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analog

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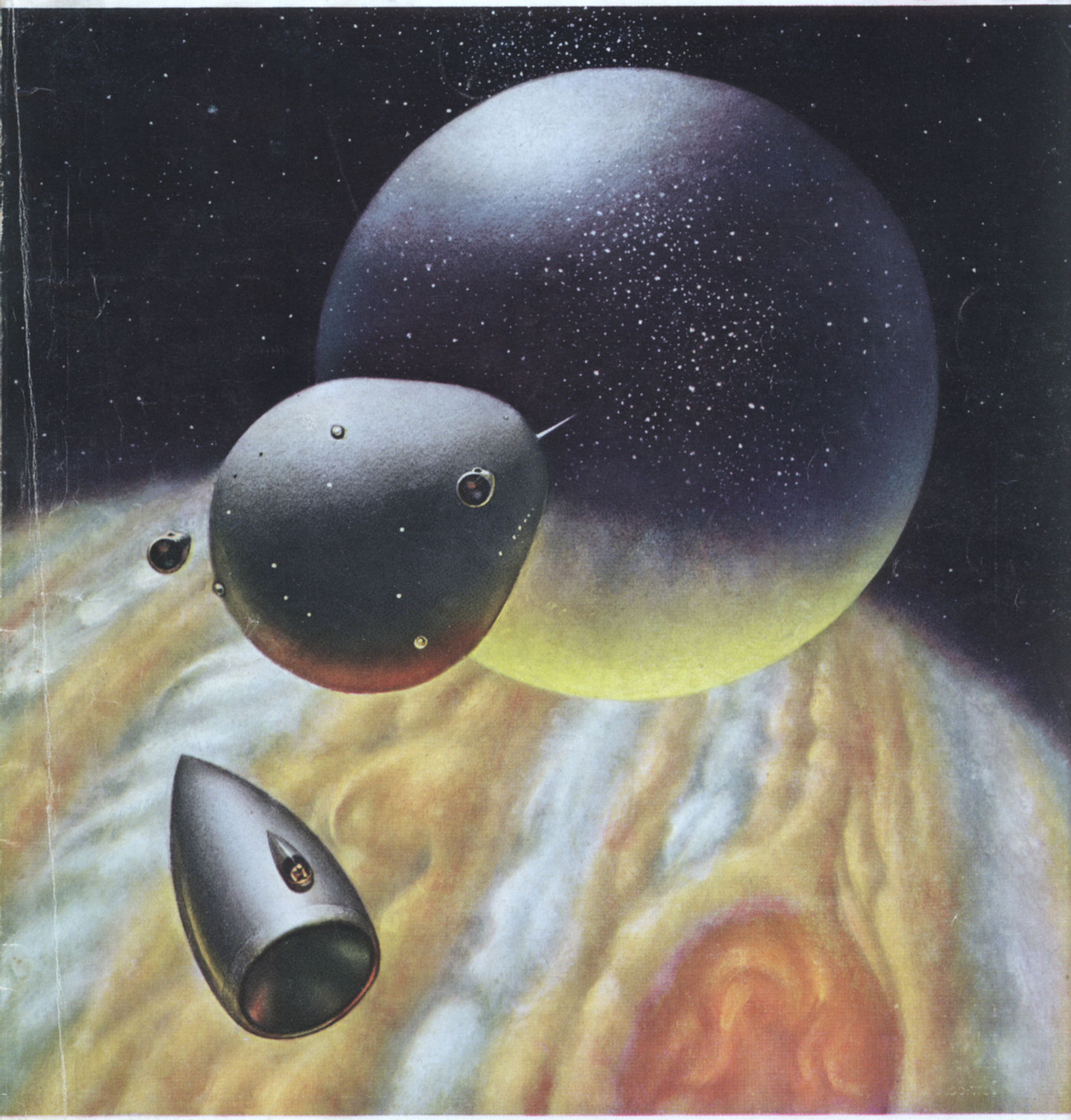

