was a good one in the 'Song of Solomon,' sexy without being dirty . . ."

"The subject has already been chosen, a wholly new concept of the Viking discoveries of North America."

Chang's frown deepened. "Sounds good, Barney, but you know I'm a specialist. I don't think this is up my alley."

"You're a good writer, Charley, which means everything is up your alley. Besides, let's not forget your contract," he added, slipping the dagger a few inches out of the scabbard so it could be seen.

"No, we can't forget the contract," Charley said coldly. "I've always been interested in doing an historical."

"That's great," Barney said, pulling the budget sheet towards him again. The door opened and a messenger pushed in a trolley loaded

with books. Barney pointed at them. "Here's the scoop from the library, everything you need to know. Take a quick flip through them and I'll be with you in a minute."

"A minute, sure, sure," Charley said, looking coldly at the twenty-odd, thick volumes.

"Five thousand seven hundred and seventy-three point two eight cubic meters with a loading of twelve thousand seven hundred and seventy-seven point six two kilograms at a power increase of twenty-seven point two percent," Professor Hewett suddenly said.

"What are you talking about?" Barney snapped.

"Those are the figures you asked for, the size of load the vremeatron will be able to handle with an increased power supply."

"Very nice. Now will you translate it into American?"

"Roughly speaking," Hewett rolled his eyes up and mumbled quickly under his breath, "I would say that a 14-ton load could be temporally moved, measuring 12 feet by 12 feet by 40 feet."

"That's more like it. That should hold anything we might possibly need."

"Contract," Betty said, dropping an eight-page multifolded document onto his desk.

"All right," Barney said, flipping quickly through the crisp sheets. "Get Dallas Levy up here."

"Miss Tove is waiting outside to see you—with her agent."

"Not now! Tell her my leprosy is acting up. And where are those bennies? I'm not going to get through this morning on coffee alone."

"I've rung the Dispensary three more times, there seems to be something about a staff shortage today."

"You better get down there and bring them back yourself."

"Why Barney Hendrickson—it must have been *years* . . ."

The hoarse-voiced words hurtled across the office and left silence in their wake. Gossip-mongers said that Slithey Tove had the acting ability of a marionette with loose strings, the brain of a Chihuahua and the moral standards of Fanny Hill. They were right. Yet these qualities, or lack of qualities, did not explain the success of her pictures. The one quality that Slithey did have, in overabundance, was femaleness, plus the ability to communicate on what must have been a hormone level. She did not generate an aura of sex, but rather one of sexual availability. Which was true enough. This aura was strong enough to carry, scarcely diminished, through all the barriers of film, lenses, and projectors to radiate, hot and steaming, from the silver screen. Her pictures made money. Most women didn't like them. Her aura, now operating unhampered by time, space or celluloid, swept the room like a sensual

sonar, clicking with passion unrestrained.

Betty sniffed loudly and swept out of the room, though she had to slow momentarily to get past the actress who stood sideways in the doorway. It was said, truthfully, that Slithey had the largest bust in Hollywood.

"Slithey . . ." Barney said, and his voice cracked. Too many cigarettes, of course.

"Barney darling," she said, as the smoothly hydraulic pistons of her rounded legs propelled her slowly across the office, "it's been ages since I've *seen* you."

With her hands on the desk top she leaned forward and gravity tugged down at the thin fabric of her blouse and at least ninety-eight percent of her undraped bosom swam into view.

"Slithey . . ." Barney said, springing suddenly to his feet. "I want to talk to you about this picture we're planning, but you see I'm busy just now . . ."

Inadvertently he had taken her arm—which throbbed like a great, hot, beating heart under his fingers as she leaned close. He snatched his hand away.

"If you'll just hold on a bit, I'll be with you as soon as I can."

"I'll just sit over there against the wall," the husky voice said. "I know I won't be in the way."

"You want me?" Dallas Levy asked from the open doorway, talking to Barney while his eyes made a careful survey of the actress. Hormone contacted hormone and she inhaled automatically. He slowly smiled.

"Yes," Barney said, digging the contract out of the litter of papers on his desk. "Take this down to Lyn and tell him to get his friend to sign it. Any trouble?"

"Not since we found out he likes burnt beefsteak and beer. Anytime he starts acting up we slip him another steak and a quart of beer and he forgets his troubles. Eight steaks and eight quarts so far."

"Get that signature," Barney said and his gaze fell accidentally on Slithey who had oozed into the armchair and crossed her silkshod legs. Her garters had little pink bows on them . . .

"What do you say, Charley?" Barney asked, collapsing into his swivel chair and spinning it about. "Any ideas yet?"

Charley Chang raised the thick volume he held in both hands.

"I'm on page 13 of this one and there are a few more books to go."

"Background material," Barney told him. "We can rough out the main story lines now and you can fill in the details later. L.M. suggested a saga, and we can't go wrong with that. We open in the Orkney Islands around the year thousand when there is plenty of trouble. You have Norse settlers and Viking raiders and things are really hotting up. Maybe you open with a Viking raid, the dragon ship

gliding across the dark waters, you know."

"Like opening a western with the bankrobbers silently riding into town?"

"That's the idea. The hero is the chief Viking, or maybe the head man ashore, you'll work that out. So there's some fighting, then some more of the same, so the hero decides to move his bunch to the new world, Vinland, which he has just heard about."

"Like the winning of the west?"

"Right. Then the voyage, the storm, the shipwreck, the landing, the first settlement, the battle with the Indians. Think big because we're going to have plenty of extras. End on a high note, looking into the sunset."

Charley Chang scribbled notes on the flyleaf of the book as Barney talked, nodding his head in agreement. "Just one thing more," he said, holding up the book. "Some of the names of the guys in this book are really a gas. Listen to this, here's one called Eyjolf the Foul, who has a friend named Hergil Hnappraz. And Polarbear Pig, Ragnar Hairybreeks—a million more. We could play this for laughs . . .?"

"This is a serious film, Charley, just as serious as any you have ever done from—"

"You're the boss, Barney. Just a suggestion. Any love interest?"

"Work her in early, you know how to do it."

"That role is made for *me,* Barney darling," the voice whispered in his ear as warm arms wrapped him.

"Don't let him sweet-talk you, Slithey," he heard a muffled voice say. "Barney Hendrickson is my buddy, indeed my old buddy, but a mighty good businessman to boot, shrewd, so no matter what you promise him, I'm sorry to have to say this, I gotta look closely at all contracts before we sign."

"Ivan," Barney said, struggling free of the perfumed octopoid embrace, "just take your client aside for a moment then I'll be with you. I don't know if we can do business, but at least we can talk."

Ivan Grissini who, despite the fact that his lank hair, hawk nose and rumpled, dandruff-speckled suit made him look like a crooked agent, was a crooked agent. He could smell a deal ten miles upwind in a hailstorm and always carried sixteen fountain pens that he filled ritually each morning before leaving for the office.

"Sit over here, baby," he said, levering Slithey towards the corner with a long-practiced motion. Since she wasn't stuffed with greenbacks he was immune to her charms. "Barney Hendrickson is a man good as his word, even better."

The phone rang just as Jens Lyn came in waving the contract.

"Ottar cannot sign this," he said. "It is in English."

"Well translate it, you're the technical adviser. Hold on." He picked up the phone.

"I could translate it, it would be extremely difficult but possible, but what would be the point? He cannot read."

"Just hold on, Lyn. No, not you, Sam. I know, Sam . . . Of course I saw the estimate, I made it myself. No, you don't have to ask me where I'm getting the LSD . . . Be realistic yourself. Yesterday neither of us was born not, I agree . . . What you don't realize is that this picture can be produced within the figure I outlined, give or take fifty thousand . . . Don't use the word impossible, Sam. The impossible may take a while, but we do it, you know the routine . . . What? . . . On the phone? Sam, be reasonable. I've got three rings of Barnum and Bailey in the office right now, this isn't the time to go into details . . . Brush-off? Me? Never! . . . Yes, by all means, ask him. L.M. has been in on this picture from the beginning, every step of the way, and you'll find that he'll back me up in my own footsteps every step of the way. Right . . . And the same to you, Sam."

He dropped the phone into the cradle and Charley Chang said, "She could be captured in the raid; in the opening, she could fight with him with true hatred, but hatred would, in spite of itself, turn to love."

"I've *never* been captured in a raid before," Slithey husked from the corner.

"A good idea, Charley," Barney agreed.

"And even if he could read—he cannot write," Lyn said.

"We've had that problem with foreign actors more than once," Barney told him. "Staple the true translation to the contract, have it notarized as a true translation by a bilingual notary, have the party of the second part make his mark and affix his thumbprint on each document both witnessed by two impartial witnesses and it will stand up in any court in the world."

"There may be some difficulty in locating a bilingual English-Old Norse notary . . ."

"Ask casting, they can find anyone."

"Here they are, Mr. Hendrickson," his secretary said, coming in through the open door and placing a bottle of Benzedrine tablets before him on the desk.

"Too late," Barney whispered, staring at them, unmoving. "Too late."

The telephone and the intercom sounded at the same moment and he groped out two of the pills and washed them down with the cold, black, cardboardy coffee.

"Hendrickson here," he said flipping the key.

"Barney, I would like to see you in my office at once," L.M.'s voice said.

Betty had answered the phone.

"That was L.M. Greenspan's secretary," she said. "L.M. would like to see you in his office at once."

"I get the message."

His thigh muscles hurt when he stood up and he wondered how long it would take for the bennies to show some effect. "Stay with it, Charley, I'll want a synopsis, a couple of sheets, as soon as possible."

When he started towards the door Ivan Grissini's hand darted towards his lapel, but he moved away from it with reflex efficiency. "Stick around, Ivan, I'll want to talk to you after I see L.M." The chorus of voices was cut off as he closed the door behind him. "Lend me your towel, will you, Betty," he asked.

She took the towel from the bottom drawer of her desk and he draped it around his shoulders, tucking it carefully inside the collar of his shirt. Then he bent and placed his head under the faucet of the water cooler and gasped when Betty turned it on. He let the icy stream run over his head and the back of his neck for a few moments, then straightened up and dried himself off. Betty loaned him her comb. He felt weaker but better, and when he looked in the mirror he looked almost human. Almost.

"Lock the door behind you," L.M. said when Barney came into the office, then grunted as he bent over to clip a telephone wire with a pair of angle-nose wire cutters. "Are there any more, Sam?"

"That's the last one," Sam said in his gray, colorless voice. Sam was pretty much of a gray, colorless man, which was assuredly protective coloration since he was L.M.'s own personal, private accountant and was reputed to be a world authority on corporative finance and tax evasion. He clutched a folder of papers protectively to his chest and flicked his eyes towards L.M. "That is no longer necessary," he said.

"Maybe, maybe," L.M. said, puffing as he fell into his chair. "But if I even say the word *bank* when the wires aren't cut my heart gives palpitations. I got not so good news for you, Barney." He bit off the end of a cigar. "We're ruined."

"What do you mean?" Barney looked back and forth from one expressionless face to the other. "Is this some kind of gag?"

"What L.M. means," Sam said, "is that Climactic Studios will soon be bankrupt."

"On the rocks, the work of a lifetime," L.M. said in a hollow voice.

Sam nodded once, as mechanically as a ventriloquist's dummy and said, "That is, roughly, the situation. Normally it would be at least three more months before our financial report would be sent to the banks whom, as you know, own the controlling percentage of this corporation. However, for some reason unknown to us, they are send-

ing their accountants to examine the books this week.

"And . . . ?" Barney asked, feeling suddenly lightheaded. The silence lengthened unbearably until he jumped to his feet and began to pace the room. "And they'll find the company is on the rocks, and that all the profits are on paper"—he turned and pointed dramatically to L.M.—"and that all the hard cash has been bled off into the untaxable L.M. Greenspan Foundation. No wonder you're not suffering. The company may go down the drain, but L.M. Greenspan goes marching on."

"Watch it! That's no way for an employee to talk to the man who gave him his first break . . ."

"And his last one, too—right here!" Barney said, and chopped himself on the neck with the edge of his hand, much harder than he had planned. "Listen, L.M.," he pleaded, rubbing the sore spot. "Until the ax falls we still have a chance. You must have thought there was the possibility of a salvage operation or you wouldn't have got involved in this deal with Professor Hewett and his machine. You must have felt that a big box-office success would get the pressure off, make the firm solvent again. We can still do it."

L.M. shook his head morosely. "Don't think it doesn't hurt to shake hands with the knife that stabs you in the back, but what else can I do? A big box-office hit, sure, even a big picture in the can and we could laugh at the teeth of the banks. But you can't make a picture in a week."

You can't make a picture in a week! The words hissed and sizzled through the caffeine clogged, Benzedrine loaded channels of Barney's brain, levering up a reluctant memory.

"L.M.," he said dramatically, "you're going to have a heart attack."

"Bite your tongue!" L.M. gasped, and clutched a roll of fat roughly near that vital organ. "Don't say that. One coronary's enough to last a lifetime."

"Listen to this. You go home with Sam to work on the books tonight, you take them with you. You get sick. It could be indigestion, it could be a coronary. Your doctor says it could be a coronary. The fees you've been paying him he should deliver at least that one small favor. Everyone runs around and shouts for a few days and the books are forgotten about and then it is the weekend, and nobody even considers looking at the books until Monday, maybe Tuesday."

"Monday," Sam said firmly. "You don't know banks. No books on Monday and they'll have a hired car full of doctors over to the house."

"All right, Monday then. That will be time enough."

"So Monday—but what difference does it make? Frankly I'm

puzzled," L.M. said and knitted his brow and looked puzzled.

"It makes this difference, L.M. On Monday I will bring you the new picture in the can. A picture that will have to gross two, three million on length, width of screen and color alone."

"But you can't!"

"But we can. You're forgetting about the vremeatron. This gadget works. Remember last night when you thought we had all gone for about ten minutes?" L.M. nodded reluctantly. "That was how long we were gone from here and now. But we were an hour or more in the Viking times. We could do it again. Take the company and everything we need back there to shoot the picture, and use just as much time as we need to do it right before we came back."

"You mean . . . ?"

"Correct. When we come back with the film in the can we need only have been gone *ten minutes* as far as you're concerned."

"Why didn't they ever think of this before?" L.M. gasped with happy appreciation.

"For a lot of reasons . . ."

"Do you mean to tell me . . ." Sam leaned so far forward in his chair that he was almost out of it, and the hint of some expression, perhaps a smile, touched his face. "Do you mean that we will have to pay production costs for just *ten minutes?"*

"I do not mean that," Barney snapped. "I can tell you in advance that there are going to be some headaches for bookkeeping. However, to cheer you up, I can guarantee that we can shoot on location—with more extras—for about one-tenth the cost of filming in Spain."

Sam's eyes glittered. "I don't know the details of this project, L.M. but some of the factors make very good sense."

"Can you do it, Barney? Pull this thing off?"

"I can do it if you give me all the help I ask for and no questions. This is Tuesday. I see no reason why we can't have everything we need sewn up by Saturday." He counted off on his fingers. "We'll have to get the contracts signed with the principals, get enough raw film to last for all the shooting, the technicians, at least two extra cameras . . ." He began to mumble to himself as he ran through all they might possibly need. "Yes," he said finally, "we can do it."

"Still, I don't know," L.M. said pensively. "It's a wild idea."

The future teetered on the balance and Barney groped desperately around for inspiration.

"Just one more thing," he said. "If we're on location for, say, six months, everyone has to be paid six months' salary. But if we rent the cameras and sound equipment, all of the expensive hardware, we will only have to pay a few *days* rental fees for them."

"Barney," L.M. said, sitting up

straight in his chair. "You've got yourself a deal."

V

"You haven't heard the last of Cinecitta yet, Mr. Hendrickson . . ."

"Barney."

". . . Not yet, Barney, not by a long shot. The new realism came out of Italy after the war, then the kitchen sink film that the British picked up. But you'll see, Rome ain't dead yet. Guys like me come over here to Hollywood for a bit, pick up some techniques . . ."

"Pick up some loot."

". . . Can't deny that, Barney, working for the Yankee Dollar. But you know, you're not going to get much on color this time of day." He swung the 8mm Bolex that hung on a thong from his wrist. "I should have loaded this up with Tri-X. It's five in the afternoon."

"Don't worry, Gino, you'll have plenty of light, take my word for that." He looked up as the warehouse door opened and Amory Blestead came in. "Over here, Amory," he said. "This is our cameraman, Gino Cappo. Amory Blestead, technical adviser."

"Pleased to meet you," Amory said, shaking hands, "I always wondered how you got those repulsive effects in 'Autumn Love'."

"You mean in 'Porco Mondo?' Those weren't effects, that's just the way that part of Yugoslavia looks."

He turned to Barney. "Dallas told me to tell you they'll be down with Ottar in about five minutes."

"About time. We'll have the Prof warm his machine up."

Barney climbed painfully into the back of the Army truck and dropped onto the boxes. He had managed to grab about an hour's sleep on the couch in his office before another urgent message from L.M. had dragged him awake and up to L.M.'s office for an extended wrangle over budgeting. The pace was beginning to tell.

"I have recalibrated all my instruments," Professor Hewett said, tapping happily on a dial face, "so that now I can guarantee the utmost precision temporally and geographically in all future time transports."

"Wonderful. See if you can recalibrate us to arrive just after our last trip, close to the same time, the same day. The light was good . . ."

The door crashed open and loud, guttural singing filled the warehouse. Ottar stumbled in with Jens Lyn and Dallas Levy each clutching one of his arms, holding him up rather than restraining him, since he was obviously roaring drunk. Tex Antonelli came behind them wheeling a handtruck loaded with packing cases. It needed all three of them to heave the Viking up into the truck where he passed out, mumbling happily to himself. They piled the boxes in around him.

"What's all this?" Barney asked.

"Trade goods," Lyn said, pushing

a crate labeled "Jack Daniels" in over the tailgate. "Ottar signed the contract, I was very surprised to discover an Icelandic notary public here . . ."

"You can find anything in Hollywood."

". . . And Ottar agreed to study English once he was back in his own house. He has developed a decided taste for distilled beverages and we agreed on a payment of one bottle of whiskey a day for every day of study."

"Couldn't you have fobbed him off with some rotgut?" Barney asked as a second crate of Jack Daniels slid into the truck. "I can see myself trying to justify this on the gyp sheet."

"We did try," Dallas said, shoving in a third case. "Slipped him some Old Overcoat 95 percent grain neutral spirits, but it was no sale. He developed an educated palate early. Two months, five cases, that's the bargain."

Jens Lyn climbed in and Barney admired his knee-high engineer's boots, puttees, many-pocketed hunting jacket and sheath knife. "Why the Jungle Jim outfit?" he asked.

"A simple matter of survival and creature comfort," Lyn said, making room for the sleeping bag and a packing crate that Dallas pushed up to him. "I have DDT for the body lice that are sure to abound, halazone tablets for the drinking water and a quantity of tinned food. The diet of the time is restricted, and I am sure unwholesome to modern tastes. Therefore, I have taken a few simple precautions."

"Fair enough," Barney said. "Climb in and lock up the tailgate, let's get rolling."

Though the vremeatron still whined and crackled with the same intensity there was no longer the tension there had been on the first trip. The conditioned reflexes of mechanized man took over and the voyage through time became just as commonplace as a ride in a high-speed elevator, a trip in a jet plane, a descent in a submarine, or a blast-off in a rocket. Only Gino, the newcomer, showed some apprehension, darting rapid glances at the bank of electronic gadgetry and the sealed warehouse. But in the face of the others' calm—Barney managed to doze off during the transition while Dallas and the Danish philologist quarreled over the opening of one of the whiskey bottles and the resultant loss thereby of a day's English lessons—he relaxed a little. When the transition did occur he half rose, startled, but sat down again when the bottle was passed to him. Though his eyes did widen considerably when the ice-blue sky appeared outside and the tang of salt spray filled the truck.

"That's a pretty good trick," he said, pointing his light meter. "How's it done?"

"For details you have to ask the

Prof here," Barney said, gasping over too large a swallow of the whiskey. "Very complex. Something about moving through time."

"I get it," Gino said, stopping his diaphragm down to 3.5. "Something like the time zones when you fly from London to New York. The sun doesn't seem to move and you arrive at the same time you took off."

"Something like that."

"Good light. We can get some good color with light like this."

"If you drive, don't drink," Dallas said, leaning out to hand the bottle to Tex who sat behind the wheel in the cab. "One slug and let's get on the trail, pardner."

The starter whined the motor to life and, looking out over the cab, Barney saw that they were following the tire tracks of another truck, clearly visible in the damp sand and gravel. Memory pushed up through the layers of fatigue and he hammered on the metal roof of the cab over Tex's head.

"Blow your horn," he shouted.

They were coming to the rocky headland and the horn sounded as they swung around it. Barney stumbled over the crates and trod on the sleeping Viking as he rushed to the rear of the truck. There was the rising grumble of another engine as an identical Army truck passed them, going in the opposite direction. Barney reached the open rear and clutched the bent-wood canvas support over his head. He had a quick glimpse of himself in the rear of the other truck, white-faced and wide-eyed and gaping like a moron. With a feeling of sadomasochistic pleasure he raised his open hand, thumb to nose, and wiggled his fingers at his shocked other self. The rock headland came in between them.

"Get much traffic around here?" Gino asked.

Ottar sat up, rubbing his side, muttering something foul under his breath. Jens quieted him easily with a long drag from the bottle as they braked to a sliding stop in the loose gravel.

"Primrose Cottage," Tex shouted back, "last stop."

Reeking smoke still drifted down from the chimney hole of the squat, turf house, but there was no one in sight. Weapons and clumsy tools littered the ground. Ottar half fell, half jumped from the truck and bellowed something, then clutched at his head with instant regret.

"Hvar erut per rakka? Komit út!"* He held his head again and looked around for the bottle which Jens Lyn had wisely tucked out of sight. The servants began to tremblingly appear.

"Let's get moving," Barney said. "Get these cases unloaded and ask Dr. Lyn where he wants them. Not you, Gino, I want you to come with me."

They climbed the low hill behind

* "Where are you, dogs? Come out!"

the house, pushing through the short, stubbly grass and almost tripping over a ragged and wild-looking sheep that went baaing down the hill away from them. From the top they had a clear view of the curving bay that swept away from them on both sides, and the vast, slate-gray ocean. A long roller came in, breaking far up on the beach, then hissing away again through the pebbles. A grim looking island with cliff sides that fell straight to the foaming ocean stood in the middle of the bay, and further off, just a dark blur on the horizon, was another, lower island.

"Pan right around in a circle, 360 degrees, so we can study it later. Zoom in for a closeup on that island."

"What about going inland a bit, take a look at the land there?" Gino asked, squinting through the viewfinder.

"Later, if there's time. But this is going to be a sea picture and with all this free ocean I want to use it."

"Along the shore then, we should see what's behind the point there."

"That's all right—but don't go alone. Take Tex or Dallas with you so you stay out of trouble. Don't get more than a fifteen minutes walk away, so we can find you when we have to leave." Barney glanced along the shore and noticed the rowboat; he took Gino's arm and pointed. "There's an idea. Get Lyn to translate and have a couple of the locals row you offshore a bit. Give me some shots of the way this place looks coming in from the sea . . ."

"Hey," Tex said, pulling himself over the brow of the hill, "they want you down at the shack, Barney. Powwow of some kind."

"Just in time, Tex. Stay with Gino here and keep an eye on him."

"I'll stick to him like glue. *'Va-, buona, eh cumpa'?"*

Gino shot him a dark, suspicious look. *"Vui sareste Italiano?"*

Tex laughed. "Me? No, I'm *Americano,* but I got ginzo relatives all around the Bay of Naples."

"Di Napoli! so' napoletano pur'io!" Gino shouted happily.

Barney left them enthusiastically pumping hands and discovering mutual relations, and went down to the house. Dallas was sitting on the tailgate of the truck smoking a cigarette held in his cupped hand. "The rest of them are inside," he said, "and I'm keeping an eye on the shop to make sure we got transportation home. Lyn said to send you in when you come."

Barney looked at the low door of the house with complete lack of enthusiasm. It stood partly open and more smoke appeared to be coming from it than was coming out of the chimney. "See that you do watch it," he said. "I can think of a lot more attractive spots to be shipwrecked."

"The same idea had occurred to me," Dallas said quietly and lifted his other hand to show the automat-

ic pistol he was holding. "Ten shots. I never miss."

Pushing the door wide, Barney stooped and entered the house. The smoke from the smoldering fire was thick around his head, and he was almost grateful since it served to mask some of the other odors that hung richly in the air. He recognized old fish, tar, locker room lilac, plus others that he did not want to recognize. For the moment he was almost blind, coming in out of the sun, since the only light here came through the door and some openings that had apparently been kicked in the wall.

"Jaeja, kunningi! pu skalt drekka méd mer!"*

Ottar's hoarse voice shivered the air and, as his eyes adjusted a bit, Barney could make out the men seated around a thick plank table, with Ottar at one end hammering on the boards with his fist.

"He wants you to join him in a drink," Lyn said. "This is a very important step, hospitality, bread and salt, that sort of thing?"

"Ol!"** Ottar bellowed, picking a small barrel up from the stamped earth floor.

"Drink what?" Barney asked, frowning into the darkness.

"Ale. They make it from barley, their staple crop. It is an invention of these north Germanic tribes, the ancestor you might say of our modern beer. Even the word has come down to us, though slightly changed in pronunciation of course . . ."

"Drekk!"* Ottar ordered as he slopped full a horn and handed it to Barney. It really was a cow's horn, Barney saw, curved and cracked and none too clean. Jens Lyn, the professor and Amory Blestead were also clutching horns. He raised it to his lips and took a sip. It was flat, sour, watery and tasted terrible.

"Good," he said, hoping his expression could not be seen in the darkness.

"Já, gott ok vel."** Ottar agreed and poured more of the loathsome beverage into Barney's cup so that it slopped over and ran stickily down his arm inside his sleeve.

"If you think that's bad," Amory said hollowly, "wait until you taste the food."

"And here it comes now."

The professor pointed to the end of the room where one of the servants was rooting about in a large wooden chest against the wall. As he straightened up, the man kicked one of the rounded dark mounds that littered the floor there and a pained lowing trembled the air.

"The livestock . . . ?" Barney could not finish.

"Kept in the house, that's right," Amory said. "That's what adds a certain, subtle fragrance to the air in here."

The servant, who looked not un-

*"Ho, my friend! You shall drink with me!"
**"Ale!"

*"Drink!"
**"Yes, very good."

like an uncurried sheepdog with his long blond hair that fell down and concealed his eyes, trudged over with a lumpish object clutched in each grimy paw and dropped them onto the table before Barney. They cracked against the wood like falling rocks.

"What's this?" Barney asked, eyeing them suspiciously out of the corner of his eye as he transferred the horn to his other hand and tried to shake the rivulet of ale out of the sleeve of his cashmere jacket.

"The chunk on the left is cheese, a native product, and the other is knaekbrod, hard bread," Jens Lyn said. "Or is it the other way around?"

Barney tried a nibble of each, or rather clattered his teeth against them, in turn. "That's great, really great," he said, throwing them back onto the table and looking at the glowing dial of his watch. "The light's going and we should start back soon. I want to talk to you, Amory, outside, if you can tear yourself away from the party."

"My pleasure," Amory said, shuddering as he finished most of his horn, then turned the thick dregs out onto the floor.

The sun had dropped behind an icy band of cloud and a cold breeze was blowing in from the sea: Barney shivered and pushed his hands into his jacket pockets.

"I need your help, Amory," he said. "Draw up a list of everything we're going to need to shoot this picture on location here. It doesn't look as though we'll be able to help ourselves locally with any commissary supplies . . ."

"Second that motion!"

". . . So we'll have to bring it all with us. I want to do all the cutting here, so set up a cutting room in one of the trailers."

"You're looking for trouble, Barney. It will be a devil of a job to turn out even a rough cut here. And what about dubbing? Or the musical score?"

"We'll do the best we can. Hire a composer and couple of musicians, maybe use a local orchestra."

"I can hear *that* already."

"It doesn't matter if we have to dub most of the sound again. What does matter is bringing back the film in the can . . ."

"Mr. Hendrickson," Jens Lyn called, pushing open the door and coming towards them. He fumbled in the breast pocket of his bush jacket. "I just remembered, there was a message I was supposed to give you."

"What is it?" Barney asked.

"I have no idea. I presumed it was confidential. Your secretary handed it to me just as we were leaving."

Barney took the crumpled envelope and tore it open. It contained a single sheet of yellow paper with a brief typed message. It read:

L.M. ON PHONE SAYS
CANCEL OPERATION, ALL

WORK TO CEASE ON PICTURE. NO REASON GIVEN.

VI

Barney threw the magazine back onto the table, but the cover stuck to his hand and half tore off. He impatiently peeled away the paper and regretted not having taken the time to wash off the viking beer before coming here. But *canceled!*

"Miss Zucker," he said. "L.M. wants to see me. He said so. He left a message. I'm sure that he is waiting impatiently to hear from me . . ."

"I'm very sorry, Mr. Hendrickson, but he left strictest instructions that he is in conference and cannot be disturbed." Her fingers poised for a second over the typewriter, her gum-chewing suspended momentarily. "I will notify him that you are waiting as soon as I am able." The typewriter thummed again, the jaws moving in slow rhythm with it.

"You could at least ring through and tell him that I'm here."

"Mr. Hendrickson!" she said, her tones those a Mother Superior might use if accused of running a bawdy house.

Barney went over and took a drink of water from the cooler, then rinsed off his sticky hand. He was drying it on some typing paper when the intercom buzzed and Miss Zucker nodded to him. "You may go in now," she said coldly.

"What do you mean, L.M.?" he asked the instant the door closed behind him. "What do you mean by sending me that message?" Sam sat propped in his chair as mobile as a log of wood and Charley Chang slumped across from him, sweating heavily and looking miserable.

"What do I mean? What could I possibly mean I mean? I mean you led me up the garden path, Barney Hendrickson, and pulled my leg. You got my agreement to go ahead on a picture when you *didn't even have a script.*"

"Of course I don't have a script, how could I when we just decided to do the picture. This is an emergency, remember?"

"How could I forget. But an emergency is one thing, doing a picture without a script is another. In France maybe, they make the arty-schmarty things you couldn't tell if they had a script or not. But in Climactic we don't work that way."

"It's not good business," Sam agreed.

Barney tried not to wring his hands. "L.M., look. Be reasonable. This is a salvage operation, have you forgotten that? There are very *special circumstances* involved . . ."

"Say *bank*. The word don't hurt no more."

"I won't say it, because we can beat them yet. We can make this picture. So you called in my script writer . . ."

"He got no script."

"Of course he's got no script. It was just yesterday when you and I finalized the idea. Now you've talked to him and explained your ideas . . ."

"He got no script."

"Hear me out, L.M. Charley's a good man, you picked him yourself and you briefed him yourself. If any man can deliver the goods, good old Charley can. If you had a Charley Chang script in your hand for this film you would let production go ahead, wouldn't you?"

"He got no . . ."

"L.M., you're not listening. *If*. That's the big word. If I were to here and now hand you a Charley Chang script for this great motion picture titled . . . titled 'Viking Columbus,' would you O.K. production?"

L.M. was wearing his best poker face. He glanced over at Sam who let his head drop the merest fraction of an inch. "Yes," L.M. instantly said.

"We're halfway home, L.M.," Barney hurried on. "If I were to hand you that script just one hour from now, you would O.K. production. Same difference, right?"

L.M. shrugged. "All right, same difference. But what difference does it make?"

"Sit right there, L.M.," Barney said, grabbing the startled Charley Chang by the arm and dragging him from the room. "Talk to Sam about the budget, have a drink—and I'll see you in exactly one hour. 'Viking Columbus' is almost ready to roll."

"My head-shrinker keeps evening hours," Charley said when the door closed behind him. "Let him talk to you, Barney. I have heard rash promises in this rash business many, many times, but this takes the gold plated bagel . . ."

"Save it, Charley. You got some work ahead of you." Barney steered the reluctant script writer out into the corridor while he talked. "Just give me your estimate of how long it would take you to rough out a first draft of a script for this film, working hard and putting your best into it. How long?"

"It's a big job. At least six months."

"Right. Six weeks. Concentrated effort, a first-class job."

"I said *months*."

"If you need six months you can have them. You have all the time you need, just take my word for it. And a nice quiet spot to work." They were passing a photomural and Barney stopped and jabbed his thumb against it. "There. Santa Catalina Island. Plenty of sun, a refreshing dip in the briny when the thoughts grow stale."

"I can't work there. It's lousy with people, parties all night."

"That's what you think. How would you like to work on Catalina without another soul around, the whole island to yourself? Just think of the work you could get done."

"Barney, honestly, I don't know what the hell you are talking about."

"You will, Charley. In a very few minutes you will."

"Fifty reams of typing paper, a box of carbon paper, typing chair —one, typing table—one, typewriter . . ."

"This is a steam model, Barney," Charley said. "The antique kind you push with the fingers. I can only work with an IBM electric."

"I'm afraid the electric current isn't so reliable on the part of the island where you'll be. You watch how fast the fingers will get the old touch back." Barney made a tick mark on the sheet as a big crate was pushed into the back of the truck. "One safari outfit, complete."

"One *what?*"

"A do-it-yourself safari from the prop department. Tent, cots, mosquito nets, chairs, folding kitchen —and everything works. You'll feel just like Dr. Livingstone only twice as comfortable. Fifty-gallon drum of water—three; spring-powered time clock with cards—one."

Charley Chang watched in numb incomprehension as the varied assortment of items was loaded into the Army truck. None of it made any sense, including the old geezer behind all the junk who was working away on a Frankenstein radio set. The ancient, mahogany time clock with roman numerals on its face was pushed over the tailgate, and Charley grabbed Barney's arm and pointed to it.

"None of this do I understand, and that least of all. Why a time clock?"

"Professor Hewett will explain everything in greatest detail in a few minutes, meanwhile take it all on faith. The clock is an important part, you'll see. Punch in every morning, don't forget."

"Mr. Hendrickson," his secretary called out, "you're very much in luck." She came into the warehouse leading by the arm a frowning Negro who wore white work clothes and a tall chef's hat. "You said you wanted a cook, but instantly, and I went right to our commissary and found Clyde Rawlston here. Not only can he cook, but he can take shorthand and type."

"You're an angel, Betty. Order another typewriter . . ."

"It's on the way. Did the first-aid box come?"

"Already aboard. That's the lot then. Clyde this is Charley, Charley, Clyde. You'll get better acquainted later. If you will kindly board the truck now."

"I'll go as soon as someone explains what is going on around here," Clyde Rawlston said with cold-eyed belligerence.

"A company emergency, Climactic needs you, and as loyal employees I know you'll both cooperate. Professor Hewett will explain it all to you. It won't take long, I'll see you both right here in just ten minutes by my watch, that's a promise. Now—if you will climb over those crates I'll get the tailgate up."

Chivvied on by the voice of authority they clambered aboard and Professor Hewett leaned out over their shoulders.

"I thought the Cambrian period would be best," he said to Barney. "You know, early Paleozoic. A nice, moderate climate, warm and comfortable, with no vertebrates around to cause trouble. Seas churning with the simple trilobite. Though it might be a little warm for continued comfort. Perhaps a little later in the Devonian. There would still be nothing big enough to harm . . ."

"You're the doctor, Prof, whatever you think best. We have to work fast now, at least on this end. Take them to Catalina, drop them off, then move six weeks ahead and bring them back here. Leave the junk on the island, we may need it later. Only about fifteen minutes left."

"Consider it done. With each trip made I feel it easier to calibrate the instruments, so that now the settings are most precise. No time shall be wasted, no time at all."

Professor Hewett returned to his instruments and the generator howled. Charley Chang was trying to say something, but his words were cut off as the truck vanished. There was no flicker or fading, it just disappeared as instantly and as quickly as the image on a back-projection screen when the film breaks. Barney started to turn to talk to his secretary, but just as his motion began the truck reappeared.

"What's wrong?" he asked, then saw that all the supplies were gone from the back. Clyde Rawlston was standing near the professor at the controls and Charley Chang was sitting on an empty crate clutching a thick folder of typed sheets.

"Nothing is wrong," the professor said. "I have just timed our return with the utmost of exact precision."

Charley was no longer wearing his jacket and his shirt was creased and faded, so bleached by the sun across the shoulders that all the color was gone. His hair was long and a black bristle of beard covered his cheeks.

"How did it go?" Barney asked.

"Not bad—considering. I'm not quite finished though, you see it's those things in the water. Those teeth! Eyes . . .!"

"How much more time do you need?"

"Two weeks should wrap it up, with time to spare. But, Barney, the eyes . . ."

"There's nothing there big enough to hurt you, that's what the Prof said."

"Maybe not big, but in the ocean, so many of them, and the teeth . . ."

"See you, Take it away, Prof. Two weeks."

This time the truck barely flickered, and if he had blinked at the

wrong moment Barney would have missed the trip altogether. Yet now Charley and Clyde were sitting together on the other side of the truck and the wad of typescript was thicker.

" 'Viking Columbus,' " Charley said, waving it over his head. "A widescreen masterpiece." He handed it down and Barney saw that there were some cards clipped to the folder. "Those are our time cards, and if you examine them you'll see that they have been punched in every day, and Clyde and I are asking double-time for Saturdays and treble for Sundays."

"Who's arguing?" Barney said, weighing the script happily. "Come on along, Charley, we'll have the story conference right away."

Charley sniffed the twilight air as they came out of the warehouse. "What a lot of stinks," he said. "I never realized it before. What great air we had there on the island." He looked down at his feet while he walked. "Feels funny to be wearing shoes again."

"The native's return," Barney said. "I'll bring the script in and you can get some clothes from wardrobe to replace your beachcomber's rags and grab a shave. Get over to L.M.'s office as soon as you can. Is it a good script?"

"Maybe it's too early to say—but in a way I think it's the best thing I have ever done. Working the way I did, no outside distractions you know—if you don't count the eyes! And Clyde was a big help, a good clean typist. He's a poet, did you know that?"

"I thought he was a cook?"

"He's a lousy cook, I ended up doing all the cooking. He only took the job in the commissary to pay his rent. He's a damn good poet, and great on dialogue. He helped me a lot there. Do you think we can get him a credit on this film?"

"I don't see why not. And don't forget that shave."

Barney went into L.M.'s office and dropped the script onto the desk. "Finished," he said.

L.M. weighed it carefully in both hands, then held it at arm's length so he could read the cover sheet.

" 'Viking Columbus.' A good title. We'll have to change it. You delivered like you said, Barney, so maybe now you can tell me the secret of in one hour producing a script. Tell Sam, he wants to hear, too." Sam was almost invisible, immobile against the dark wallpaper, until he nodded his head.

"No secret, L.M., it's the vremeatron. You saw it in action. Charley Chang went back in time to a nice quiet spot where he worked very hard to produce this script. He stayed as long as he needed, then we brought him back to almost the same moment when he left. Hardly any time at all elapsed here while he was away, so from our point of view it looks like it took just an hour to produce a complete script."

"A script in an hour!" L.M. said, beaming happily. "This is going to revolutionize the business. Don't be cheap, Barney. Give me the highest hourly rate you can imagine, then double it—twice! I don't care about money. I want to do the right thing and see that Charley Chang gets the greatest rate per hour ever paid to man, paid for one hour of his time."

"You missed the point, L.M. Maybe only an hour of *your* time went by, but Charley Chang worked more than two months on that script, Saturdays and Sundays included, and he has to get paid for that time."

"He can't prove it!" L.M. said, scowling fiercely.

"He can prove it. He punched a time clock every day and I have the time card right here."

"He can sue! One hour it took, one hour I pay for."

"Sam," Barney pleaded, "talk to him. Tell him you don't get nothing for nothing in this world. Eight weeks' pay is still beans for a great script like this."

"I liked the one-hour script better," Sam said.

"We all liked the one-hour script better, except there never was a one-hour script. This is just a new way of working, but we still have to pay the same amount for the work whatever happens."

The buzz of the phone interrupted and L.M. picked it up, first listening, then answering with a monosyllabic series of grunts, finally slamming the handpiece back into the cradle.

"Ruf Hawk is on his way up," L.M. said. "I think maybe we can use him for the lead, but also I think he is under contract to an independent for another picture. Feel him out, Barney, before his agent gets here. Now—about this one hour . . ."

"Later we discuss the one hour, please, L.M. It'll work out."

Ruf Hawk came in, stopping for a moment in the doorway and turning his head in profile so they could see how good he looked. He looked good. He looked good because that was really the only thing in life that he cared about. While all around the world, in countless movie houses, women's hearts beat faster when they watched Ruf lock some lucky starlet in his firm embrace, little did these countless women know that their chances of getting locked in that embrace were exactly zero. Ruf did not like women. Not that he was a queer or something, he didn't like men either. Or sheep or raincoats or whips, et cetera. Ruf just liked Ruf, and the light of love in his eye was nothing more than a reflected gleam of narcissistic appreciation.

He had been just one more slab of beefcake on Muscle Beach until it was discovered that he could act. He couldn't act really, but it had been also discovered that he could act what he had been told to act.

He would follow exactly whatever instructions were given to him, repeating the same words and actions over and over again with infinite bovine patience. Between takes he refreshed himself by looking into a mirror.

His incompetence had never been revealed because, in the kind of pictures he appeared in, before anyone could notice how bad he was the Indians would attack, or the dinosaurs stampede, or the walls of Troy would get torn down, or something else mildly distracting would happen. Therefore, Ruf was happy, and when the producers looked at box office receipts they were happy, and everyone agreed that he had plenty of mileage left in him before his gut began to spread.

"Hi, Ruf," Barney said, "just the man we want to see."

Ruf raised his hand in greeting and smiled. He didn't talk much when he hadn't been told to talk.

"I'm not going to beat around the point, Ruf, all I'm going to say is that we're going to make the world's greatest picture and we were talking about a lead and your name was mentioned, and I said right out loud if we are going to do a Viking picture, then Ruf Hawk is the most vikingest Viking I can think of."

Ruf showed no signs of emotion or interest at this revelation. "You've heard of Vikings, haven't you, Ruf?" Barney asked.

Ruf smiled slightly.

"You remember," Barney said, "tall guys with big axes and horns on their helmets always sailing around in ships with a carved dragon in front . . ."

"Oh, yeah, sure," Ruf said, his attention captured at last. "I've heard of Vikings. I've never played a Viking."

"But in your heart of hearts you have always wanted to play a Viking, Ruf, it couldn't be any other way. This is the kind of role that is made for you, the kind of role you can sink your teeth into, the kind of role that will make you look great in front of the camera."

The thick eyebrows slowly crawled together to form a frown. "I always look great in front of the camera."

"Of course you do, Ruf, that's why we have you here. You haven't got any big commitments, any other pictures, do you?"

Ruf frowned even deeper as he thought. "Got a picture coming up end of next week, something about Atlantis."

L.M. Greenspan glanced up from the script and matched his frown to Ruf's. "I thought so. My apologies to your agent, Ruf, but we gotta find someone else."

"L.M.," Barney said. "Read the script. Enjoy it. Let me talk to Ruf. You've forgotten that this film will be in the can by Monday, which will give Ruf three days to rest up before Atlantis sinks."

"I'm glad you mentioned the

script because it has some grave faults, big ones."

"How can you tell—you've only read ten pages? Read it a bit more then we'll talk about it, the writer is waiting outside right now. Any changes that are needed he can make them practically while you wait." He turned back to Ruf. "You're going to get your wish and play that Viking. We've got a new technical process whereby we go on location to shoot the picture, and, though we'll be back in only a couple of days, you get paid for a feature-length picture. What do you think of that?"

"I think you better talk to my agent. Anything to do with money I don't say a word."

"That's the way it should be, Ruf, that's what agents are for and I wouldn't have it any other way."

"It just won't do," L.M. said in a voice of doom. "From Charley Chang I expected better. The opening won't do."

"I'll get Charley in now, L.M., and we'll thrash this out, find the trouble and lick it."

Barney looked at the clock. 8:00 p.m. And get hold of this slab of muscle's agent. And fight the script through a rewrite and shoot Charley back to Catalina and his teeth and eyes to do the job. And find actors for the supporting roles. And get every single item lined up that they might need for a couple of months of shooting, then get the entire company moved back in time. And shoot the picture in the Eleventh Century, which should raise some interesting problems of its own. And get the entire thing done, finished and in the can by Monday morning. And here it was eight o'clock of a Wednesday night. Plenty of time.

Sure, nothing to it, plenty of time.

Then why was he sweating?

VII

"A miracle of logistics, that's what I call it, Mr. Hendrickson, getting all this done in less than four days," Betty said, as they walked along the column of trucks and trailers that stretched along the concrete roadway leading to sound stage B.

"That's not what I would call it," Barney said, "but I'm always very careful what words I use in front of women. How does the list check out?"

"All systems go. All the departments have turned in their check lists completed and signed, they've really done wonderfully."

"Fine—but where is everybody?"

They had passed almost all the vehicles and Barney realized that, other than a few drivers, he had seen nobody.

"It was after you left last night to get the raw film, and everyone was sitting around and we couldn't leave and that sort of thing. Well, you know, one thing led to another . . ."

"No, I don't know. What sort of things led to what sort of things?"

"It was fun, really, and we did miss you. Charley Chang ordered two cases of beer from the commissary because he said he hadn't had a beer in a year, and someone else got some drinks and sandwiches, and before you knew it there was a real swinging party going. It went on very late, so I guess they must all be pooped and still asleep in the trailers."

"Are you sure? Did anyone make a head count?"

"The guards weren't drinking and they said no one left the area so it must be all right."

Barney looked at the row of silent trailers and shrugged. "Good enough, I guess. We'll do a roll call after we arrive and send back for anyone who is missing. Let them sleep during the trip, it's probably the best way. You better get some sleep yourself if you have been up all night."

"Thanks, bossman. I'll be in Trailer 12 if you need me."

The sound of rapid hammering echoed from the gaping doors of the sound stage where the carpenters were putting the final bit of flooring onto the time platform. Barney stopped just inside the door and lighted a cigarette and tried to work up an enthusiastic attitude towards the jury-rigged fabrication that was to take the company on location in the Orkneys.

A rectangular channel iron frame had been welded to the professor's specifications, then floored with heavy planks. As soon as the first bit of planking was down at the front end a windowed control room had been built and Professor Hewett had mounted his enlarged vremeatron—which in addition to being larger seemed to have far more festooned wires and glittering coils than the original—and a heavy-duty diesel motor-generator. Almost two dozen large truck tires had been fastened to the bottom of the platform, to absorb any landing shock, a pipe railing had been put along the sides and a rickety looking pipe structure went across the top to delimitate the edges of the time field.

The whole thing looked insubstantial and shoddy and Barney decided that the best thing he could do would be to not think about it.

"Start it up," Professor Hewett said, crawling out from behind his apparatus with a smoking soldering iron in his hand. A grip bent over the diesel engine which groaned and turned over, then coughed out a cloud of blue exhaust and broke into hammering life.

"How is it going, Prof?" Barney asked through the open door. Hewett turned and blinked at him.

"Mr. Hendrickson, good morning. I presume you are inquiring about the condition of my vremeatron mark 2, and I am pleased to answer in the affirmative. It is ready to begin operation at any time, the

circuits are all tested and I am ready whenever you are."

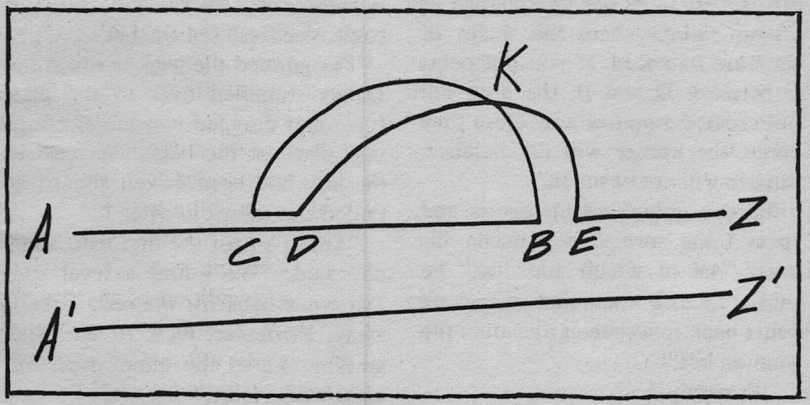
Barney looked at the carpenters, who were hammering home the last boards, then kicked a scrap of wood off the platform. "We'll leave at once—unless you've found a way to beat the return trip trouble?"

Hewett shook his head *no*. "I have experimented with the vremeatron to see if this barrier can be crossed, but it is impossible. When we return in time we cut an arc through the continuum, using energy to warp our own time lines out of the world time line. The return trip, after a visit in the past, no matter how prolonged the visit, is a reverse voyage along the same time-vector that was established by the original time motion; in a sense the return voyage may be called endotempic, an absorption of time energy, just as the outward or backward voyage was exotempic. Therefore, we can no more return to a point in time before the time of our original parting from the world time line, than a dropped ball on rebound can bounce higher than its original point when first dropped. You understand?"

"Not a single word. Could you try it again—in English this time?"

Professor Hewett picked up a clean piece of pine board, licked the tip of his ball point pen, and drew a simple diagram.

"Examine this," he said, "and all will be instantly clear. The line A_1 Z_1 is the world time line, with A_1 the past and Z_1 the future. The point B represents our consciousness, today, our 'right now' in time. The line A Z is the time line of the vremeatron making a voyage in time, or our own time lines as we travel with it. You will note that we leave the world line at Point B, today, and arc back through the extratemporal continuum to arrive at —say 1,000 A.D., at point C. Therefore, the arc BC is our voyage. We



reenter the world time line at C and stay for a while, moving with the world line, and the duration of our visit is represented by the line CD. Do you follow?"

"So far," Barney said, tracing the lines with his fingertip. "So keep talking while I still know what you're talking about."

"Surely. Now note the arc DE, our return voyage in time to an instant in time, perhaps just a fraction of a second after the time we originally left, point B that is. I can control the arrival at point E until it comes just after point B—but I can never arrive before point B. The graph must always read BE, never EB."

"Why?"

"I am glad you asked that question, because that is the heart of the matter. Look again at the graph and you will note point K, this is the point where arc BC crosses arc DE. That point K must exist or it would be impossible to make the return voyage, for K is the interchange of energy point, where the scales of time are balanced. If you put point E between D and B, the arcs will not cross; no matter how close they come, the energy will not balance, the trip will not be made."

Barney unknotted his brows and rubbed the sore spot between his eyes. "All of which adds up," he said, "to the fact that we can't come back to a time earlier than the time we left."

"Precisely."

"So all the time we have used up this week is gone forever?"

"Correct."

"So if we want the picture to be completed by ten o'clock Monday morning we have to go back in time and stay there until it is done."

"I could not have phrased it more succinctly myself."

"Then let's get this show on the road since it is already Saturday morning. The carpenters are finished so it's time to roll."

The first vehicle in the parade was a jeep: Tex was asleep in the front seat and Dallas in the back. Barney went over and leaned on the horn button, then found himself staring down the barrel of a long six-shooter held in Tex's quivering grip.

"I got a headache," Tex said hoarsely, "and I wish you wouldn't do that." He reluctantly slid the gun back into the holster.

"Nervy this morning, aren't we?" Barney said. "What you need is some nice fresh sea air. Let's go."

Tex gunned the jeep to life while Dallas stumbled over to the platform and dragged two metal ramps into place at the back. As soon as the jeep had been driven aboard he pulled the ramps in after it.

"That's all for the first trip," Barney said. "We'll find a level spot and come back for the rest. Take it away, Professor, back to the same landing site as the other trips, but eight weeks later."

Hewett mumbled to himself as he set the dials, then activated the vremeatron. The mark 2 was an improvement on the original model in that it compacted all the electrocution and nausea symptoms into a single quick twang of sensation, as though the passengers were harp strings plucked by a celestial finger, which was finished almost before it began. The sound stage vanished and salt spray and sharp, clear air took its place. Tex moaned softly and pulled up the zipper on his jacket.

"Over there, that meadow looks like a good spot," Barney said, pointing to a fairly level field that ran down to the beach. "Drive me over there, Tex, and Dallas stay with the professor."

The jeep ground up the rise in compound low, the popping of its exhaust sending the blackfaced gulls screaming in circles over their heads.

"Looks big enough," Barney said, climbing out and kicking at a tuft of short grass. "You can drive back and tell the Prof to jump forward in time a bit and to land the platform over here, just to make sure he can find the right spot when we start bringing the company back."

Barney dropped to the ground and dug a pack of cigarettes out of his pocket, but it was empty. He crunched it up and threw it away while Tex wheeled the jeep in a circle and roared back to the platform. The ramps were still down and the jeep bounced up them again. Barney had a clear view as Dallas pulled the ramps in and the professor turned to the vremeatron.

"Hey . . ." Barney said, just as the whole thing vanished, leaving nothing but the jeep tracks and the impression of the rows of tires on which the platform rested. He hadn't intended Tex to go on with the others.

A cloud passed in front of the sun and he shivered. The gulls were settling down at the water's edge again and the only sound now was the distant rush of the surf as the small waves broke on the beach. Barney glanced at the cigarette pack, the only familiar thing in the alien landscape, and shivered again.

He never looked at his watch, but surely no more than a minute or two passed. Yet in that short time he realized only too well how Charley Chang had felt, stranded on prehistoric Catalina with the eyes and teeth, and he hoped that Jens Lyn wasn't too unhappy after his two months stay. If his conscience had not been eroded away by years in the movie business, he might have felt a twang of pity for them. As it was he just felt sorry for himself. The cloud moved away and the sun shone warmly upon him, but he was still cold. For those few minutes he felt alone and lost in a manner he had never experienced before.

The platform appeared and dropped a few inches into the meadow close by.

"About time," he shouted, the authority coming back with a rush as he stood and squared his shoulders. "Where have you been?"

"In the Twentieth Century—where else?" the professor said. "You have not forgotten point K already, have you? In order to come forward these few minutes in your subjective time I had to first return the time platform to the time we had left, then return here with the correct physical and temporal displacement. How long did it take—from your point of view?"

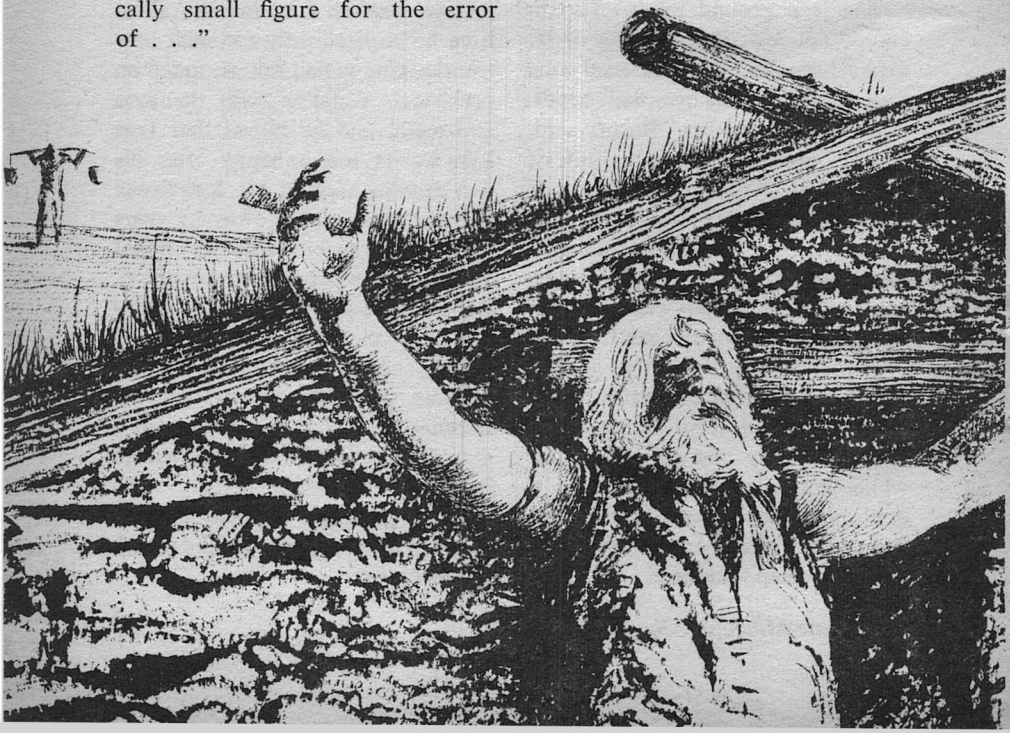
"I don't know, a few minutes I suppose."

"Very good, I should say, for a round trip of approximately two thousand years. Let us say five minutes, that would give a microscopically small figure for the error of . . ."

"All right, Prof, work it out on your own time. We want to get the company back in time and to work. Drive that jeep off and you two stay here with it. We'll start shuttling back the vehicles and I want you to move them as soon as they arrive so we can have room for the next ones. Let's roll."

This time Barney returned with the platform and never for an instant did he think about how the two men must feel who had been left behind.

The transfer went easily enough. Once the first few trips had been made the trucks and trailers moved smoothly through the doors of the sound stage and vanished into the



past. The only mishap was on the third transfer when a truck overhung the platform so that when the time trip was made two inches of exhaust pipe and half a license plate clattered to the floor. Barney picked up the piece of pipe and looked at the shining end, flat and smooth as if it had been polished. Apparently this bit had been outside the time field and had simply stayed behind. It could happen as easily to an arm.

"I want everyone inside the vehicles during the trip, all except the professor. We can't afford accidents."

A tractor towing the motorboat trailer and the deep-freeze truck made up the last load, and Barney climbed on after them. He took one last look at the California sunshine, then signaled the professor to take it away. His watch said 11:57, just before noon of the Saturday as the Twentieth Century winked out and the Eleventh Century appeared, and he took a deep relieved breath. Now time—in the century they had left—would have a stop. As long as they stayed in this era to film the picture, no matter how long they took, no time would elapse back home. When they returned with the film it would be noon Saturday, almost two full days before the Monday deadline. For the first time the pressure was off.

For approximately four seconds Barney relaxed as the tension drained away. Then he remembered that he had an entire picture to shoot, with all the problems and miseries that would entail, and the

pressure dropped heavily back onto his shoulders and the knot of tension returned, full strength.

A roar of sound burst over him as the tractor driver revved up his engine, and the clear air was filled with reeking exhaust. Barney got out of the way as the motorboat trailer was carefully backed off, and looked across the meadow. The trucks and trailer were scattered about at random, though some of them had been drawn up in a circle like a wagon train getting ready for the Indians. A few figures were visible, but most of the people were still asleep. Barney wished that he were, too, but he knew that he wouldn't sleep even if he tried. So he might as well get some work done.

Tex and Dallas were just settling down in the grass with cushions from the jeep when he came up. "Catch," he said, flipping a quarter towards Dallas who grabbed it out of the air. "Toss. I want one of you to go with me to pick up Jens Lyn, the other can catch up on his beauty sleep."

"Tails you go," Dallas said, then cursed at George Washington's portrait. Tex laughed once, then settled himself down.

"You know," Dallas said, as they drove down to the beach, "I don't even know where we are."

"The Orkney Islands," Barney said, watching the gulls rocketing into the air before them, screaming insults.

"My geography was always weak."

"They're a little group of islands north of Scotland, about the same latitude as Stockholm."

"*North* of Scotland—come off it! I was stationed in Scotland during the war and the only time I ever saw the sun was through a hole in the clouds, but not often, and it was cold enough to freeze . . ."

"I'm sure of it, but that was in the Twentieth Century. We're now in the Eleventh and in the middle of something called the Little Climatic Optimum. At least that's what the Prof called it and if you want to know more ask him. The weather was—or is—warmer, that's what it adds up to."

"Hard to believe," Dallas said, looking suspiciously up at the sun as though he expected it to go out.

The house looked the same as when they had seen it last, and one of the servants was sitting by the door sharpening a knife when they drove up. He looked up, startled, dropping the whetstone and ran into the house. A moment later Ottar appeared, wiping his mouth on his forearm.

"Welcome," he shouted as the jeep braked to a stop. "Very pleased to see you again. Where is Jack Daniels?"

"The language lessons seem to have worked," Dallas said, "but they did nothing for his thirst."

"There's plenty to drink," Barney

reassured him. "But I want to talk to Dr. Lyn first."

"He's out in back," Ottar said, then raised his voice to a bellow. "Jens—kom hingat!"*

Jens Lyn tramped sluggishly around a corner of the house carrying a crude wooden bucket. His legs were bare and he was caked in mud as high as his waist. He wore an indifferent sort of sacklike garment, very ragged and caught about the middle with a length of hide, while his beard and hair were shoulder length and almost as impressive as Ottar's. When he saw the jeep he stopped dead, his eyes widening, then shouted a harsh cry, raised the bucket over his head and ran towards them. Dallas jumped out of the jeep to face him.

"Hold it, Doc," he said. "Put the pail down before someone gets hurt."

The words or the stuntman's waiting figure penetrated Lyn's anger and he slowed to a halt, lowering the bucket. "What went wrong?" he asked loudly. "Where have you been?"

"Getting the production rolling, what else?" Barney said. "It's only been a couple of days since I dropped you, for us that is, though I realize that for you it has been two months . . ."

"Two months!" Jens bellowed. "It's been over a year! What went wrong?"

Barney shrugged. "I guess the Prof made a mistake. All those instruments, you know . . ."

Jens Lyn grated his teeth together so hard that the sound could clearly be heard across the intervening space. "A mistake . . . That's all it is to you. While I've been stranded here with these louse-ridden barbarians, taking care of their filthy animals. Five minutes after you were gone Ottar hit me in the side of the head, took all my clothes and supplies and all the whiskey."

"Why work for whiskey when it is just there to take," Ottar said with simple Viking logic.

"What's done is done," Barney said. "You've served your year here, but I'll see you don't suffer for it. Your contract is still valid and you'll get a full year's pay. That's not bad money for a couple of days' work, and you still have your sabbatical coming up and a full year's pay for that. You did your job and taught Ottar English . . ."

"His thirst did that. He was repellently drunk for almost a month and when he recovered he remembered about the English lessons. He made me teach him every day so he could get some whiskey if you ever returned."

"Ottar speak pretty good, that's right. Where's whiskey?"

"We have plenty, Ottar, just relax," Barney said, then turned back to Jens, thoughts of lawsuits dancing darkly in his head. "What do you say we call it even, Doc? A year's

*"Jens—come here!"

salary for teaching Ottar English and you're still working for us while we shoot the picture. I'm sure it has been a very interesting experience . . ."

"Aaaarh!"

". . . And one you won't easily forget, plus the fact I bet you've learned a lot of Old Norse . . ."

"Far more than I ever wanted to know."

". . . So let's call it quits. How about it?"

Jens Lyn stood for a long moment, fists clenched, then he dropped the bucket and savagely kicked it to pieces.

"All right," he said. "Not that I have much choice. But I don't do one moment's work until I have a shower, a delousing and a change of clothes."

"Sure, Doc. We'll drive you back to the company in a few minutes, we're right around the headland . . ."

"I'll find it myself if you don't mind," he said, stamping off down the beach."

"Whiskey," Ottar said. "You give me some . . ."

"Work," Barney told him. "If you're on a whiskey salary you're going to earn it. This picture starts rolling tomorrow and I want some information from you first."

"Sure. Come in house."

"Not on your life," Barney said, shying away. "I remember what happened to the last guy who did that."

VIII

"Stand still," Gino shouted. "All you got to do is stand still and you can't even do that."

"Need a drink," Ottar grumbled, and petulantly shook the housecarl with the matted hair who was standing in for Slithey. The man bleated and almost collapsed.

Gino swore and turned away from the viewfinder of the camera. "Barney," he pleaded, "talk to those Stone-Age slobs. This is supposed to be a love scene and they're moving around like some kind of wrestling match on the hill there. They're the worse standins I ever worked with."

"Just set up the shot, we'll be with you in a minute, Gino," Barney said, turning back to his stars. Ruf had his arms folded, staring vacantly into space, looking very impressive indeed in the Viking outfit and blond beard. Slithey was leaning back in her safari chair while her wig was being combed, and she looked even more impressive with about twelve cubic feet of rounded flesh rising from the lowcut top of her dress.

"I'll give it to you once more," Barney said. "You're in love and Ruf is leaving to go to battle and you may never see him again, so you are saying goodbye on the hill, passionately."

"I thought I hated him?" Slithey said.

"That was yesterday," Barney told her. "We're not shooting in

sequence, I explained this to you twice already this morning. Let me do it once more, briefly, and if I might have a small amount of your attention too, Mr. Hawk. The picture opens when Thor, who is played by Ruf, comes with his Viking raiders to capture the farm on which you live, Slithey. You are Gudrid, the daughter of the house. In the battle all are killed by the Vikings except you, and Thor takes you as his prize. He wants you but you fight him because you hate him. But slowly he wins your heart until you fall in love with him. No sooner does this happen than he goes away on a Viking raid again and leaves you to wait for his return. That's the scene we're shooting now. He has left you, you run after him, you call to him, he turns and you come to him on the hill, right here. Is that clear . . ."

"Look," Ruf said, pointing out to sea, "here comes a ship."

They all turned to look and sure enough, there was a Viking longship just clearing the headland and coming into the bay. The sail was furled, but the dragon's head on the bow rose and fell as the oarsmen on each side hauled the ship through the water.

"Tomorrow!" Barney shouted. "Lyn, where are you? Didn't you and Ottar arrange with this Finnboggi to bring his ship tomorrow?"

"They have a very loose sense of time," Lyn said.

Barney hurled his hat to the ground and ran to the camera. "What about it, Gino?" he asked. "Is there a shot here? Anything you can get?"

Gino spun the turret to the big telescopic lens and jammed his face against the eyepiece. "Looks good," he said, "a really nice shot."

Ottar and the other northmen were running down the hill towards the house, nor did they stop when Barney shouted at them to keep out of the shot.

"What are they doing?" he asked, when they began to stream out clutching weapons.

"I am sure I would not know," Lyn told him. "Perhaps it is some custom of greeting I don't know."

Ottar and his men stood on the shore shouting and the men in the Viking ship shouted back.

"Get all this, Gino," Barney ordered. "If it's any good, we can write it into the script."

Under the thrust of the oars the longship ran up onto the beach, the dragon prow towering above the men waiting there. Almost before the ship had stopped moving the men aboard her had grabbed up the shields that were slung along the gunwhales and jumped into the water. Like the men ashore they also waved over their heads a varied collection of short swords and axes. The two groups met.

"How does it look?" Barney asked.

"*Santa Maria!*" Gino said. "They are killing each other."

The clang of metal mingled with the hoarse battle cries as the men fought. No details could be made out of the turmoil by the watchers above, it was just a mass of struggling figures, until one man broke from the crowd and ran haltingly down the beach. He had been disarmed, he appeared to be wounded, and his antagonist was right behind him swinging an ax in wide circles. The chase was brief and the end was sudden. As the gap closed the ax swooped down and the first man's head jumped from his shoulders and bounded along the beach.

"They play for keeps . . ." Barney said in a choked voice.

"I do not think that this is Finnboggi and his men," Lyn said. "I think this is a different ship that has arrived."

Barney was a man of action, but not this kind of action. The sound of battle and the sight of the beheaded corpse and blood-drenched sand had a paralytic effect on him. What could he do? This was not his kind of world, his kind of affair. This was the kind of situation Tex, or Dallas, could handle. Where were they?

"The radio," he said, belatedly remembering the transceiver slung over his shoulder; he thumbed it to life and hurriedly sent out a call for the stuntmen.

"He's seen us, he's turning—he's coming this way," Gino shouted. "What a tremendous shot."

Instead of returning to the battle the killer was lumbering up the slope towards them, shaking the ax and calling out hoarsely. The handful of movie people on the hill watched his approach, yet did not move. This was all so alien that they could think of themselves only as onlookers, they could not imagine themselves being involved in the murderous business taking place below. The attacking Viking lumbered closer and closer, until the black marks of the ocean spray and the perspiration stains were clearly visible on the coarse red wool of his blouse—and the red spatters of blood on his ax and arm.

He went towards Gino, breathing heavily, perhaps thinking that the camera was some kind of weapon. The cameraman stayed in position until the last possible instant—filming his enraged attacker—jumping away just as the ax came down. The blade smashed into one leg of the tripod, bending it and almost knocking the camera to the ground.

"Hey—watch out for the equipment!" Barney shouted, then regretted it instantly as the maddened Viking turned towards him.

Gino was crouched, his arm before him with the glistening blade of a knife projecting from his fist in a very efficient manner, undoubtedly the result of his childhood training in the slums of Naples. The instant the Viking turned his attention away, Gino lunged.

The blow should have gone home but, for all his size, the Viking was

as quick as a cat. He spun about and the blade slid into the slab of muscle in his side. Bellowing with sudden pain he continued the motion, bringing up the ax so the haft caught Gino on the head, knocking him sprawling. Still shouting angrily the man seized Gino by the hair, twisting his head down so his neck was taut and bared, at the same time raising the ax for a decapitating blow.

The shot made a clear, hard sound and the Viking's body jerked as the bullet caught him in the chest. He turned, mouth open with voiceless pain and Tex—they had not even been aware the jeep had driven up—steadied his hand on the steering wheel and fired the revolver twice more. Both bullets hit the Viking in the forehead and he collapsed, dead before he hit the ground.

Gino pushed the man's lifeless weight off his legs and stood up, shakily, going at once to the camera. Tex started the jeep's engine again. The others were still too stunned by the suddenness of the attack to move.

"You want me to go down there and give our extras a hand?" Tex asked, pushing fresh cartridges into his gun.

"Yes," Barney said. "We have to stop this mess before any more people are killed."

"I can't guarantee that won't happen," Tex suggested ominously, and started the jeep down the hill.

"Cut," Barney called out to the cameraman. "We can fit a lot of things into this film—but not jeeps."

Tex had jammed something into the button so that the horn blared continuously, and he kept the gears in compound low so that the gear box screeched and the motor roared. At a bumpy five miles an hour he raced towards the battle.

Ottar and his men had seen the jeep often enough before to be accustomed to it, but this was not true of the invading Vikings. They saw what could only have been some sort of bellowing monster approaching, and understandably refused to stand before its charge. They scattered to right and left while Tex skidded the jeep in a tight circle at the water's edge, knocking down one of the men who hadn't moved quickly enough. Ottar and his followers rallied behind the jeep and pressed in on the divided enemy. The invaders broke and ran, clambering back into the longship and grabbing up the oars again.

This was where the engagement should have ended, and it would have if Tex had not been carried away with battle fever. Before the ship had started to move astern he ran to the front of the jeep and pulled a great length of steel cable from the drum under the front bumper. There was a loop at the end and he took this up and clambered up onto the jeep's hood, spinning it in larger and larger

circles as he climbed. His rebel yell was clearly audible above the other shouts as he released the cable. Straight up the loop rose to settle neatly over the dragon's head onto the high stem post. He gave it a pull to settle it home, then leisurely jumped down and dropped into the driver's seat.

With slow grace the longship began to glide astern as the oars churned up a froth. Tex lit a cigarette and let the cable run out until twenty, thirty feet of it stretched between the ship and the jeep. One of the Vikings aboard the ship was hacking at the steel cable, with no results other than the ruination of the edge of his ax. Tex reached out his shoe and kicked the power take-off into gear. The cable rose dripping from the water, grew taut and bar-straight, and the longship shuddered through its length and halted. Then, slowly but steadily it was dragged back onto the beach. The oars splashed and dug deep into the water to no avail.

It was all over then but the mopping up. Whatever enthusiasm had carried the raiders ashore had been wiped out by this last maneuver. Weapons splashed over the sides and the men raised their arms in surrender. Only one of them had any fight left, the man in the bow who had been hacking at the cable. With his ax in one hand, round shield in the other, he jumped ashore and charged the jeep. Tex cocked his revolver and waited, but Ottar joined the fight and cut off the attack. Both men shouted insults at each other as they circled warily at the water's edge. Tex carefully released the hammer and slid the gun back into its holster when he saw that all other action had stopped as the two champions joined battle.

Ottar, drenched with perspiration and already elated by the fighting was working himself into a berserker rage, roaring and biting at the rim of his shield and running forward until the waves were up to his thighs. The invading chieftain stood scant yards away, glowering out from under the edge of his iron helmet, shouting his own guttural insults. Ottar beat the flat of his ax against his shield with thudding sledge blows—then suddenly charged swinging his ax in a looping blow at the other's head. The invader's shield swung up to deflect the ax, but the force of the stroke was so powerful that it drove the man to his knees.

There was a note of pure joy in Ottar's bellow as he swung his ax again and again, never slowing, with the relentless measure of a woodsman felling a tree. The invader could not bring his own ax up, in fact he was leaning on his ax arm for support against the rain of blows. Pieces of wood flew from the shield and a wave sent spray swirling around them.

For an instant the rhythm of ax on shield slowed as Ottar swung his

weapon high and brought it straight down with all his strength at the other's head. The shield went up, but could not stop it. The ax glanced from it, scarcely slowed, and hewed down into the Viking's thigh. He howled with pain and swung his own ax in a backhand blow. Ottar jumped away, dodging it easily, and paused a moment to see the effect of his stroke. The invader struggled to a standing position, with all of his weight on his good leg, and it could be seen that the other was cut halfway through and pouring out blood. At this happy sight Ottar threw away his sword and ax and gave a shout of victory. The wounded Viking tried to attack him, but he dodged away, laughing at the clumsy attempt. All the northmen on shore—and most of the men in the ship—were laughing, too, at the wounded man's helpless anger. He kept crawling after Ottar, attempting to bring down his enemy.

Ottar must have realized that this kind of fun could end only in his enemy's death by bleeding, because he ran in suddenly and hit the man on the back, pushing him face downwards into the frothing water. Then, with one foot on the Viking's ax hand, he seized the man's head in both hands and ground his face down into the sand and gravel, holding it there despite the frantic writhings until his enemy perished. Drowned in the few inches of bubbling sea. All the men on the beach and in the ship cheered.

On the hill above there was only a shocked silence, broken by Ruf Hawk who stumbled away to throw up. Barney noticed for the first time that Gino was back at the camera. "Did you get the fight?" he asked, painfully aware that his voice cracked as he said it.

"All in here," Gino said, slapping the film container. "Though from this far away I'm not sure I got all the details."

"That's all for the best," Barney said. "Let's wind up the shooting for the day, the light will be going soon and I don't think anyone wants to work with that around—" He nodded towards the grisly scene on the beach below.

"Doesn't bother me," Slithey said. "Reminds me of the slaughterhouse where my father worked when we lived in Chicago. I used to bring him his lunch every day."

"Not all of us have your advantage," Barney said. "7:30 tomorrow on the dot, we'll pick up where we left off today." He started down the hill towards the noisy mob scene below.

The dead and wounded from both groups had been pulled into a heap above the line of the waves, and the victors were already looting the ship of its supplies, starting with the ale. The surviving attackers had been grouped together under guard and were being harangued by Ottar, who strode back and forth before them, shouting and waving his fists for punctuation. Whatever he said

seemed to do the job because, before Barney reached the foot of the hill, the northmen, invaders and defenders both, turned and started towards the house. Only one man remained behind and Ottar struck him a wicked blow on the head with his fist, stretching him on the ground, and two of the housecarls carried him off. Ottar was groping in the sea for his ax when Barney came up.

"Would you mind telling me what all that was about?" Barney said.

"Did you see how I hit the leg?" Ottar said, brandishing the retrieved ax over his head. "Hit him. *Krasc!* Leg next to off."

"Very well played, I saw it all. My congratulations. But who was he—and what were they doing here?"

"He was called Torfi. Whiskey?" The last was added in an exultant shout as Tex dropped the freed cable into the sand and dug a pint bottle out from under the jeep's seat.

"Whiskey," Tex said. "Not your favorite brand, but it'll do. That's a great backhand you got with that thing."

Ottar rolled his eyes with pleasure, then closed them tight as he raised the pint bottle to his lips and drained it.

"Wish I could do that," Tex said enviously.

Barney waited until the bottle was empty and Ottar had hurled it into the sea with a happy cry before he asked, "This Torfi. What was the trouble with him?"

The aftereffects of the battle—and the whiskey—hit Ottar at the same time and he sat down suddenly on the pebbles, shaking his great head. "Torfi, the son of Valbrand," he said as he got his breath back, "the son of Valthjof, the son of Orlyg came to Sviney . . . Torfi killed the men of Kropp twelve of them together. He also made the killing of the Holesmen, and he was at Hellisfitar, with Illugi the Black and Sturli the Godi when eighteen cave living people were killed there. They also burned, in his own house, Audun the son of Smidkel at Bergen." He stopped and nodded his head sagely as though he felt he had communicated vital information.

"Well?" Barney asked, puzzled. "What does all that mean."

Ottar looked at him and frowned. "Smidkel married Thorodda, my sister."

"Of course," Barney said. "How could I have forgotten that. So this Torfi has been in trouble with your brother-in-law and this means trouble with you, and it all ends up when he tries a bit of manslaughter here. What a way to live. Who were the men with him?"

Ottar shrugged and climbed to his feet, pulling himself up on the jeep's front wheel. "Vikings, raiders. Go to raid England. They don't like Torfi now because he comes here first instead of raiding England. Now they go with me to raid

England. They go in my new longship." He pointed the ax at the dragon ship and roared with laughter.

"And that one man who didn't want to join you?"

"One Haki brother of Torfi. I make him a slave. Sell him back to his family."

"I gotta give these guys credit," Tex said. "No beating about the bush."

"You can say that again," Barney said, looking in open wonder at the Viking, who at that moment seemed a giant of a man in every way. "Climb into the jeep, Ottar, we'll drive you back to the house."

"Ottar ride the cheap," he said enthusiastically, throwing his ax and shield in, then climbing over the side.

"Not in the driver's seat," Tex told him. "That comes much later."

The supplies looted from the longship had included a dozen kegs of ale, most of which had been broached in front of the house where a victory celebration was already in progress. There seemed to be no ill will held towards the former invaders, who mixed with the victors and matched them drink for drink. Haki, who had been tied hand and foot and flung under a bench, seemed to be the only one who wasn't enjoying himself. A hubbub of welcoming shouts heralded Ottar's appearance, and he went at once to the nearest barrel that had a knocked-in head, plunging his cupped hands into the ale and drinking from them.

As the shouting died away a rumbling exhaust could be heard and Barney turned to see one of the film company pickups come bouncing along the beach. It skidded to a stop in a rain of fine gravel and Dallas leaned out.

"We've been trying to contact you on the radio for ten minutes, maybe more," he said.

Barney looked down at the radio and saw that all the power had been turned off. "There's nothing wrong here," he said. "I just made a mistake and switched this thing off."

"Well there's plenty wrong at the camp, that's why we've been trying to call you . . ."

"What! What do you mean?"

"It's Ruf Hawk. He came back all excited, wasn't looking where he was going. He tripped over a sheep, you know them dirty gray ones, they look just like rocks. Anyway he fell over it and broke his leg."

"Are you trying to tell me—on the third day of shooting this picture—that my leading man has broken his leg?"

Dallas looked him straight in the eyes, not without a certain sympathy, and slowly nodded his head.

TO BE CONTINUED

Radical Center

We've been pestered with the Radical Right, the Radical Left, the Radical Radical— so why not the Radical Center?