NATURAL RESOURCE | THE GAS MINE IN THE SKY

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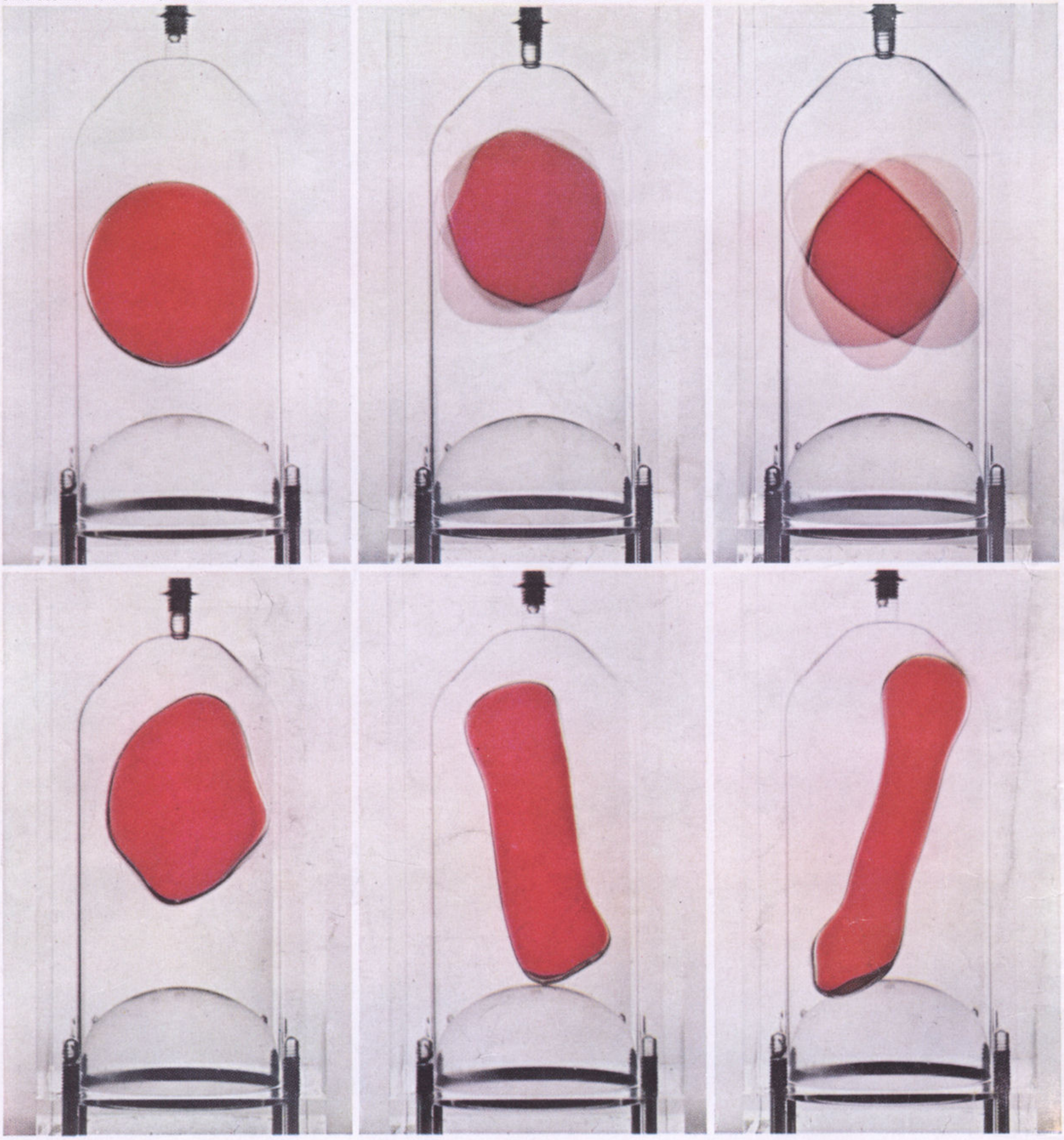


FOR EXTENDED STUDIES OF LIQUID BEHAVIOR IN ZERO-GRAVITY ENVIRONMENT...

Joint research by General Dynamics, National Aeronautics and Space Administration, and the U.S. Air Force has resulted in an insight of major importance. ∞ A lucite model of a space vehicle's fuel tank is used to simulate the effects of zero-gravity on propellants. The fluids filling the tank cavity—colored water, representing the *gaseous* hydrogen, and clear oil, representing *liquid* hydrogen—do not mix. Both are of equal density, and the natural surface of the water forms an interface of constant equal tension between them, which is almost like a membrane. Thus, the fluids behave as if they were in a zero-gravity state. They are shown above after various degrees of agitation and rotation. These tests duplicate fuel patterns seen earlier in models subjected to zero-gravity during elaborate drop tower and aircraft tests. ∞ This new "liquid-liquid" adaptation of an old principle is now permitting extended, low-cost study of one of the demanding problems of space flight . . . in the laboratories of General Dynamics.

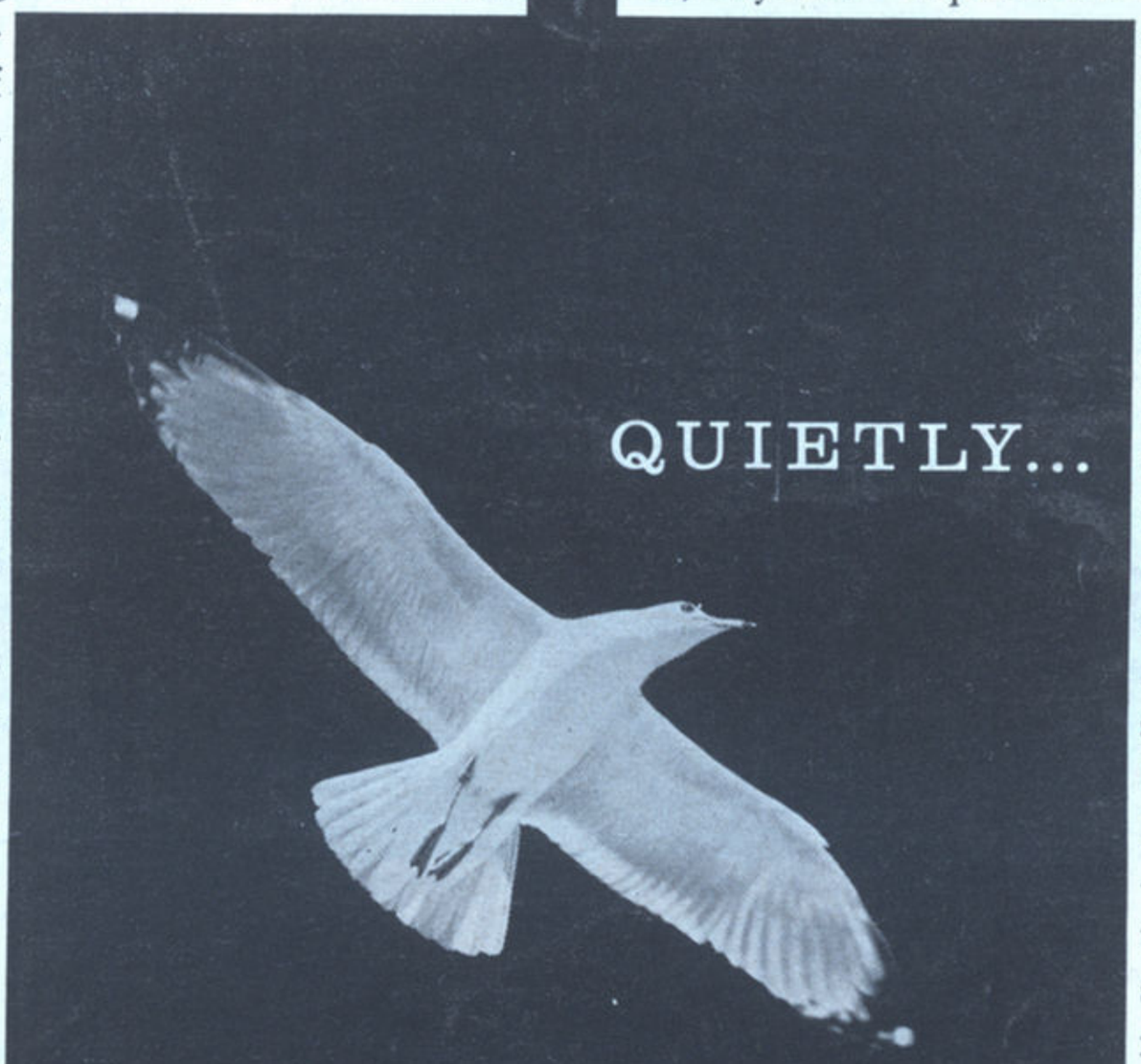
GENERAL DYNAMICS GD

A Message to the Engineer/Scientist Community At Large — and a Question: there's a dynamic technological race going on at the Atlantic Missile Range, a race between the fast-increasing capabilities of new missiles and space vehicles and the capacity of range instrumentation to test their performance. ☐ We wonder how much you have heard about this. . . . and about the challenge it offers engineers and scientists with PAN AM at Cape Canaveral? ☐ You may know a small segment of the work . . . many do. But only a handful are aware of its scope. In fact, we of PAN AM'S Guided Missiles Range Division sometimes think that only the ubiquitous seagulls know the full story of the new range instrumentation technology we've created in the 9 years we've been charged with development and management responsibilities for AMR by the U.S. Air Force. ☐ The measure of the distance we've come is the measure of the technological jump between MATADOR and MARINER. ☐ In the simplest terms, this has meant acquiring ever greater funds of data, of ever higher accuracy, at ever greater distances — and converting and transmitting it at ever increasing speeds. ☐ FIRST, the existing range instrumentation and communications techniques were pushed to the utmost bounds of their capacities — THEN they were replaced with new range systems built to new concepts, as specified by PAN AM engineers and scientists backed by research groups. ☐ *Today — a new phase of range technology development is under way — staff build-up is proceeding on schedule.* ☐ To meet the demanding requirements of both today and tomorrow, much of the work of the Range is divided into three time projections:

(A) designing and implementing range instrumentation for launches programmed for this year and next;

(B) developing range technology concepts required for launches in the near future (Dyna-Soar, Gemini, Apollo test vehicles, advanced Saturn boosters and Nova);

(C) advanced planning, looking forward as much as 15 years. Includes considering such problems as how to service, launch, track and recover information from multi-million pound thrust booster systems and anticipating the problems associated with the launching and support of nuclear propelled boosters and spacecraft.



OPPORTUNITIES are open right now to join Pan Am in developing range test systems of hemispheric, global and celestial scope. ☐ ☐ **SYSTEMS ENGINEERS** EE, Physicist — capable of accepting project responsibility for design of range instrumentation systems, monitoring systems development, installation and acceptance. (Must also be adept at liaison.) Background in one of the following areas is essential: Pulse radar, CW techniques, telemetry, infrared, data handling, communications, closed circuit TV, frequency analysis, command control, command guidance, underwater sound, timing ☐ **INSTRUMENTATION PLANNING ENGINEERS** EE, Physicist — with managerial capacities, to accept responsibility for specific global range instrumentation concepts. Must be able to comprehend overall range instrumentation concepts and have extensive experience in one of the following areas: radar, telemetry, infrared, optics, data handling, communications, underwater sound, shipboard instrumentation ☐ **SENIOR ENGINEERS & SCIENTISTS / FORWARD PLANNING** PhD's, Math., Physics, Applied Mechanics, Astronomy, Electronics — to evaluate and project the state-of-the-art in all applications to range instrumentation. Help establish both theoretical and practical limitations of existing relevant technologies. ☐ **In addition to** all the uncommon professional values, you get Florida, too! Those who enjoy casual, year-round, outdoor living are in their element at the Cape, where a majority of engineers and scientists live and play near the water. Consider too that PAN AM gives you a 90% world-wide air travel discount.