MACK REYNOLDS

Illustrated by Kelly Freas

The first inkling I must have had was when I went into the corner drugstore and said to Jerry: "Let me have a pack of butts."

Jerry knew my brand. He had been pushing them over the counter to me for the past five years.

He said: "Yessir, Mr. Myers. Here you are."

I scowled at the unfamiliar package.

"What the hell's this?" I said, not picking the pack up.

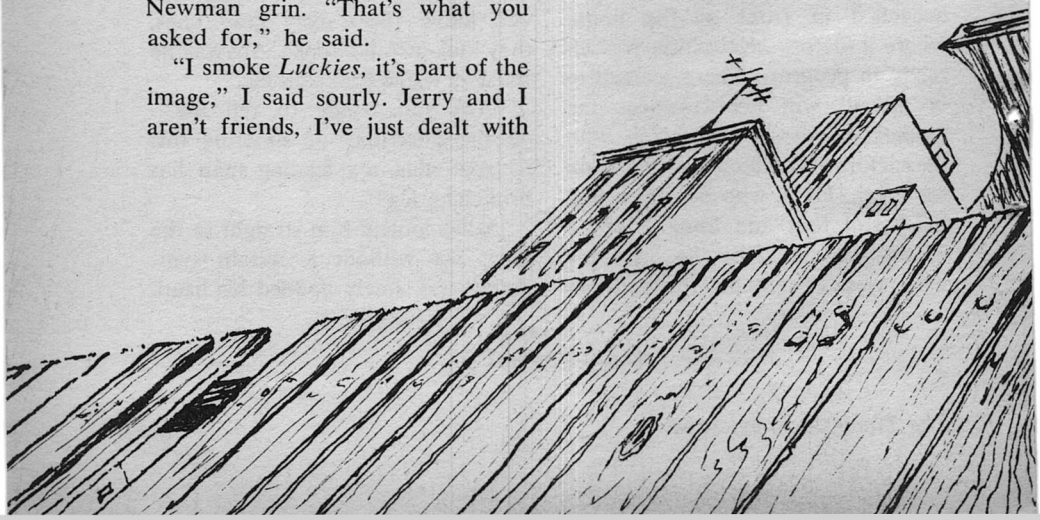
Jerry grinned his stupid Alfred E. Newman grin. "That's what you asked for," he said.

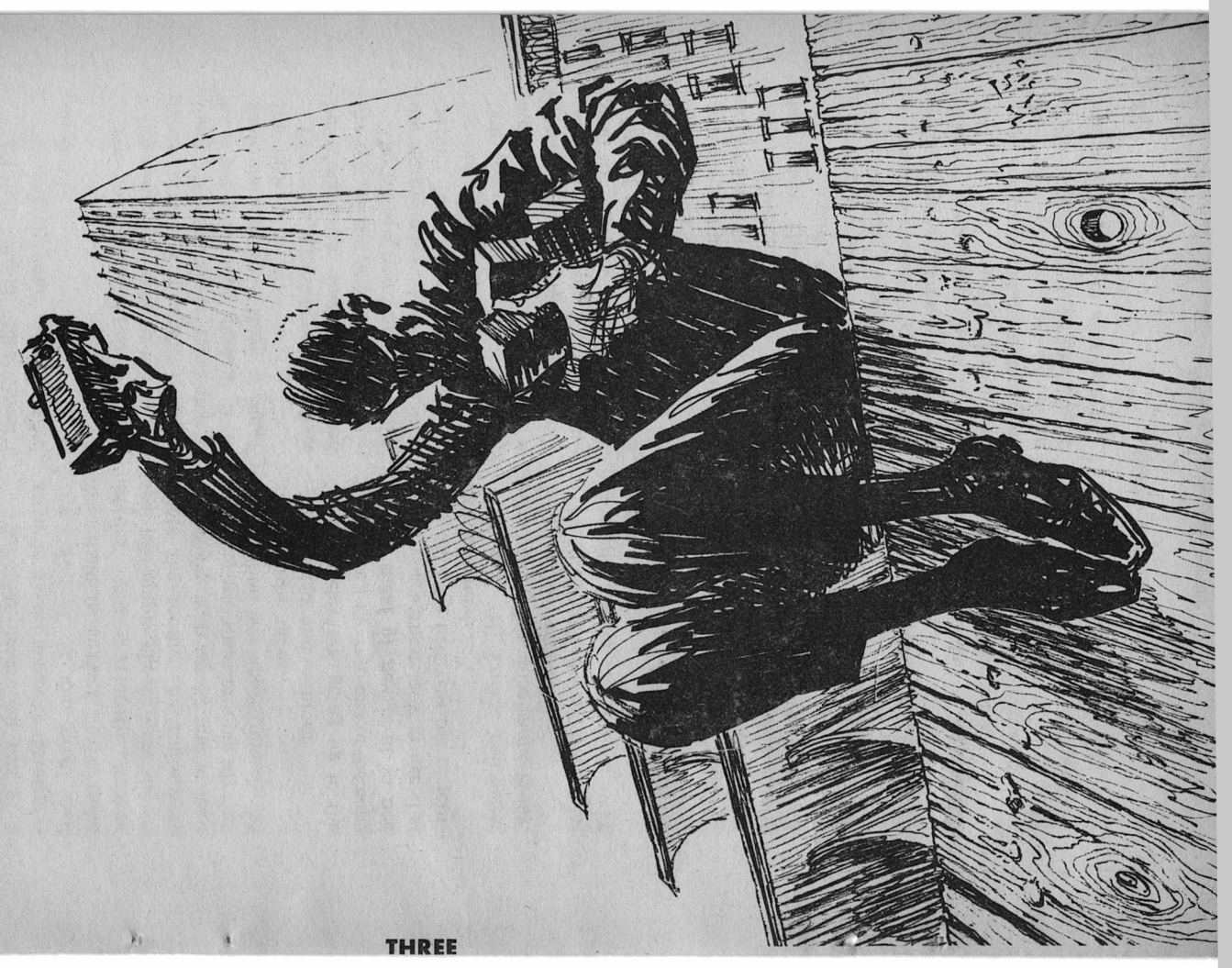
"I smoke *Luckies,* it's part of the image," I said sourly. Jerry and I aren't friends, I've just dealt with him for years. Besides, I'd only had time for one cup of coffee that morning.

"You asked for *Butts,*" he said.

I looked at him. Finally, I picked up the package. The label read: *Butts.*

I snorted, as though the clerk had told a pun. I turned the pack over, just to see if there was anything else. On the bottom it read: *If Any Cigarette Will Give You Lung Cancer,* Butts *Will.*





THREE

"All right," I said. "I'll try them."

"Everybody does," Jerry grinned idiotically.

I'm no connoisseur of tobacco. They tasted the same to me as any other brand. I probably bought them with the idea of being able to haul the pack out, present it to someone and say, "Have a *Butt*." Big joke.

I found a place where I could set the Volkshover down and walked the rest of the way to the office.

There was a new display in a liquor store window. A couple of illustrations took a far departure from the old traditional man of distinction sipping delicately away at a highball whilst being admired by a yearning goddess combining the pulchritude of a dozen of Tri-Di's current sex symbols.

One of the illustrations portrayed a skid-row specimen, sprawling up against a brick wall in what was evidently a garbage dump. In one hand he held a half empty fifth, and he was obviously smashed. Smashed, but happy. His eyes were crossed and his mouth was hanging open. The caption read: *NEW CORN WHISKEY isn't made in Maryland or Kentucky. It isn't aged beyond what the law requires. We don't use any particular water in its distillation and we wouldn't know sour mash and a pot still if we saw them. But MAN can you get stoned on NEW CORN WHISKEY. Hooch with a Hangover in every drop.*

The other illustration was of a party in its last stages of disintegration. Several of the guests had passed out on the floor. Two or three bottles were overturned. Broken and half-empty glasses were strewn about the room. The atmosphere was heavy with smoke and at least one cigar was smoldering in the rug. The caption was approximately the same as the other.

I grunted and went on.

In the elevator, going up to the city room, I ran into one of the copy kids, a sheaf of newsprint in one hand, that earnest look in eye that they have the first year out of journalism school.

She said, "Hi, Lucky. You better look out for Mr. Blackstone today. He's on the warpath."

I said, "Ruthie, I shall giveth him the gentle answer that turneth away rats."

"You'd better," she said, popping out on the third floor.

So Blackstone was on the warpath. It had happened before, but the last time hadn't been too long after my Dolly Tetter coup and I'd survived the scalping party.

This time might prove to be different.

The blast rattled me as I entered the city room.

"Mars!" he yelled. "Lucky Mars!"

I approached his desk.

"Yes, sir," I said earnestly.

"What'd yawl think this is, a club? Where've you been? You might be Wilkins' fair-haired boy, but yawl

don't pull these banker's hours on my edition."

"Yes, sir," I told him. "Working."

"Working!" Old Burnoff blatted. "Working who? You've already borrowed from everybody who doesn't know better."

Rank has its privileges. I chuckled at his *bon mot* appreciatively.

Then, in instinctive self-defense, I became earnest again. "I've been researching another big one, I think, Mr. Blackstone."

His eyes had a baleful quality. "That's what yawl said last week. Frankly, Mars, my opinion is you couldn't get the story of your own house burning down."

I had to answer that one. "Yes, sir. But I'm the only reporter on this rag that ever copped the Pulitzer. Not to speak of doing it twice."

He glared. "Don't remind me of that, Mars. It hurts. I admit, you've had two or three flukes. That's why Wilkins insists on keeping you. But a Pulitzer Prize doesn't . . ."

"Two," I said.

". . . Make you a newspaperman." However, he shifted gears down. "What's this big story you're working on?"

My mind raced. Old Burnoff was the oldest hand on the *Journal.* A Southerner, he had come up from the country weeklies . . . the hard way. He knew I was no newspaperman, and I knew I was no newspaperman, and what galled him most of all was that my pay was approximately the same as his own. I was the highest paid reporter in the State.

I said cautiously, "I'd rather keep this under my hat for a while, Mr. Blackstone."

"I'll bet you would. Don't curd me, Lucky Mars. What're you supposedly working on?"

The old magic was slipping. He *knew* I was no newspaperman, but on the other hand I'd produced the two greatest beats this part of the country had ever seen. How could he be sure I wouldn't do it again? How could he take a chance on throwing me out, when I might go over to the *News-Chronicle* and hand them the story of the year?

My mind was still trying to race, but it was hardly in second.

He growled, low and suspiciously, "Is it crime?"

Obviously, he couldn't forget the Dolly Teeter bank robbery. I'd had enough sense, when that happened, to put over the impression that I'd been working on the story for weeks, rather than stumbling on it.

But I knew no more about crime in Center City than did my kid sister. Besides, I can get the cold shudders from just looking at a hood safely stashed behind bars, with steel bracelets on his wrists and a cop at each side.

I didn't want Blackstone to get any idea whatsoever that I was snooping around Syndicate of Mafia operations in Center City.

"No, sir."

"Well, what *is* it, Mars? Yawl don't have to give me details, I'd just like a general idea of what you're supposedly doing to earn your pay."

I cleared my throat. "Well, sir," I improvised, "it's more like subversion." I thought about it. "Yes, sir," I added.

"Subversion! In Center City? Listen, Mars, the last commie in this town died three years ago of old age."

"Well, yes, sir, but this isn't exactly commie, Mr. Blackstone." I hesitated. "At least I don't think it is."

His expression turned less belligerent, more speculative. "Ahhh. The radical right, eh?"

Oh, oh. I didn't want to get tangled up in that, either. The owners of the *Journal* aren't exactly liberals.

"Well, sir, not really. This seems to be, uh, a new group."

"Neither left nor right?" he scowled.

"Well, no, sir." I cleared my throat. "You might say, the radical center."

He looked at me for a long moment, as though he'd put his last dime in a pay telephone and got the wrong number.

Finally, "Mars, just for the record. Something to give me a vague idea of what yawl think you're doing. Let me have one example of something that's led you along this path. Anything at all, you hear?"

My imagination jumped on its horse and began riding off in all directions. It was put up or shut up, now, and Old Burnoff wasn't going to take any more gobbledygook.

On an impulse, I pulled out my package of cigarettes.

"Have you seen these?" I demanded.

He looked at them. *"Butts?"* he growled. "New brand? So what?"

I tapped the pack with an emphatic forefinger. "How come they pick Center City to introduce a snide attack on the American Way? Years ago it was decided that cigarettes were one of our institutions and that we'd ignore all the curd the medicos were supposedly discovering."

He looked at the cigarettes blankly. "A lot of tryout campaigns start here, Lucky. Center of the nation. Average big city. That sort of thing."

"Yeah," I snorted. "And such recent items as *New Corn Whiskey*. Whoever heard of a whiskey being *new?* Traditionally, both bourbon and rye are invariably named *Old*-something-or-other. *Old Forester, Old Granddad, Old Crow,* and so on. I tell you, this attack is subtle."

He said unhappily, "Undermining the country's image, eh? The radical center."

I said, "I don't want to say any more, sir. I've got a lot of leads but it's going to take time."

He thought about it some more. Finally, unhappily, "All right,

Lucky. Supposedly you're our roving reporter. Keep roving."

"Yes, sir," I said, giving him a semisalute. I turned and slouched away, trying to twist my face into the suggestion that I had something mighty weighty on my mind.

As a matter of fact, I did. The problem of keeping one of the best jobs in town. Long years past I had given up the hope of ever holding down any job beyond putting cans on ultramarket shelves. This one had dropped into my lap. Holding it for over a year was a straight miracle. And I didn't believe in miracles although I had participated in two of them.

All right, so it was too early in the day to start drinking. Nevertheless, I went on over to The Hole and climbed up on a stool and said to Sam, "A long dark."

It must have been the first glass he had drawn that day. The head was too high. He took his spatula and flicked some of it out, then put the glass down to let it settle.

I said gloomily, "You know how much a beer cost back when I first started drinking?"

"Yep," he said. "Fifteen cents."

"Now it's four bits."

"Yep," he said, taking up the glass again.

"It's inflation," I said accusingly. "The government ought to put price ceilings on the necessities."

Sam topped the glass off neatly and put it in front of me.

"How much pay were you pulling down then?" he asked.

I thought about it. "About eighty bucks."

"You were lucky. How much do you make now?"

I took up the beer. "Nearly three hundred. And I need every penny of it. I'm the only guy in the world that can go into a revolving door and come out ten dollars poorer."

"It all balances out, Mr. Myers. You know what I hafta pay a good barman, now? Two hunerd, and and even then he figures he's got stealing privileges."

"Stealing privileges?"

"Yep. The right to play on the cash register."

"Don't tell me your troubles. I've got my own."

"Mr. Myers, you don't know what trouble is," Sam said, leaning on the bar before me. "They don't call you Lucky for nothing."

"Oh, they don't, eh?"

"No, sir. The way I figure it, I'm glad you don't play that one-armed bandit of mine. As it is, it pays the rent for me."

I took down about half of the beer.

"I'll tell you something," I said. "You know why I don't play your slot machine, Sam?"

"No. Why?"

"Because I've got to maintain my public image. But don't tell anybody I said so."

He waited for me to elaborate that.

I shook a finger at him. "Sam, luck makes luck. When people think you've got it, you do have it. And it's like having a property. Like having a pension. And if you've got good sense, you hang onto it."

He twisted his ugly face thinking that over.

He said, "The way I figure it, Mr. Myers, it all balances out—the laws of chance, like. You take the hunerd million men we got in this country. Each one gets an average number of breaks, good and bad. But mind, I said average. In making that up some guys got such bad luck they'll break their arm picking their nose. But to balance them, we got guys like yourself. If you fell into a cesspool, you'd come up with a diamond ring somebody lost down the drain the day before."

I finished the beer and pushed the glass back to him for a refill. "That's what you think," I said nastily. "Let me tell you the way it really is."

"All right," he told me, drawing another dark. "You tell me the way it is."

"Like I said, luck can make luck. You have a chunk of it and everybody thinks, so O.K., he had a piece of luck. But then a short time after you have another king-size chunk. Everybody's impressed. They figure you've got Old Lady Fortune riding around on your shoulder. From then on, it builds up and every happy happenstance that comes to you is kind of magnified as part of your *lucky* image. And that's when your supposed luck makes luck. You meet a new girl at a party. She had half a dozen other men around her. When you show interest, with your known luck, they figure they haven't got a chance and fade. You get the girl."

Sam pushed the second beer over to me and leaned on the bar again, interested.

"So that's how you figure it works."

"Yes," I said gloomily. "And they never think about it when later on she turns out to be a witch on wheels."

"Well," Sam said, "maybe that's the way it is. But I've always wondered why you didn't go on out to Vegas and play the wheels, instead of holding down a newspaper job. You don't like reporter work anyways, do you?"

I grunted at him sourly. "With beer at four bits a throw, I like any job that'll pay me three hundred a week."

Sam looked at the clock up on the wall. "Hey," he said, "Dugan's on." He turned and flicked on the idiot box, ignoring my expression of distaste.

"Don't you like my conversation?" I growled.

"It's not that, Mr. Myers," he said, even while fiddling with the dials. "It's this new Tri-Di character, Dugan."

"Never heard of him."

"He'll be on in a minute," Sam

said, chuckling anticipation. "He's new. He's supposed to be the hero, like, unnerstand? But he's not good looking, like. In fact, he's ugly as a monkey. He's got kind of a mean temper and everything happens to him, and he never gets the girl or anything. Ordinary, you'd think that everybody who watches Tri-Di'd hate his guts. And kind of, you do. But he's not the villain, like, unnerstand? He's the hero. Only nothing ever comes out right for him."

I grumbled disgust. "So he's the new smash hit, eh? Whatever happened to characters like Cary Grant and Rock Hudson? Good guys who always got the girl."

Sam said: "You wanta nother beer before Dugan comes on?"

"The hell with Dugan," I growled, tossing him a dollar piece and getting down from the stool. "I've got to think about the radical center." Then something came to me and I scowled. "This Dugan, he's an anti-hero type, eh?"

"Yeah, yeah I guess that's it," Sam said happily as the announcer rounded in.

The announcer's fling was for one of the new minicars imported from Japan, and involved running down the Detroit dinosaurs. This Jap car was about as gadget-free and chrome-free as the prehistoric Model A Ford, and it cost about half the next cheapest thing on air cushions. I knew they were selling like crazy locally.

I climbed back onto the stool.

"So you like this anti-hero type, eh?" I said.

"Yeah. You know, those guys you mentioned, like Rock Hudson. That was all a lot of curd. They was always rich and always so pretty. And they'd meet this girl and everybody lives in beautiful houses and drives Italian sport hovercars and eat in those classy restaurants where they still have waiters, and hang out in million-dollar nightclubs drinking champagne wine. And the girl, she could fall off the cliff but it never mussed her hair, and it always ended with them living happy ever after and all that curd."

"Cynicism, Sam, doesn't become you," I told him. Then I said, under my breath, "So in the most popular Tri-Di shows these days, the good guy no longer gets the girl."

In the morning, I didn't even get as far as the city desk to check in with Blackstone. Ruthie, as ever breathless, met me at the elevator.

She gushed: "Mr. Myers, I've been looking for you everywhere."

"That's not where I am," I said. "I'm here."

She giggled appreciatively. "Oh, Mr. Myers, you're always so humorous. Mr. Wilkins wants to see you."

"Oh, oh," I said. "I just stopped being humorous."

I went on down the corridor to the managing editor's office.

Wentworth Wilkins, unlike the city editor, Blackstone, was of the

new school of journalism. He inherited most of the *Journal* from his father, who inherited it from *his* father. The way the old hands tell it, Wentworth's father insisted he learn the business from the bottom up. As a result, he spent one week as a copy boy, one week as a cub reporter, one week on the police beat, one week on the copy desk, one month as night editor, one month as city editor, and since then, knowing the business all ways from Tuesday, he's been managing editor.

I don't know why I should knock it, he was my in. Had it been left to Blackstone, I would have been fired within twenty-four hours of being given my job. And at least once a week ever since. But old man Wilkins *believed* in me. He probably expected me to come up with another blockbuster one of these days and cop the Pulitzer for the third time, thus making some sort of journalistic record.

I stood in front of the door screen and waited for the lock to hum. When it came, I turned the knob and went in.

Miss Patton looked up from her desk and smiled coldly before saying: "Good morning, Lucky."

I said: "Good morning. Mr. Wilkins wanted to see me."

"That is correct. Go right in, Lucky."

I went right in.

Wentworth Wilkins had one of those successful executive desks. Nothing on it, not even a pencil. When he wanted to give some instruction to his secretary, all he had to do was say, "Miss Patton," and she was on. The mike must have been built into the desk top. I don't know where he kept his outside phone.

The desk looked as though no work had ever been done on it and that jibed with Wentworth Wilkins. He looked as though he never did any work. In the morning, he wore morning clothes.

I said, "Yes, sir. One of the copy girls said you wanted to see me, Mr. Wilkins."

He got up and shook hands. Mr. Wilkins was very democratic. Then he sat down again, reached into a drawer for a *Kleenex,* wiped his palms on it and dropped it into a disposal chute.

He said, "That was a couple of hours ago, Lucky." He chuckled. "Don't tell me you turn up two hours after *I* do."

I could have told him that I'd had a hangover this morning. I could have—but didn't.

I said earnestly, "Sir, I've been doing some concentrated research on a new story. Well, series of stories, I suppose. I, uh, had to go down to the library."

"Well, sit down, my boy." He touched along that French pimp moustache of his, as though checking the wax content. "Blackie tells me you've acquired a bit of a bug in your bonnet."

He was the only man on the *Jour-*

nal who called Old Burnoff, Blackie. He called everybody by a nickname, whether or not he had one. It was part of his being very democratic.

I said in all modesty, "Well, sir, I'm just at the beginning of what might turn out very important."

He looked at me skeptically. "After thinking it over, Blackie came to me with a suggestion."

"Yes, sir." The situation was looking up. Perhaps I could get a series of feature articles out of the idea, particularly if they assigned one of the old-timers to me.

"He suggested we fire you."

"Yes, sir." The situation was looking down. I was going to have to talk fast. "I mean, no, sir."

"Now, this radical center subversion matter. Suppose you tell me about it, Lucky."

I turned on the earnestness, full blast. "Well, yes, sir. I think there's some sort of plot running down the national image, like. Lousing up the national image."

He flicked the other side of his pretty moustache. "Ah?"

Whatever that meant.

I said, "Yes, sir. When I was a kid, we used to go to the movies and cheer the one hundred per cent American pioneers and cowboys who were fighting off the Indians. Finally, the U.S. cavalry would come to the rescue, the flag bearer riding out in front. Then we'd cheer *them*."

He was frowning at me. "Your point, Lucky?"

"Now at the movies the kids cheer the Indians."

"I seem to fail to . . ." He let the sentence dribble off.

I was warming to the subject. "I don't know how far back it started, Mr. Wilkins, but it's accelerating."

"See here, Lucky, we need some examples, not just generalities." There was an edge of impatience.

Think fast, Lucky Myers. Live up to your name. Lose this job, Buster, and you'll wind up servicing automated shoeshining machines after your unemployment insurance is gone.

I said hurriedly, "Well, to go back a way, take Gary Powers and the U-2 hassle. When the Russians turned him loose, they probably figured we'd shoot him. Instead, the government gave him another high-paying job, and finally a decoration. Medals are given to heroes. Evidently, our U-2 pilot was a hero. Some hero."

"That was a long time ago," Wilkins said unhappily.

"Sure, but the trend was starting even then. When I was a kid, we used to read *Superman* and *Batman* and identify with those criminal busters. But before long, people started becoming camp conscious. They took *Batman* and put him on TV."

Wilkins was scowling. "I'm afraid this isn't getting through to me, Lucky. I don't seem to get your point."

I didn't get it either. Or, at least, it was only coming to me as I went along.

I said hurriedly, "Well, take another example from about the same time. The James Bond stories, written by that British . . ."

"Ian Fleming," Wilkins said. "I used to read his thrillers."

"Sure. Almost everybody did. They were satire. Far out to the point of being ridiculous. A take-off on our old crime solvers such as Sam Spade, Mike Hammer, Perry Mason and Nero Wolfe. A big spoof and everybody lapped it up. They were tired—or were being *made* tired—of the old crime busters."

Mr. Wilkins was very unhappy. He said, "Lucky, I fail to connect all this with what Blackie told me regarding your story of subversion. Your, what did you call it? Your radical center."

"Well, yes, sir. That's just a term I pulled out of the air. I don't know what they call themselves. I don't even know what they have in mind."

"Who?" he blurted.

"Whoever's doing this."

"Doing what, good heavens!"

"Running down the American dream, destroying the American image, making our fondest ideals look silly." I snorted in indignation. "Whatever happened to the Fourth of July speech? Who'd dare, these days, to get up and give one? He'd be snickered off the stand."

It seemed to me I was doing a pretty good job. I was beginning to believe it myself.

Wentworth Wilkins shook his head, as though in despair. "See, here, my boy, let us get to cases. What did you expect to do in this investigation of yours?"

For the moment, he had me there. I twisted up my face as though trying to figure out a way of presenting a plan I'd already laid out. Actually, I was grabbing around for anything at all—a straw would have looked just fine.

I said earnestly, "Well, sir, possibly Mr. Blackstone put his finger on it when he mentioned that a lot of advertising campaigns were tested out in advance in Center City. Average American city, center of the country, neither east nor west. Yes, sir. I have a hunch that this radical center outfit is using our town for testing."

Wilkins, still unhappy, snorted, "To what end?"

I looked at him.

"What are they trying to accomplish?" he added.

"They're subversives," I said weakly.

"But what are they subverting? What do they aim to achieve?"

He had me there. The brain finally gave out. I couldn't think of a damn thing.

Finally Wilkins shook his head.

"Lucky, my boy, you've pulled a bad one. You can't expect your intuitive news sense to work out every time. Don't worry about it. Your

batting average is still superlative. The recovery of the Shultz kidnapping victim and the incredible photography of the Dolly Tetter bank robbers, will live forever in journalistic annals."

I said, trying to project worry, which wasn't hard, "Then you think I ought to drop this, sir?"

"I'm afraid I do, Lucky. I'm afraid I must insist upon it."

"Well, sir, you're the boss."

He beamed at me. "Don't put it that way, my boy. We're a team, here on the *Journal*. We all pull together." He winked condescension. "It's just that in my position I decide which way to pull."

"Yes, sir." I was being dismissed. I got to my feet.

Wilkins said, "Ah, just tell Blackie that you'll now be available for some other assignments."

I winced, not figuring on that particular ax falling at that particular moment. In other words, I was no longer a roving reporter, free to seek out my own stories. From now on, I was to take assignments from Blackstone. And I had no illusions. It wouldn't take that old pro a week to discover that I didn't know a scoop from an obituary. He already suspected it.

Old Burnoff had a sense of humor, or thought he had. For my first assignment, he sent me to a Salvation Army banquet, a regional meeting of officers with rank of captain up.

I had a sense of humor, too, or thought I had. Before the banquet, I approached the speaker and got a copy of his speech. I told him I had a deadline to meet, and hightailed it down to The Hole.

The trouble was, one dark brew led to another and I didn't make it back to the office until just before the night shift came on.

Blackstone smiled at me sweetly. "Lucky Mars, the demon Pulitzer Prize winner," he murmured. "I assume the story yawl intend to do on the sky pilots will hit every wire service from Reuters to Tass."

I refuse to recall the rest of the scene.

Afterwards, I returned to Sam's dark lager.

The next morning, happily, I was off. I didn't go immediately down for my check. I went on over to Mort Zimmerman's apartment and got him out of bed.

He glared at me from the door, standing there in pajama pants but no tops. The scrawniness of his chest was made up for by a mat of black hair he could have used for a mattress—or a flea zoo.

"What do you want this time of night?"

"It's ten o'clock in the morning," I said, pushing past him into his chaotic living room.

"I do my writing from midnight to dawn, damn it!"

"I know," I said. I tossed a few copies of *Cynic* and *Misanthrope* to

the coffee table, and pushed to one side a stack of *Iconoclast,* thus making room on the couch. I sank down.

"I had to have somebody to talk to," I said.

"Why me?" he snarled. "You want some coffee?"

"Yes. Why not you? You're smaller than I am, and can't get away."

"Jollies we get, this time of day," he growled, going off into his kitchenette.

While he was gone, I picked up a copy of *Cynic* and fluttered through the pages, sourly.

The lead article was on Momism. From what I could see, the author had done most of his research in that old classic "Generation of Vipers" with which Wylie had made himself infamous and solvent a few decades ago.

There was another piece reviving the idea of establishing a Veterans of Future Wars organization. The idea being to start teen-age kids off with a pension, so they'd have the spending of the money while they were still young enough and whole enough to enjoy it. The theme was, why should men who *survived* a war be the only ones to enjoy the veteran gravy that the government ponied up? The ones who were killed ought to get in on it as well—before the war ever started.

I grunted and tossed the magazine back to the coffee table, when Mort reentered the room bearing two cups of coffee, spoons sticking out of them, and a paper sack of sugar.

I took one of the cups, dug down into the sack for sugar with a spoon, and nodded at the magazines.

"You still selling articles to those?"

"Occasionally," Mort said disinterestedly. He sat down in his easy chair, ignoring the papers and a dirty towel that already occupied the seat. "The competition is getting tougher. When they first started coming out, you could sell just about anything you wrote. But now a lot of the pro free-lancers are switching over from the other magazines and getting into the act. I can't compete with name writers."

I said glumly, "Whatever happened to the men's girlie magazines? The ones that used to do articles on bottomless bathing suits and such?"

He sipped his coffee and found it too hot.

"That was the *last* fad," he muttered. "Some are still going. Those that are have switched to the same type articles as these new ones, *Cynic* and *Iconoclast*. I sold a piece last week to *Roguish Playboy* on how to beat the draft."

"How to beat the draft?" I said.

"Sure. There's a lot of ways. Some even legal. One thing you can do is commit a crime. Steal a hovercar or something. Get yourself a police record. Then you're a felon and the military won't take you. Or you can guarantee flunking your medical by taking a heart stimulant.

Or I know of one guy who made no protest about being inducted, but once he was in the Reception Center he started hanging around the showers all the time. Finally, he was brought up before the camp medicos who asked him, 'How do you like girls?' and he said, 'I guess they're all right.' And that was the end of his military career. Then . . ."

I said, "I know there's a lot of ways to beat the draft. What I meant was, I'm surprised they'd run an article like that."

His shaggy eyebrows went up. "Why not? It's a free country."

"And getting freer by the minute," I said.

He tried the coffee again, found it drinkable and waggled his coffee spoon at me. "There's only one reason for having draft laws," he pontificated. "That's because your citizens aren't silly enough to volunteer. How long's it been since anybody in this country volunteered?"

"Well, there's some . . ."

He shook his head in disgust at my opinion. "The kind of guy who volunteers for the Army these days is so light in the head that they don't want him. They need somebody with a smidgeon of intelligence. The days when the military was staffed with sergeants whose average I.Q. was less than ninety are over."

I said, "Some pick the military for a career. After twenty years, you're out and on a pension, with all sorts of privileges."

"Sure," he said, evidently losing interest in the subject. "The only exceptions. They don't join because of anything as old hat as patriotism. They join for the security. And you can imagine the caliber of anybody who takes the guff handed out by the Army for twenty years because he figures he can't compete in ordinary civilian life. That the Army will offer more in the way of reward, than working on the outside." He grunted contempt.

He stood up and went into the kitchen for more coffee.

When he came back, I said, "What're you working on now, Mort?"

"Couple of things. I've got a nibble on a series on politics. It's overworked but I've got some new angles."

"What about politics?"

He picked up a newspaper and tossed it over to me. "Did you see this bit about the pickpocket who was elected mayor up in this New England town?"

"Pickpocket?"

He laughed bitterly. "Yeah. Long police record. He ran on a ticket that he needed the job to keep him honest. That if he wasn't elected, he'd have to go back to stealing for a living. And even if he had to steal for a living, he'd rather do it sitting down at a desk, the way politicians did, instead of wandering around crowded theatre lobbies and state fairs."

I was staring at him. "And he was elected?"

"Oh, he was elected, all right. They laughed him into office."

"Holy Jumping Zen," I groaned. "What's the country coming to?"

Mort snorted. "It's just that at long last the voters are getting as cynical as the politicians. Do you have any idea of how many ballots, in elections these days, have written in as candidates such names as Pogo or Donald Duck?"

I said, "I thought the big trend was not voting at all."

Mort said, on the belligerent side. "Who can blame them! It's unusual for even a hot election to bring out half the potential voters."

I said, "Well, if the voters don't like what's going on, they can put a new man in."

"Can they?" he demanded. "That's the old story, and it's fiction —when the usual thing is that both candidates stand for the same thing. How many politicians, railing away at the incumbent, stand by their promises, once in themselves? You vote for a man because he takes your stand against the other candidate, then as soon as he gets in, he reverses himself. Look at Johnson and Goldwater, back in the old days."

He shook his coffee spoon at me again.

"That's one of the things I'm going to write up. The growing cynicism of people in regard to *anything* the politicians do any more. We've given up expecting anything except a sideshow from them. Lucky, there hasn't been a real idealist in the White House since Woodrow Wilson, and he was an anachronism and probably slightly crackpot to boot."

"Well, there was Roosevelt," I said weakly.

"Was there? You know who nominated him the first time? Huey Long. Who supported him? Among others, the big city political machines. Tammany Hall, Frank Hague, the Kelly-Nash machine. And where did he get his third vice president? From the Pendergast machine of Kansas City. Lucky, my friend, what do you think old Roosevelt, the super-liberal, had to promise and later deliver to these people to get their support?"

He was getting warmed up. "And what've we had since? Clowns and military types who spent the whole eight years playing golf . . ."

"Well," I squirmed uncomfortably. "There was Jack . . ."

"And the Irish mafia, eh? That was when Madison Avenue really took over an election for the first time. When the public image and TV appearance made more difference than party principles and platforms. The guy who won a presidential election because his opponent didn't shave closely enough before a TV debate. Another big liberal. The one who O.K.'d the Bay of Pigs fiasco and first escalated the Asia War." Mort Zimmerman

snorted. "I'll admit, at least he had dignity. He and his family. He wasn't one of the clowns we've been getting since."

He was getting a little far out for me. I said, "Look, we're moving away from the point. We were talking about voter cynicism."

"Why shouldn't they be cynical? About every two years a new case of a police force being the biggest burglars and thieves in town comes up. I can think back over the years. Denver, Chicago, Los Angeles, Detroit, Idaho Falls, and all the more recent examples. And that's only the police. Peanuts compared to corruption in office."

I said, half angrily, "I still say that the voters can turn them out if they don't like them."

He shook his head. "Even that's becoming impossible. Are you familiar with the election laws that prevail now? In half the States, it's all but impossible for a third party to get on the ballot any more. In some States there is no provision in election laws for a third party; in others the requirements are such that if the equivalent of Lincoln's Republican party of the mid-1800's came along, they'd never be able to make their bid for power, because they wouldn't be able to meet the requirements for candidates.

"Sure, you can vote for one party or the other, but both parties stand for the same thing. How long has it been since there was any difference in national platforms?"

I finally gave up,under his barrage, and put my coffee cup back on the table. "Well," I said, "yesterday I would have been more interested. Today, I've got to start dreaming up something besides the country's growing cynicism."

"Oh? What's up, Lucky?"

"It looks as though people are going to have to go back to calling me Charlie."

His face went questioning.

I said, "I doubt if my job's going to last the week out."

"Actually," Mort grunted, "you never were much of a newspaperman, Lucky."

I sighed. "Everybody keeps telling me that. However, I need the money. I'm the most improvident man on record. I can jump into my own swimming pool in my back yard and come out three dollars poorer."

He looked at me strangely. "How'd you ever get that Dolly Tetter bank romp story?"

I was beginning not to care. "My kid sister had taken a roll of film in a new camera and didn't know how to get it out. Neither did I, so I took it down to the photo shop. On the way back, outside the First Bank of America, I ran into Dolly Tetter, or he ran into me. He was carrying one of these new Gyrojet rocket guns, kind of a poor man's bazooka, and he was covering the retreat of three of his troupe who'd just picked up a quarter of a million, the easy way."

Mort was taken aback. "You just *stumbled* on it?"

"That's right," I said, complete with self-deprecation. "Dolly was banging away at two groups of cops —one up the street, one down. But they were up against a handicap or two. A lot of innocent bystanders, including me, were on the streets and, besides, they were face to face with the toughest Public Enemy Number One since the legendary Dillinger. They weren't *that* anxious to earn their salaries."

"What'd you do?"

"I don't know what I did. I just stood there. Kind of frozen. Too scared to drop to the sidewalk. I wasn't more than fifteen feet from Dolly. His cool wasn't at all affected. In fact, he was kind of whistling to himself as he'd toss a couple of those Gyrojet 13mm rockets at first one set of cops, then the other. His men came running out of the bank, carrying the loot, and piled into the armored car they had there for their get. I got several pictures of them, too."

Mort closed his eyes in pain. "Too?"

"Yeah. You remember the pictures."

"I thought you'd taken them with a telephoto lens, from way off somewhere," he muttered. "Go on."

"So then Dolly noticed me and upped with his Gyrojet carbine, or whatever it was, to wing one at me."

Mort's eyes opened again to stare.

"But he'd emptied the clip, evidently, and didn't have time to reload. He made a snatch at the camera, as he piled into the car after his troupe, but by this time I'd come out of my daze, and I stepped backward, kind of in a hurry, and went flat on my fanny.

"Anyway, I took the camera up to the pix department on the paper and left it with the chief darkroom technician. I told him I thought I might have something on the robbery, but he took one look at the kid camera and went back to the shots the regular photogs were bringing in of the street outside the bank and the three wounded cops and the safe that Dolly and the boys had blasted open. It wasn't until later they found every one of my shots had come out clear as day. By that time, I'd got over my shakes and came over here to you. You'd been working on that true detective article about the Tetter gang and had all the dope. So, between us, we cooked up that article and I took it down and submitted it to Blackstone. And that's the piece I won the second Pulitzer on."

He groaned. "And paid me four hundred bucks for writing it." He looked at me and shook his head. "I can't imagine you having the guts to just stand there and take shot after shot of all that action."

"I can't either," I told him. "I didn't know I was doing it. I looked down later, after Dolly had taken off, and noticed that the whole roll of film had been exposed. I can't re-

member doing it. It was an automated camera, self-winding film and all. Maybe my finger just jittered."

"Listen," he demanded. "How'd you ever find that Shultz kid. The first Pulitzer prize deal?"

"You wouldn't believe me," I told him, getting up. "Well, I better get about my business."

"Oh, great," he said. "Now that I'm all woke up." He scratched his mat of black hair and ran his tongue over his teeth distastefully.

I didn't get around to my usual day-off activities: laundry, shopping and such. I was feeling depressed.

It was obvious what was going to happen. Old Burnoff Blackstone was going to continue to hand me cub-reporter assignments. And I was going to make a mess of each in turn. They weren't going to be the sort of thing I could take around to Mort Zimmerman and have him do up for me. The only way I could afford Mort's ghosting was on a fairly major article. I'd resorted to him possibly eight or ten times in the past year, including both of my big beats, and each time he'd come through. Why not? He was a twenty-year free-lancer.

When I left his house and piled into my Volkshover, I noticed a man staring into the store front of the neighborhood autogrocery, next door to Mort Zimmerman's apartment house. The store fronts of autogroceries aren't that interesting, but that wasn't what bugged me.

I felt I ought to say hello to the guy. I knew him—vaguely. But I couldn't remember his name.

I hit the lift lever and tromped down on the accelerator. I was halfway down the block before I placed him. He wasn't actually an acquaintance. I'd seen him the night before, in The Hole. He had been sitting in a booth immediately behind me. I had been at the bar. He seemed to be a lone drinker, never stirring as long as I was there and I was there until closing.