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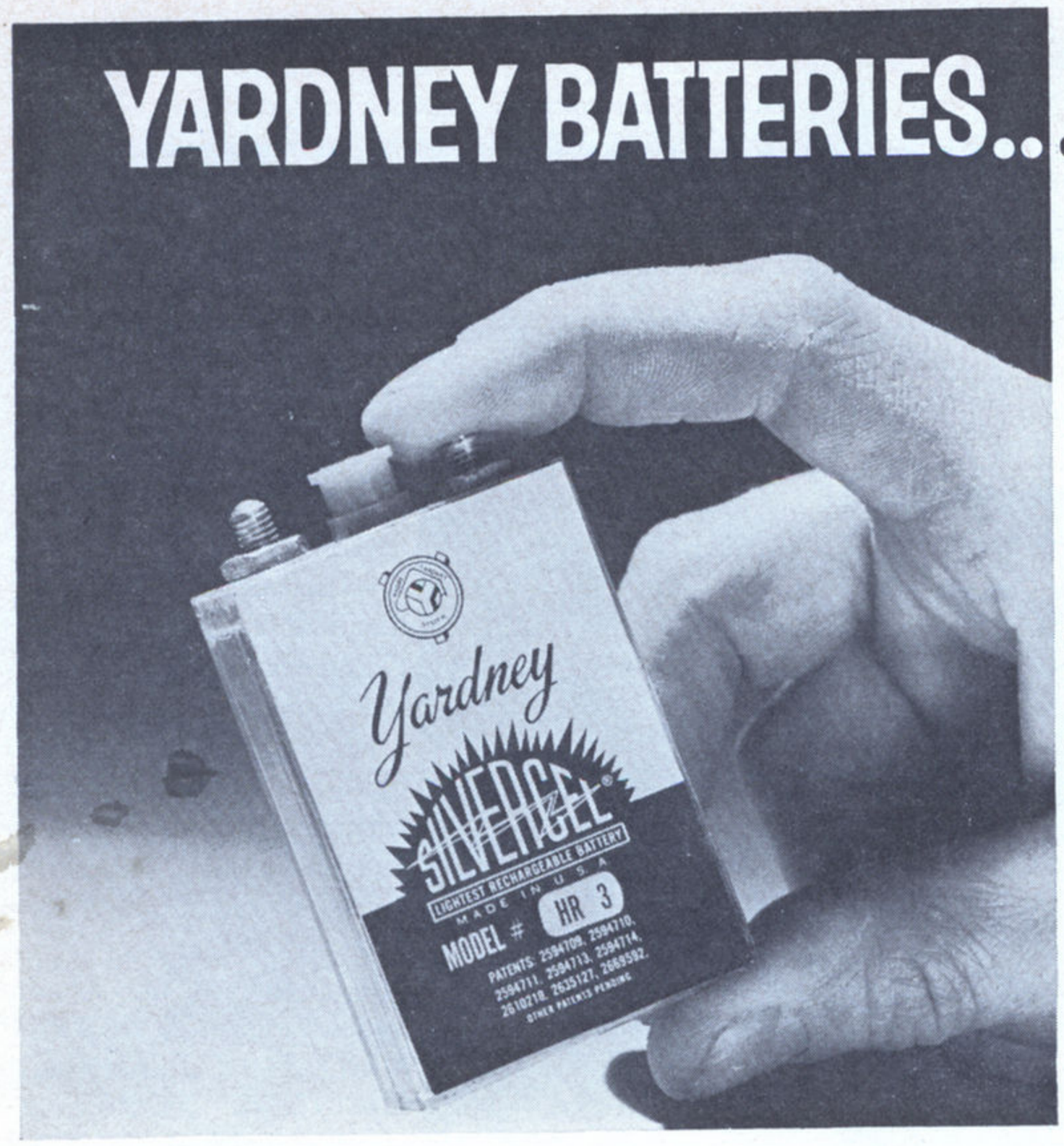

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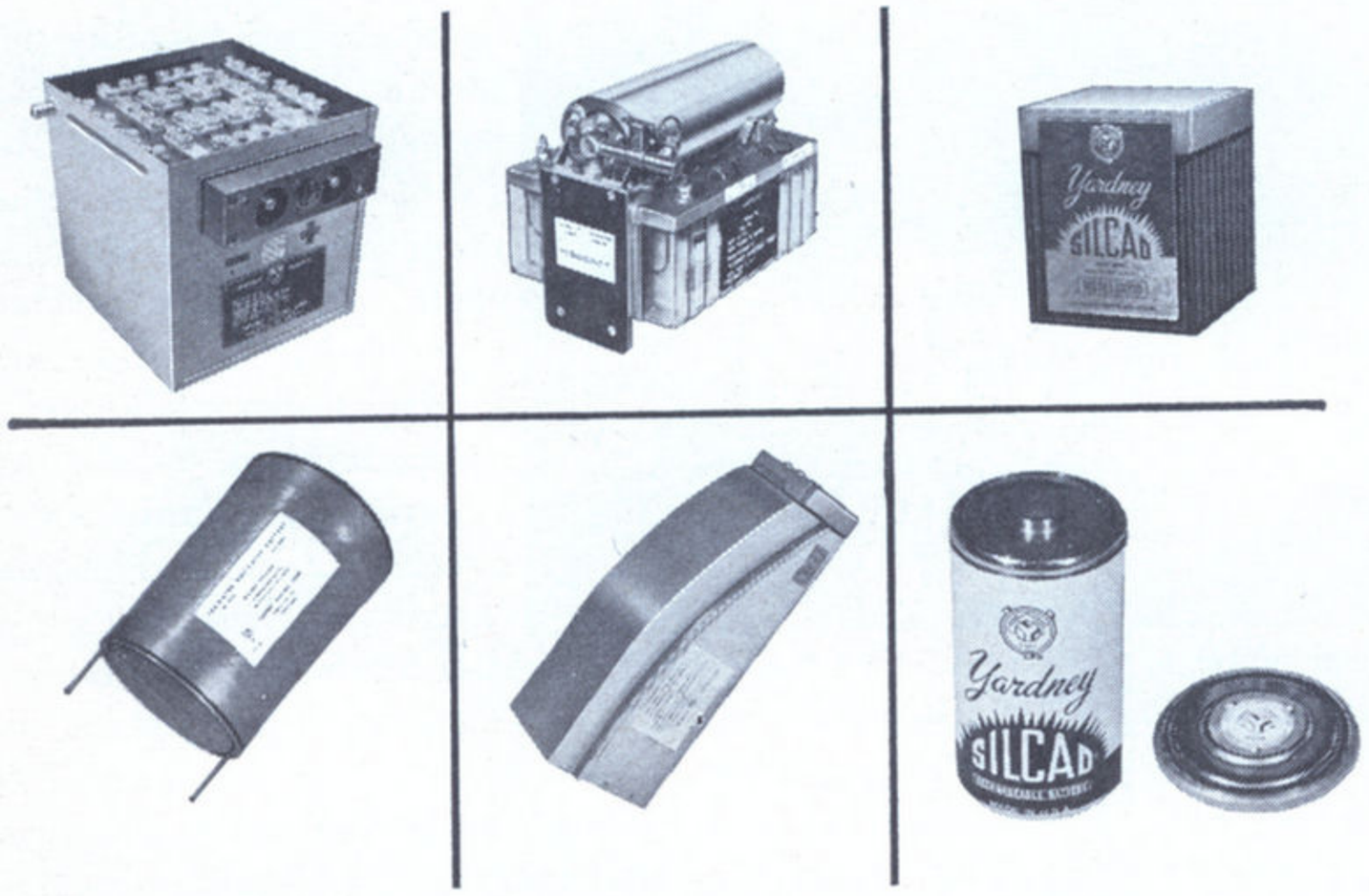