I went around to the library, not exactly knowing why. I think I had a vague idea of trying to find some new subject with which to wow Wentworth Wilkins. If I could come up with a real blockbuster of a story idea, I might still be able to have Mort write it up for me and preserve my image with the *Journal*'s managing editor, if not with Old Burnoff. That might put me back on my roving-reporter basis, a situation where I wasn't actually responsible to Blackstone and where no one really kept tabs on what I was doing.

I didn't find anything at the library. Somehow or other I drifted into checking back on some of the things Mort had brought up about politics. Not that I've ever been particularly interested in politics.

He was right about the two-party system. The third party is a thing of yesteryear. I checked back through

the national elections. Each one that went by, the minority parties became more pathetic, appearing on fewer and fewer State ballots. The Prohibition Party, the third oldest in the country, was on the ballot in only eleven states and had less than twenty thousand votes. The Socialist Party, which had once garnered almost a million votes in the days of Eugene V. Debs, had now disappeared. The Socialist Labor Party, largest of the minority outfits, had scored in the last election in seventeen states, but some of these had evidently been write-in votes for their candidates; they hadn't actually been on the ballot.

I didn't know why I bothered. I wasn't interested.

While I was at it, I looked up some of the crime statistics.

Crimes, particularly petty crimes and juvenile delinquent stuff, were growing all but geometrically. And, to balance that fact, crime punishment was falling off almost at the same rate. Evidently, some young jerk could pull anything short of murder or grand larceny and get off without more than a scolding. By the time he became an habitual offender, he had evidently got around to the point of achieving protection and could have fixed even major felonies.

I wasn't getting any ideas with which to impress Wilkins. This was all old hat. People had had these statistics thrown at them for so long, they couldn't be bothered any more.

It came to me that there were a lot of things people couldn't be bothered with any more. That they were fed up and cynical about.

It was getting on into the day. I called it quits and decided to head for The Hole as soon as I'd picked up my check.

By coincidence, the man I'd seen staring into the autogrocery window next to Zimmerman's house, was passing along the street when I came out of the library.

There are actually two reasons why I hang out at Sam's, three if you count the fact that he cashes my checks. The other two are the dark beer and the fact that he's off on a side street where you can usually find parking.

I found parking, dropped the lift of the Volkshover and went on into The Hole.

Sam continued mopping the bar listlessly with his bar rag until I climbed onto my usual stool.

He said, "Hi, Mr. Myers. Guy in here asking about you today."

"About me?" I scowled.

"Yep." He picked up a beer glass and headed for the spigot.

"What did he want?"

Sam said, "I couldn't figure out. He seemed to want to know more *about* you than where you were, or when you usually dropped in."

"Surprising he didn't look me up at the office."

"Mr. Myers, you don't have any enemies, have you?" Sam asked.

"Me? Who'd bother to have me for an enemy?"

He nodded, as though in agreement. "Yeah, I guess that's right."

"Oh, it is!" I snarled at him, suddenly irritated. "Just suppose I take my business elsewhere?"

Sam said, wide-eyed, "I didn't mean anything, Mr. Myers. Zen! you're my best customer."

"Huh," I snorted. "What about this guy?"

"He sure asked a lot of leading questions, like."

"Such as?"

"I can't remember most of them. I didn't know the answers mostly. Things like, what were you working on these days? What did you talk to me about? Hell, I just told him you never said anything worth listening much to."

I glared at him for a long moment.

Somebody entered and slipped into the booth immediately behind me. I turned, but didn't recognize the big bruiser. He had an empty face.

One brew led to another brew. It was a slow night and Sam wasn't too busy, so he spent most of his time listening to me beef. When I ran out of other items to beef about, I brought up some of the subjects Mort Zimmerman and I had been talking about that morning. Public cynicism toward the police and politicians, the declining percentage of eligibles who voted, that sort of thing.

Sam mostly grunted agreement.

When I finally called it quits, it was good and dark.

I'd forgotten about the bruiser who had been sitting in the booth behind me. When I slid off my stool to leave, he paid his bill as well and followed after.

I had on quite a load of lager and wondered vaguely if I ought to leave the Volkshover where it was and get an autocab. But it takes a rare drunk to leave his car because he knows he's been drinking too much. I am not a rare drunk.

When I got to where I'd parked the little hovercar, I found a stranger leaning nonchalantly against it. Only it wasn't a stranger. It was the character I'd seen next to Mort's apartment house and later outside the library, not to speak of the fact that he'd been sitting in the booth behind me the night before.

From behind, I could hear the footsteps of the tough looking type who had spent this evening in the same booth, sipping at his drinks and listening to what I had to say to Sam.

You can see what a quick thinker I am. It wasn't until then I began to smell a rat.

I was lurching up the street in a mild zigzag, one eye closed for more effective vision.

The one leaning against the car murmured pleasantly, "So you couldn't keep your beak out of other people's business, even when warned off, eh, Myers?"

I heard a sudden quickening of the steps behind me.

At this point of progress, in an effort to reach the car so as to steady myself against it with at least one hand, ordinarily I would have zigged . . . but I zagged.

The fist went whistling past my head, missing completely the original target, but slamming into an alternative—the one who had just spoken.

The next few minutes are still none too clear in my memory. I can vaguely recall a colossal kick being aimed at my ribs, after I had stumbled and fallen to one knee. I can vaguely remember the horrible sound, like a watermelon falling to the ground and splitting open, when the kick threw kicker off balance and he conked his head against the sidewalk. And the various grunts, groans, growls and scuffling sounds as they tried to coordinate sufficiently to get at me. And, oh yes, my own squeals of terror as one thing after another kept happening.

At long last, I could hear somebody coming a-running.

It was Sam, and two or three others from The Hole.

Sam was yelling something. He had a hard rubber bung starter in his beefy right hand. I winced when he brought it down on the head of one of them, the one still able to sit up on the curb.

When the shouting had simmered down slightly, Sam was there staring at me. "You don't have a mark on you," he accused. "How come?"

"I don't?" I said, holding onto the side of the hovercar. I was almost sober again.

"What happened?" he said.

"How would I know?"

He looked at me. So did the others.

It had obviously been an insufficient answer.

I cleared my throat and said, "It looks like they kind of beat each other up . . . by accident."

Sam still looked at me. "So luck makes luck, eh?" he growled. "All I can say, yours must be a regular assembly line."

There was some more confused hassle when the police cars Sam had phoned for came dashing in. We all had to go down and help book the two. They asked me a lot of confused questions and I gave them a lot of confused answers which they obviously didn't believe.

Finally, I went on home and slept it off.

The next day was a working day. I got there moderately on time.

Old Burnoff wasn't in a particularly bad mood, evidently. He gave me an assignment to go to the zoo and get a story on the newly born hippo. I ignored the snide crack that went along with it.

I stood next to the hippo pool for a while staring at the newborn. I couldn't think of anything beyond the fact that it looked like a small duplicate of its mother.

I said to the keeper, "What's its name?"

"What's name?"

"The baby hippo."

"It hasn't got any name, yet."

I looked at it some more.

Finally, I said, "What does it weigh?"

"How would I know?"

I gave up and went on back to the office where I told Blackstone there wasn't any story on the baby hippo.

His temper had gone into a setback since that morning. He glared at me. On the desk in front of him was a copy of the rival rag, the *News-Chronicle*. He slapped it with the back of his hand.

"Look at this beat," he blatted. "Right in our own backyard. Lugs and Benny Onassis picked up here on an assault with intent to kill romp. The toughest enforcers the Syndicate has on its rolls. And what happens? We don't have a word on it! What kind of police coverage are we getting, Mars?"

I said weakly, "I'm not assigned to the police, Mr. Blackstone."

"I know that," he growled. "Thank God." He stared down at the story again. "Lugs and Benny. You seldom get anything about them, out of Chi. They all must've been sent down on a special job. Evidently to finish off this . . . this Charles Myers." His voice had slowed. "Charles Myers?" He looked up at me, his face beginning to go ominous. "Lucky, what's your first name?"

I cleared my throat. "Charles."

He closed his eyes and held them closed for a long time. He was counting, I suppose.

When he opened them, at long last, he said very evenly, "Why didn't yawl phone in?"

"I forgot to. It didn't occur to me." I added apologetically, "It was kind of drunk out last night."

He closed his eyes some more. He wasn't counting now. His mutters sounded more like prayer.

Finally he said, "Lucky, we still might be able to rescue something. Why did those two hatchetmen jump you?"

I shook my head, trying to be cooperative. "I don't know, Mr. Blackstone. I sure don't."

"You think they were old friends of Dolly Tetter's troupe, or possibly those kidnapers who tried to snatch the Shultz baby?"

I shook my head, dumbly.

He closed his eyes still once again.

Finally, without opening them this time, he said in a flat voice, "You're fired, you hear? I don't care what Wilkins says. It's yawl or me. If he doesn't let me fire you, I quit. Get your things out of your desk and yawl get out of here, you hear?"

I went over to my desk and stared at it. I didn't have anything in it to get out.

So I left the city room and headed for the elevators.

Ruthie came up, as ever breathless. "Oh, Mr. Myers, I caught you

just in time. Mr. Wilkins wants to see you soonest."

I thought about it. Was there any reason to bother seeing Wentworth Wilkins? Could I possibly rescue the job? No. Old Burnoff was really down on me now. Even if Wilkins went to bat, it couldn't last. Not with Blackstone out to get me. Even if I'd been a decent reporter, you couldn't expect me to hold out against my city editor. So what was the use? He'd already given me an inkling of what an editor's harassment could consist—Salvation Army and baby hippo assignments.

Nevertheless, I started toward Wilkins' office.

I stood in front of the door screen and the lock hummed immediately.

When I entered, Miss Patton said hurriedly, "Mr. Wilkins and the others are awaiting you, Mr. Myers."

Mr. Myers, yet. Not Lucky.

I entered the sanctum sanctorum.

Wilkins was sitting at his clean as a hound's tooth desk, flanked by two strangers who could have been his twins. Between the three of them, they looked like several million bucks on the hoof.

Wentworth Wilkins popped to his feet, more jovial and democratic than ever. He shook hands and forgot to wipe his off later. How democratic can you get?

He said, "Gentlemen, this is Lucky Myers, our two-time Pulitzer Prize winner." He looked at me. "Ah. Lucky, this gentleman is from Greater New York, and this one from Washington. For reasons that will become obvious to you, we shan't use names here today."

That made a lot of sense. He'd just used mine.

"Please have a chair, Lucky," he beamed.

I located a chair.

I cleared my throat and said, "Just in case you didn't know, Mr. Blackstone fired me a few minutes ago."

"Because of that matter last night?"

I nodded, a lump in my throat.

"Fine," he said.

What was fine about it? Maybe I could get a job in some cheap cafeteria that couldn't afford to automate the dishwashing.

One of the nameless said, after checking his watch, "Shouldn't we get about this, Wenty?"

I looked at Wentworth Wilkins. It had never occurred to me that he *too* had a nickname. Wenty, yet.

"Um-m-m," Wilkins nodded, working the wax into his moustache with his fingernail. "Of course." He continued to beam at me. "Lucky, my boy, we have had second thoughts since your demonstration of fortitude and quick wittedness last night."

"Quick wittedness," I repeated.

Wilkins nodded and so did his pal on his right. The one on the left looked thoughtful.

"In spite of our advantageous

position, in view of your journalistic renown it could have become quite . . . ah . . . embarrassing, had you . . . ah . . . lowered the boom, Lucky."

Somewhere in here, something made sense. Until it turned up, I had best keep my trap shut and my face looking as though I knew what was going on.

I kept my trap shut and my face looking as though I knew what was going on.

"So," Wentworth Wilkins said jovially, "when it became obvious that you wished to be on *our* side, we decided to take you in."

There's more than one way of interpreting being taken in.

I kept my trap shut and my face looking as though I knew what was going on.

He thumped his well manicured forefinger on the desk. "Besides your well demonstrated journalistic intuitiveness, we now find you almost unbelievably apt in, ah, the clutch . . ."

He turned to his confreres. "Imagine. Bare handed, roughing up the two best strong-arm men Chicago could send us."

The one on the right grunted affirmation. The other still looked thoughtful.

Wilkins turned back to me. "But I was most impressed by the manner in which you handled the police and the press"—he chuckled appreciatively—"including our own publication." He shook his head. "Had Blackie got hold of the story, I am afraid he would have frontpaged it before I ever arrived on the scene this morning. And, I fear, the fat would have been in the fire. It certainly wouldn't have done the radical center much good, Lucky, my boy."

"The radical center," I said, trying to keep my voice from going completely idiotic.

He chuckled again. "We like the term you coined. Very apt. Amongst ourselves, at least, we'll continue to use it."

"Oh," I said.

The one on the left checked his watch again.

Wilkins said, "My boy, you're in."

"Yes, sir," I said earnestly. "In what? That is to say, how?" That didn't sound right either. I decided I'd better return to keeping my trap shut and my face looking as though I knew what was going on.

He chuckled deprecation. "Getting right down to basics, eh, Lucky? Well, my boy, how does a thousand sound to you?"

Whatever the new job was, it evidently wasn't going to pay as well as the last. A *salary* of a thousand a month didn't add up to the three hundred a week *wage* I had got as a roving reporter. My lack of enthusiasm must have come through.

The colleague to the right stirred and muttered, "It seems to me an income bettering fifty thousand a year is ample for a former journal-

ist, no matter how proficient he is."

My jaws shut audibly.

Wilkins nodded. "I'm afraid that is what you will have to start at, Lucky. Now then, I suppose you have questions, in spite of the extent to which you have obviously ferreted out our basic, over-all, long view, ah, schema."

"Well, uh, you might sum it up for me, sir. There's a lot of, well, ramifications."

"Of course, of course." He flicked his pretty moustache again. "To get very basic, Lucky, how many different ways would you say there were to overthrow a government, or a socioeconomic system, so as to bring a new group to power?"

I must have blinked.

I said, "Well, you can shoot yourself in."

One of the colleagues grunted.

"Indeed you can," Wilkins beamed. "But the trouble is, when you start shooting you don't know who might get stirred up and start shooting back. That type of revolution has a way of getting confused. Remember when Kerenski and the Mensheviks started the Russian Revolution in 1917? When the smoke cleared, the Czar and his group were out, sure enough. But Kerenski and the Mensheviks weren't in. They were either dead or, ah, on the lam. The Bolsheviks were in."

I nodded very thoughtfully. "That's true." Frankly, I had never heard of Kerenski or the Menshe-whatever-he-called-them.

"Of course," Wilkins said, "violence as a method of taking over certainly has its precedents. Frazer's 'Golden Bough' tells us of the prehistoric priest-king of Lake Nemi who lost his position only when someone managed to steal into the wood abiut his temple and pilfer a sprig of mistletoe from an old oak there. The thief then had the right to fight it out with the priest-king. If he won, he became the new incumbent."

He twisted his face, in a false grimace. "Later, of course, violence was often resorted to by an exploited majority which took to the streets, threw up barricades and defeated the adherents of the old regime. The French Revolution is the example that comes to mind. Or the American Revolution, which was slightly different, being led, at least, by the best elements in the colonies."

The one with the nervous watch stirred impatiently.

Wilkins hurried on. "Then, of course, there came the vote. In England, at least, a whole socioeconomic system was so changed. Over a lengthy period, of course. From feudalism, step by step, emerged classical capitalism. Violence there was, from time to time, but no single bloody revolution, as occurred elsewhere. Remnants of feudalism, such as the House of Lords and the royal family, remained for a century and more, but feudalism, *per*

se, had been definitely abolished."

The longer he talked, the less I knew what he was talking about.

He pursed his lips, in another phony grimace. "Then, of course, there is a new government imposed from the outside. Excellent examples followed the Second War. But nations such as Czechoslovakia, Poland and East Germany never did adjust to the Russian type communism. Yugoslavia, which put over its own revolution and adapted to its own conditions, did considerably better. On the other hand, Greece provides another unsuccessful example of imposing a government from the outside. The partisans there had thrown out the Nazis, in much the manner Tito's Yugoslavians had, but first British and then American help allowed the old regime to return, and the partisans were defeated. And for the next twenty years Greece floundered around in the same way East Germany and Poland did. The people, as a whole, had been thwarted.

In Times To Come

Next month's feature novelette is by James Blish and Norman L. Knight—"To Love Another". Now many long years ago, Norman L. Knight did an excellent yarn for us about the Tritons, modified humanity, produced by genetic engineering, capable of true amphibious living under the sea or above it.

I tried to get him to continue the idea, develop the series . . . but didn't get any stories. Now, twenty-seven years later, a collaboration with Jim Blish seems to have produced results —a sequel to "Crisis in Utopia."

This story takes a closer look at the problem of cooperation between two distinctively different human sub-types, the Drylanders and the Tritons—and the inevitable gap of understanding between them.

And—something the genetic engineers never planned. There is a totally unexpected consequence that absolutely forces these divergent branches of the human stock to reunite!

THE EDITOR

Whether or not their own adaptation of communism would have been any better for them is debatable but the fact was they were thwarted and didn't do as well as, say, Yugoslavia, despite the fabulous amounts of aid plowed in by the West."

One of his colleagues said disgustedly, "Good grief, Wenty, where'd you pick up your history?"

Wentworth Wilkins glared at him. "I make a hobby of the history of revolution. Real history, not the pap we turn out for the flats. And considering our position, you should, too."

He turned back to me. "We couldn't fool Lucky, anyway, even if we wished. He's one of *us*. Meant to be on top."

The one with the watch said, "Let's get on with this, Wenty. My jet's waiting. I want to be sure of Mr. Myers' response, but I've got a committee meeting in Denver."

Wilkins, looking a bit grumpy, came back to me. "What we're leading to, Lucky, is that a *new* method of taking over has had to be devised. None of the old apply to the situation we are now in. Violence is too unpredictable, with modern weapons at hand. Having a new socioeconomic system imposed from outside is also out of the question, considering what the chaps on the outside would be prone to impose."

I had to say something somewhere in here, or I'd look like a kook. So I said, "What's wrong with the vote?"

"Um-m-m." Wentworth Wilkins looked at me thoughtfully. "I see what you mean, but we're ahead of you, Lucky. Which isn't surprising, since we've been working on this for so very long. You obviously are cognizant of the fact that the vote in the old, the classical connotation, is out. We don't want to ever bring *that* back again. Why, anything might happen, with all the old values almost completely devaluated by our long-term campaigns. But, of course, you meant the vote in the *new* sense of the word."

"Of course," I said. What else could I say?

"Well, we shall utilize that. As window dressing. We've been working a long time on creating voter apathy. You don't have to win the votes of a majority to win an election. Just a majority of those who actually get out and vote. Make the opposition apathetic, while your own group is enthusiastic, and you win the election. Even if your group is only five per cent of the electorate."

I felt as though I had come late into this conversation. Either that, or every third sentence was being left out. I went back to my old strategy of keeping my trap shut and my face looking as though I knew what was going on.

"But what it amounts to, my boy, is that we're going to take over through apathetic cynicism on the

part of the citizenry. We're going to take over because nobody gives a damn, any longer."

I tried to keep from staring.

He said, in satisfaction, "The day of the radical center is dawning. The nation is equally cynical about the radical right and the radical left, but transcending even that is the fact that they couldn't care less who takes over the reins of government. They're too busy living up to the new moral code."

One of his two buddies murmured, *"Buzz off, Jack, I'm all right."*

And the other grinned without humor and said, "Or, *If I didn't take advantage of this situation, somebody else would."*

Wentworth Wilkins entered into the spirit of the thing and added, *"Do your neighbor before he does you."*

They looked at me.

I swallowed and said, "You mean, like, *Never give a sucker an even break?"*

They all chuckled.

"The new morality," the one who had the jet waiting said. But then he added briskly. "Well, Mr. Myers, are you with us?"

"I said carefully, "Well, what would my duties be?"

"Duties?" Wentworth Wilkins protested. "My dear boy, you mustn't think in such terms, on this level. You have proven your worth. You will be *one of us*. Pondering on top policy, that sort of thing. Undoubtedly, your intuitive abilities will come up with a superlative idea once or twice a year. Perhaps guiding us toward a positive step, or warning us away from a negative one. For instance, what do you think of the name Democratic-Republicans for the projected amalgamation of the political parties?"

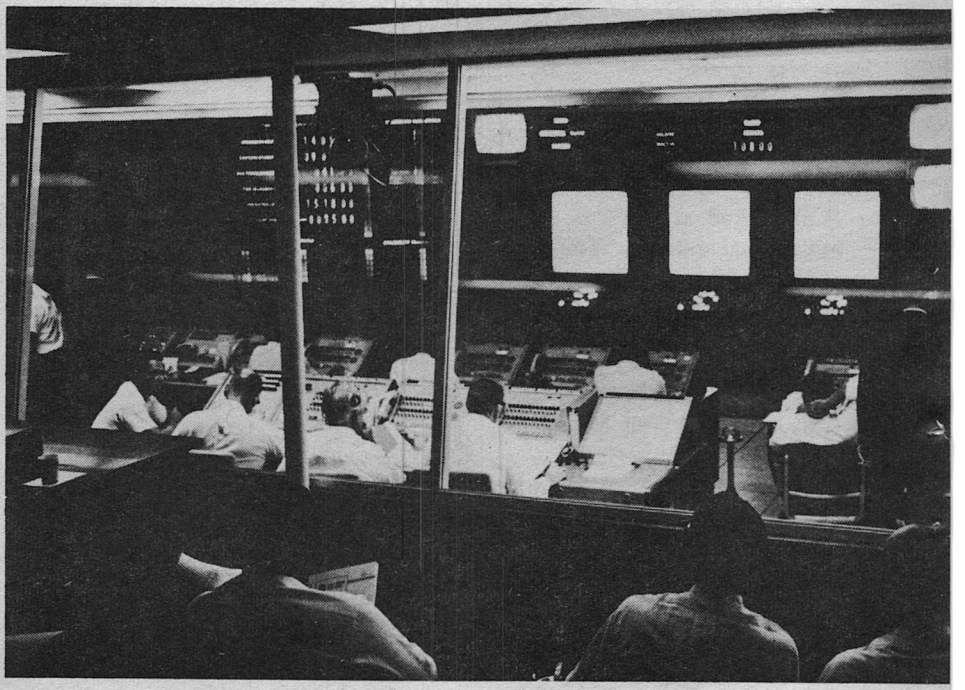
The one with the watch said evenly, "Before discussing radical center policies, perhaps we should be sure just where Mr. Myers stands."

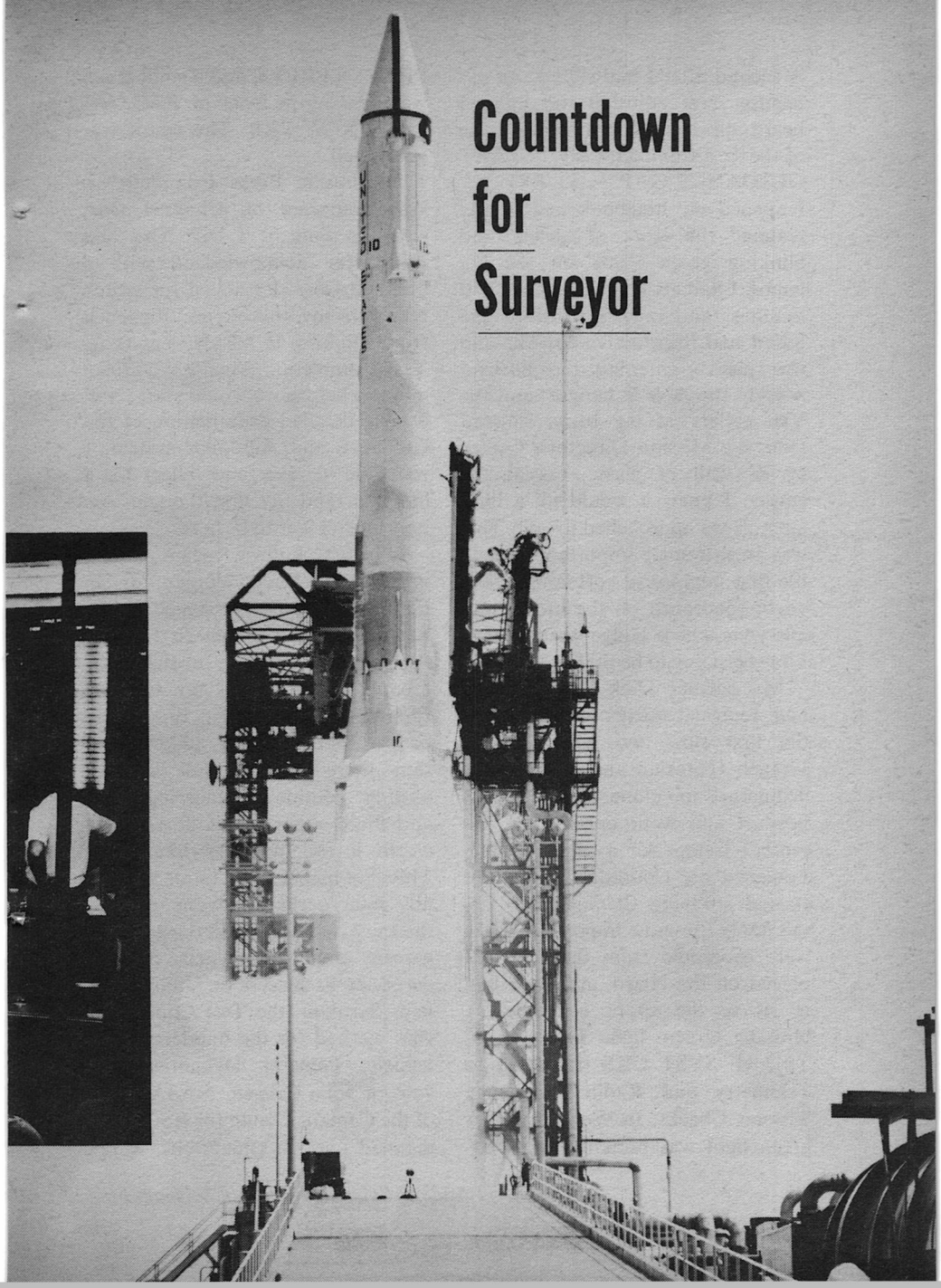
It's no skin off my nose. When it comes to not sticking his neck out, but at the same time looking out for Number One, I go along with the times.

An anti-hero, that's Lucky Myers. ■

SURVEYOR I was a perfect success
in its effort to soft-land on the moon, but,
when you are sitting at the countdown board at Cape Kennedy,
the hours-long strain of waiting for things to work
together results from the fact
you don't know how successful it will be.

By Joseph Green





Countdown for Surveyor

A second after I had slipped on my headset and adjusted the mike I heard the strong, controlled voice of the Test Conductor say, "START GUIDANCE GAP TEST PREPS." I opened my notebook and hastily scanned the bank of steady and blinking green lights on the big board. I had arrived at T minus 170 minutes, and only a third of the board had been activated. The sun was just brightening the horizon outside the A & E hangar, and the VIP gallery at my back, isolated from the Mission Director's Center by its wall of glass, was almost empty. I knew it would fill a little later, as we approached lift-off. This was an extremely important launch, the first attempt to soft-land a Surveyor spacecraft on the moon, and everyone whose badge would admit him was going to be there.

My partner Dick Shatsky, who had reported earlier and handled the first slow two hours of the Launch Historian and Display Coordinator's job alone, slipped off his headset and went outside the Director's Center for a cup of coffee. I opened my Countdown Log and started studying the board in detail. Only the most important Tasks were excerpted from the Log and placed on the board, and each had to fit in the space available. A blinking green light in front of TM&RF SYST CKS translated to Telemetry and Radio Frequency Systems Checks, In Work. Another green light was blinking for PROPEL SYS PREPS, and a solid green was burning in front of FAC/ATLAS PNEW PRP. The count was going well.

"Hydraulic Preps Complete," a voice reported on Channel One, right on time at T-160. The Test Conductor acknowledged with a brief "Roger." I reached for switch No. 6 on my console and flipped it from blinking to steady, signifying Task Completion. Then I had fifteen minutes before we would start GAP Test, a detailed examination of the Guidance and Autopilot system. I was able to relax and reflect for a moment, and my first thought was how lucky I was to be here.

I hadn't known, when I had joined Ling-Temco-Vought, as an Engineering Writer assigned to the Kennedy Space Center in Florida, that I would be picked for the job of Launch Historian for the Centaur Program. We launched only three or four vehicles a year, and between times there were long dull weeks of writing routine engineering tests and flight reports, but it was well worth it for moments like these. This shot meant more to me personally than perhaps anyone else on the Launch Team, even those whose careers could be helped, or hindered, by its success or failure. Perhaps Sarokon, the Test Conductor, who worked for the builders of the vehicle, General Dynamics/Convair, or John Gossett, NASA Chief of the Centaur Group for KSC's Unmanned Launch Operations, would

have been hard to convince, but it was true.

This flight, along with the Apollo program of which it was an important part, was the culmination of a dream I had had since the age of twelve, when I picked up my first science-fiction magazine and read stories of the strange and marvelous world we would have by the year 2,000, where men outraced the sun around the earth, where communications satellites hovered motionless in the sky, and astronauts walked on the face of the moon; the first two miracles had already come to pass, and I was working on the third.

"All GAP Test Preps Complete," said a distant voice on Channel One. The Test Conductor acknowledged with a "Roger," and after a few seconds gave one of the most important commands of the launch—in the same measured tones he would have used to ask for a light for one of the long cigars he was perpetually smoking—"START GAP TEST."

If the GAP Test went through without problems, we were well on our way to a launch. I found myself wondering, as I flipped the switch that started the "In Progress" light blinking, if those cigars were Sarokon's outlet for tension. Both the NASA Mission Director and Launch Director were technically above him in authority, but his was the console that actually controlled the vehicle, and in any emergency he was the one on whom the burden of decision-making fell. You wouldn't have known this from hearing his voice on the intercom channels, or seeing him in person. If he had problems or doubts, they never surfaced above his unshakable calm.

"Propulsion Final Inspection Complete."

"Roger."

So far this countdown had gone unusually well, so much so it almost scared me. The Centaur had a long and unhappy history. We were three years behind schedule and unhappy because we had had only two successes out of six launch attempts. Rumbles of discontent were so loud they were heard in the halls of Congress. Costs had climbed faster than the Centaur, going from an original estimate of a quarter-billion to an anticipated three-quarters of a billion dollars. The most recent launch attempt had been only a partial success. The Centaur had ridden into the sky on its Atlas booster and performed perfectly on its first burn, placing itself and a dummy Surveyor in an almost perfect parking orbit. The Centaur was programmed to restart, after twenty-five minutes of coasting, for the second and longer burn that would carry it and the dummy spacecraft to a simulated moon 260,000 miles out in space.

I had been sitting at my console, as tense as everyone else, when one of the down-range tracking stations

confirmed second ignition. For a brief moment we had all been happily jubilant, but then word had come from the Carnarvon station in Australia that it had failed to acquire the Centaur and spacecraft. Anxious minutes later we knew the truth. A problem in the Propellant Feed system had resulted in only a tiny amount of fuel reaching the engines. They had shut off after barely starting Second Burn. Both Centaur and spacecraft were still in orbit around the earth.

Sonny Jones, the young launch operations engineer in charge of the Centaur Propulsion Systems for NASA—and the best chess player in our building—had told me earlier that the Atlas/Centaur had had exactly one completely successful and uncomplicated countdown; the one for Mission No. 5. It had blown up on the pad.

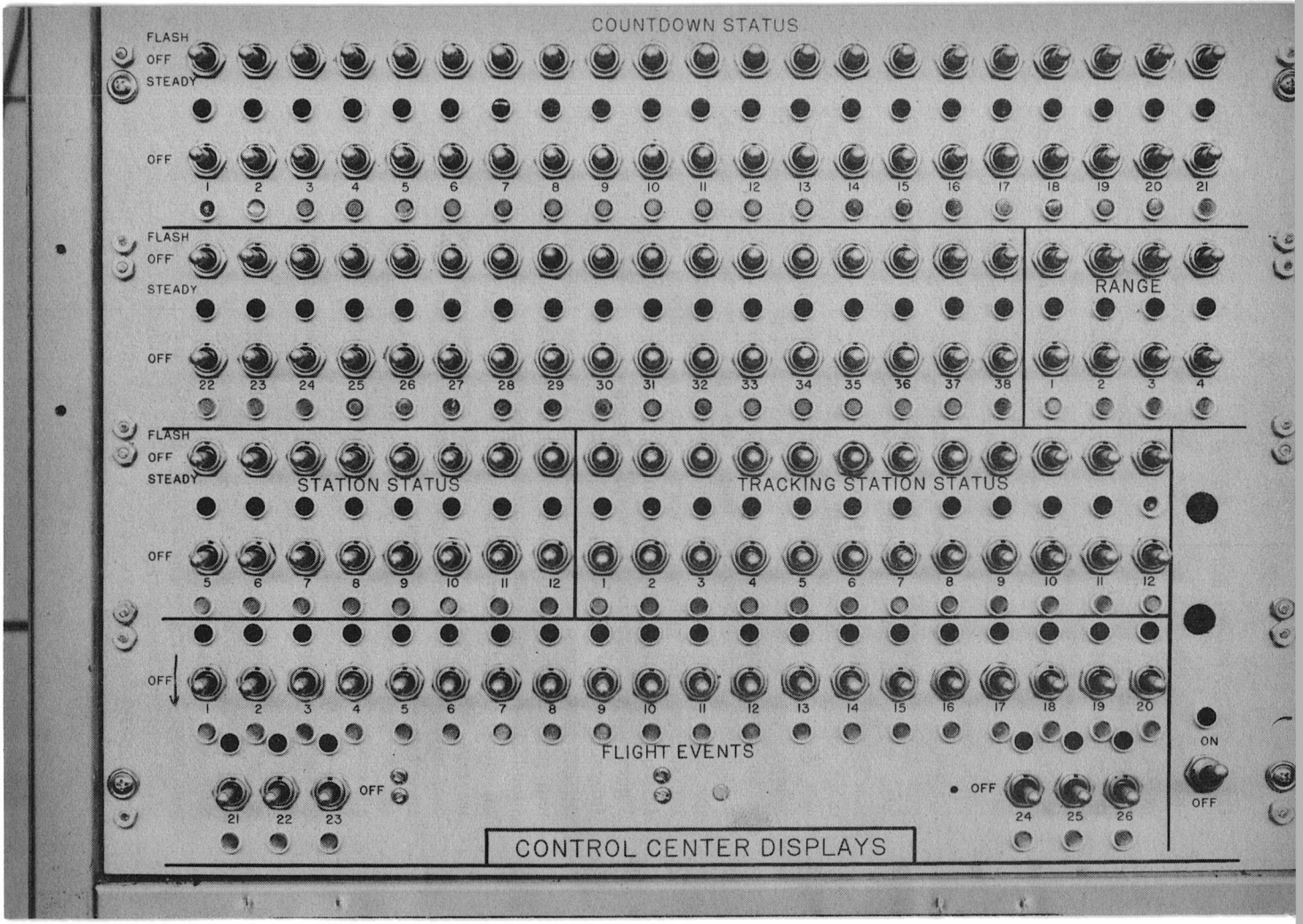
"START TOWER REMOVAL."

T-120, and on one of the four 21″ television screens on the big board I saw the tower crew scurrying about, trying to complete last-minute tasks. The tower did not actually move. I flipped the "In Progress" blinker and let it go at that. Evidently not enough time had been allotted for this task.

My eye caught the small sticky-tape identification strip some earlier wit had pasted below the switches on the Display Coordinator's Console. In mock German it said: DER CHIEFEN SCHNICKLEGRUBER; OFFEN ONNEN DER FLIPPEN FLOPPEN FLASHEN. On second thought maybe he was a half-wit. It's true that the job of Launch Historian and Display Coordinator, though it takes both Dick Shatsky and myself to handle it, is not of great importance. The bird will fly, or fall, regardless of the way we indicate it on the big board. But this is not a one-man show, and the work of literally thousands is implicit in every nut, every valve, every complex engineering design built into the Atlas, the Centaur, the Surveyor itself, and I am one of those thousands, and my job, too, must be done.

This Surveyor mission is terribly important. We need close-up pictures of the moon's surface, need them desperately to help select a landing site for the Apollo team. We need to prove the practicality of using the powerful but extremely volatile liquid hydrogen/liquid oxygen mixture that powers the Centaur's engines. We need proof that engines using these exotic liquids can be shut down and restarted in orbit. The third stage of the Saturn V, the 362 feet tall behemoth that will lift our Apollo astronauts to the moon, will use the same propellants and must have the same restart capability. We can shorten development time on that stage by a year if we prove out the Centaur. For

Close-up Display Coordinator's Console. Each switch controls a light on the large boards.


COUNTDOWN STATUS
FLASH
OFF
STEADY
OFF
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
FLASH
OFF
STEADY
OFF
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
RANGE
1 2 3 4
FLASH
OFF
STEADY
STATION STATUS
OFF
5 6 7 8 9 10 11 12
TRACKING STATION STATUS
1 2 3 4 5 6 7 8 9 10 11 12
OFF
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
FLIGHT EVENTS
ON
OFF
OFF
21 22 23
OFF
24 25 26
CONTROL CENTER DISPLAYS

this mission, though, starting in orbit is not on the program. The particular target chosen can be reached on a single burn. This means that, even if we have a successful flight, we will not have solved that Propellant Feed problem that ended the last one. Sonny Jones, and all the Convair and Pratt & Whitney people who build the vehicle and its engines, still have a major problem ahead.

"T-90 minutes and holding for one hour," came the crisp voice of the invisible man who called the times. This was a programmed hold, during which the Surveyor air-conditioning temperature would be reset and a few other small tasks performed. It was also an hour during which the decision-makers in the blockhouse and Mission Director's Center could huddle and discuss problems, if we had any. And it was a good chance for me to get a cup of coffee and a bite of breakfast. I hadn't felt much like eating when I had crawled out at four a.m. that morning.

I stood by the filing cabinet in the open hangar where I had stashed sandwiches and washed down a roast beef with a cup of hot coffee. Through the windows at the front of the building I could see the early morning sun, promising a bright Memorial Day on this May 30th of 1966. I found my thoughts ranging back over the last twenty years, and the enduring interest in rockets and spaceships that had been born in a twelve-year-old bookworm when he saw that first garish science-fiction magazine cover, and the inevitable march of days that had brought him here. I had known, even then, that I had found my literature.

When I read that first description of blasting rockets, of flame spewing from mighty engines as the sleek silvery ship clawed its way into the sky, of the self-consciously heroic young man wearing the deep blue of the Space Patrol who sat strapped in the pilot's chair, his nimble fingers playing a symphony of power over the keyboard that controlled the thundering, roaring horse he rode . . . I had found my literature, perhaps, but the reality twenty years later could hardly equal those old pulp stories for thrills and excitement. Reality was four television screens watching a still and silent vehicle, reality was a pencil and notebook and switches that went FLASHEN when you FLIPPEN and FLOPPEN them OFFEN and ONNEN. Reality was a hundred men going about their work with professional calm and competence, reality was a cold roast beef sandwich and hot coffee in the early morning . . .

Dick had put two more activities "In Progress" when I returned, and I saw that the countdown was still going well. The board indicated that some of the spacecraft tracking stations had reported. The visi-

tor's gallery was almost full now. When we resumed the count at T-90 we would be in the final two hours, where the supercold oxygen and hydrogen would start flowing into the vehicle, and then I would throw the switch for "Terminal Count," and then if we aborted the Test Conductor would have to face the tricky and dangerous task of defueling.

Two minutes till the end of the hold; the Test Conductor ran through the standard status check before resuming the count.

"ATLAS PROPULSION?"