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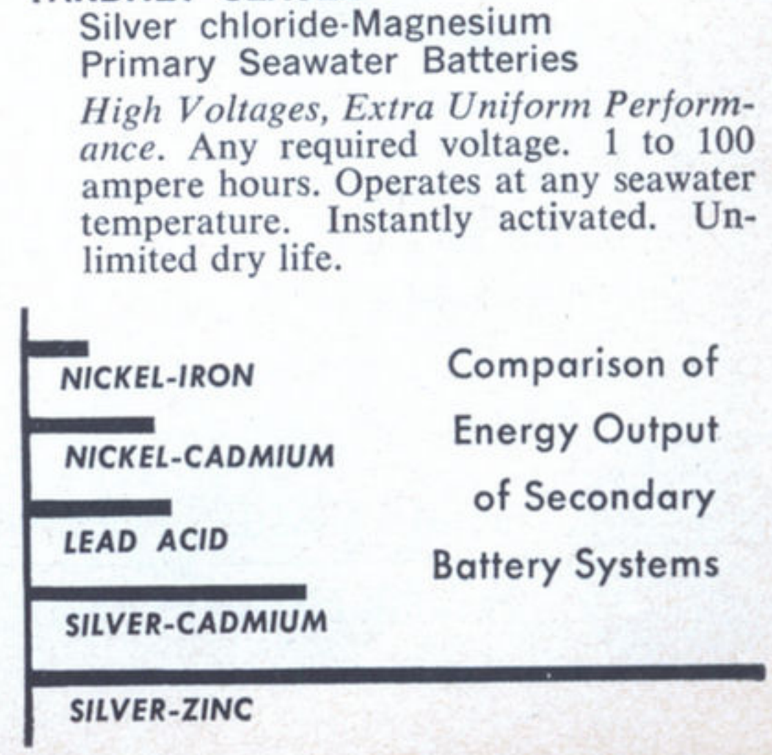

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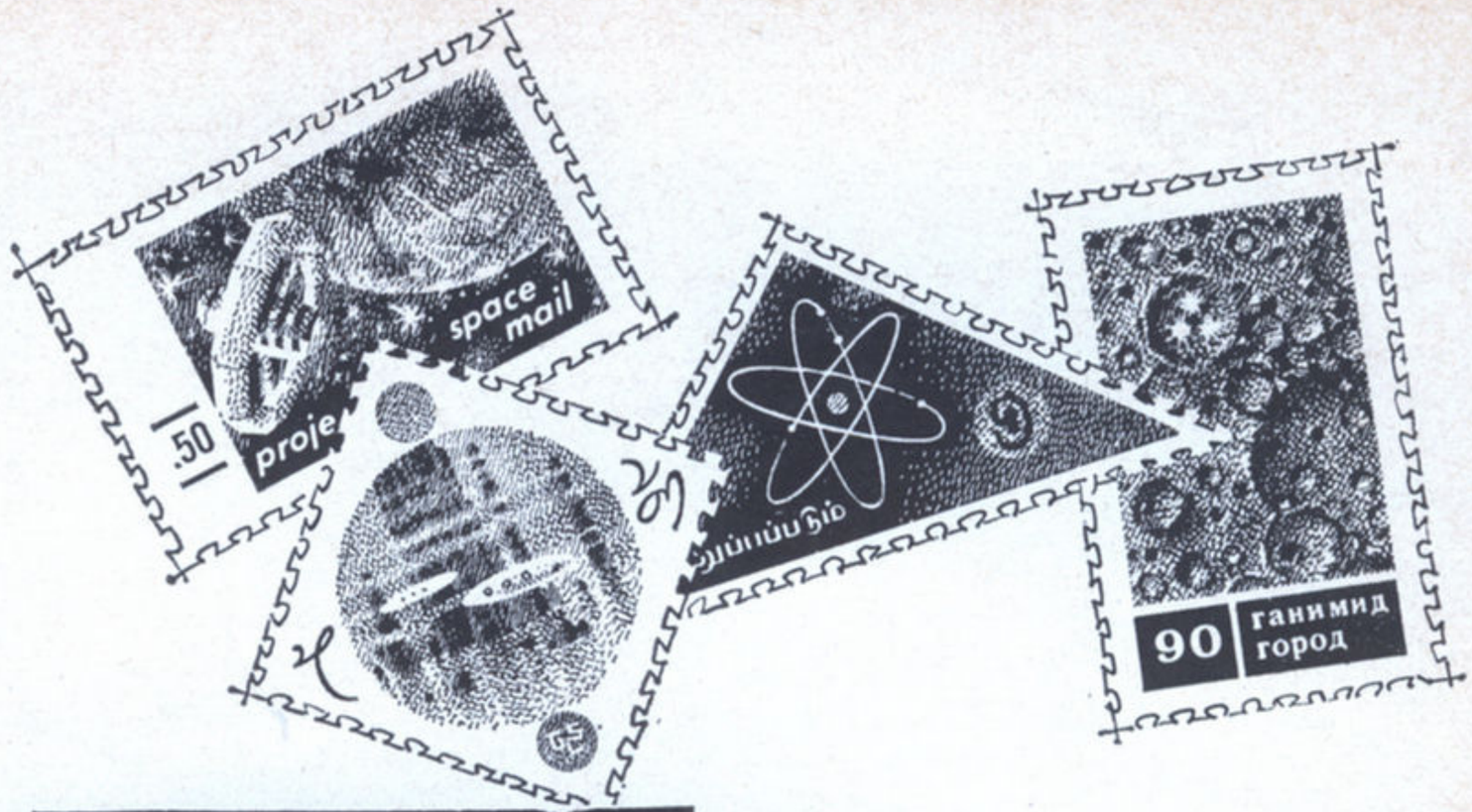