"Go!" came the quick, hard answer. The Launch Countdown Log allowed only two responses, "Go" and "No Go," but if we heard a "No Go" you could bet we'd also hear the reason for it.

"CENTAUR PROPULSION?"

"Go!"

"ATLAS AUTOPILOT?"

"Go!"

"GUIDANCE?" There was no need for an emphatic answer—the GAP Test was still in progress and we couldn't possibly obtain full status until it was complete—but the same hard "Go!" came ringing back, and so it went through the remaining twenty-six items on the check list, of which the last two were confirmations from the Launch Director and Mission Director that the countdown could proceed. It was still going unbelievably well.

I heard a familiar voice and glanced behind me. The Public Information Officer's console stood just behind mine, and Jack King, whose voice was familiar to millions due to his regular coverage of these launches for NASA, was giving one of the many reports he would issue during the day. I thought my own job of deciphering the flood of information I received and displaying the countdown progress on the big board was tough. Jack had to understand the situation as well or better, and release it in capsule form to the waiting radio stations, where it was usually recorded. He couldn't afford to be wrong.

"T.C., this is Centaur Autopilot."

"Roger."

"Request permission to leave my station and evaluate GAP Test data. I have a replacement."

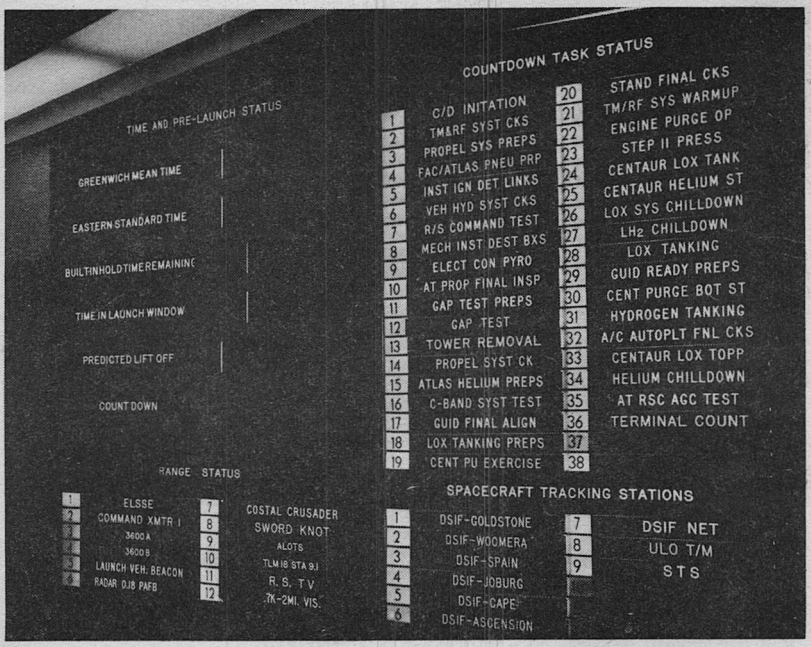
"Proceed."

A moment later someone called in with a request for relief that did not sound as legitimate, and I grinned when T.C. granted it with the same laconic acknowledgment. In reality it was probably a request for a kidney-break. The hours could be long when you stayed on station for a solid eight hours of countdown.

"START TEST STAND FINAL CHECKS."

"Starting checks."

The pace would pick up now, as we moved into the crowded and vital last ninety minutes of countdown. Two minutes later the acknowledgment that test-stand checks were complete came



Launch Countdown Status Board, on left side of Mission Director's Center.

through, followed by a Public Address System general announcement:

"Complex Area in Red Condition! Complex Area in Red Condition! All personnel clear the test stand to your designated fall-back area!"

I checked the board for the thousandth time. Two more tracking stations had come in, and since this was a direct ascent lunar trajectory we would have only a few stations reporting. All those that would be tracking were in the green.

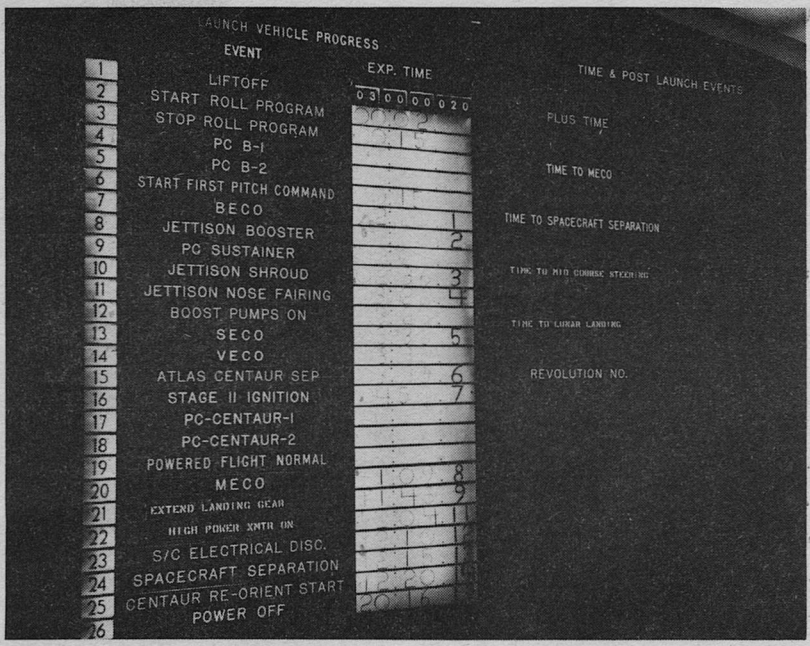
T-80, and I waited with apprehension for the next voice on Channel One. It came, a few seconds late. "GAP Test results are Go!"

We were over a major hurdle, and this terribly smooth countdown was still right on the money. The Test Conductor acknowledged the good news with the same brief and emotionless "Roger" he had granted the less important events.

"Request permission to start LOX chilldown!" came a measured voice, and now the more dangerous part of any launch was getting underway.

"PROCEED WITH CHILLDOWN."

"Guidance Final Align Com-



Major Flight Events Status Board, right side Mission Director's Center.

plete!" came a report, followed by two more in swift succession. Still going well.

I glanced around the Director's Center and saw Bill Brinkly, the acting Head of the Technical Support Branch of Unmanned Launch Operations, talking to the Centaur Project manager, who was down from Lewis Research Center for the launch. Bill was relatively new to the job, having taken over only a few months previously when Dodd Brandt, the former manager, had died of a sudden heart attack. The death had come as a terrible shock to those of us who worked with Dodd. He was only thirty-nine, and had appeared to be in the best of health. I found myself wondering, as I turned back to my console, how much his demanding job had had to do with such a sudden passing. I had heard he had undergone a light attack two days prior to the final one, and had ignored it. There was work to do on one of the towers. And there were hundreds more like Dodd, men whose dedication to their jobs was complete and total. Working on the space program became a way of life, not just a job.

I had done my own share of

working without pay when the authorized overtime was exhausted, but I was a piker compared to some of these men. Brevard County had a quarter-million population, most of whom supported and were supported by the Air Force Eastern Test Range and the Kennedy Space Center. We also had the highest divorce rate in the state, and one of the highest in the nation. Lonely young wives sat at home, uprooted from homes in Denver, Seattle, New York, and hated the entire space program because it was stealing their husbands' devotion. Small NO TRESPASSING signs appeared on stylish new houses anywhere at any time, and it was an FHA repossession because another couple had broken up, another marriage not strong enough to survive a bad strain had yielded to a missile-man's divided allegiance. A Cocoa Beach policeman had told me recently that more law officers were shot when answering calls to calm family squabbles than when preventing attempted robberies. The local Junior College had twice as many part-time night students as full-time day, and had grown so swiftly new buildings could not be provided fast enough to house the flood of young people. Our area was certainly unique.

"Request permission to start liquid hydrogen tanking!"

"START LIQUID HYDROGEN TANKING." And now we were in that portion of the count considered "Terminal," and the tension that had been quietly building seemed to condense and become almost tangible, as though you could smell or taste it.

"START ATLAS AND CENTAUR AUTOPILOT FINAL CHECKS."

Unlikely anything would go wrong in that area.

"START CENTAUR LOX TOPPING."

The liquid oxygen tanks were almost full, and the final delicate task of topping them off could begin. Only the hydrogen to go.

"Final RSC Test complete!" "C-Band Beacon is go!" "TIMER READY SWITCH TO READY." The Test Conductor as calm as at the beginning. "START ATLAS LOX TOPPING." "JPL Operations, Building AO, update DSN frequency constants," on Channel One. "PERFORM PROPELLANT UTILIZATION EXERCISE." T-14 minutes, and now the big board and the yellow blinking lights on my own console take all my attention. Events are coming thick and fast. "Atlas Autopilot final tests complete!" "Verify pens inking and marking charts." "Check timing on all recorders!" Those who watch the bright flames of "blasting rockets" and see the "sleek silvery ship clawing its way into the sky" are not likely to understand, or appreciate, the ten thousand small and individually insignificant tasks that went into that single moment. There

is no daring young man in Space Patrol blue either, just a lot of men wearing headphones, with tense faces and eyes glued to recorders, charts, tables. The two men at the doppler plotting boards in the center of the display area are nervously fiddling with their equipment, sending the machine-controlled pencils racing across the transparent plotting sheets. Three views of the launch area on the four television screens now, one of them a long-range view taking in the entire vehicle, a tall black shadow against the early morning brightness.

"Ten percent liquid hydrogen."

Down into the final half hour of countdown, but there will be another programmed twenty-minute hold at T-5, and some of us will leave our consoles and step outside into the hangar and walk vigorously up and down.

"Twenty percent liquid hydrogen."

. . . With the Service Tower rolled back the angular skeleton form of the umbilical tower was the only object marring the trim lines of the Atlas/Centaur . . . one view of the base of the Atlas, and white puffs of vapor forming small fleecy clouds that boil off into the bright Florida day . . .

". . . Forty percent liquid hydrogen . . ."

At the top of the vehicle another boiloff, and these are standard and normal operations and nothing to worry about.

". . . Ninety-eight percent Centaur LOX . . ."

Red and green lights on the doppler console controls, my partner calling the blockhouse for confirmation of an item which is past due on our board . . . all tracking stations still green . . . range status good . . . T-5, and the twenty-minute hold.

A hasty cup of coffee in the hangar and then back to the chair and some frantic scribbling of notes—an attempt to catch a little of this and hope later I can reconstruct it for those who are interested in cold, hard facts. These last few minutes seem to fly by, are gone, and then T.C. is on Channel One, starting the last status check, and when the Mission Director gives the final "Go!" we are actually nearing a launch.

"Uh, hold number four camera on the interstage fairing, please," an unidentified voice, and I glance quickly at number four TV screen. A small trail of vapor is oozing from the line where the fairing sits on top of the Atlas. A leak.

It had to be this way. No one could be as lucky as we had been so far. At T-3 minutes this countdown at last seems normal. We have something to worry about.

"T.C., fairing pressure is normal," came a calm voice, and after a moment I learn that this small leak is nothing more than the gas between the two vehicles, is not terribly important, and has in fact

been leaking for several minutes. If the fairing can maintain normal pressure until lift-off there will be no problem.

"CENTAUR PROPULSION TO LAUNCH."

T-90 seconds, and the final status check by the Test Conductor, this time only to four vital areas:

"GUIDANCE?"

"Go!"

"SPACECRAFT?"

"Go!"

"RANGE LAUNCH CLEARANCE?"

"Go!"

"RANGE READY SWITCH ON?"

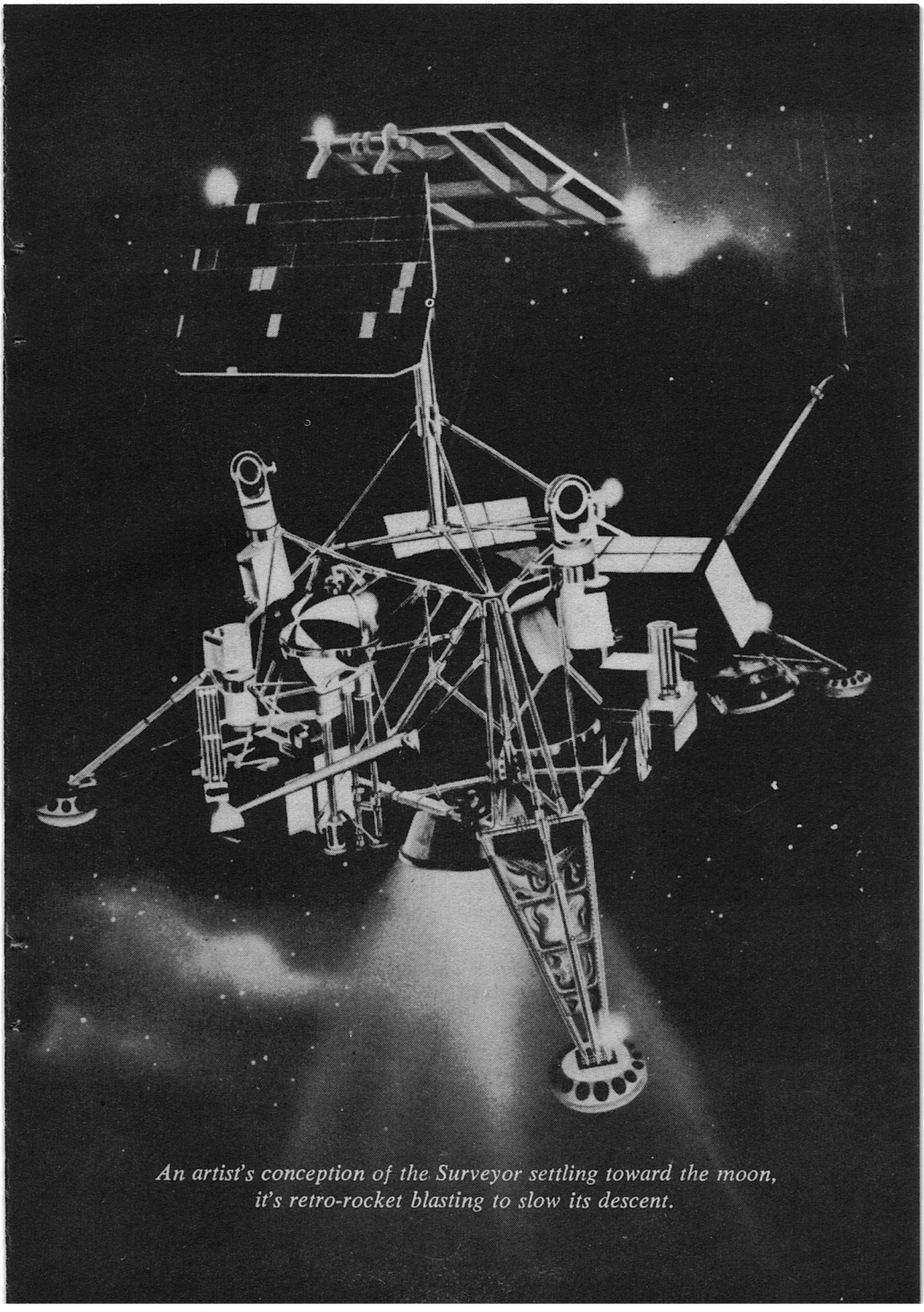
"Switch on!"

Into the last minute, and now everyone is leaning tensely forward over his console, eyes glued to the television screens; my board is clear, a solid bank of green, the mission is Go. Jack King behind me giving the last bit of information to the radio audience.

"ALL RECORDERS TO FAST." As calm as ever, and that is T.C.'s last command. Now we are on automatic sequence.

"Engine start!" and with the unknown observer's voice a burst of smoke billows from the base of the Atlas, its three engines are burning; seconds fly by, and then "Lift-off!" The vehicle is rising, the base hidden now by clouds of smoke and flame. Number one camera is set far enough back to show the full length of the rising Atlas/Centaur, and a curved black line is drawn on the screen, a line leading sharply into the sky. The vehicle is flowing along it, smoothly, silently, a huge tail of flame behind it. But this is not a science-fiction movie and we are not wired for sound—just the smoothness and power and increasing speed—yet in my head I hear the deafening thunder of rockets, and with inner eyes I see that young hero in blue sitting tensely at the controls.

The voice of Skip Mackey is on the headset now, reporting from the instrumentation room he bosses, where a thousand extensions of man's senses tell him more about what is actually happening than the television screen could possibly show. "Steady plot, both vertically and horizontally . . . moving nicely . . . very good chamber pressures. Propellant people all smiling, they're real happy . . ." and Propellant Feed would be no trouble on this flight, but that two-burn problem still lay ahead. Jack King talking behind me, his even, controlled voice relaying the news we were all getting to the radio audience. Skip Mackey again: "Same smooth, steady plot . . . everything good, can't report much more . . ." If Skip saw no problems, we were in good shape. The vehicle was still in sight, though turned now at a sharp angle to the camera. I glanced at one of the other screens and saw a nationally known news



An artist's conception of the Surveyor settling toward the moon, it's retro-rocket blasting to slow its descent.

commentator standing by a huge photograph of the moon, gesturing with a pointer at the Sea of Storms where the Surveyor was expected to land. The Director's Center manager was piping in regular television. The vehicle was far down the range now, just a small bright spot on one screen.

"We have BECO!" said Skip in my ear, and now only the sustainer engine was pushing the Atlas. The news commentator had been replaced by a woman drinking something from a glass, I turned up Channel Five and heard her saccharine voice, and hastily cut it off again. She was more bearable without sound.

"We have SECO and VECO!" came Skip's voice, with a small note of excitement, and a moment later, "We have Main Engine Ignition! We have Main Engine Ignition!" The Centaur was burning, another highly critical point had been passed, and the Surveyor was well on its way to the moon.

One camera switched to the pad. It was smoking slightly, but I could see very little damage. It had been a good lift-off.

"We have word from Joburg. They have acquired the spacecraft and are receiving data."

The happy news begins to arrive in a flood. We have had a good Centaur/Surveyor separation, the omni-antenna on the spacecraft is extended. I flip Flight Event switches as fast as I can reach them . . . hold, a problem. Indications are that one antenna did not extend. There are two of these omni antennae and either will carry the communications load, it shouldn't matter . . . Yes it does, the delicate balance of the spacecraft will be hurt if the antenna is not extended . . . could easily cause the Surveyor to crash while landing. Wish I knew the Surveyor as well as the JPL and Hughes people, the Centaur as well as the GD/C people . . . but then I'd need to know the instrumentation, and the tracking ships and stations, and the Ground Support Equipment. No one can know it all.

The blockhouse crew has arrived, all smiling. This looks like a happy milestone along a rough road for everyone connected with Centaur. The outside telephone is ringing constantly. I realize suddenly that I am standing, have been for some time, the Flight Events switches have all been thrown, and I have been working nothing but communications for several minutes. Now we all listen for the voices reporting the progress of the spacecraft, but there is little new. Preliminary indications are that the Centaur placed the Surveyor so precisely on target the programmed mid-course correction maneuver may not even be necessary. The vehicle has done its job, and now it is up to the spacecraft to carry through. We won't know the answer on that one until Thursday

a.m. Can the fuel we've saved by placing the spacecraft precisely on target be used to compensate for the unbalanced condition caused by that antenna?

I get off the telephone and hear Jack King announce that the spacecraft has acquired the sun. I see the Launch Operations Chief for the Agena program talking to a visiting dignitary—he is dressed in a sportshirt. It isn't his program and he wouldn't put on a tie, but he is too fascinated to stay home, even on a holiday. His attitude toward the space program is typical, rather than an exception.

The room begins to quiet down. There is little to report. I call it quits and leave for my desk in the nearby engineering building, to prepare a teletype report that must be on its way to VIP's in the program within four hours. The tension, the excitement, the frenetic and demanding work of the launch is over, and now there will be weeks and months of necessary, but tedious, engineering paperwork. Only this launch is not really over, and won't be until the Surveyor hits the moon, hard or soft, on Thursday morning.

Thursday morning, and I stagger into the living room to see Frank McGee on NBC, and a moment later the first 600-line frame of the lunar surface appears, and the mission has been a success! On the job, and the first man I see is Sonny Jones, walking around with a slightly dazed, but ecstatic, expression. He was up until four a.m., waiting until two o'clock for the good news that the Surveyor had landed safely and started to transmit pictures; and another two hours because he was too happy and excited to sleep. Sonny has been on the program over six years, five of them with GD/C before switching to NASA, and this is the answer to long days and weeks and months of patient, unrelenting toil, of dedication to a program that gave every indication of dying on the vine after wasting a half-billion of the taxpayers' money. With this one spectacular success we have regained over a year of the time lost on this program, and no failure in the future can do much to dim this overwhelming triumph. Even the problem of re-igniting the Centaur for a successful second burn does not worry Sonny now.

The rest of the Centaur crew is almost equally happy, but the demands of the work load they carry are beginning to press on them again, and after some discussion and comparisons each man moves away to his desk, to start preparing inputs for the Field Flight Report we have to write; to attend to various jobs that were neglected in the last hectic days prior to launch. Preparatory work must start for the next launch, though it will not occur until September.

We'll be counting the days. ■

The magazine *Aviation Week & Space Technology,* in their October 3, 1966 issue, carries a long and extremely interesting article on UFO's—and does an excellent job of identifying the precise nature of nearly all the hitherto unexplained UFO sightings.

It seems they're actually plasmoids—ball lightning phenomena.

This scientific explanation of UFO's was, of course, impossible to achieve until Science could, first, acknowledge that ball lightning actually existed as an acceptable scientific reality. Before that—so long as ball lightning was explained *away* instead of being studied and explained—to describe UFO's as ball lightning would have been scientifically equivalent to explaining one unacceptable set of observations in terms of a second set of "scientific nonsense" observations. Like explaining that ghosts were absolutely nonsense; really they were simply demons playing tricks.

It's now possible—since ball lightning is finally acknowledged—to explain nearly all the fairly solid reports of aerial UFO phenomena.

A plasmoid consists of a metastable structure of ions and/or dust particles trapped in a self-generated magnetic field. The intense ionization produces a strong glow, like the glow of the electrically generated plasma inside a neon tube or fluorescent lamp. The actual mass of glowing ions involved is minute; there are powerful electrostatic and magnetic effects present in a plasmoid; the plasmoid represents a very large quantity of energy stored in magnetic and electrostatic field form. But the mass is minute—which makes it easy for the plasmoid to react almost instantaneously to external electric and magnetic field effects. It can start in one direction, stop instantaneously, reverse its course, make a 90° turn, and, as its stored energy is radiated away, disappear completely as the ions relapse back to quiescent air molecules. The glow varies in color with the type of ions being excited by the plasmoid's energy, and by the level of ionization achieved. The ionization can be simple, single ionization—only one electron stripped from the atom—or double or possibly triply ionized—two or three electrons stripped away. The color then depends on the spectrum radiation produced when the electron(s) fall back into the atom's electron shells. Thus the plasmoids can have any color we

can see—plus "colors" we can't see, from microwave radio to soft X rays.

Plasmas being highly conductive, they reflect radar waves magnificently, and will continue to do so long after the energy intensity has declined below the level that radiates visible light. Thus radar "gizmoes"—strong radar echoes from volumes of perfectly clear air—can be fully explained as low-intensity plasmoids.

The reentry of an ICBM smashing its way through the upper atmosphere produces a plasma trail that reflects radar energy much better than the large, metallic structure of the ICBM itself. Minute meteoroids coming in produce plasma trails that are readily detected by radar, while the meteoroid itself is too small to be detected.

With the final acceptance that ball lightning is *not* mis-observation, delusion, hallucination or "luminous owls flying around at night," it becomes possible to make a rational analysis of most of the reasonably well-organized UFO sightings. (There's still a residuum of non-aerial sightings, however, which plasmoids can't explain.)

The observations of UFO's following planes, or circling around a plane, is equally explainable; they're charged entities, and can be attracted to or repelled from a plane depending on its polarity of charge. They're also magnetic entities, and will react in highly complex ways to the magnetic and electrostatic anomaly a plane-in-the-air constitutes. It's an old-fashioned children's game to suspend and control a pith-ball in air over an electrostatically charged rod; the pith-ball doesn't have to have intelligent piloting to follow the charged rod.

The existence of ball lightning has finally been acknowledged—but no understanding of the mechanism that approaches completeness has yet been achieved. Plasma physics is new; the most intense interest has stemmed from the hydrogen fusion problem—and the

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immense difficulty the fusion research scientists have encountered in achieving magnetic containment of the hydrogen plasma makes them doubtful that Nature can produce plasmoids of high stability—plasmoids lasting up to twenty minutes have been observed!—so casually.

Of course, the fact that Nature can, also, produce quite casually a lightning discharge running some 30,000,000 amperes at 20,000,000 volts may have something to do with it. And using clouds as Van de Graaff generators, placed a few thousand feet apart Nature can operate with apparatus on a somewhat larger scale than we find practical. After all, Nature's commonest system of plasma generation and hydrogen fusion is simply gathering up some hydrogen until it starts fusing. All it takes is a few hundred thousand Earth-masses of hydrogen, and it starts fusing without trouble. What could be simpler? Just a matter of scale . . .

One of the most interesting comments in *Aviation Week's* article is the remark of a meteorologist that "If no one had ever seen a hurricane, and we had no other evidence that one could exist, we certainly would conclude that such a phenomenon was impossible."

Meteorologists haven't any idea why one of the thousands of minor tropical disturbances constantly present, suddenly starts growing, instead of dissipating as practically all such minor disturbances do. Nor why, once started, it grows to such immense size, nor do they know how it can maintain its high-velocity winds for many days, expending energy equivalent to thousands of atomic bombs.

They certainly didn't do well at predicting where Inez was going! Remember? That's the one that, after tramping back and forth on Cuba, started off for Miami, changed its mind and headed in the general direction of Britain, backtracked toward Florida again, and wound up with a further Caribbean cruise around Yucatan and then Mexico.

If there *are* intelligent aliens visiting us, we'll never know it until we can separate aliens-visiting from natural-phenomena-in-our-atmosphere.

The recognition of most UFO reports as being ball-lightning plasmoids—now that Science can acknowledge that exists!—will make a real and major contribution both to UFOlogy and to hydrogen fusion research. ■

TO: ANALOG SUBSCRIBERS. The U. S. Post Office is currently putting the new Zip Code plan into effect which should result eventually in greatly improved service. While this change is under way, your subscription copy may be late in arriving. Please be patient with us—the delay is unavoidable.

IN THE SHADOW

Michael Karageorge

If the strange star didn't constitute a true ghost—
the powerful, and malign spirit of a departed entity—what would?
And it was certainly powerful and deadly—

Illustrated by Leo Summers

Author's note to editor:

The hypothesis behind this story is not due to me, but to a pair of very respectable physicists. See the paper by K. Nishijima and M. H. Saffouri in Physical Review Letters *for 8 February 1965. Science is getting more imaginative than science fiction!*

There was a man called Danilo Rouvaratz who signed the Petition of Rights. When it was denied and rioting became insurrection, he led the rebels in his own sector. A fire-gun killed him as the monitors entered Zagreb.

At that time the Gearch was Huang III, wily enough to understand the uses of mercy. He pardoned most of the insurgents, made certain reforms, and thus put out the fire. Still, he knew that embers remained under the ashes. Best would be to scatter them. Investigators learned that Danilo Rouvaratz had left several children. Government care was provided. Ten-year-old Karl went to a boarding school in North America, and thence to the Space Academy. He proved to be an excellent pilot, and his role in the hazardous rescue of the Mars liner *Flying World* made him quite a public hero. But he had always been a prickly, too independent sort, and his dossier suggested that some degree of resentment lingered in him. A very natural solution to the potential problem was to offer him a berth on the Acheron expedition. He ought to feel duly grateful for that; and he would most certainly be out of the way for a while.

Thus it was that he found himself nearing a star he could not see.

He did not know until too late. His boat was in orbit, under low reverse thrust, so that she spiraled in toward what he supposed was the burned-out dwarf he had come to find. He sat tense in his harness at the pilot board, eyes flickering from sky to radarscope to gauges which registered the emissions of test probes fired ahead. As soon as he got reflections from an astronomical body—and his instruments could pick out a meter-wide rock at a thousand kilometers—he would stop the jets and swing free. But the screen showed only random flick-

ers, ghost images of atoms and electrons lost in vacuum.

Aaron Wheeler entered the control turret, balanced his slight deceleration-pressure weight against a handhold, and asked if there was any sign yet.

"No," said Karl Rouvaratz. "Get aft where you belong."

Wheeler bridled. The movement was actually noticeable in his spacesuit. He was a lean, sharp-faced, gray-haired man of good family and considerable attainments. Throughout his life, people had deferred to him. "May I remind you," he snapped, "that this trip is on my account? You are simply ferrying me to the object I am to study."

Rouvaratz turned his blocky frame half around. His eyes flared green in the dark, rough countenance. "While we're out here alone," he said, "I've got ship captain's authority. Go back. I'll let you know when we spot something. What do you think intercoms are for?"

Wheeler poised stiff and stubborn. Briefly, Rouvaratz wanted to force him. That would be easy and satisfying. The gods who gave the pilot two men's physical strength had put him in a milieu where he had no use for it. This was the basic source of his anger at the world.

But no. He must not leave his post while they were under power. And he must be diplomatic. The expedition comprised twenty human beings, almost a dozen astronomical units from home, receding fifty kilometers further with every second that passed. Mystery encompassed them, and if trouble came there could be no succor. If they did not work together, they were dead.

Darkness and knife-bright stars crowned Wheeler in the viewdome. Sol was cruelly radiant, but shrunken and strange. Acheron could not be found, not by any means save the fact of its monstrous pull. The boat fumbled through night.

Rouvaratz sighed. It was as if some of the weariness of the journey still possessed him, six months from Lunar orbit to the point where the *Shikari* intercepted her target. And then had followed tedious maneuverings; the firing of one radio rocket after another; the computation of where Acheron must be by the curvatures that were forced on their trajectories; the failure of telescopic search—all before this boat was sent to make a close approach. Nerves wore thin.

Firespit! Rouvaratz thought. *Come off that. Doc O'Casey says we're in good shape.*

He spoke with care, his voice sounding hollow to him through the murmur of ventilators and air renewers, throb of thermonuclear power plant, backpulse of the ion jets that splashed darkness with faint fire. "Look, sir, we're closer in than I like, and still haven't seen a thing. Maybe some absorption effect is blocking our radar—but, we

should be able to see an occulting disk with the naked eye by now! When I do get an indication, we may turn out to be so near that I'll have to cut blast immediately. You could take a bad tumble, maybe even crash into the controls, gone null-G without warning. For your own safety, please go strap in."

"And for yours," Wheeler gibed.

"Well, I enjoy being alive."

"You don't act like it."

Rouvaratz didn't bother to reply. He was habitually curt with his superiors. Even aboard the *Shikari,* he and the astrophysicist could hardly be said to move in the same social circles. A chance for privacy being as important as oxygen, on so long a cruise, cliques had inevitably formed within the gigantic hull. Wheeler did not roister and roughhouse with the engineer gang or party with the girls. Rouvaratz wondered what memories of Earth were dear to him. Surely not snowclad immensity on the Himalayas, or skip-sailing in the salt wind across the Gulf of Mexico. (On a spaceship pilot's salary, you could afford the cost of entering what few outdoor preserves survived.) Most double surely not soarwing racing, or small oddball taverns in low-level Chicago Complex.

Studying him, Wheeler relented. "Very well," he said. "Perhaps I misunderstood. I was never further out before than Luna Prime Observatory. You don't realize—" He broke off and left the turret.

Rouvaratz stayed. But the stars crowded in on him, brilliant and heartless as diamonds, unwinking as snake's eyes. He didn't know why they should appear strange to him The constellations hadn't changed worth mentioning, in a mere billion and a half kilometers. Maybe the difference was that Sol had joined them, little more than the brightest of their horde. The things that were a man's real awareness—play of muscles under the skin, breath in the nostrils, a gust of air across the face, odors of machine oil and one's flesh—had lost their comfort.

He adjusted the spectroscope. Doppler shift in starlight gave a measure of velocity. So did the radio carrier wave from the distantly orbiting mother ship. A computer analyzed the data. Its screen declared that the boat was spinning furiously around the thing he could not detect.

He was startled to hear himself say into the intercom: "Let's not fight, Professor. Could be I did speak too rough. What don't I realize?"

"Eh?" Rouvaratz could hear the astrophysicist's own astonishment, where he sat in his webbing among blank metal bulkheads. "Oh. Yes. You don't know how important this is to me. I gave up much to join the expedition. And space is not kind to a middle-aged body. But for so rare and wonderful a phenomenon—" A laugh, uncertain but nonetheless unexpected, cracked through his

words. "Why, I feel six years old again, on my birthday morning. Do you blame me for wanting to look at the gifts?"

Rouvaratz frowned, puzzled. Was a black dwarf that spectacular?

So they had told him. The Scientific Enterprise Board had long wanted to launch missions, telemetric probes at least, beyond the Solar System. But authorization was not forthcoming. Even the Gearchy must take taxpayers' opinions into account when planning something so expensive, whose rewards would be delayed for years and would never amount to more than pure knowledge. There was no hostile word spoken, however, when a journey was proposed to the thing named Acheron.

For it passed through the System, ripping Uranus into a wild new orbit, troubling mighty Jupiter, changing the galactic track of the sun itself. Earth was little perturbed, and the Lunar instruments swung eagerly in search: optical, radio, X ray, particle detectors.

They got no whisper of response, not a photon, not an electron, not so much as an eclipse. The lure which drew the *Shikari* was, in the end, blackness and blankness.

Sometimes Rouvaratz wondered why he had come along. The best rationale he could find was that after he got back, if he did, he would have prestige which he could use to propagandize for a real interstellar trip. Tau Ceti, say; that one must have planets, and you could cold-sleep during the decades of the voyage. God, to walk on a world uncluttered by cities and crowds and governments and police, a world unraped by man! But the chance of finding New Earth in his lifetime was negligible. His reason didn't make sense. Maybe he only wanted to kick the cosmos in the teeth.

"Have you noticed something?" Wheeler exclaimed.

Rouvaratz started, then grinned. "No. Sorry. I was woozing. Uh, I meant to ask why you're so excited. That is, I know this'll be the first body of its kind that has ever been observed. You might find some new law of nature. But aren't the odds against you? Doesn't theory pretty well predict what a star is like that's used up its last energy reserves?"

"As a matter of fact," Wheeler said, "according to theory, there should be no black dwarfs. The galaxy isn't that old. Well, so this one drifted in from elsewhere. But with a mass like Sol's, it should not be so small that we can't find it this close. Indeed, it probably shouldn't be dark at all; it should reflect rather brightly."

His aloofness vanished. "Pilot," he said, "if my hopes turn out to be justified, we will never see that star."

"Huh?"

"You don't know? Didn't your briefings include—"

"Nothing. I'm just a slob of a jet jockey, remember? The scientists had no time to waste on me. Go on."

"What we will see is a . . . a treasure of information . . . something unique in the galaxy, something to make me believe there really is a God who cares about us."

"What's that?"

"Please." Wheeler chuckled. "Let me have my fun. I should be able to tell you before long if I am right or not."

Rouvaratz clenched one big fist. "I want to know what the devil we're getting into," he said.

"If it's what I suspect, we can't possibly be hurt. If not, well, then I am as baffled as you. What is our current position?"

"Who knows, when we've got nothing to refer to except the computed centroid? But we're orbiting at 435 kilometers per second. If this were Sol, we'd be skimming the photosphere. We can't go much deeper into the gravitational well; wouldn't have enough reaction mass to get back out."

"The pull is, then, increasing as if this were a sunlike body—right?"

"Uh-huh. And it shouldn't. If that's a neutron star, a chunk of collapsed matter smaller than Earth, its field ought to drop off so sharply that—"

Then they were struck.

This far into emptiness, there had seemed no reason to sacrifice other capabilities for the sake of keeping meteoroid spotters at maximum scope. Furthermore, evasive maneuvers are handicapped when one is hard by a powerfully attracting mass. Accordingly, the boat's automats were unable to react in time.

Rouvaratz's first sensation was shock. A troll's fist slammed him against his harness and rattled his head in the open helmet. Fury toned through metal. Circuits arced over, the air smelled full of lightning. At once safety switches clashed open, the engines died, and the boat spun free. There was only the shriek of gases rushing out of the pierced hull.

"Close your faceplate!" he bawled automatically, and did so himself. His eardrums had almost burst as pressure dropped. But he had no chance to notice the pain, or be afraid, or do anything except whip through the motions of survival.

A glance across the instruments: most were functioning, yet, he could see that the power plant was undamaged, likewise the ion tubes. But one mass tank must have been cracked, letting liquid boil into space, for that indicator needle plummeted toward zero. Circuits printed in the vessel's structure registered damage sites. He threw off his harness and vaulted weightless from the seat.

Now the boat held vacuum. Light

from the fluorescents, from sun and stars, fell in undiffused puddles, with death-black shadows around. Rouvaratz gave a shove and sped aft, clawing himself along by the handholds. In the main section, the sky glared at him through a hole punched in the plates. Wreckage trailed aft, out a broken bulkhead and thus to the tank from which the smasher had made its exit. Bits and pieces floated wherever he looked, chaos unleashed in an elemental silence. He looked upon the ruined air renewer and wanted to vomit.

A spacesuited figure moved awkwardly in his direction. "Go away!" Rouvaratz yelled, with obscenities. Wheeler made scarecrow gestures. Rouvaratz realized his radio was off. He switched it on and said between clenched jaws: "Get out of my way. You've killed us both, but I won't let you interfere with my job."

"But . . . but what—" Sunlight sickled past the gap in the side, casting Wheeler's face into ghastly highlights. "What's happened?"

Rouvaratz snarled, grabbed him, and hustled him to the berth cabin. "Strap in," he ordered. "Sit till I send for you."

The other man flinched from him. He heard a near whisper, grunted, and returned to the main section.

In the hour or two that followed, he worked some of the wrath out of himself. He must catch loose material, and make a general inspection, and weld on repair plates, and test everything, and finally release air from the reserve stock—a considerable task for a single man, with skill and coolness prerequisite.

He didn't hurry. The boat circled in a balance of forces that could prevail till the galaxy burned out. It was sheer, incredible bad luck that she had been hit, in so vast a volume of space. The odds against another strike were literally astronomical.

All it took, though, was one, he thought.

After he had raised the mother ship on the maser and reported, he could do little. So, in the end, he summoned Wheeler to the control turret. They might as well try to figure out what had doomed them.

Alarm bells rang. Crewfolk hastened to their posts. Messages stabbed forth, notifying those boats which had gone to investigate other regions around Acheron. The *Shikari* reassembled her two sections and got underweigh.

She moved with care. The hull which had crossed space at a hundred kilometers per second was an enormous bubble, frailer than any of the auxiliary vessels she bore. Her approach to the dark star, matching velocities and assuming orbit, had been as cautious a maneuver as anyone ever carried out.

The strain had eaten at Commander Nathans, even before word

came of disaster. He felt very old, looking forth into the glittery dark. *You've taken two good men,* he thought. *You want the rest of us also, don't you?*

Janice Falconet had no duties at the moment. Everyone must be a trained technician, but her assignment was to maintain the scientific instruments. Now she could merely sit in her cabin, enclosed by vibrating metal, and try not to weep. She failed.

Maura O'Casey, the biomed, had joined her, sensing that the girl needed company. "Don't feel so badly, dear," she murmured. "We'll get them back."

"We have to!" Janice cried.

"Now—" Maura checked herself. This was not the time to remind the other that casualties might well be expected. The cold and hollowness of space, blind brutality of matter with no friction or gravity to control it, cataracting radiation, that unseeable thing which had trapped the boat . . . Suddenly she understood that Janice's anguish was not from terror.

"You mean this is personal?"

"W-w-well, our friends, we've got to be friends out here."

"I doubt if Dr. Wheeler would affect you so," Maura said.

Janice shivered.

"Did you sign on because of Karl Rouvaratz?" Maura asked.

She got no reply except for the quick, ragged breathing. "Doesn't matter, really," she sighed. "Same result if the attachment developed on board. You mustn't let it become too deep, you know."

"Why not?" the girl defied her.

"You know perfectly well why not. The situation was explained to you over and over before we left. Our margin of survival is too slim as is, without letting in emotional rivalries, jealousies, intrigues, or even grief at someone's death. Keeping temporary company is fine. Exclusive relationships are not."

Janice looked at her hands, twisted together in her lap. "I do have some daydreams about after we get home."

"Does Karl share them?"

"I don't know. He isn't the kind to . . . to reveal himself. He'll talk and joke like anyone else, most of the time. But he gets these silent moods. And he never says anything meaningful."

"Meaningful to a woman, that is." Maura smiled. "Well, we're going to be with Acheron for at least a year, and then it's a long haul back. That's ample opportunity to work on a man, *provided* you observe the social articles of the expedition meanwhile."

"I will," Janice said forlornly. The implication penetrated. She tautened. "What do you mean by 'at least a year'?"

"We could stay indefinitely. The ship is a closed ecological system."

"I won't! They can't! We contracted for one certain period. To grow old out here—!"

"One step at a time, child," Maura counseled. "First, we have to save those men."

Around and around the spaceboat hurtled, in a circle of nearly four and a half million kilometers' circumference. Chill enfolded her, wan sunlight fell on her flanks, the Milky Way rimmed her visual universe. Within the control turret, silence stretched like a drumhead over the little sounds of machinery and life. Rouvaratz could not grasp the thought that he fell through incandescence.

Storms raved, flames sheeted, light and heat flooded from that multibillion-year violence which is a star. He could not survive a fractional second. Nothing could. Yet his gauges showed vacuum outside, ordinary cosmic radiation, a weak plasma-borne magnetic field. His radio receiver hummed with the beam from the *Shikari,* rustled with spatial interference, the voice of nebulae and galaxies.

"I don't get you," he said. A part of him wondered if he was deliberately being commonplace, downright stupid: one way to assert humanness. He regarded Wheeler. The astrophysicist was in the emergency copilot's seat by him. They could have talked over the intercom, but they needed each other's physical presence. "Give me some detail about this theory of yours."

"First, suppose you explain what our trouble is," Wheeler retorted. His arrogance drew no anger now, it was so plainly a defense. He was chalk-white and a tic had developed in one eyelid.

"A probe rocket hit us," Rouvaratz said. "One of the first that we were shot off, from the mother ship as we came into range. The batteries ran down and it wasn't emitting any longer. You recall some probes were telesteered into close orbits around the computed centroid, to see how they'd behave and so give the math boys a line on what Acheron is like."

"Kindly don't patronize me!" Wheeler paused and gulped. "No, I'm sorry. My nerves are on edge. Tell me in any way you like."

"Well, before the transmissions stopped, the orbits of the rocket shells had been figured out. Highly eccentric, for some reason, but we used an approach curve that ought not to have brought us anywhere near one of 'em. Only somehow, somebody was mistaken. I think I see why."

"Me, too." Wheeler nodded, jerkily. "The predictions of where the rockets would be were made on the assumption that Acheron is a neutron star, small and ultra-dense. Since the case is otherwise—yes, rapid precession; and the force-field itself varies unpredictably, according to variations in density within the star. I should have— No. Since the paths were, as I say, unpredictable, you and I would have had to accept the risk anyway."

Rouvaratz choked. He came near hitting the older man. "That's not so!" he rasped. "If you brain-rotted snobs had told me what Acheron maybe was, I could've guessed at this danger and taken precautions —Argh!" He couldn't go on.

Wheeler sat quiet until the pilot seemed calmer. Then the astrophysicist said, as dryly as might be, "If you think you are entitled to an apology, please accept mine. But no one intended to slight you. They simply didn't think you would be interested in what, remember, all the specialists but me considered a most remote possibility."

Rouvaratz said nothing. Wheeler grimaced and went on: "It's true, the data from the probes did not accord with Acheron being an ultradense ball. But there is good reason to think neutron stars may have extensive atmosphere. That would account equally well for the behavior of the rockets—and, indeed, would make them crash on the central globe before this boat arrived.

"The only solid evidence I had for my belief was that we failed to locate the star optically. And this could be explained, under some rather forced assumptions, by the light-bending properties of—"

Rouvaratz decided to be mollified before he was talked to death. "O.K.," he interrupted, "maybe you domebrains weren't being stupid. Maybe nature just took you by surprise. But in any case, you and me are in a box. We can spend what mass we've got left to recede quite a ways from Acheron. But we can't make rendezvous with *Shikari* or any other boat. They can't get near enough. This was the only craft with so much velocity-change capability that she could duck this far down into the star's gravity well and climb back up."

"But can they not send us extra mass . . . oh, say aboard an unmanned auxiliary?"

"Huh! You don't know what it takes to be alongside an object like that, under these kind of velocities." Rouvaratz shrugged. "We can try, of course. We plan to. But I have my doubts if we'll succeed. And we won't get more than one or two tries, you understand. Our air renewer is smashed beyond fixing with anything we have aboard. We've got a few days' worth of oxy in reserve. After that, good-bye, chum."

Wheeler bit his lip.

"We're not in any rush at the moment," Rouvaratz said. "The *Shikari* . . . all the boats . . . will take a while to reach this neighborhood. So we wouldn't gain anything by starting our outward spiral for some hours yet. Before we commit ourselves to that . . . well, maybe we can think of a better way. Go on, man. Explain yourself. What the devil is this shadow matter of yours?"

Wheeler sniffed. "I don't see how a supposedly educated man has failed to hear about one of the most basic items in physics."

Rouvaratz growled: "I don't see how anybody can call himself educated who doesn't know diddly-squat about how the machine he's riding in works." With an effort, he smoothed his tone. "Could be the idea was mentioned in one of my classes, but not emphasized, so I forgot. We both had too much to learn, you and me, in our different specialities. Besides, the Gearchy doesn't encourage really liberal education. That might start people thinking."

As expected, Wheeler was shocked out of his pique. Rouvaratz laughed with scant humor. "Never mind. I always was a malcontent. Go on, Professor. If I've caught your drift, there's supposed to be another universe besides our own. The shadow universe, you call it? How can it be?"

"The idea was first advanced in the . . . the twentieth century, I believe, to account for certain anomalies," Wheeler said. Talking, he gradually lost himself, until he was a lecturer and almost happy. "You see, the long-lived component of the neutral K meson beam was found apparently to exhibit the two-pion decay mode, which would have violated the principle of CP invariance. That principle was so important that several attempts were made to construct a theory which would preserve it while explaining the data. The one which succeeded was the one which postulated the shadow universe. In fact, the hypothesis proved so fruitful that at last, in a modified and more elaborate form, it was incorporated into the body of fundamental physics. Of course, hitherto it was useful for nothing except theoretical calculations, so I must concede it is not too surprising that you are not familiar with the concept.

"To continue. You have another universe of matter and energy, occupying the same space-time as ours and not dissimilar. But there is no strong interaction between the particles of these two universes. Thus we cannot detect shadow matter, or even shadow photons; they do not act upon our electromagnetic fields, or we on theirs.

"Weak interactions are not forbidden, however. This includes the K meson decay for which the theory was first advanced. There is a certain probability of a K_1 meson yielding two shadow pions, which then become undetectable by us.

"And, to be sure, gravitation is a weak force."

Like hell! Rouvaratz thought. *What it's doing to this boat . . . But no. The whole mass of a star can't yank us to 500 KPS. Though that'll do to kill us.*

He shook himself a little, for the idea was an eerie one, and asked, "How come we can't spot pions from the other universe's K mesons?"

"Oh, we could, given sufficient concentration," Wheeler replied.

"Within Acheron, for example. Do you realize now why I was so excited? When it passed through the System, already then I dared hope it might really be a shadow sun. The possibility was discounted by everyone else, which I suppose is the reason it was never mentioned in the news accounts. But as we began to gather data, I grew more and more convinced. That's why I insisted on being the man to come with you.

"A shadow sun!" He spoke as Lancelot might have spoken of the Grail, and tears stood in his eyes. "A thing we can probe, even enter ourselves with a specially built ship. We can trace out density gradients and their time variations, infer details of nuclear reactions, learn what men had resigned themselves to never learning. Quite probably our discoveries will revolutionize the whole of physics. And high time, too. They've gotten smug and stagnant on Earth, they think everything is known and nothing is left to do but add the next decimal point. If we could find another race on another planet, comparable to us but with a new outlook, a new knowledge and philosophy—" His tone sank. "But too few people are willing to make such an effort. The shadow star might perhaps serve as well."

Satan on a rocket! Rouvaratz thought in surprise. *The old man is human after all.*

He brought himself back to questions. "I guess what we'd observe would be two pions appearing out of nowhere," he said. Wheeler agreed. "Then why haven't we ever done so?"

"Because the concentration of shadow matter in the region of Sol is too small," the scientist explained. "The chance of such an event is infinitesimal. That's quite plausible, of course. Space is mostly empty. No doubt we lie somewhere between galaxies, as far as the shadow universe is concerned.

"The theory has had great cosmological value. The existence of two complexes makes the interstellar medium twice as dense as it would otherwise be, gravitationally speaking. That helps account for the observed distribution of our own galaxies. But still, this is a fantastically lucky accident, that we have found this actual sample."

"Luck? Huh!" Rouvaratz managed a grin. "Well, I suppose you could say so. How'd it happen, do you think?"

"I daresay Acheron escaped from its home galaxy. The speed suggests as much."

"Planets?"

"Why not? We can find them by their gravitational effects." Wheeler returned to immediate reality. "But I admit our first aim must be to escape. Are you quite certain that our prospect of matching up with a reaction mass carrier is poor?"

"I am," Rouvaratz said. His flicker of philosophical interest died out.

"Ah . . . what about some less conventional procedure? Don't forget, this is an unconventional situation. You may be so used to thinking in terms of ordinary astronautics that—"

"Shut up!" Rouvaratz exploded.

He clamped his fists together. Rage mounted anew, driving out all else. He could stand dying—but for some better reason than a stupid failure of communication between men from two social orders. And in some better way than suffocation, the husk of him rattling forever around this phantom of a sun.

Charge!

An oath tore from him. Wheeler asked what he meant. Rouvaratz ignored the question, scarcely heard. His lips moved with unspoken calculation and he stared out at the stars like a blind man.

Then he cracked down the maser switch and barked, "Hello, *Shikari*. Me here. Get me Navigator Chai, and have him make ready to do some high-powered figuring."

Waiting was the hardest part. Commander Nathans grew yet more shriveled and gray while the time passed. Silence filled the bridge, the whole interior of the ship. Those who were aboard stared at each other, and away again, and fumbled with things. Janice Falconet sat hard by Maura O'Casey, but a shadow wall had risen around her and words or gestures did not seem to penetrate.

Sweat runneled from Chai and his gang where they hunched over their instruments. No telescope they had would reveal what was happening, at the distance which the mother ship must keep. Radar had lost the boat and could not find her; likewise the communications beam. Nothing but the radiation of her jets tracked her as she plunged into Acheron.

Into: down toward the core of the sun, where pressures reached the millions of atmospheres, temperatures the millions of degrees, where atoms were stripped bare and flung together with such ferocity that they fused and burned. Yet to men, those were ghosts, untouchable, unreal. Reality was the roar and shudder of thrust, barbarous acceleration, the grip of a mass as great as Sol's.

One could imagine: Rouvaratz among the thunders, eyes locked to instruments, fingers slugging across controls, sweat rivering over his own skin, his weight become nearly too huge a burden to bear. Yet he must drive, with nigh absolute precision, through shifting vectors that had been calculated for him—knowing the whole while that the computation was based on a handful of data, a hatful of theory, and might be altogether wrong.

One could imagine: Wheeler in his couch, frail frame dragged down into itself till bones creaked and heartbeat stuttered, maybe fainted, maybe dead.

One could imagine: the boat spouting flame across heaven, then running for some minutes inert, reeled in by the shadow sun, until time came to swing onto a new line and leap once more under power.

Inward—around the star's core—then the ultimate acceleration, everything the jets could give, everything the pilot could endure.

For the energy of reaction mass is not only kinetic. It has a potential component, due to its position in some given gravity field. Had the boat followed normal procedures and spiraled out, none of the potential would have been realized. Indeed, kinetic energy would have been spent simply to raise unexhausted mass higher.

Falling, the boat was flung in a cometary path around the centroid of Acheron. At the moment when her direction was reversed and she headed back out, she made her great effort; all else had just been to steer her into that orbit. Rather than being carried up again, her reaction mass was left behind, near the bottom of the gravity well, where it supplied maximum energy.

The principle is simple. Oberth himself first noticed it, when space flight lived nowhere but in the dreams of a few. It is, in fact, routinely used in plotting departure maneuvers from the vicinity of a planet. Rouvaratz had not thought of it at once because he, like every pilot, was conditioned to stay well clear of the sun. Suns eat people.

Acheron did not. None of its blaze could touch a man. But of course the computation had been difficult. The boat was not to swing around a point mass, but to go through a stellar object of varying density. The law of attraction was no longer Newton's familiar inverse-square rule; it had trigonometric factors. And too many parameters could only be guessed at.

On the mother ship, on every boat, they waited.

"Here they come! I've got them!" The animal part of the radarman screamed the words. His hands danced over the knobs with a life of their own. Numbers poured forth, were analyzed in seconds, told Navigator Chai what was happening.

Breath gusted from his lungs. "They made it," he said. "They've got more than escape velocity. Much more."

He vanished into mathematics. When he emerged, he knew how the boat was orbiting and which auxiliary could best make rendezvous when she was far enough out. Commands raced over the maser.

No token came from Rouvaratz. Perhaps he was dead. Even with modern anti-acceleration drugs, no one should have had to take such pressure. Perhaps weight had broken some part of his communications system. In any event, time must pass before the other boat could join him. Once more men had to wait.

And wait.

Until the speaker croaked: "Rouvaratz to *Shikari*. I think I've centered you. Do you read me?"

"Yes, yes, yes! How are you?"

More waiting, while photons crossed space and back again.

"Operational, I think."

"Wheeler?"

"I don't know. I just came back to consciousness myself, and he's not very strong. No response from him. I'm about to go have a look." The breath whistled through Rouvaratz's teeth. "Stars out yonder," he mumbled. "Hello, universe."

Maura O'Casey released him from sick bay after twenty-four hours. It felt good to have weight underfoot; the *Shikari* was spiraling out of Acheron's presence at a steady one G. Prolonged free fall was not simply bad for you physically, however much counteracting pharmacopoeia you loaded yourself with, he thought. Some kind of insult as well—for him, at any rate. He wanted to use his muscles.

Now he'd get the chance. O'Casey didn't want him piloting till he was entirely recovered. The *Shikari* would assume a reasonable orbit, divide her sections, link them with five kilometers of whisker-wire cable, and go into a centrifuging spin.

He chuckled.

"What's so funny?" Janice asked, as they walked down the corridor.

"A tag. The little star that isn't there."

She shivered. "Don't speak of that thing. It nearly killed you."

"Well, it tried, but not quite hard enough. Even Wheeler should be back in commission after a week or two. Last time I looked in, he was giving Doc hell. Wants loose already, to start probing Acheron."

Janice winced. "How I wish it had been what we supposed. A cinder, not a ghost."

"By its lights, we're the ghosts. More so. It probably has planets, and maybe one or two of the planets have life. In this universe, we're

"So we— Hoy!"

all the life there is from here to Sol.

The intercom voice rolled down the passageways. Echoes gave an iron resonance, not entirely human. But the speaker was only little Commander Nathans.

"General announcement. General announcement. I, ah, I think everyone will be interested. A discovery has been made like—frankly, I have trouble believing it myself. Word has come in from Boat Four, pilot Krishnamurti and physicist Oliveira. You know that, er, as soon as the rescue was effected, what with the boats being in the region of the shadow sun anyway, we started them on a search for planets. Well, a planet has been found. It is of approximately Earth's mass, about one astronomical unit from the primary. The boat is now in surface orbit around it and tests Dr. Wheeler suggested are being prepared. Over."

Rouvaratz stood still, then suddenly slapped his thigh with a pistol noise and shouted, "How *about* that?"

"Yes, yes," Janice said through tense lips. "But—"

"Don't you get the point?" He grabbed her shoulders with bruising force. "Earth-type planet around a Sol-type star. Almost bound to be life!"

"Specters," she said in a shaken tone. "We'll never know. One more thing to make us lie awake."

"But maybe we will find out! I've been thinking. And Wheeler and I talked some while we waited to be picked up. If Acheron escaped from its home galaxy, well, that must've been one whale of a time ago. You don't cross a million or so light-years overnight. So the planet must be old. Older than Earth. It's had time for intelligence to evolve and . . . and grow beyond us—Don't you see?"

She flushed with rebellion. "No, I don't. That is, you may be right, but how can we ever tell?"

"Mesons. Any large nuclear power plants they have must be grinding out so many K mesons on the side that we can spot the pions that get formed in our universe. If we do, then we can rig a beam generator of our own. Get into the same orbit, right at the planetary center. Fire our beam so fast that we get the benefit of relativistic time contraction and it doesn't decay too far before it reaches the surface. Use a rotating system, so we always hit the same point. A point where we know there is a power plant. Somebody ought to be on hand to detect and reply to us—"

"If, if, if!" she exclaimed, not far from tears. "Go ahead and try. You won't get any answer out of your ghosts!"

They did.

Ten men and ten women filled the common room of the *Shikari*. The artists among them had attempted to brighten the place with murals, but somehow those wistful landscapes of Arcadia only underlined a starkness. The sounds of breath, muttered conversation, shuffled feet and chairs slid back, like the endless hum of the ship herself, flickered above immortal silence.

Commander Nathans rose and faced them. He had driven this vessel across desolation, and he could still drive her home. But the years had gnawed him, until he could no longer direct his people against their wills. Small, stooped, faintly trembling, he said:

"You, ah, you know why we are met. But I think best that, ah, the issue be summarized. Otherwise, well, we might waste valuable time talking at cross purposes.

"There is life on Shadow Earth. Intelligent life, with a technology at least equal to ours and probably superior. We know this because our meson-pion bursts produced a very quick response, a corresponding set

of bursts aimed directly at the center of the planet where the boat was. This proves an instant comprehension of what, ah, was going on. It also proves an ability to send a particle beam straight through their world. Whether they have a tunnel, or use some induction effect, or whatever, this is something man cannot do. And they must be eager to communicate."

"I should think so!" Rouvaratz barked. "Judas! Through their entire history, they've been in what they see as intergalactic space. Not another star in sight, nothing but a few spiral wisps. I bet they took a million years to go from farming to science. They know they've passed by a sun they can't spot, and that's the whole of what they know. Those poor, lonely devils!"

"Please." Nathans winced. "Such things have been said very often in the past several watches. This is a business meeting."

"But damnation, the business is emotional. We have to decide what we want to do." Janice plucked at Rouvaratz's arm. He grumbled and subsided.

"The problem is this," Nathans said. "Pions offer a means of communication. We can go from a pulse code to . . . anything, theoretically. In time, we can even exchange pictures, for example by specifying points on a diagram. But that will take a great deal of time and effort. We will have to build a far more elaborate setup than, er, anything a boat can carry. In fact, we shall have to establish the *Shikari* within Shadow Earth and make our research center there. Then we must experiment, and develop our equipment, and commence the slow process of constructing a mutual language. The project will require years just to start. Centuries will not exhaust it, I am sure. But you are enlisted for a one-year stay. Ah . . . under the articles of the expedition, barring emergencies, a two-thirds majority is required to modify those articles. Thereafter the minority is bound by them.

"In short, we must vote whether to remain or return. The floor is now open to discussion."

Hands flew high. "Dr. Wheeler?" Nathans said.

The astrophysicist rose. Zeal flamed from him. "Everybody knows my wishes," he said. "A year . . . no, less . . . hardly suffices to begin studying Acheron. I would gladly give the rest of my life to that. But of course you aren't all my colleagues. So I would like to remind you what Shadow Earth can mean. A whole world—a geology, meteorology, oceanography, chemistry, biology—an entire civilization, with its own long experience, its arts and philosophies . . . yes, its science, too. Conceivably, fantastic thought but perhaps, they can give us a method to travel faster than light. Thus the whole galaxy would be opened to mankind. But quite without any such result, what

we can tell Earth will be like nothing Earth has imagined. We must stay. It is our duty."

"Chief Montelius? I gather you are in opposition."

"I am," said the boss engineer. "I've got kinfolk at home. If Earth wants to know more about the shadow universe, they can send another expedition, manned by people who're willing to go. Me, I'll stay put."

Janice halted a cheer.

"Ah . . . no, no, Dr. Wheeler, please wait your next turn . . . Dr. Settle?"

"I'm not sure that Earth would send another ship," said the plasma dynamics man. "I'll speak frankly and trust that no one will repeat my remarks if we do return. The decision would lie with the Gearch. And he will probably think twice. A scientific and philosophical revolution would bring a social revolution. He needn't flatly refuse. It would do to maintain that, since Acheron is after all getting farther away, the notion is unfeasible."

Rouvaratz sprang to his feet. "That's right!" he shouted.

"You're out of order," Nathans protested.

"Sorry. But listen." The big form loomed over the assembly, half wrathful, half pleading. "When did a government that has to gun down its own people ever want something really new? It was O.K. to give the scientists their toys. An expedition

to some useless dead star kept them happy, and also kept them away from human affairs where they might've got interested in things like freedom. But this? No! I've been there, I tell you.

"If we stay, and beam back what we learn, they won't have any choice but to send another ship with more equipment. The Gearchy depends on the technician class to keep the world running. Get those boys interested—and once we start sending home some real information, they will be . . . the government'll have to give in and hope for the best. Then you can go home, if you want."

"We're receding every second," Janice wailed. "The new ship would have to be built—and get here . . . How many years?"

Chaos broke loose. Everyone was up, clamoring into his neighbor's mouth. Nathans spoke and was not heard.

Rouvaratz jumped to the front of the room. He filled his lungs and bellowed across the tumult. *"Quiet!* Pipe down or I'll start breaking some heads!"

"Go on and try," Montelius said, red-faced.

Rouvaratz looked at him, from a greater height and from his own youth, before saying with a gentleness that sliced through the dying racket: "You're my friend, Conrad, and I'd sure hate to get rough with you. But I can, and you very well know it."

"Karl," Janice pleaded. The sound reached his ears but not his brain.

He roared them to order and then funneled all the vitality there was in him into his words and his presence.

"Look," he said, "you want to leave, some of you. Go back to the green hills of Earth. What green hills? If you're rich, you can find a square kilometer here and there not cluttered by some stinking human warren. If you're willing to do as the state tells you, you can live nice and peaceful, like an ox in a stall. But I don't think you're that kind. You wouldn't have come in the first place if you were.

"We won't have a bad life where we are. We've got room aboard ship. If we disassemble the drive units, we can have twice as much room. Those who want can redecorate the place. Didn't the old-time monks get along on less?

"And we won't be sitting around bored, either. Those fellows on Shadow Earth are smart. I'll bet you googolplex plutons that they'll find a way to establish meaningful talk with us inside a year or two. As we start to learn what they know, why, we'll be building apparatus and conducting experiments till hell wouldn't have us. O.K., maybe ship number two won't arrive soon. But we'll not be old when she does. Me, I'd like to stick around afterward, too. Unless we've gotten us a Shadow Earth type boat which'll

take us around the galaxy. Have we any right to deny our race a chance like that? Or the million other chances that we really can be sure will come?

"But never mind. I'm no altruist myself. I only say we can have fun here—more fun than any men or women have had since Columbus took off. How about that?"

There is a mystery and magic in power. Call it bandwagon psychology, call it charisma, call it *mana:* you have still merely tacked a name to what you don't understand. Nathans had given his away, to this ship and to those he had commanded before her. Wheeler had never had any. But in today's confrontation, Karl Rouvaratz was physically the strongest creature aboard. That shouldn't have mattered; a fight was out of the question. However, in some jungle fashion it did matter. And he was stronger yet in his psyche, for he knew exactly what he wanted.

He made enough of them want it, too.

Afterward, when they were alone in his cabin, Janice regarded him for a long while. She did not cry. Despair was behind her.

"I guess I should apologize," he said uncomfortably. "To you, anyway."

"No need." Her words fell flat into the mechanical murmur around them.

"I know you'd rather go home and raise kids and . . ."

"Not you, though." She attempted a smile. "So I'd better change my mind."

After a pause, she went on, "But I can't help wondering. Why do you want to stay . . . here, locked in metal for the rest of your life, with nothing around you but unreachable stars? You're no scientist yourself. You won't be talking to Shadow Earth."

"Someday I will," he said. "With my opposite number, a space pilot in their universe."

"Oh, yes, you have your Quixote dream of a galactic drive. But the hope is so tiny. You must admit that; you're no fool. And as for everything else, the science, the engineering, the fresh new outlook if it isn't too alien for us—even what changes might happen on Earth—those are sort of religious goals, and you're not a very religious man. Why, Karl? Revenge?"

"I don't think so." He sat down on the bunk beside her.

"What, then?"

"Something I have this minute, right in my hand." His gaze left her, went to the bulkhead and saw visions beyond, Polaris, Andromeda, the whole sister cosmos. "Freedom. I'm my own man now." ■

The Uninvited Guest

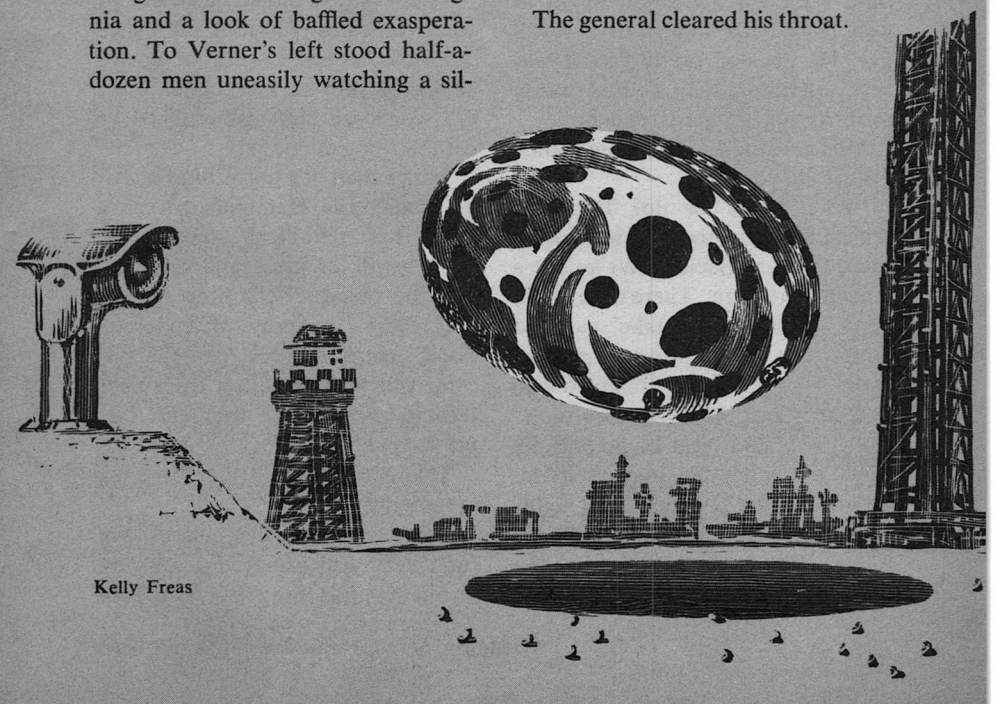
Sometimes a panhandler is hard to get rid of. Particularly when the panhandler is extraterrestrial— and you don't know why he wants what to take where!

CHRISTOPHER ANVIL

Richard Verner stood in the morning sun between the umbilical tower with part of its upper stage sheared off, and the massive dome of a blockhouse from the top of which two periscopes looked out. To Verner's right stood a spare, straight officer with general's insignia and a look of baffled exasperation. To Verner's left stood half-a-dozen men uneasily watching a silvery object that floated before them with no visible support.

This object was so shiny that it was hard to see, but Verner, intently studying the warped and distorted surface reflections, could make out a flattened ovoid about eight-and-a-half feet across and some five feet high at the center, drifting about six inches clear of the ground. The shiny surface showed numerous tiny black spots that expanded, contracted, and vanished, to reappear in another place, expand, contract, and again vanish. A faint smell of ammonia hung in the air.

The general cleared his throat.



Kelly Freas

"This thing showed up here about a week ago. The day was hotter and brighter than it is today, and those black spots were smaller, so the surface was even shinier, and no one knew at first whether he was seeing a mirage, a current of heated air, spots on his glasses, or whether he needed a quick trip to the head-shrinker. So at first, nobody even mentioned it. Then the thing hung dead still in front of Aaronson, who was walking to the blockhouse, and Aaronson tossed a pebble at it. If the pebble bounced off, he could tell himself it was real. The pebble didn't bounce off—it disappeared inside somewhere. Then this—whatever it is—spat the pebble back at Aaronson, and hit him in the right shoulder. Aaronson might as well have been shot with a forty-five. He decided pretty fast it was real, and before long we had twenty to thirty other reports that fit."

Verner studied it thoughtfully. "What did you do?"

"What could we do? This is a missile-test site, not a branch of the Interplanetary Society. We've got a schedule to keep. There's an outfit that's supposed to take care of things like this, and we notified them. They sent some people out to look at it and they said 'Hm-m-m,' and 'I see,' and went home and decided it's either 'an improperly-inflated weather balloon,' 'ball lightning,' or maybe 'a form of the St. Elmo's fire formerly seen on the masts of ships.' "

The general waved a hand to indicate the various towers looming on the landscape. "They figure the wind blows by these towers and 'generates static electricity.' Well, so much for that. They've explained it away, but we're still stuck with it. We've tried to ignore it, but it noses around all over the place and you *can't* ignore it. We were ten seconds from launch the other day, with this thing wandering around erratically at four hundred feet, and it got into exactly the wrong spot and stayed there, so we finally had to give up. There are three fresh holes in the fence, eight to nine feet across and five feet high, where it went through, and around each hole there's a spatter of iron shot.

"Yesterday, it sidled up to one of our technicians, and took off a slice of his clothes and about four square inches of skin surface underneath. We won't see him again till we've got this thing out of here.

"Since then, it's taken bites out of the blockhouse, Hammerson's car, a tree, that umbilical tower, and thirty yards of grass and dirt outside the fence. Every time it does this, there's a spray of concrete, wood, metal, or rock, and the bits come out with velocities from near zero to about three thousand feet per second."

The general eyed the hovering ovoid sourly.

"You see where this puts us. We can't very well armor our missiles, just in case this thing decides to take

a bite out of something nearby. None of our men signed up for duty in a combat zone, either. What I'd *like* to do is to work on it with a rocket launcher. But the boys tell me the internal energy of the thing is probably such that the resulting explosion would take out this whole end of the state.

"So," said the general, turning to Verner, "since you're a heuristician, and it's a heuristician's job to solve problems other experts alone can't take on, I'm turning the whole mess over to you. I don't care who you call in, or *what* you do. Just get rid of this thing before it wrecks our whole space program!"

Verner studied the ovoid intently, sniffed hard, and promptly sent off a telegram. He then spent the rest of the day keeping an eye on the ovoid, and listening to the accounts of a stream of witnesses who described their experiences with it. Twice he had to drop flat as the ovoid dipped too low and sent bits of concrete whining overhead. Several times, people who had had ovoid experiences spoke uneasily. "There's something wrong with it. It doesn't fly as high as it did. It doesn't move around as much. And —Look there!"

For an instant, the reflectivity of the ovoid's surface dulled, like a mirror filmed over with grayish mist. The numerous black spots all shrank to pinpoints. A moment later, everything was as it had been before. But the impression persisted that something was wrong.

As one engineer said, "I think it's *sick*. And God help us if it dies. When a man's system goes out of balance, he collapses, and that's that. But with the internal energy this has, I'm afraid that when it dies, it's likely to turn into a miniature, short-lived nova."

By the end of the afternoon, Verner had accumulated a store of information, hunches, and misgivings, and an answer to his telegram. He now sent several of the men on a rush errand to the nearest shopping center. A little later he looked around at the sound of approaching footsteps.

"Well," said the general hopefully, "have you got any ideas?"

"Yes, but first I want to ask a few questions."

"Ask away."

"Does it *always* have that faint ammonia odor?"

"As far as we know."

"What does it do at night?"

"Settles down within an inch or so of the surface. The whole outside seems to turn silvery, and you can see the moon and stars reflected in it. It's an eerie thing— Like a big, silvery crystal ball."

"Do you think it's a kind of spaceship, some kind of reconnaissance device, or a living creature?"

The general started to speak, glanced around at the gradually gathering dusk, then said, "The only answer I can logically give is: I don't

know. It's possible to make mechanical devices that will react very much as if they were alive. But the impression I have is of a living creature, and one that's experiencing a certain amount of discomfort."

"Why do you suppose it's here?"

"There you've got me. Why, of all the places there are on earth, should it hang around a missile-test site? I don't know."

Verner looked at it thoughtfully. "Where do you suppose it originally came from?"

"Same answer. Only, here we have that faint ammonia odor. One of the constituents in our atmosphere is carbon dioxide. We *exhale* carbon dioxide. There are planets we think have ammonia, among other things, in their atmospheres. This creature, if that's what it is, exhales a little ammonia now and then. Maybe it comes from a planet with ammonia in *its* atmosphere. It could come from Jupiter, for all I know."

"Did it appear shortly after a launch?"

"Yes, as a matter of fact it did. We'd just put a satellite in orbit. But what's that got to do with its coming down *here?"*

"Suppose you were an interplanetary traveler, in trouble of some kind, looking for help, and a satellite came up from a planet close by, and went into orbit?"

The general thought it over. "I'd probably go down where the satellite came from to try to get help."

"But how would you show them what you needed?"

"Well . . . I certainly wouldn't be able to talk their language—It stands to reason I'd have to use a kind of" —he growled— *"sign language."*

"Exactly. Now, if we assume that this creature is doing the same thing, what is it trying to say?"

"But it takes *bites* out of things." He scowled. "All right. Assume for the purpose of argument that what it wants is *something to eat*. What do you feed a thing like this? Suppose it came from Jupiter? *Where are we going to get Jupiterian food for it?"*

"I sent a telegram off earlier today for just that information."

The general snorted. "Where are they going to—" He turned, to find several of his men setting down twenty-five and fifty pound sacks, then he looked back at Verner. "You don't waste any time."

"This ovoid has been here a week," said Verner. "It has hardly moved all today, and several people tell me it looks 'sick.' They also say that if anything does happen to it, it's likely to go off in a bright flash and take half the state with it. I don't think we ought to delay."

The general nodded. "Go right ahead. If it gets just a little darker, the ovoid will settle down to sleep —or whatever it is that it does at night."

Verner opened a pocketknife, cut one of the sacks, reached in to feel

a small, hard, curving surface with a roughness underneath, drew back his arm, and threw.

Something hit the pavement near the ovoid, and rolled past close by. The ovoid didn't move.

Verner threw again. This time, it rolled directly under the ovoid.

Again nothing happened.

The general stared unmoving into the gathering dusk. There was a silence as if that whole section of the countryside was holding its breath.

This time, Verner cut two pungent-smelling halves, and threw one. It hit in front of the ovoid. The ovoid didn't move. He threw the other half. It landed on the top of the ovoid and vanished from sight.

Nothing happened.

The general shook his head.

THE ANALYTICAL LABORATORY

For the newcomers—there have been several thousand join the ranks since last I published this—a description of the voting system of the An. Lab. is needed.

Please vote! Send in a postcard, letter, note, something, simply listing the stories in the order of your preference. These cards, notes, et cetera, are tabulated. A card voting Story A into first place is recorded as a "1" after Story A's name; a vote for second place earns it a 2, and third place a 3, of course.

When we make up the department, we add the points each story's received, and divide by the total number of votes; this is that story's point score. The *lowest* point-score, of course, means the most first-place votes; that story wins first place in the issue; next lowest point score is second place. And we print the following little table:

NOVEMBER 1966 ISSUE

PLACE	STORY	AUTHOR	POINTS
1.	Too Many Magicians (Conc.)	*Randall Garrett*	1.80
2.	Quarantine World	*Murray Leinster*	2.12
3.	Facts To Fit The Theory	*Christopher Anvil*	2.69
4.	Letter From A Higher Critic	*Stewart Robb*	3.31

However, the thing that interests authors most is that a first-place story wins a 33% bonus—the author gets an extra 1¢ a word bonus for reader-chosen quality. (This saves the editor from embittered authors who insist their greatest story wasn't appreciated by the editor, and wasn't adequately paid for. If the *readers* didn't like it. . . .? Look, friends, this is *your* magazine; if you stop putting down the 60¢ on the counter, the authors—and editors—stop getting paid, and the magazine folds.)

Second place wins its author half as much—a 16% bonus.

Please send in your votes!

THE EDITOR

"We'll have to try something else. We can—"

"Wait—" said Verner sharply.

One of the men said, "It hasn't spat it out yet. It always—"

Another yelled, *"Run for it!"*

The ovoid started to move.

It came toward them in a blur.

They bolted in all directions. The general moved as if he'd been fired out of a gun, glanced back over his shoulder and shouted, *"Down!"*

There were gasps as they hit gravel, dirt, and concrete, then there was the whir and whine of bits and fragments flying overhead.

In an instant, Verner and the general had twisted to face back, toward where the ovoid whirled and spun, taking in entire sacks at once, and in its eagerness dipping too low and getting chunks of paving, which it got rid of in a blur of flying fragments.

They watched in silence as the ovoid finished the last bit of the sacks, moved around like a dog looking for scraps, shot across the field, darted here, then there, and suddenly sprang for the sky so fast it was out of sight in an instant.

From somewhere came a crash like a plane breaking the sound barrier.

Verner and the general got warily to their feet.

Several minutes passed. The ovoid didn't reappear.

"Well," said the general, relieved and cheerful, "you hit it on the nose. I don't know how."

Verner handed him a crumpled telegram.

The general snapped his cigarette lighter. The flame sprang up, to show letters in a flickering light:

. . . PRELIMINARY SEARCH REVEALS FOLLOWING FIRST MAY 5 1966 WALL ST JOURNAL REPORTS UNION CARBIDE RESEARCHER FINDS ONION SEEDS SPROUT IN ATMOSPHERE OF PURE AMMONIA REPEAT PURE AMMONIA . . .

Verner said, "Starting tomorrow, I intended to try every available kind of food grown on Earth's surface. But there was just time enough tonight to try this first."

The general shook his head. *"Onions.* Well, that fits. If there's anything that smells more like Jupiter's atmosphere must smell, I don't know what it is. Who knows —maybe some traveling Jupiterian dropped a seed here a long time ago." He glanced around in relief. "Anyway, thank God *that's* over with."

"Not quite," said Verner.

"What's that?"

"How will that outfit that checks unidentified flying objects explain *this* incident?"

A grin slowly spread over the general's face.

"That's a thought. Well, well. I'll send them full particulars, and a sample onion. Then I'll eagerly wait to see what they say."

That was six months ago.

The general is still waiting. ■

The Compleat All-American

He was sort of small for football—
only one hundred sixty pounds or so—
but he very much more than made up for it in toughness—
if you could call it that.

R. C. FITZPATRICK

Kelly Freas

Two ordinary fellows were sitting on the fifty-yard line; totally dedicated, exceptionally competent ordinary fellows. They had choice seats from a government with catholic interests. Both appeared normal, "normal" normal, and both could disappear in a crowd; al-

"His name is Jimmy Tuttle," said Mathewson. "And if they told you anything else it would color your view."