BRASS TACKS

Dear Mr. Campbell:

This letter is primarily a reply to Mr. Jack Slattery's letter. Since I'm not as well acquainted with some of the ideas and scientific matters mentioned in his letter, I will dwell on only that portion of his correspondence which says ". . . And—dear to your heart—the fact that our satellite program has yielded far more information than has the Russian. Don't misunderstand me; I am not saying we have reason to be complacent, but we have no cause to be ashamed."

Now I will agree with Mr. Slattery when he says that on the whole our satellite program is better than the Russians' and ours has yielded more information. But—(a) with all this mass of data, what good has it been to us, spacewise? We're still second place and we're losing ground fast; and (b) the people of the world and—more important—the government leaders of the "neutral" or "uncommitted" nations are chiefly interested in how and what *man* is *doing* in space, not how many satellites are whizzing around their heads.

No, we have no reason to be ashamed of our satellite program. But what about our whole Space Program?

Just for fun, let's list the Big achievements in space and see who accomplished them. (I've tried to keep this list as chronologically correct as possible, but so much has happened that my list may not be correct in the beginning, timewise.)

ACHIEVEMENT	BY WHOM
(a) First satellite to be put in orbit around the Earth.	U.S.S.R.
(b) First satellite to be put in orbit around the Earth, containing a living being.	U.S.S.R.
(c) First Moon Probe to land a package on the Moon.	U.S.S.R.
(d) First Moon Probe to orbit the Moon and photograph pictures of the far side.	U.S.S.R.
(e) Project Farside (which sent the first deep space probes and brought back much useful information.)	U.S.A.
(f) First vehicle to put a man into space.	U.S.S.R.
(g) First vehicle to orbit a man around the Earth.	U.S.S.R.
(h) First nation to orbit two different manned capsules, launched an hour apart, and bring these vehicles into close range of each other.	U.S.S.R.
(i) First successful communication satellite.	U.S.A.
(j) First successful Venus Probe (if you want to consider Mariner II which won't be a complete success until two months from now.)	U.S.A.

And there it stands. What do you mean, Mr. Slattery, when you say ". . . We have no cause to be ashamed."

I don't like to think about the consequences if this trend continues. To put it frankly, John, I'm scared as hell.

And for the Analytical Laboratory: October 1962

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2. . . . After a Few Words . . .
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And, as a parting note: If all the maritime workers of America cease to buy Analog, I'll still be a faithful reader, for you edit the best S-F magazine in the field.

JIM MAUGHAN
211 North Patterson Road,
Olympia, Wisconsin.

■ *Corrections: Project Farside preceded Sputnik I. The Van Allen belts were discovered by American satellites. The first chance people of the world had to see a satellite-launching was American—and when Telstar got going, people of two continents had the chance to see it happen.*

Dear Editor:

Since your astro-meteorologist neglected to mention Arizona for the first few days of October, I note that your Mr. Random predicted hailstorms or winter snow.

On October 2nd, some Arizona temperatures were Yuma 106°, Phoenix 97°, Tucson 92° at Airport and 96° at University of Arizona.

USWB merely reported 106° at Yuma, and didn't mention whether there was any snow.

CARL PAYNE TOBEY
6562 E. Calle Dened
Tucson, Arizona.