"They won't have that trouble with you," said Michaels. He was patently aghast. "And you played football! You like this autumn auto

a Roman Circus. You dragged me here, Charley"—Mathewson's given name was George—"at least you can let me be on the winning side. This score will be sixty-four to zilch."

Mathewson gauged him appraisingly. "How many points to a zilch?"

"You want points?" Michaels asked eagerly.

Mathewson shook his head negatively. "Only a bet." He reached in his wallet and brought out a twenty dollar bill. He wrapped it around the stick of his banner and offered it to Michaels. "Match that and I'll trade you."

"You," said Michaels happily, "are out of your mind!" With one hand he reached for his own wallet, and with the other he snatched the banner from Mathewson's hand. Mathewson had to retrieve the Berea pennant from the concrete.

"Maybe," said Mathewson resuming his seat, "but at least it will keep you off my back. Now shut up and watch the game; you've got an interest. You can root against the kid if you won't root for him."

Michaels carefully tucked both twenties in his jacket pocket. "Now I'll do *you* a favor," he said. "I'll root for all of 'em." He turned back to the field. "Let's go, Swifties! Tom Mix is on the air!"

Mathewson feigned disgust and put his binoculars to his eyes. On the playing field the captains and officials were cross-introduced. Berea won the toss. "Now," he said softly. "Now we'll see."

Ohio State kicked off. Berea had one receiver back who took the ball on the three and scampered to the seven before being tackled. On the first play the Berea quarterback, who was a very bad quarterback, tried a quarterback sneak. He fought his way forward to the eight. Then the fullback made an off-tackle slice for two yards, and the quarterback tried another sneak that was good for one.

"That's real heads-up football," said Michaels earnestly. He sounded sincere. "Now I'll bet they've got a punter who averages thirty yards!"

Mathewson glanced at him.

"You wanna pay off now?" Michaels offered. "I'll settle for ninety-eight cents on the dollar."

"I'll wait," said Mathewson. "You may get compassionate later in the game."

"I'll save my compassion for those poor slobs out there," said Michaels. "They'll be lucky to get this kick away."

"They won't kick."

"It's the fourth and six!" said Michaels.

"They won't kick," repeated Mathewson.

Berea did not kick. On fourth down the left halfback made eight yards straight up the center before he was stopped.

Michaels blinked. "I didn't see that!"

"Use these!" Mathewson reached over and pulled on the binoculars hung around Michaels' neck. "Why do you suppose I gave them to you? For a necklace?"

"Even with binoculars I didn't see it," Michaels complained. "That kid doesn't weigh a hundred and sixty pounds with his uniform on . . . and nobody . . . nobody plays football like that anymore."

"Berea does," Mathewson said matter-of-factly. "And that was James, alias Tom Swift, Tuttle. Now will you watch the game?"

Michaels watched the game. Even though it was unexciting, Michaels watched the game. Michaels watched everything. Even the water boys fell under his surveillance. By the end of the first period a pattern had emerged. Berea would march thirty or forty yards and be forced to kick. Ohio State would march seventy or eighty yards and lose the ball on downs. The same man always made the key tackle or the key block if you were knowledgeable enough about football to notice. His name was James Edward Tuttle, and he played left halfback.

With ten minutes gone in the final period the game was scoreless. Berea had the ball on their own thirty-six, third down, and eight yards to go. The Berea quarterback, who was indeed a very bad quarterback, rolled out and threw a short swing pass to his left halfback. It was poorly executed, and everyone in the stands had diagnosed the play before it developed. And if everyone in the stands knew what was coming, so did Ohio State. Not only that, but the very bad quarterback threw a very bad pass seven feet in the air. Jimmy Tuttle had to go up on his toes and reach for the ball with both hands over his head. Otto Kreipehanger, the Ohio State linebacker who weighed two hundred eighty-six pounds, put his head down and rammed Tuttle in the stomach. Mortimer Moriarity, "Morty Mortician" the sports writers called him, who weighed three hundred and four pounds, came charging in from the blind side and hit Tuttle from behind, right above the knees. Both behemoths slammed into him in unison.

The crowd came to its feet, relatively silent. Play was stopped while white-coated stretcher bearers and worried-looking players huddled around a figure writhing on the ground. Mathewson was coming back from the refreshment stand with coffee and hamburgers. Michaels was sitting on the bench with his face in his hands.

"What happened?" asked Mathewson.

"They broke him in half," Michaels answered in a choked voice. "Maybe the Romans had the right idea . . . lions make more noise, but they do a neater job."

"Broke who in half?" asked Mathewson.

"Tom Swift," snapped Michaels.

"Did you bring me here to see anyone else get slaughtered?"

"Jim Tuttle," said Mathewson. "But not to be slaughtered. And there's not a thing wrong with him so far as I can notice. Not a thing! That cheerleader he's talking to is some babe."

"You gotta be kidding," said Michaels. "Dead men can't talk." He put his binoculars to his eyes and studied the field. "Where is he? They can't have buried him already, it wouldn't be decent."

"Right below us, Wise Guy," said Mathewson.

Michaels looked down. "I don't believe it!" He threw his binoculars back into place. After a pause, he said, "I still don't believe it." He held his gaze, and then reluctantly swung the binoculars to cover the field. "O.K., that was Tuttle," he admitted. "Now who's lying on the ground out there?"

"You tell me," said Mathewson. "I was getting us goodies, remember? Here!" he said pushing a cup of coffee at Michaels. "You're making noises like you need it. What did you do, borrow a jug?"

Michaels ignored the proffered cup and studied the field intently. "I still don't believe it," he said again.

"All right," said Mathewson reasonably, "you don't believe it, you've convinced me; neither do I. But just because I'm nosy by profession, what is it that I don't believe?"

"Tom Swift got creamed!" said Michaels. "But good! Boy Monster and Baby Elephant hit him at the same time. Fore and aft! High and low! They should have snapped his spine in two like a toothpick. Now Boy Monster is flaked-out cold, with his feet sticking out of his helmet. And Baby Elephant is rolling around like he broke all the bones in his trunk." Michaels waggled his head slowly from side to side. "I just don't believe it."

Mathewson said sarcastically. "Maybe it only looked like they got him. Maybe they missed."

"I can't believe that," said Michaels. "I heard the crunch."

"Maybe they hit each other," Mathewson suggested.

"If they did it was through the kid," Michaels answered.

"No," Mathewson expanded, "I mean maybe they missed Tuttle and got each other."

"I can't believe *that!*" said Michaels.

"Can't you?" Mathewson said in a pitying tone. "Try again: draw a long breath, and shut your eyes."

Michaels slowly lowered his glasses as he turned to face Mathewson. "What?"

Mathewson had a twinkle in his eye. "Forget it."

Michaels raised his binoculars and continued to study the field. "Go play White Queen with somebody else," he said in a tormented voice. "This situation is weird enough as it is—"He was too bewildered to even take advantage of his pun.

Mathewson pursed his lips. Michaels' dedication impressed him.

Elmo Edward Tuttle was, in the little town of Berea, Ohio, the most natural and successful businessman, and the most unnatural and least successful athlete—which was not surprising. In common with a majority of citizens, his most pressing need had always been need; first for himself, then for a wife, and then for a family. Life had left him little time for play.

Eddie was the offspring of a nice intelligent mother, which helped; and a brave dedicated father, which did not. His father had been one of the leading scientists at Hanford, Washington, and when things went wrong he'd sacrificed himself to save his fellow workers. It was an admirable thing to do, but it left a young mother and a young son with nothing much to do but go on living, and with nothing much to do it on.

Eddie went to grade school, and then to high school. And after school in the afternoons he carried newspapers, which he liked. And before school in the mornings he carried newspapers, which he liked. And in the evenings and on Saturdays he delivered things for the drug store, which he did not like—the Saturdays, that is. Whenever possible Eddie did those things that high school boys like to do; it was only that there were lots of things that he would have liked to do but for which he did not have time.

Saturday things. Things like playing football.

Edward grew into a worker, and an overall good man. Honest, capable, forthright and determined. And not given to any nonsense. Well—one nonsense—he dreamed of being an All-American. Exclusive of reality it was his one overriding ambition. He dreamed of being an All-American. And when he had matured beyond his dream, he dreamed of fathering an All-American. After he married he set about accomplishing this dream.

The first-born child lacked sufficient courage to emerge as a female. His mother had him named William Elmo, and his daddy called him Bullet Bill. And his daddy gave him a football as soon as he could walk, and he took him out into the backyard, and the two of them played football. They did not play hand-, base-, or basketball, they played football. And football. And—football.

This son was a good boy and a rugged boy, ready to give and take the knocks that life handed out. And he liked football. He made All-City in his Junior year of high school, and Second String All-State as a Senior. He had his choice of colleges, but he picked his daddy's school. And in his first year on campus, in the first practice session for the first game of the season, on the first play of the first scrimmage, he broke his left leg in eight places and limped for the rest of his life.

E. Edward eventually forgave him.

E. Edward then looked—a first look you might say—at the rest of his brood. His wife's second child was named Helene. And though at the age of sixteen she weighed enough for anyone's first team, she lacked the proper attitude for a future All-American.

His wife had botched the third production, too. Gwendolyn! And wouldn't that be one helluva thing to call an All-American.

That brought him to his fourth born, a male heir named Jim. And when Edward looked at Jim he was shocked—"I tell you, Nancy, I was shocked"—because Jim was a natural athlete. He was the fastest kid in the gang; good at tennis, good at swimming, and good at climbing trees. But he wasn't very good at football. He wasn't good at football even when he tried, which wasn't often, because Jim did not like football.

Jim was an otter; an animal with a natural grace that only devotes itself seriously to enjoying the gifts of life. He was his mother's love and his teacher's despair. Anything he liked or was willing to do, he did well. And anything he did not like or was unwilling to do, he did not do well. Not particularly well, just well enough to get along. He did not like to run in front of the pack, not on anything that was considered important or likely to draw attention. Second or third would always suffice. Even at eleven he had a natural intelligence to go with his natural grace. And he'd also had a grandfather—as his mother often told him—who'd run in front of the pack and had his head handed to him for the trouble.

This son was a good boy but not a rugged boy. And he was not yet ready to take the knocks that life handed out, because he saw no logic in taking any knocks that were not absolutely necessary. And he did not like football. He was a fair-haired, fair-minded boy and getting lumped by others twice his size had never much appealed to him.

"I'll soon put a stop to that sort of thinking," E. Edward stormed at his wife. "And on that you can bet every cent in the bank!"

Somehow Jim's personality survived. He changed, but the change was inward. He had never been a religious youngster, and he did not turn to religion now, nor later; but in future years, "Up yours, Mr. Camp!" was the only expletive he was ever heard to utter.

E. Edward marshaled his forces and made Jim climb down from his trees; made him trade his sneakers for a pair of cleats, his swimming trunks for shoulder pads, and his tennis racket for a helmet. Elmo Edward supplied the football free of charge. And he and his son sallied forth into the backyard and played football . . . and football . . . and football. Every afternoon they played football until Jim finally got the idea.

The idea being that there was no way out. Short of hopping on a freighter for a foreign shore, Jim was doomed to becoming an All-American.

The initials on the glass read BFI. Mathewson ushered three men through the door and then followed after, shutting it firmly behind him.

One of the men asked, a bit apprehensively, "What does BFI stand for, Mr. Mathewson?"

Mathewson chuckled. "I won't give you all the local variations, Doctor. We're about like any other government agency on that score; we get free"—he amended himself—"we get gross associations by the gross." Then he sobered. "It stands for Bureau of Federal Intelligence."

Dr. Goldberg started to say, "Federal Bureau . . . ?"

Dr. Rossiter began, "Central Intelligence . . . ?"

"Both and neither, Doctors," Mathewson answered. "Neither and both." He deliberately laughed his best bureaucratic laugh, a combination of: "Let's be kind to the visitors, Boys, they don't understand;" and, "For Pete's Sake! The name explains itself;" and, "Shape up, Gentlemen! These are taxpayers;" and finishing, "Man the barricades! Outsiders!"

Dr. Franko said, "Bureau of *Federal* Intelligence?"

Mathewson smiled softly—crocodile softly.

"I didn't mean it to sound that way," Dr. Franko hastened to add.

Mathewson said, "That's all right, Doctor, I'm sure you didn't. And most federal agencies overlap in some spheres. It's inevitable! It even happens to corporations. We do run into the CIA and FBI. Even bump into Treasury sometimes. But CIA spends most of its time chasing after raincoated Russians, and the FBI is concerned with domestic Italians who run around shooting machine guns; we go after everybody."

Dr. Franko looked sorry that he'd opened his mouth.

Mathewson took pity on him. "We don't really go after anyone, Doctor. We're not crime and punishment people unless we have to be. We simply investigate anything that appears interesting."

The room they'd entered was a small auditorium. Mathewson waved his charges into seats in the front row before he continued. "For instance, we're working on an intriguing case in Fargo, North Dakota: woman wrote into the Department of Agriculture that she had boll weevils in the crankcase of her automobile. We were interested in the boll weevils in her crankcase—still are. It looks like some weevil 'wenta lookin' fer a home' and found one. Then we were interested in what kind of a woman would get involved with her own crankcase. And then we wanted to know how a woman in Fargo would recognize a boll weevil in the first place.

"Simple, really," Mathewson nodded at the doctors. "Turned out

she's an old maid, Texas-type schoolmarm; if she's a little short on cash and something has to get done—which is most of the time—she's the one who has to do it. And she also likes to do it. Which explains why she took her crankcase apart and how she recognized a weevil. And as I've said, it also turns out she has weevils in her crankcase . . . nobody's explained that yet, at least not to our satisfaction. But that may give you some picture of our activities.

"We really are interested in everything," Mathewson continued convincingly. "That's why you are here. We have a series of X rays where your analyses would be invaluable." He raised his eyes to the back of the room and made a head signal.

Michaels was seated near the projectionist in the rear of the auditorium. He reached under his chair for a briefcase, took out two large manila envelopes, and brought them forward. He handed them to Mathewson one at a time. "Boy Monster of the Bashed-in Beazer," he said placing an audible title on the first envelope. "And 'Baby Elephant with the Truncated Trunk'; subtitled, 'How to Fracture Your Shoulder in One Easy Lesson'." He placed the second envelope daintily in Mathewson's impatient palm.

"I'd rather fracture your funnybone," Mathewson growled. He turned to the doctors and passed the envelopes on to Dr. Goldberg. "Will you examine those, please. We've already consulted our own people, but we're afraid they might be too much like we are, with overstimulated imaginations. We'd like more objective findings, and we really do value your opinions." He smiled. "Nothing but the best for Uncle Sam. And I'm positive you'll find those of interest."

The three doctors were renowned orthopedic surgeons; Goldberg from Chicago, Rossiter from Richmond, Virginia, and Franko from Los Angeles.

Dr. Goldberg opened the first envelope and removed a series of six X rays. He placed the ankle of one leg on the knee of the other and braced the films upright. He studied the first intently, then held it up to the light for closer inspection. After two minutes he handed the plate to Dr. Rossiter while he reached for the second. He compared the second with the third, the third with the fifth, and so on, then started to say something. But he stopped himself and shook his head negatively, "I'd better reserve an opinion until I've studied them all." He scrutinized each of the remaining X rays carefully before handing them on. He took a full five minutes on the last film.

Mathewson gave them all the time they needed. There was a chair behind a small podium in the front of the room. Mathewson walked over and picked up the chair and brought it back, setting it squarely

in front of the doctors. Then he sat down, took out a cigarette, and lit it deliberately. He leaned back on the chair's rear legs and blew smoke over his shoulder at Michaels, who was standing behind him. "There are times," he said disparagingly, "when you don't think fast enough."

"You are a real, live, buddy," said Michaels.

Mathewson grinned and waited for the doctors to finish. After a while Dr. Franko put down the last X ray. He crossed his arms over his chest to signify that he was ready but said nothing. Everyone said nothing.

The silence became depressing.

Finally Mathewson said, "Come on, Doctors! Your reputations aren't on the line here. Can you tell us how it happened?" He was addressing Dr. Goldberg.

"That," said Dr. Goldberg, "was what I feared. Mr. Mathewson," he said firmly, "I am not a clairvoyant. I am a surgeon. I can tell you what has happened and what should happen, but you will have to tell me how it happened."

Mathewson simply rocked in his chair.

The silence became uncomfortable again...

"All right!" said Dr. Goldberg finally. "If you want only an educated guess; I'd say the man was a soldier standing at attention when something heavy, directly overhead, fell down and landed right smack dab on top of his helmet. He has a squashed cervical vertebra . . . I've never seen anything like it before."

"I think I have," said Dr. Rossiter. "I handled a somewhat similar case three years ago. A steel worker. Structural steel," he amplified. "There's nothing for it but a gamble. You have to go in there and remove the vertebra. With any luck the patient should still be able to function." He lit a cigar and passed to Dr. Franko.

Dr. Franko shrugged. "My guess is as good as Goldberg's. The man fell out of an airplane and landed on his head. In the water possibly, or on swamp land. In any event he has an unbelievably hard head; that had to be a tremendous blow. Maybe an operation will work and maybe not. It will have to be performed . . . and that's all I will say definitely."

Mathewson was noncommittal. "Thank you, Gentlemen, now will you examine the second set?"

The procedure was the same. All three doctors took their time in studying the X rays closely. But when they were through there was no long delay waiting for an opinion.

"This time I will tell you what happened," said Dr. Goldberg. "It's amazing though. I had a case like this immediately upon graduating from medical school. I couldn't afford to take a residency at the time." he explained in an aside, "I was married and had the first child on the way. I took a job with a lumber

company. And this was one of my first cases. I never thought to see another like it! This man, a lumberjack, had been struck on the shoulder by a falling tree; either the tree itself or a large branch—that's what got my first patient, a large branch. In either case the trauma is identical with the first one I treated. Here!" —he swiveled in his chair and leaned toward Dr. Rossiter, pointing—"See here? Notice the large concave depression? It may appear difficult, but actually the damage is no more severe than any other compound fracture. There'll be a bit more muscle and ligament damage, but less tissue destruction than if the bones had splintered and impacted the surrounding area. Simply take more time in the operating room, that's all."

"You take more time in the operating room!" said Dr. Rossiter. "I've had my fill of cases like this. Riggers!" he said in an exasperated tone that explained his stand. "They're careful enough around steel girders, but when they start to sink wooden pilings they get careless. I've seen a dozen cases like this in the past five years."

"Beach bums!" said Dr. Franko exactly as Dr. Rossiter had said "Riggers." "They're so busy impressing each other with their manly physiques that they don't watch where their surfboards are headed. Right into the pier! *Pow!*" He smashed his hands together. "And I have to spend four hours in an operating room so they can go out and do it again."

"Then you doctors are all agreed?" asked Mathewson. "This man was struck on the shoulder by a large, hard, polelike object?"

"A tree trunk," said Dr. Goldberg.

"A piling," said Dr. Rossiter.

"A concrete piling," Dr. Franko amended.

"Thank you, Gentlemen," said Mathewson. His manner changed abruptly. He did not bare his fangs, but then he had no need to, "And now if you'll follow Mr. Michaels, he'll escort you to your transportation."

Mathewson came erect before the doctors could protest. He gave one last, absent nod to civility. "I'm sorry. I am sorry. I know you'd like to be informed as to what happened, and why it is so important that we would summon physicians of your standing. But, I will not tell you. And you will not tell anyone. And this, regardless of the fact that you are legally civilians. I trust you understand this thoroughly." There was no attempt at courtesy in Mathewson's blunt consummation. He did not mean to be, nor was he, misunderstood. He raised his eyebrows at Michaels. "Mr. Michaels!"

Michaels exited grumbling, followed by the cowed, but still, unwilling doctors.

When he returned, Mathewson was back to normal and concluding

a short presentation of the Tuttle case to the men remaining. Michaels took a vacated seat in the front row in good heckling position.

Mathewson acknowledged him with a corner of one eye. "And now, are there any questions before you see these accident films?" He looked directly at Michaels, forestalling him. "How about you, Sam? Any questions?" Michaels' first name was William.

"None from me, Matt. I'm convinced." Michaels winced. "Twenty dollars convinced! This kid Tom Swift has a tummy like a sidewalk and legs like ponderosa pines. Show the film to the rest of the crew . . . they won't believe it either."

"Who's Tom Swift?" asked one of the men.

"Michaels' affectionate nickname for Tuttle," Mathewson answered. "He's grown attached to the boy."

"Any kid who can do what this kid can do shouldn't be called Jimmy Tuttle," Michaels retorted. "That's only an accident of birth. He oughta be named Rock Ramrod."

"A yuk," said Mathewson. "A double yuk." He signaled the projectionist to start his camera.

"Wait a minute!" said Michaels. "I do have a question. What about those doctors? I thought I'd come back wearing every scalpel in their bags. You brought them here to see this film and then to examine Ta- . . . Tuttle. Now you had me chase them out. How come?"

"Changed my mind," Mathewson answered. "They were too positive in their opinions, even though they didn't agree. That's why I chilled. I meant to put the fear of Guv into 'em, and I did. They were too damn sure that material objects caused those fractures. If they found out it was the body of another human being, there'd be too much explaining to do. Too hellofamuch explaining!"

He studied the assembled scientists and intelligence men appraisingly. "We can't have this brought out in the open yet. Interesting or unusual medical cases are one thing, but medical marvels make headlines. If those doctors knew of James Edward Tuttle now, they'd spread it all over the world." He paused meaningfully. "And with their reputations, if they said the youngster was a superman, everyone would know we had a superman on our hands—including our bearded friends in their bearskin berets."

The doctor was drying his hands when Mathewson and Michaels entered the examining room. An orderly had just escorted Jimmy Tuttle to the X-ray lab. He had been requested to take a physical as part of his college deferment. Why it was given in Washington was not explained. The BFI men had been restive waiting for Jim to leave; with the exception of film clips and the football field, the men had never seen each other.

"Well?" demanded Mathewson.

He was once again all Bureau Sub-Chief.

"Well," the doctor concurred indifferently. He was a major general in the U.S. Army Medical Corps.

Mathewson frowned. "What did you find out?" He did not disguise his impatience. "Let's not play games, Doctor. We're only assuming your rank makes you a qualified physician." Mathewson did not like pretentious people.

"A point," said the general. "A damn good point." The general did not like pretentious people either. "And speaking of points, this is Sunday; I had three of my favorite pigeons lined up for golf . . ." his voice trailed as he took a dozen strokes from his handicap. He forced himself back to the present. "Precisely what was your point?"

"We told you!" Mathewson snapped. "This lad is unusual. We needed a comprehensive physical. We needed something beyond that given to astronauts. We *need* every bit of physical data that we can accumulate."

"I gave it to you," said the doctor. "The man is well."

He turned deliberately to the towel rack and carefully folded his towel before hanging it in its proper place. "I'll wait for all the test results before I make that official, of course, but they're not going to tell me a thing that I don't already know." He faced Mathewson again. "Not, that is, unless you want me to perform an autopsy."

"Don't get wise!" Michaels warned.

"Wise?" said the general. "If I got stupid, you'd have to have your chief here explain it to you."

Michaels face cast a ruddy glow as he started to rise. "I've never doctored a general-doctor-general," he stated pleasantly.

"Hold it!" Mathewson ordered. He held both hands aloft in surrender. "We apologize, General. We seem to have loused up your foursome and your fortune as well. But we were so sure that whatever this man has could be discovered by an expert diagnostician, that we couldn't wait." He paused and shook his head in perplexed amazement. "You actually found nothing unusual at all?"

The general was mollified; as much by Mathewson's plaintive expression as by his words. There could be no doubting the man's sincerity. "Not a thing," he apologized. He turned to Michaels, "Sorry about that crack," he said.

"I'm not, sir," said Michaels, grinning.

"What did you expect me to find?" asked the doctor returning to business. "I realize why you wouldn't tell me before, but now that I've examined the man, what did you expect me to find? So far as I can be certain, he's normal in every respect. A trifle underweight, perhaps, but that can be hereditary. I'd say that physically he's a well-conditioned Mr. Average Guy."

"Boyohboyohboy are you wrong," Michaels blurted.

"Are you a doctor, Mr. Michaels?" asked the doctor.

Michaels reddened again. "Sorry, sir, but if you'd—"

"It's a defense mechanism," Mathewson interrupted. "He has to be flippant. We have reason to suspect Tuttle to be so superior that he makes the rest of us Neanderthals by comparison. Only these qualities seem to be brought out only under conditions of extreme stress. Tell me, sir, is that possible? Are there abilities that he might possess that would be missed in a physical, no matter how exhaustive?"

"Certainly," the doctor stated. "And the more you know of the human animal the more sure you are to be. My Lord, Man! I thought you people let nothing pass. Don't you know the story—and it's true—about a one hundred and some odd fraction pound woman in Florida who lifted the entire rear end of an automobile because her son was trapped beneath it? She crushed a vertebra if I remember correctly, but what of it? She did in moments—under stress—what the three of us would have taken half an hour to do with a block and tackle." He added whimsically, "Can't use the jack when your own son is wearing part of it for a pant leg."

"Does this ability apply to soldiers?" Michaels asked.

"No," said the doctor. "There's nothing superhuman in battle, it's a human trait. You're talking of courage? If it's physical, it's Adrenalin. If it's mental it's a matter of training and environment. The hero charges, and the coward turns and runs; neither one can generally explain 'why' later. Don't let me undersell the importance of individual personality, but heroes and cowards usually begin in their baby buggies; and it takes a tough DI to turn the latter into someone who can survive combat."

"Suppose we place Tuttle in that kind of environment?" Mathewson asked. "Not combat, but an emergency situation of some kind where he's convinced his life is in danger. Could you tell us more about him under those circumstances?"

The doctor cocked his head to one side suspiciously. "What type of an emergency do you suggest, Mr. Mathewson?"

"Nothing to endanger his life," Mathewson answered quickly. "But if he thought his life endangered, or that he might suffer severe physical harm, wouldn't he react the same way?"

"Certainly again," said the doctor. "You're a cop, aren't you? Haven't you ever sworn at a newspaper for not knowing that a cap pistol isn't a cap pistol if the person it's pointed at thinks it's a dangerous weapon."

"Your point," said Mathewson. "O.K., let's dope something out."

The three men sat in silence for

a while before they carted out their suggestions, and then after a thorough discussion, they carted them away as too dangerous, or too obvious, or not subject to proper observation. Jim Tuttle had a brain to go with his body. No one had wanted to delve too deeply into that aspect beyond ascertaining an IQ in the mid one-forties. Bright they hoped, but not too bright. Tough, and much too tough they'd already discovered, and that was enough of an avenue of exploration for the present.

Finally Mathewson said, "I've got one for you. A natural! This is a hospital; actually it's a hospital complex. Suppose a dangerous lunatic should escape and a frantic ward attendant come tumbling after? Michaels could be the lunatic and I could be the ward . . . no . . . I'll be the lunatic and Michaels can be the ward attendant."

"I like that better," said Michaels. "Good casting."

"Yeah, I thought you would," said Mathewson. "And you're a lousy actor to boot! But this is the way it would work." Mathewson turned to the doctor, "We put Tuttle in a room with you—this room will do fine—Michaels rushes in and warns you there's a maniac loose and to be on your guard. We can play it by ear, but I can come whooping in right after and whomp him a good one."

"Gently, on that 'good one,' " Michaels interjected.

"Gently," Mathewson continued. "But I can be waving a knife or the proverbial blunt weapon, and before you can stop me, I scream something like 'Lousy Draft Dodgers' and attack the kid. Let's see what happens."

"That's a snap," said Michaels. "I can tell you what'll happen, and I don't need a medical education. You go for that man and public enemies one through nineteen can relax. I'll get number twenty," he added modestly.

"Is he really all that dangerous?" asked the doctor.

"Not to himself," Michaels answered. "But if Matt swings a knife at him, Tom Swift will . . . shall . . . break his arm in six places."

"We'll see," said Mathewson.

"Bye-bye," said Michaels.

Fifteen minutes later the scene was set. Jimmy Tuttle and the doctor were sitting in the examination room while the doctor made meaningless comments. Suddenly the door burst in and a wide-eyed attendant asked breathlessly, "Have you seen him?"

"Seen who?" snapped the general.

"Napoleon Lee's escaped," the attendant cried.

"Good Lord!" exclaimed the doctor. "Have you alerted the staff?"

"Everybody but the Navy," said Michaels-the-wide-eyed-attendant. "Even the State Police. Keep your eyes open, sir. And you'd better lock this door!" He started to leave.

"Stay put!" the general com-

manded. "If everyone's been warned, the best we can do is wait. And the more of us the better. That maniac should have been transferred weeks ago," the doctor said bitterly to Jim. "He's killed at least three of his own buddies that we know about . . . and that for no reason at all, he didn't even think they were commies. Simply murdered them and went about his business. He was a cook/striker. Half blind in one eye and can't see out the other. Thank the Lord Harry they didn't give him a rifle."

Michaels-the-attendant collapsed in a chair. "You got a bodyguard, Doctor." He appeared relieved. "I was getting heart failure everytime I opened a door." He looked Jim Tuttle up and down. "You don't look like no softy, kid! If that bedbug comes in here, you take him from one side and I'll get him from the other. The Doc here, he can call for help."

"The Doc here, he can help, not call for help."

"Huh?" said Michaels.

"Follow your own advice," the general advised.

"Huh?" said Michaels.

"The door!" said the general. "Lock it!"

"Oh . . . Yes, sir!" Michaels double-timed across the room—and was knocked violently back to where he'd started as the door slammed inward.

Napoleon Lee Mathewson blocked the doorway. He began to grin inanely. The remnants of a straitjacket hung from his shoulders; the buckles across his chest like a tattered bandolier. There was a blood-stained butcher knife in his left hand, and, as Michaels recognized, his own sidearm in his right.

"Well look what Ol' Mama Cat Luck done brought together?" Lee/Mathewson crooned softly. "The Chipmunk"—he nodded at the doctor. "The Weasel"—he winked at Michaels sprawled on the floor. "And the—" he stared at Jimmy Tuttle. "Who you?" he demanded. "What you doin' here? You," he said, "I ain't ever seen before."

"He's a patient," said the doctor.

"He's a Toad," said Lee/Mathewson. "All you pretty pink white people are Toads."

"Are you color-blind, too," the general roared.

"You ain't no Toad," said Lee/Mathewson. "I call you a Toad? You're a Chipmunk! An' Chipmunks don't bark. You tone that bark down to a whine, or I won't leave you nothin' to whine with! I ain't no sojer," he added defiantly.

"Soldier or not, I can be your friend," the doctor offered.

"You can be a Chipmunk," Lee/Mathewson sneered. "An' you can be a Weasel," he told Michaels. "An' you . . .?" he addressed Jim Tuttle. "You . . . Toad!" He spat the words out. Then he added apologetically, "You don't mind bein' no Toad do you?"

Jim numbly nodded no.

"That's good," said Lee/Mathewson. "That's real good, Massuh. You didn't like it none, I'd a sliced you in two." He closed the door carefully behind him. "Cook out there didn't like it; I cut him up good!" He waved the bloody butcher knife. "Neither did a cop," he added. He let them see the revolver.

"You don't really need those weapons here," the doctor said.

"You got yourself a point, Chippie," said Lee/Mathewson. "I don't need nothin' but me." He held both weapons aloft. "But these here increase my range." He grinned again happily. "I like that . . . 'my range' . . . I'm gonna be the cowboss an' you gonna be the cows on my range. How 'bout that, Weasel?" He smiled down at Michaels, "You gonna be a good cow?"

Michaels nodded.

"Say moo," said Lee/Mathewson.

"Moo," said Michaels.

Lee/Mathewson cackled wildly. "Man, man, if you ain't the only mooin' Weasel in this here wicked world. Now how 'bout Toads?" he said to Jimmy. "You moo, too?" He cackled again, viciously. "To moo, or not to moo. Ain't that a question!"

Jim looked to the doctor, who nodded imperceptibly.

"We moo," said Jimmy.

"Man! Don't you say 'we moo', you just say MOO!" Lee/Mathewson advanced threateningly across the room.

"Moo," said Jimmy. "Moo . . ."

Lee/Mathewson stopped and turned to the doctor.

"Moo," said the doctor.

"Nah," said Lee/Mathewson. "Uh! Uh! A Chipmunk, he don't say moo. A Chipmunk, he say"—Mathewson/Lee glanced at the telephone on the desk—"he say into that telephone what I tell him to say. That right?"

The doctor stared at him.

"That right!" The maniac glare was complete. Defiant. Desperate. Destined.

The doctor dropped his gaze. "What do you want me to say?"

"Well now, you let me think on that a spell," said Mathewson/Lee. He absently wiped the bloodstained knife on his pant leg and used it as a pointer; first at Jim, then reluctantly away from Michaels, and brought it to rest against the doctor's chest. "You know man . . . I ain't dumb! I may be squirrelly, but I ain't dumb. You ain't gonna let me outa here, even to save your own life. An' Little Toad White here," he gestured to Michaels on the floor, "will be on my back before I get it turned. I'll give you that much, Toad," he said to Michaels.

"I thought I was a Weasel?" said Michaels.

"You wanna argue?" Mathewson/Lee leaned down, with the knife outthrust. He showed no emotion at all, only an indifferent interest.

Michaels kept silent.

Lee straightened in triumph. "But this here youngster . . ." He nodded in agreement with his own brilliance. "You a doctor," he said to the doctor, "you save lives. An' that man," he indicated Michaels, "he save lives too, his own way. Now how is it maybe you don't save lives? Everytime you say what I don't want, or Toad/Weasel make a move, I put a bullet in the kid?" Lee's mind was racing at maniac efficiency.

The doctor looked worried. And Michaels was worried; his chief's acting was far too realistic.

"Maybe I put a bullet in the kid just to show I ain't foolin'." Lee pointed the weapon at Jimmy.

"Hold on," said the doctor in real fright. "I'll do what you say."

"Nah you won't," said Lee "Not 'til you know I ain't kiddin'." He began to squeeze the trigger.

Realization exploded in Michaels as he started to rise.

"Matt! Don't!"

Matt did.

The bullet went *ching* . . . *whunk* as it ricocheted from Jim Tuttle and lodged in a volume of the doctor's library.

Mathewson's maniac mask became an expression of intolerable relief; like a gambler who's doubled four times in a row, has ten for a point, and makes it. He lowered his revolver and spoke to the doctor reflectively. "Now just how normal is our normal boy?"

Michaels sank back on the floor.

"That wasn't a blank," said the doctor. It was a statement of utter disbelief.

"A .357 Magnum," Mathewson answered. "You may find a bruise or a reddening of the skin. On an elephant you could drive through the hole where the slug came out."

Jimmy Tuttle was rubbing his forehead.

"Is that where you aimed?" asked Michaels.

Mathewson nodded.

"He doesn't miss," Michaels said to the doctor.

"Neither do I," said the general.

"You wear a black-eye beautifully," Michaels said after the general stalked out. "It blends with your complexion and makes you look sexy."

Michaels did not wear a black-eye beautifully.

In the BFI auditorium the assembled VIP's blinked daylight into their eyes as the shades were raised. They'd seen film clips of six exhaustive months of six thousand exhaustive tests on James Edward Tuttle. Not one had he failed—and not one had provided an answer as to why he had not failed. His last two months had been spent in an Air Force pressure chamber.

Psychological dangers had not fazed him either.

"That's it," said Mathewson. "You've seen it all." He spread his hands in submission. "So what do we do know?"

"I guess we let him go," said someone.

"Too dangerous," Mathewson answered. "By now we have to assume the boys with the beards know as much about him as we do."

"You can't simply hold him," a scientist stated.

Mathewson passed that one by.

"More tests?" said someone else.

"If you can think of anything we haven't tried, we'll do it," said Mathewson.

"Can we breed him?" asked a female psychologist.

"We have enough semen to impregnate every woman in the District," Mathewson answered.

"So send him to the Moon," said Michaels.

"Don't joke!" snapped Mathewson. "Not here. Not now."

"I'm not joking," said Michaels unabashed. "If the Moon's too tame, try Venus or Mars."

"Astronauts we have," said Mathewson.

"Astronauts wear helmets," Michaels answered. "And they have to ride in special ships. When you cut loose with that Magnum you had nothing to go on but faith. I thought it was time I tried a little faith myself . . . that chamber's air tight, you know."

The audience began to murmur.

"The man hasn't breathed in over a month." Michaels chuckled at Mathewson's dismay. "Now it's your turn."

"Oh Lord," said Mathewson. ■

the reference library *P. Schuyler Miller*

VELIKOVSKY REVISITED

If Dr. Immanuel Velikovsky, as a psychiatrist, had set out to formulate a demonstration of the automatic defensiveness of an "in" group, he could not have done better than to publish "Worlds in Collision" in 1950. Now, sixteen years later, the in-fighting has not yet died down. The Science section of the October 2nd New York *Times* is devoted to an address made at Princeton University, in which Velikovsky claimed that physics and astronomy are—without acknowledgment—confirming his predictions. And a new book, "The Velikovsky Affair. The Warfare of Science and Scientism" (University Books, New Hyde Park, N.Y.; 1966; 260 pp.; $5.95) provides a useful summing up of the controversy.

There are also now paperback editions of Velikovsky's first two books, which deal mainly with the cosmic catastrophes which, he says, ravaged the Earth around 1500 and 700 B.C. "Worlds in Collision" is Delta No. 9702 (401 pp.; $1.95). "Earth in Upheaval" is Delta No. 2203 (308 pp.; $1.85).

"The Velikovsky Affair" is edited by Dr. Alfred de Grazia, Professor of Government at New York University and publisher-editor of *American Behavioral Scientist*. Most of the book is a reprint of articles which appeared in a special issue of his magazine in September, 1963, with additional chapters bringing the controversy up to date. The other contributors, who are not identified in any way in the book or on its jacket—sloppy editing, and a most unscholarly oversight, though the men may be known to "everybody" in their own fields—are Ralph E. Juergens and Livio C. Stecchini (who from the internal evidence in his own chapters has a Ph.D. from Harvard, probably in history), with Velikovsky himself.

I suppose most readers of Analog know that there are really two "Velikovsky affairs." The first, which this new book summarizes and documents effectively, is the united front which astronomers, geologists and other orthodox scientists formed in an attempt to get Velikovsky's books banned. The first publisher of "Worlds in Collision," Macmillan, was blackmailed into withdrawing and turning

it and future books over to Doubleday. At least two men seem to have been fired because they protested that Velikovsky had a right to be heard. Even such thorough scholars as L. Sprague de Camp and Willy Ley seem to have been trapped into using, in articles of their own, the "evidence" of specialists who misquoted Velikovsky, picked statements out of context in order to refute them with irrelevant information, and otherwise behaved like the California censors who wanted the "Tarzan" books banned—they had never read any of them—because Johnny Weismuller and Maureen O'Sullivan weren't married in the movies.

In two initial chapters, Juergens summarizes this ridiculous and indefensible procedure very well. Stecchini then points to parallels in the history of science, both for ideas like Velikovsky's and for the reception he has had, and de Grazia in a devastating analysis convicts the scientific hierarchy of practicing anything but the rational processes of reasoning that they claim are the essence of the scientific method.

The other "Velikovsky affair" is his body of theories about past and present. In the final chapters of the book he points out that some of the predictions in "Worlds in Collision" and the other books have been confirmed: the high temperature of Venus, radio "noise" from Jupiter, and the importance of the interplanetary and quite possibly the intra- and intergalactic magnetic fields in shaping the cosmos.