■ *Well, that's the chance you take when you rely on Random.*

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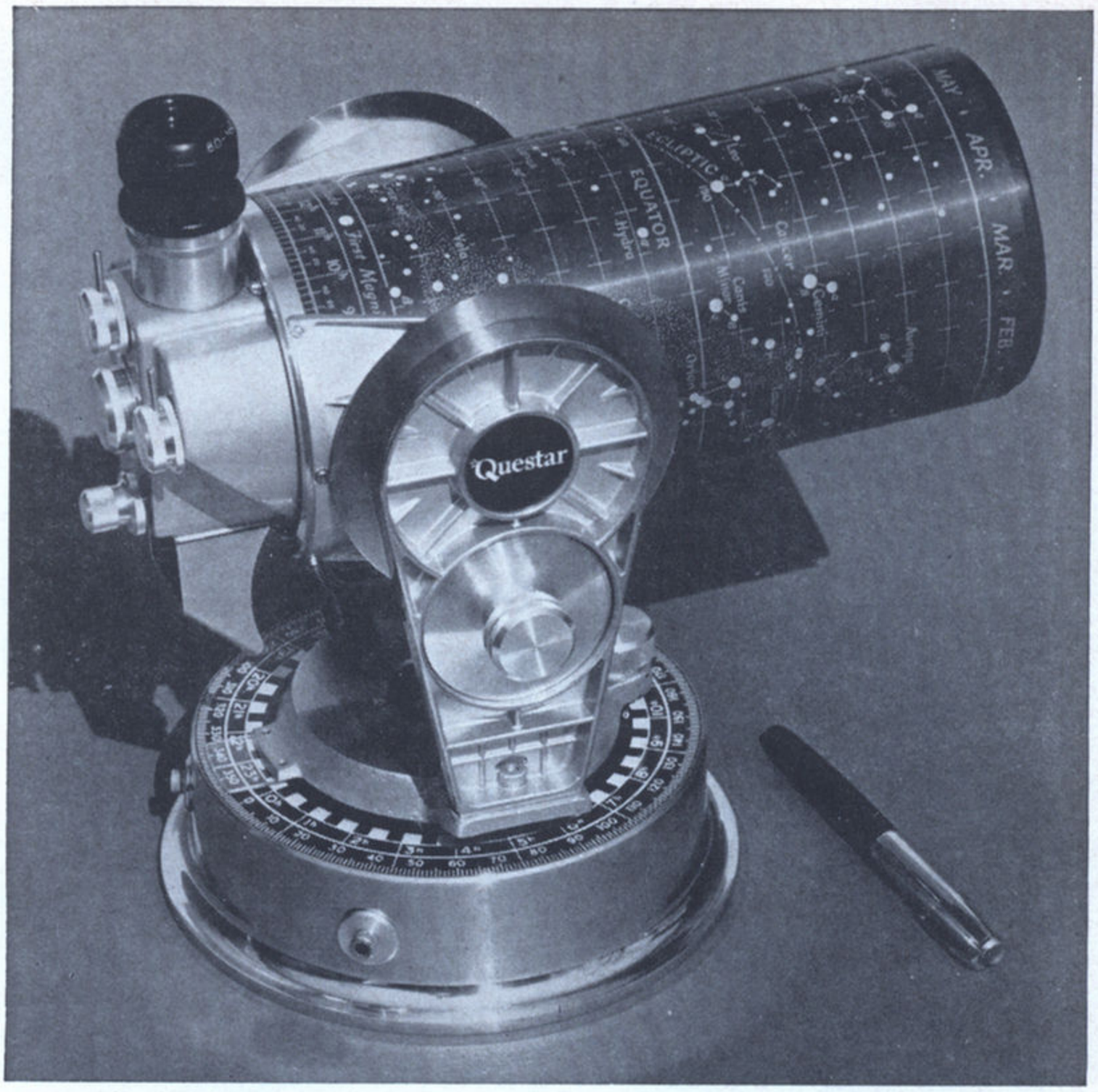

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Questar introduced the new optics to the world in this daringly short design in May, 1954, after 8 years of research and development. Since then its performance has astonished everyone, including us who make it. It has firmly established the superfine telescope on a new level of serious respect. And it has made this company not only the world's largest manufacturer of short catadioptric telescopes but the only maker of f/2 Cassegrain high-power optical systems.

These paragraphs open the 23-page Questar booklet which is illustrated by some astonishing photographs, showing 1- and 2-second detail, that let the instrument's high performance speak for itself. May we send you a copy? Questar costs only $995 in English fitted leather case and is sold only direct at one factory price.

QUESTAR

Box 70 New Hope, Pennsylvania

EDITORIAL

NO ACCEPTABLE EXPERIMENT

One thing about running this magazine—I can count on getting lots of help and suggestions from the readers on any problem brought up in these pages. Not only via mail but by personal visits to my office, and by chance encounters anywhere.

The problem of experimental demonstration of the validity of the dowsing rods has come up many times—and gradually through the many suggestions and comments, some pattern began to emerge. I believe I can, now, make a precise statement of the problem—and present you readers with a real dilly of a problem for solution as a result!

It appears now that there is not, *and never can be* an acceptable experiment demonstrating the function of dowsing rods within the strict requirements of the modern scientific method. Literally, that *no possible scientific experiment*—within the limitations defined by modern science—is, or ever will be, possible.

The reason is fairly simple—and perhaps can best be illustrated by the account of an incident of an African zoological collecting expedition of some years ago.

One of the members of the expedition had gone off into the "brush" alone—and two leopards jumped him simultaneously. It seems that chimpanzees are a more-or-less standard item of diet for leopards, and they apparently decided the hunter was just a slightly oversize chimp.

The hunter returned to camp somewhat later definitely clawed up here and there . . . but with two dead leopards. Very definitely the man must have been considerable of a *man*—but his defensive technique was quite simple. He had beaten leopard #2 to death by picking up leopard #1 and using it as a flail.

The phenomenal violence this man demonstrated is a familiar type of behavior to psychologists and doctors—they've got a name for it. It's called "hysterical strength"; the old Norse used to call that sort of thing, when it appeared in battle, "berserker rage."

If you are approximately normal, your muscles are, right now, strong

Continued on page 94



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NATURAL RESOURCES IN SPACE

There is, of course,
a limit to the natural resources available on any planet.
But when you have a solar system for resources . . . it ceases
to be a matter of quantity, but of availability!

by JOHN W. CAMPBELL



Courtesy of the
American Museum of Natural History

There is a tale of an old prospector who showed up at the office of a mining syndicate with some fabulous ore samples. His samples said he'd found an enormously rich lode. His story was that it was an extensive body. And the price he wanted for it was so low that the syndicate people were decidedly uneasy. So they sent their own mining engineer to investigate . . .