It is also true that no scientist or panel of scientists has yet taken the trouble to refute Velikovsky's books, item by item and claim by claim. To do so would be an almost impossible task for any one person, even though one person wrote the book. Velikovsky is a man of imposing scholarship, apparently with a fantastic memory for detail, who has pored through obscure books and journals published in many different languages, over many centuries. To even check the accuracy of his citations would take years, for I doubt that any American and probably no one European library has most of these sources. (They are *not,* let it be said, the untranslated inscription in unknown languages on lost tablets that "document" the Mu and Atlantis stories.)

Whatever may be said for his reconstruction of history—something that only historians and archeologists can judge—it is evident even to laymen that Velikovsky's ideas of physics and astronomy would demand the construction of a totally new system of physical science. Physicists and astronomers complain that he has not constructed such a system, which they would know how to evaluate by orderly methods. But no more did Copernicus—far more of a scientist than Velikovsky—offer the mathematical theory that had to wait for

Tycho Brahe's observations, Kepler's laws of motion, and Newton's calculus.

A great many of the most sensational unorthodoxies in Velikovsky's books have been used as the themes of science-fiction yarns without arousing undue furor. But science-fiction readers—at least, Analog readers—have a pretty definite two-value system. To present an outlandish idea as fiction is one thing. To insist it is fact is another. Velikovsky's principal followers have been fundamentalists who rejoiced that a "scientist," a scholar, was "proving" that the word of the Bible was literally true, and the divine revelation that they had always been taught it is. That he made no claims about divinity or revelation was irrelevant; that he accepted the literal truth of the Word was enough. Few science-fiction readers are Velikovsky disciples, just as few are UFO believers—as distinguished from investigators.

Even so, I hope that no Analog reader would protest his right to publish these theories as prominent scientists did, nor launch a rather uninformed polemic to get them suppressed. I was rather set back, not long ago, to hear a prominent archeologist make an even more blunt statement about an amateur's unorthodox theories: "No amateur has any right to dig. If he digs, he is incompetent to describe what he finds. If he describes it, he has no right to draw conclusions about it. If he does write a report on what he has done and what he thinks, no journal should be permitted to publish it. And if it is published, no professional should waste time reading it."

This sums up pretty well what happened to Velikovsky. It casts no light at all on the validity of his theories.

COLLECTED EDITORIALS FROM ANALOG

By John W. Campbell; selected by Harry Harrison •Doubleday & Co., Garden City, N.Y. • 1966 • 264 pp. • $4.95

A collection of John Campbell's editorials from this magazine and its predecessor, Astounding Science Fiction, has long been overdue. Harry Harrison has made a good and representative choice from a span extending from 1943 to late 1965, and although one can quarrel with a few of his selections, mostly on minor grounds, the total effect is excellent and almost any one of the thirty-one essays reprinted here should be good for a lively if not violent discussion, as of course they already have been in *Brass Tacks*.

To get my major gripe out of the way, Harrison prefaces the book with a quotation from Arnold Koestler that points to the resistance to innovation among academic professionals. This has been one of John's favorite subjects over the years; he has documented it well, and my complaint is that this selec-

tion does not develop the theme as fully as it should have done, given the indicated theme. The inertia of educators is dealt with, but not, on the whole, the inertia of scientists—except physicians.

I don't know whether John had the opportunity to edit his own comments. In a couple of places the type seems to have been set from tear-sheets or photocopies of the magazine pages, and to incorporate parenthetical material that confuses rather than clarifies the point of the editorial. The prediction (in "Non-Escape Literature," February 1959) that fission would "never" be used to any major extent as a source of commercial power has been allowed to stand, although to date fusion has been technologically impractical and fusion reactors are promising to close in on fossil-fuel power plants.

The book is organized in eight blocks of two to six essays on related themes, beginning with four of John's sociological arguments (all recent), progressing through several of his unique insights into various fields of science (mostly in the 1950s), and returning to the current scene with discussions of modern medicine, logic as a limited technique of rational thinking, the evolutionary value of intolerance, evidence for the effective selective breeding of mankind, psi, the habitability of other planets, and practical politics.

In his sociological fulminations John is at his least effective—not at arousing thought and discussion, which is, of course, his real purpose, but at selling his expressed point of view. This is largely because of his habit of paring the argument down to its bare bones, and to documenting his reasoning with dogmatically stated data and examples that later evidence may show to be invalid. (A second look generally shows that he could have used other data, or other examples, that would stand up.) Even so, the only point-blank (and relatively unimportant) statement that I can refute from personal knowledge (in the essay on "Colonialism") is that the Mohawk Valley of upstate New York still has neat, prosperous, well-managed farms run by Mohawk Indian families. It hasn't. The Mohawks were run out during and after the Revolution and moved to the Grand River area in Ontario. The Mohawk steel workers John watched from his window were probably from the urbanized colony in Brooklyn, or possibly from the St. Regis Reservation on the New York/Quebec border or the Caughnawaga settlement near Montreal, both established by the French during the colonial wars as havens for the Catholicized Mohawks—who preyed enthusiastically on their Protestant and pagan relatives in the original Mohawk towns, as well as on the white colonists.

If the Mohawks' talent for high-steel work is genetic and not cul-

tural, it is hard to see why their Onondaga, Oneida, Cayuga and Seneca kinsmen don't share it. Perhaps it is a question of a cultural environment which gave a genetic trait value.

If both British and French had not bid liberally for Iroquois help in the colonial wars, New York might have been a Type 3 colony until well into the Nineteenth Century. The reports of the Sullivan-Clinton genocidal expedition of 1779, to destroy the towns of England's Iroquois allies, show that the Senecas and other western New York tribes had flourishing orchards and were well on their way to becoming as good farmers as the whites. The Iroquois had land; the Cherokee and other "civilized" tribes of the south had gold: so in the two areas in which Type 3 colonization might have been feasible, other motives shifted it to Type 1.

Incidentally, it's interesting to see John, in 1948 ("No Copying Allowed") making a point that negates some of his liveliest stories of a decade earlier, in which his heroes did copy the most complex devices at the drop of a hat.

These essays are, incidentally, easier to read straight through than many a recent novel unless you are needled into an "Oh, now, look here!" mood. (The only person I have ever seen stand up to John in a technical argument is Barbara Silverberg, wife of the SF writer and herself an electronic engineer. But if you want to try, here is ample encouragement.)

REPRINTS AND REISSUES

TERROR ON PLANET IONUS

By Allen Adler • Paperback Library, New York • No. 52-941 • 160 pp. • 50¢

This was called "Mach I" back in 1957. It reads like the script for or novelization of one of the more lurid monster movies.

SPECTRUM 4

Edited by Kingsley Amis & Robert Conquest • Berkley Books, New York • No. S-1272 • 287 pp. • 75¢

The 1965 volume in the series of annual anthologies by two British friends of science fiction. It is one of their best.

THE STAR FOX

By Poul Anderson • Signet Books, New York • No. P-2920 • 207 pp. • 60¢

Pb of the 1965 hardback edition. Nobody does these space operas quite as well these days.

WEST OF THE SUN

By Edgar Pangborn • Dell Publishing Co., New York • No. 9442 • 219 pp. • 50¢

The success of "Davy" probably explains why the author's first SF novel, from 'way back in 1953, is finally a paperback. Four men and two women are trying to implant the human race on a far planet.

brass tacks brass tack

Dear Mr. Campbell:

In the last month's issue which I just finished reading night before last, one of your letter-writers asked why the manufacturers of outdoor equipment did not print their instruction manuals on plastic so that it would be water-proof, oil-resistant, et cetera.

The letter you are now reading is typed on a sheet of new printing plastic which is trade-named "Tinselex." I do not sell this product, but yesterday after reading this letter in the magazine I called a paper distributor in Atlanta and asked him if there was anything along the lines which the writer of that letter suggested. This piece of paper is the answer which I received.

I have also tried printing this paper in black. Enclosed is a copy of a form letter which was on one of the presses here. It was printed in the middle of a run for regular stationary. So there was no special makeready. I am myself very pleased with the results from this paper. I have already thought of several uses we could put it to around our office.

I want to thank the man who wrote the letter in last month's issue for giving me the idea.

HAYNES C.-MCFADDEN
816 Piedmont Avenue, Apt. 7
Atlanta, Georgia 30308

The original letter-writer was: L. Friedlander.

Dear Mr. Campbell:

In reply to your request for further examples of how to prove anything with statistics, I offer the following proposition, which should be of interest to both you and your readers:

There is no such person as John W. Campbell.

Consider the sequence of persons consisting of Mr. Campbell's father, grandfather, great-grandfather . . . *ad lib.* If any one of these male persons had been a female, the subsequent history of the family would have been entirely different and Mr. Campbell would not have come into existence. But the probability that any specified person will be born a male is ½. Therefore, assuming that a male ancestor was alive at the beginning of the Christian era, and reckoning four generations to the century, the probability of Mr. Campbell's being alive is of the order of 2^{-76}, or about 10^{-23}. Clearly,

an event with such a small probability cannot occur, and Mr. Campbell does not exist.

This argument can obviously be extended to show that any specified person does not exist, and hence Earth is uninhabited.

I wonder who's writing this letter?

J. V. SMART

183 Howlands,
Welwyn Garden City,
Herts, England

Ghost writers, of course.

Dear Mr. Campbell:

As one who shares your confidence that statistical studies are invaluable in breaking down superstitions, I would like to point out that one of the superstitions you disproved statistically, namely that human reproduction occurs, is derived from a much more fundamental superstition, that life exists on the earth and probably elsewhere. The implausibility of this widely held belief is evident from the following considerations:

The *sine qua non* for life is said to be *protein,* a substance whose molecules consist of amino acids linked together in long chains. But not any random protein will suffice for a living organism; proteins whose amino acids are linked in specific sequences are required. Since life is reputed to have originated on earth from chance combinations of primordial compounds, what is the probability that the proteins necessary for life could have been formed from accidental combinations of amino acids?

Let us imagine a typical protein of molecular weight 34,000. Each of its molecules would then consist of 288 amino acids linked together. If we assume that only twelve different kinds of amino acids were used in constructing these molecules, there would then be 10^{300} different amino acid sequences, or isomers, possible for this protein. This means that if we could produce one molecule of every possible isomer of this protein, we would have a sphere of protein with a mass of 10^{280} grams and a radius of 10^{75} *light years!* It is obvious that the necessary proteins, i.e. those with just the right amino acid sequences, could never have arisen by chance, and that life could never have begun.

The latter assertion is supported by the fact that if one analyzed the entire earth for the presence of organic matter, using tests accurate to 0.0001%, the results would be completely negative.

Therefore, we must conclude that life, like extrasensory perception and other superstitions, must be relegated to the domain of science fiction and not concern sensible men such as ourselves.

RICHARD EMBS

148 Kedzie Drive,
East Lansing, Michigan

It's a good thing we aren't dependent on anything so improbable as this mythical stuff!

Dear Mr. Campbell:

I am writing for some assistance from you and some of your readers. Having been a long time reader of Analog—as well as the old "Astounding"—I recall some discussion a few years back in your editorial and reader's columns concerning the use of dowsing rods. It is in this matter I need some help.

I am a Marine Lieutenant Colonel currently stationed at the Marine Corps Landing Force Development Center at Quantico, Virginia and, as the title indicates, we are concerned with technical developments that would assist our combat elements in the field—particularly in Vietnam.

I have taken it as a personal matter to investigate the use of the dowsing technique to assist in locating underground tunnels or caves; as well as buried objects such as weapons, munitions and et cetera.

I do not know whether this approach will prove productive, but I think we would be remiss if it wasn't explored.

Therefore, I would ask that you and any of your readers who may have any information on the dowsing technique please write to me as indicated below. I am primarily concerned with material that may describe techniques, functions and personal experiences.

HARLAN TRENT, Lt. Col. USMC
Landing Force Development Center
Quantico, Virginia 22134

Anyone with relevant data on dowsing for tunnels, send it along to Colonel Trent!

Dear Mr. Campbell:

Your recent editorial on Pollution is one of the best things you have done in a long time. However, I would like to take exception to one of your statements concerning possible alternatives to the internal combustion engine. You stated that the electric car could never have made it, as batteries are too heavy, too expensive, and too short lived.

My colleagues and I at the Southern California Industrial Planning Seminar were recently privileged to witness a demonstration by the RAND Corporation which tends to show that this is not true. Not only is it not true now, but it was not true even in the days of automotive invention. After all, the fuel cell principle was discovered back in 1830 odd; and for that matter, the RAND people have pretty well shown that a practical electric car based on silver-containing batteries could be built right now at a price that everyone could afford. They took a different approach from most electric-car designers, too. They started with the promise that trim, shape, and performance of their electric should be about equal to the present-day car, while the five-year cost should not be greatly different from the present job either.

As it happens, this can be done now. The silver in the batteries

causes a higher initial expense, but as it is completely recoverable only the interest loss on the investment should be counted as a "cost." And if you go to fuel cells, a practical electric car with range, speed, weight, trim, shape, and comfort comparable to anything put out now by Detroit could be built. There remains, of course, the fuel-distribution problem. The simplest way would be for all electrics to have compatible fuel cells or batteries so that they were normally stocked by gas stations; then when you pull up, they take out your exhausted cells, and put in new ones, and recharge your old ones at their leisure. Since a fuel cell is functionally equivalent to a battery (it has two terminals from which you can draw power or put it in to "charge" it, the only difference being that the fuel cell has a hole in it for air intake) I am not sure that for general discussion purposes there is much point in distinguishing between them anyway. The fuel cell does have a greater potential wt.hrs./lb ratio than the best batteries, and, therefore, a longer range, but an automobile which worked from either could be developed. That way it could take advantage of anticipated future developments in fuel cell technology.

In any event, much of the R&D you ask for is being done. Not only RAND, but the State of California, private semitechnical management associations like SCIPS, and the oil companies are working on it. Given the inherent lag in buying habits of the American public, I would think that it will be about twenty-five years before the electric definitely replaces the internal combustion engine, but I do think that it is inevitable.

J. E. POURNELLE, PH.D.
Los Angeles, California

Somebody at RAND is having an optimistic daydream if he thinks silver-zinc or silver-cadmium batteries can be used for "popular priced" cars. A mass market would require hundreds of tons of silver; there's already an acute shortage of the element. Silver-zinc batteries can be recharged only about five to twenty times before the zinc, which plates out on recharge in all the wrong places, shorts the cells. Silver-cadmium cells last longer—but cadmium, too, is in short supply, and the quantities involved would boost the price from about $3 a pound to about $800 a pound. Moreover, the cost of the Ag batteries is the huge labor cost involved in construction—which is not *recoverable by melting them down again. Ni-Cd batteries are vastly superior in cycle life, running 500-2000 cycles, instead of a dozen or so; nickel is cheap—but take a look at the price of a Ni-Cd cell! That price is not due to materials, but due to structure and formation problems.*

In the fuel-cell battery area, the current interest in hydrogen-oxygen and hydrogen-air cells is, I think, going to die shortly. They're necessarily a plumber's nightmare, an

electrician's horror, and require someone with the high technical skill and courage of an astronaut to operate them. Get a few bubbles of the hydrogen in the oxygen line, or vice versa, and—well, remember that hydrogen-oxygen is the most powerful fuel combination NASA has! It blows up spectacularly. A minor accident could produce some illuminating results.

A better approach, I feel, is the Westinghouse Zr-Ca oxide solid ceramic electrolyte.

Incidentally—no current fuel cell can be "charged" by running electric power into it. It'll store the energy all right—but not in the fuel-storage tanks. In the cells. As an accumulation of hyper-explosive mixed oxygen-hydrogen.

Unlike current fuel cells, the Westinghouse zirconia cells can be operated on coal, charcoal, kerosene, or other solid or liquid fuels—they don't have to have hard-to-store gaseous fuels that are an invitation to explosions and/or blowtorch fires from ruptured gas-line plumbing after a minor accident. An oxy-hydrogen flame can burn its way through any material in modern automobiles; not even alumina or asbestos could stop it.

Dear Mr. Campbell:

Once again I am moved to comment on one of your editorials. I must confess I have been tempted to do so many times, but have only yielded to the temptation once before. I refer this time to the editorial on voter registration and literacy tests. I would like to make two comments.

1. The idea of all men being equal is frequently included as a ridiculous argument against or for abolishing racial discrimination etc., etc. The confusion, it seems to me arises when one forgets that the law of the country provides that there shall be equal opportunity, not that there should necessarily be equal success. Then it doesn't really matter whether you like the law or not. If you are a "law abiding" citizen, you are obligated to obey the law, or get it changed. The point I am trying to make here is that you spent a lot of time berating the point that all men are equal, (and I couldn't agree with you more) but ignored the basic point of law which says that they should at least have the opportunity to prove or disprove the point.

2. Agreed that abolishing the literacy test is not a solution to the problem. I do not agree, however, that your solution is any better. It is relatively simple to rig a computer so that it will respond to the responses of the examinee. Thus, although the process you describe might lessen the problem, it could still be poised in favor of or against particular groups of people. If we take the South as an example and use the Negro as the group to be discriminated against and have as you say the computer under state control,

there are several ways that the thing can be rigged.

1. Blatant identification of the respondent by an observer.
2. Supplying the favored group with the "correct answers" to certain key questions which would then, answered correctly, alter the pattern of questions the computer would supply.
3. Asking key questions that a White might answer one way and a Negro another. Again the responses determine succeeding questions.

Thus, since there is really no way to insure randomness without constant surveillance, there is really no way to prevent this or similar transgressions on your method of avoiding this problem. Since, in the case of the Negro, there tends to be statewide discrimination, it would seem likely that such rigging of registrations could and would take place. The alternative, which I think is no better, or probably worse, would be to have the computer under Federal control. The consequences of Federal rigging, however, would pale the present problem into non-existence.

RYK PETER SPOOR, PHD.

There never was and never will be any system a determined crook can't bollix somehow.

That's why an absolute tyranny operated by highly intelligent and judicious men was, is, and will be the only good government.

If you can just find those intelligent and judicious men to put in charge!

PORTABLE POWER

continued from page 7

Moreover, any Ag- cell must have some very trick separators; AgO is appreciably soluble in the KOH electrolyte used. In a free solution of electrolyte, AgO goes into solution, wanders across to the Zn or Cd negative plates, where the AgO is reduced by the Zn, and plates out on the Zn plate. This establishes a local Zn-Ag cell, that proceeds to dissolve the Zn away, releases H_2 bubbles, and presently generates gas pressure in the cell that can't be dissipated in an hermetically sealed system.

The Ag-Zn cell is equipped with separators that amount to little plastic bags completely sealing in the Ag plates; the plastic is an ion-exchange material, in effect, that passes water and KOH freely, but traps and blocks the Ag^+ ions so they can't reach the Zn.

The construction of the AgZn and AgCd cells is not cheap.

Battery building was, and is, more Black Art than Science. For reasons known only to God, *small* hermetically sealed Ni-Cd cells can be produced very successfully. But *large* cells produce hydrogen gas and presently blow themselves up. This never bothered the old Jungner type—they were vented cells, and didn't have gas-pressure problems.

Flashlight-size—D-cells—Ni-Cd batteries work fine in the sintered-plate type. The large—60 to 200 ampere-hour size—have unexpected and utterly inexplicable problems. They gas off when they theoretically shouldn't, which is bad. But, although they will hold a charge beautifully for a year or more, they won't hold a charge if you keep them charged! That crazy-sounding statement comes not from theory but experience.

A bank of Ni-Cd sintered-plate cells, of 60 amp.-hr. rating, was installed in my home shop; I hitched on an automatic charge regulator which trickle-charged the cells, and cut off all charge automatically when the battery reached 1.45V./cell, as per specifications.

After nine months on relatively light duty—running electronic equipment, and occasional light-duty carbon-arc welding—I found that my fully-charged 60 amp.-hr. battery could deliver only about 3 amp.-hrs.!

The instruction manual explains that the cure for this situation is to fully discharge the battery, short-circuit it for twelve to twenty-four hours, and then recharge, whereupon it will be found to have full capacity.

It did. Only—at about fourteen months, one of the cells suddenly didn't have any voltage, and no electrolyte. But it did have a hole the size of a quarter burned through the nylon case. It had shorted out internally, and the violent short-circuit current—such cells are rated for normal use at currents up to 2,000 amperes!—had melted a hole through the plate and the plastic case.

The battery is now three and a half years old; of the original eighteen volts of sintered-plate cells, I have six volts still somewhat usable. Full capacity can't be obtained any more, and they won't throw a satisfactory carbon-arc-welding current—of about 75-100 amperes. The 6-volt Jungner type Ni-Cd doesn't store as much energy per pound or per cubic inch—but it's now four years old and retains full capacity and full current capability.

The sintered plate, large-size batteries can't be used for standby service. The D-size flashlight type rechargeable Ni-Cds—specifically the Gould National Nicad D-size—do work well.

But the price is high; they're not economically practicable as a power source for an electrically powered vehicle.

And that leaves us back where we were in the dear, dead days of the "outhouse on wheels" Detroit Electric car—with lead-acid storage batteries. And they simply aren't good enough.

The Edison nickel-iron battery gives somewhat more power-per-pound than the lead acid; it costs a darned sight more, too, and isn't practical.

And nobody seemed at all inter-

ested in doing anything to make any quantum-jump improvement. Oh, they had improved the batteries somewhat—added calcium to the lead in the lead-acids for longer life. Plastics made better separators. Trick design of the upper part of the cells made them unspillable—but nothing really important. Why, didn't everybody know that this was *the* way to make batteries?

The pressure of the anti-smog legislation, and the obvious fact that things were going to get *much* tougher, and the pressure for portable power supplies for the more and more sophisticated and complicated electronic military gear, lighted some fires. The Battery Experts suddenly found themselves assigned the job of building damn sight better batteries—or get the hell out of here and we'll get somebody who *can*. "I don't care whether it can't be done or not—all I know is we've got to have it, so do something about getting it!"

One breakthrough came from a one hundred percent non-expert layman, who got a patent on a new kind of dry cell. Magnesium-copper chloride couple, activated just before actual use by injecting salt water, gives a fine voltage, and a startlingly powerful current from small, compact cells. And *cheap*. He made the Experts most unhappy—and his patent stood up.

They have now come up with an air-breathing cell that consumes magnesium metal as fuel, and a porous, treated nickel electrode, fed with air, as the oxidizing plate. It has far more power per pound than any cell containing both fuel and oxidizer system, naturally. It's inefficient—delivers only a bit more than half the full voltage it theoretically should—because of internal side-reactions and resistance. The Army doesn't mind that inefficiency, except for the heating it produces, which limits the power you can afford to draw from a bank of such cells.

A Zn-air cell has also been developed, which is much more efficient, and can be arranged to be rechargeable. It uses a potassium hydroxide electrolyte; the Army prefers the inefficient Mg-air cell, however, because it uses salt water as an electrolyte. If a man's backpacking the power pack in a Viet Namese jungle, and some little brown brother pot-shoots the guy in the back, leaking KOH dribbling down his back would not be at all healthy. Leaking salt water isn't anything new in those jungles; it's just a bit more concentrated than sweat usually is.

However, the Zn-air cell makes a strong bid for a real automotive power pack. It can be recharged—but it has certain un-nice difficulties there. Zinc, remember, plates out in places you don't want it, in the form of "trees" which tend to short-circuit your carefully formed cell. Moreover, the cell will get plugged

up with zinc oxide produced by the discharge current during use—ZnO is very voluminous—unless you pump the electrolyte around and through a filter, and into a storage tank. This makes the Zn-air battery a complicated contraption with quite a bit of plumbing and auxiliary equipment. And unless you have separate pumps and plumbing systems for each cell, you'll have a built-in short circuit through the electrolyte storage system.

Moreover, being an air-breather, it has to have "lungs" to take in the needed air—an air pump and air-distribution manifolding system. More plumbing and accessory equipment.

Finally, since our atmosphere contains considerable CO_2, and the electrolyte of the Zn-air cell is KOH —you're pumping air-borne acid into your strong alkali. Presently your electrolyte is not KOH but a very poor substitute—$KHCO_3$.

Shall we try a different direction?

Lead-acid batteries of very light construction—and correspondingly short life—store at best about 10 watt-hours per pound. At 10 watt-hours per pound, you could drive about twenty miles through average city traffic before you needed a recharge. Roughly two miles per watt-hour.

The Ni-Cd batteries store more energy per pound, and would allow some thirty-five miles of city traffic driving—or about seventy miles of open-country cruising.

The very expensive, short-lived Ag-Zn cells would give about fifty miles in traffic, and one hundred in open-country driving.

The zinc-air batteries, on the other hand, could drive an electric car about three hundred miles on the open road, at a speed of fifty-five miles an hour—even one hundred fifty miles at ninety miles per hour.

The Ford Motor Co. has been both very diligent and very interested in electric-drive research. They took a Falcon, removed the normal gasoline engine and transmission, drive shaft, et cetera, and installed an electric motor and a bank of low-weight-high-energy batteries, the best now available, and made some tests of a modern electric car. With that system—and admittedly inadequate batteries—the car did over eighty miles per hour on the test track, and showed better acceleration at traffic speeds than did the standard gasoline model. At the higher open-road speeds, above thirty miles per hour, it did not have quite as good a performance—but it was by no means sluggish.

Ford is now building, both here and in England, test cars which will, at first, be powered with lead-acid batteries while they develop the *car* so they'll have something ready when they finish developing the new Ford Na-S battery—which is a real breakthrough in battery conceptions.

First, a bit on the accessories for using a battery.

In the old Detroit Electric days, the speed of the motor was controlled partly by a heavy-duty rheostat, and partly by switching battery cells in and out of circuit. With all battery cells in circuit, and no resistance, you had maximum power; by switching down from all sixteen cells to fewer cells, you dropped the voltage applied to the motor, and so dropped the speed.

It worked fine . . . except that with a rheostat, you're throwing battery power away in a resistor, and with the switching system you're making the low-end cells work all the time, while the high-end cells get taken along for the ride, unless you're running full-speed flat-out. Since the old Detroit's full racing speed was about twenty-five miles per hour that was practical. But with a modern electric having a top speed of ninety to one hundred miles per hour, this wouldn't be quite so safe.

They didn't have silicon controlled rectifiers back in the old Detroit Electric days. A silicon controlled rectifier (SCR) is a solid-state device that is a no-moving-parts switch, or relay, capable of handling currents of hundreds or thousands of amperes at voltages up as high as five hundred or so and acts in microseconds. (Or miniature models that can handle milliamps at a few volts.) Using SCR's in conjunction with transistorized feedback circuits, a battery-operated DC motor can be rigged for speed control that will allow it to deliver full-power torque, and yet *not* run at full-power speed. It's done by having the SCR open and close the battery circuit a few hundred times per second—and leave it closed only part of the cycle under light load, but always-closed if the motor is running below the called-for speed. This way, no power need be wasted in resistors, and all cells carry the same proportion of the load.

Moreover it'll be no great trick to rig additional SCR circuits to accomplish the following desirable effects:

The current flowing in a DC motor depends on the speed with which it turns, its internal resistance, the density of the magnetic field of the field coils, and the voltage of the supply. With a given speed, and a given magnetic field, and a fixed voltage supply, the current flow is determined. Now, if the motor is pushed to a higher speed, the swift rotation of the armature in the strong magnetic field causes it to *generate* a higher voltage than the supply voltage—and it pumps power back into the power-supply.

At a given speed, then, whether the unit draws current, or generates current, depends on the ratio between field-coil strength and armature speed. If you increase the field-coil magnetization, you can increase the back-generator effect, and make

it generate; decrease the field strength, and it draws current and drives the load, still at the same speed.

This regenerative breaking means that the electric car's motor can be made to brake the car's speed, and pump the kinetic energy of the car back into the battery as useful power. (If you're coming down from Pike's Peak in your electric, you make sure your battery is pretty well discharged so you'll have room for all the power you'll generate on the way down. You'll reach bottom with a full-charged battery and cool, unused brakes.)

It will be no great trick for circuit designers to work out solid-state circuits that can switch the constants around in such a way as to give the desired braking effect at any speed above, say, five miles an hour.

Incidentally, regenerative braking means you're generating *real* power; it was tried on some of the diesel-electric buses when those were first introduced—and quickly abandoned. Having no storage batteries, the buses discarded the generated electric power in cast-iron resistance grids under the bus. After a few dozen molten iron grids had been dug out of streets, and the damaged buses removed from shrubbery, buildings or trees, it was realized that regenerative braking could *not* be used going down long hills—unless you had something to dump the power into! Trolley-buses can use it by dumping the power back into the power line.

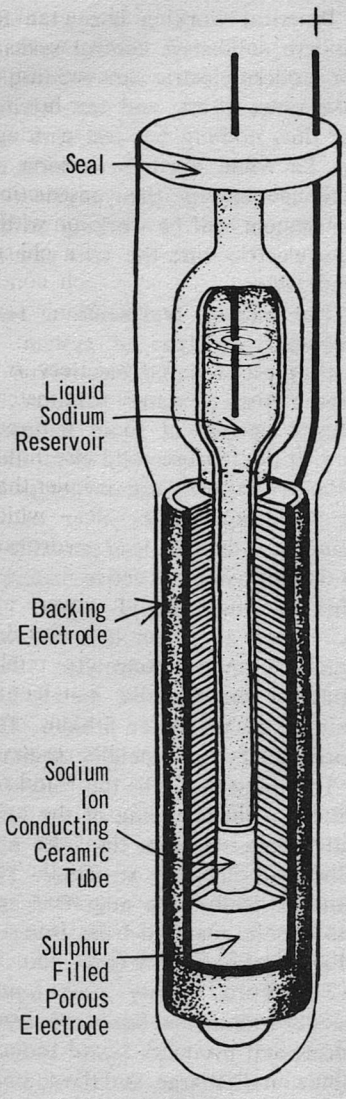
Practical working hardware for modern solid-state control systems for modern electric cars is going to take time, effort, and test-driving; for this, nothing but test cars can do. So while Ford is working on their new battery, their engineering department will be working on the new electric car; the two can be mated later.

The battery represents a real, new-approach type of system. It doesn't use a liquid electrolyte. It doesn't use a water solution. It doesn't operate at room temperature. It doesn't use solid electrodes. All other batteries use oxygen or an oxide—nickel oxide, silver oxide, manganese dioxide, lead peroxide—as the positive plate active material. This one uses liquid sulfur.

Because all other batteries use water solution electrolytes, they can't use really active metals like sodium, potassium or lithium. The Ford battery uses metallic sodium.

The thing that kills the lead-acid battery is the shedding of the solid active material from the solid metallic lead electrode structure. The same, basically—the migration and loss of solid material from plates—kills the other battery types, too.

The Ford battery uses *liquid* metallic sodium and *liquid* elemental sulfur, and produces *liquid* sodium sulfide on discharge, and the sodium sulfide is broken back to liquid sodium and liquid sulfur on charge.



Basic structure of the Ford sodium-sulfur cell

The cell operates at about 300°C. —above the melting point of sodium metal, sulfur, and sodium polysulfide. The ceramic (Al_2O_3) tube mechanically isolates the Na from the S, but passes Na^+ ions freely—it's about as good an electrolyte as the heretofore standard aqueous electrolytes. This is a laboratory-cell design; engineering production cells won't waste so much space, naturally. Since no component or reaction product is gaseous at anywhere near the operating temperature—sulfur boils at 450°C. —there is no "gassing off" to generate pressure.

The two liquid active materials are separated by a solid electrolyte made of aluminum oxide—one of the most stable compounds in the universe.

All of the component active materials are extremely cheap; sodium is the cheapest of all metals, on a cents per cubic foot basis. Sulfur, of course, is also very cheap, and very plentiful.

(If silver-zinc cells were tried for cars—they could not be mass produced on the necessary scale. There *isn't* that much silver in the world!)

With the Na-S battery, Ford's breaking through into a whole new category of non-aqueous, liquid-reactant batteries. It has disadvantages—it has to be kept at about 500° to operate; a bad accident that cracked the batteries open could produce an inextinguishable and violently spitting fire as the components reacted—but it has tremendous advantages. It yields far more power-per-pound than any of the previous battery types, and makes practical electric cars capable of lively performance in traffic, road speeds above ninety miles per hour, and one-charge endurance over two hundred fifty miles. Moreover, there's every reason to believe—no published data as yet—that very high charge rates would make possible recharging such a battery in less time than it takes to recharge the driver. I.e., on a long trip, while you stop for food there will be plenty of time to recharge the car's battery for another two-hundred-fifty-mile run.

Insulation that can keep a tank of liquid helium liquid for two weeks is commercially available now; insulation to keep the batteries hot for two weeks wouldn't be a tough problem—and could also serve to make the battery-case indestructible to anything less than collision with a high-speed locomotive, or a charge of dynamite. (Under which conditions the passengers wouldn't care anyway.)

In effect, the Na-S battery *is* a fuel battery—with liquid Na instead of gaseous H_2, and liquid S instead of gaseous O_2. Storing those liquid elements is enormously simpler than storing liquid H_2 and lox—which would be needed if hydrogen-oxygen fuel cells were used.

The H_2-O_2 cells, moreover, are enormously more complex and difficult to operate than the public realizes. Each separate cell has to be supplied with hydrogen, and with oxygen. The fuel-oxidizer gases have to be specially purified and refined—or the catalysts in the cells are poisoned and stop working. The complicated plumbing, and the extremely explosive character of H_2-O_2 mixtures make starting up a hydrogen fuel cell something calling for the highly trained skill, and high courage of an astronaut. Connecting up and purging their plumbing would make a fuel-celled electric car garage an excellent place to stay away from. Keeping such

cells and their very plumbing in perfect condition—and "imperfect" with that stuff means "explosive"—when subject to automobile vibration would be quite a task.

Since Ford's opened the field of non-aqueous, non-room-temperature batteries, it may be that the actual commercial battery won't be Na-S. Could be that lithium might replace sodium, for instance; the electrochemical potential of sodium is 2.7 volts, while lithium is 3.04 volts—and lithium has an atomic weight of only 7 against sodium's 23, so you'd get somewhat more voltage, and markedly less weight. Lithium's somewhat more expensive than sodium, but it's available in adequate quantities, and, if there were a massive market for it, could probably be produced cheaply enough. And you'd need only about one-third as much.

Again, a Li-F_2 cell would, theoretically, yield over 5.5 volts per cell—obviously impossible in any aqueous cell, but not in the new non-aqueous cells. Elemental fluorine is just a wee bit too vigorous to handle—but there are a lot of metallic fluorides that would give somewhat lower voltages, yet very vigorous and effective positive plate "oxidizers."

The most encouraging thing is that, at long last, real effort to develop *much* better batteries, *much* better power packs, is being applied.

The Na-S battery has all the characteristics of a fuel cell with built-in oxidizer and fuel, which can be recharged. The "fuel cell" of the standard type offers little advantage at best for a mobile power supply, and most of them offer large disadvantages—their fuels are much harder to store and handle than the sodium and sulfur. And the standard fuel cells aren't rechargeable, nor can they accept a charge current, which deprives the electric car of the possibility of regenerative breaking.

Of the exterior-storage fuel cells, the Westinghouse zirconium-calcium oxide solid electrolyte type could have the simplest and most practicable system. It doesn't require elaborate and tricky plumbing, nor chemically delicate catalysts.

It, too, is a high-temperature cell—about twice as high as the Ford Na-S battery.

But it would involve either a gaseous fuel generator as an accessory, or storage facilities for liquid, or compressed gaseous hydrogen.

For a fixed installation, the Westinghouse cell, because it is essentially a primary cell—rather than a secondary, or storage cell—system is obviously superior. Hitch it to the city gas lines, and it would produce the power you want. (To charge the Na-S battery in your car over night!)

Some of the accessories on a modern battery-operated car are

going to be interesting. With solid-state SCR circuits, the car could be equipped with 100-volt AC lines—the motors and all equipment designed to run on 220-volt 400-cycle power, for instance, derived from the battery through standard SCR inverter circuits of very high efficiency.

In gasoline cars, the engine's inherent inefficiency is so great that heat is necessarily thrown away profligately—which makes winter-time car-heating cheap and easy. In an electric battery-powered car, the equipment runs above eighty-five percent efficient—there's no free heat to throw around! The cars could well use small electric-driven oil-fired furnaces, of course. And to save battery power, why not the heat-operated refrigeration cycle for summer air conditioning? Again—small fuel-burning auxiliary.

The interesting inversion that where gasoline cars rely on electric battery-powered auxiliaries, the electric battery-powered car would tend toward oil-powered auxiliaries!

Of course, with the ever-tightening anti-smog regulations, the oil-powered auxiliaries might be forced to change over to alcohol-powered units. Alcohol burns with a smokeless, smogless flame.

The thing to remember here is that the average car heater, on a cold winter day, throws off enough heat to warm the average six-room house. It would require several kilowatts of electric power to replace it.

If that sounds wrong, remember that few houses are subjected to continuous fifty to sixty mile an hour winds at 0° or colder, while having large glass areas, thin insulation, and lots of metal wall to pass heat through, and many poorly weather-stripped control passageways. And remember that for every horsepower your engine delivers at the flywheel, it throws away at least two as waste heat. While the automobile manufacturer has to design his heating system to keep the car comfortable during a deep-winter blizzard in Upper Peninsula Michigan or Alaska—not just for the climate where *you* live—he's got to think in terms of 40-below and an 80-mile-an-hour wind.

Maintenance on the electric cars is going to be wonderful indeed! They'll be simpler to maintain than even the wonderful old classic, the Model A Ford, where all you needed was a screwdriver, a monkey wrench and a pair of pliers. (The monkey wrench reversed to be a hammer, of course.) An electric motor has only two bearings; in constant use, day and night, all year round, an electric car's motors might consume as much as half a pint of oil a year. In the old electric trucks, the principal maintenance cost was new brushes about twice a year, at about seventy-five cents a pair, and new contact points on the speed-regulator control. Modern electric traction motors don't need brushes; they can use solid-state de-

vices, and the control system uses solid-state gadgets, too.

An electrified Falcon might cost fifty percent more than the gas-powered equivalent—the batteries are going to be more expensive, certainly for a while. But the gas mileage is infinite! The routine system would be recharging the car in the home garage at night, to the delight of the electric power companies, and consequently at low, off-peak-load rates. This would give the power companies a far better use-factor for their equipment, since the automotive load would come at night, and would be disconnected—cars in use—during the day.

Since you'd recover about ninety percent of the electric energy you charged in as actual usable power, your power bills would be cheap in terms of cents per mile. With practically no maintenance of the engine-transmission system, and much longer brake life—because of regenerative braking—overall operating costs would go *down*.

More and more, you'd be driving a nuclear-powered vehicle. Gasoline and fuel oil prices are rising—while electric power rates are dropping, and more and more power plants are nuclear fueled. So your car would be second-hand-nuclear-powered to a greater and greater extent.

On a long trip, where you recharged the car while you were in the restaurant recharging your own energy converter, your bill for a full charge might be expected to run about what a similar tank full of gas would cost you now—say five dollars. A charge at home at night would cost perhaps two dollars, because of the off-peak-load rate, and the inevitable higher efficiency of the slower charge. Your home equipment wouldn't be generating so much heat to dissipate power.

I can just imagine a Howard Johnson restaurant on the New Jersey Garden State Parkway on a summer Saturday noon, with their big parking lot solidly filled with cars, each thirstily drinking in the juice at 1,000 to 1,500 amperes apiece—and the dull roaring of the six 60-inch cooling fans trying to keep the box-car-size transformers and silicon rectifiers from frying in the 95° heat . . .

"Why, no, son! We don't use bus bars, they'd cost too much. We've got 30-inch steel pipe poured full of metallic sodium for distributing that charge current. Right now we're feeding 290,000 amps. Whoa . . . don't get your watch too close there, son—it'll get magnetized by the field around that pipe.

"Huh? Why are they set in concrete? Well they're kept six feet apart, but the magnetic force between 'em on full load runs about four tons per running foot. They've got to be anchored, or they'd climb out of the ground like a pair of angry snakes!"

The Editor.