One week went by . . . two weeks . . . finally, after three and a half weeks, a telegram came from him:

ORE THERE. LOTS OF IT. SEND PACK TRAIN OF BALD EAGLES TO CARRY IT OUT.

The value of any resource is a function of accessibility—and often that factor is the overriding consideration. That old mining story is, of course, clearly stamped with the problems of an earlier age. The modern engineer would simply send in a proposal concerning the best way to install helicopter facilities, and an analysis of whether it would be cheaper to fly in processing equipment to the mining area, or to fly the raw ore out. It's still acknowledging that sometimes it takes something with the abilities of a bald eagle to get there—the only difference is that we now expect to use low-cost, high-capacity mechanical "bald eagles"—and the once useless ore-body becomes an asset.

The United States is planning on spending forty billion dollars minimum on development of space technology; it takes more than a pack train of bald eagles to establish a manned base on the Moon. I do not, myself, believe that rocket technol-

Fig. 1. This meteorite—at the American Museum-Hayden Planetarium in New York—is the best view we can get, as of now, of an asteroid. A chunk of the finest nickel-steel.

ogy is a useful, economically sound method of space transport; balloons weren't the right answer to air transport, but their development was crucial to the development of practical air-borne commerce.

Today, the idea that anything *but* rockets can ever be used in space is roundly rejected by NASA and other scientific agencies—but one of the everlasting problems of human organizations is the tendency to Know For Sure what can't ever, possibly, be done. For example, one of the best reference textbooks on general astronomy I've found was written by Dr. Forest Ray Moulton, in 1931. In his "Astronomy," on page 296, he says:

> "Many a story has been written of some miraculous journey to the Moon or Mars. These romances have found eager readers in every generation, for there are few who have not wished they might sometimes fly away from the Earth and visit those distant worlds. There is no hope, however, that such a wish will ever be realized. The difficulty of escaping Earth's gravity is insuperable; the problem of directing a journey through the celestial spaces, and that of descending gently to rest on the surface of another gravitating body are equally formidable. Only those unfamiliar with the physical factors involved believe that such adventures will ever pass beyond the realms of fancy."

Dr. Moulton was one of the world's foremost astrophysicists; he was writing several years after Dr. Robert Goddard's successful tests of early liquid-fueled rockets, and years after Oberth's mathematical analysis of the possibilities and problems of interplanetary rocket flight.

As of 1931, when I got that book, I found it most helpful in working out science-fiction ideas of precisely the type Dr. Moulton was so unqualifiedly certain had "no hope that they would . . . ever . . . be realized."

Some individuals quite familiar with the physical factors involved have made those adventures quite real; the accessibility of space is no longer in the "absolutely no, never, no hope!" class.

If we're going to develop improved means of access—isn't it worth doing a little analysis as to what it is we'll be gaining access to? When we do achieve our super-bald-eagle pack-trains, what ores, where, will make their employment worth while?

Without knowing what the precise mechanism of economically practical space-vehicles may be, we can still make some basic analyses. It wasn't—back in the '40s—necessary to know what kind of rocket fuels might be developed, to be able to lay out some picture of the basics of rocket astrogation. The general pattern of accessibility of the resources of space can be studied today, in some degree, without need to know the precise mechanism of the spacedrives yet to be developed.

First, we need to recognize that all of human transport experience, throughout history, has been based on what can be reasonably accurately described as an "isopotential, viscous surface." Marine transportation is almost exactly that; land transport very seldom moves so much as one mile vertically—and when it does, the costs tend to go up as a high exponent of the altitude attained. Even air transport is essentially isopotential since it starts and ends at nearly the same altitude normally, and planes rise only to reduce the viscous drag of the atmosphere.

The only form of transport so far developed which does not fit that category is the ICBM; it escapes the viscous drag of the Earth's surface layers by rising sufficiently into space to be free of friction.

All forms of transportation—marine, rail, road, or air—have commonly been compared in terms of "ton-miles" of cargo movement, which is related directly to the viscous drag problem. Distance is important *only because of viscous drag.*

Any automobile driver is acutely aware that distance per se means very little in going from Point A to Point B; if Route One calls for a five-mile drive, while Route Two requires twelve miles, the distance figures mean nothing if Route One is through the heart of a major city, while Route Two is all along a limited access freeway.

Space transport will be freed entirely of the viscous drag problem; space is, instead of an isopotential viscous system, a frictionless field-force system. Accessibility will be determined by field-forces, not by mileages. Occasionally, viscous-drag situations will be markedly useful, and deliberately sought out. (Viscous drag makes a wonderfully cheap and convenient way of achieving a soft landing for a capsule returning to Earth's surface, for instance. Parachutes are a lot cheaper than rocket power!)

A simple, and relatively immediate example of how these factors work out might arise this way:

Assume that a reasonably good space-drive mechanism has been developed to engineering application, and has been in use about five years. Some bases have now been established on various bodies in the Solar System—Mars, Venus, the Moon, perhaps one of the asteroids, and one of Jupiter's moons.

The Lunar Observatory is under construction; they need fifty tons of

water to establish a hydroponic closed-ecological system for the Observatory, and two hundred fifty tons for making concrete, et cetera.

Should this supply of water be brought from Mars, or just lifted up from Lake Superior or Lake Titicaca?

Why, obviously bringing water from desiccated little Mars, across 100,000,000 or more miles of space would be nonsense!

Oh . . . it would? Are you sure?

A complicating factor in our thinking is that all historical transport has been battling not only the viscous drag of Earth's surface, but also the unpredictables of wind, wave, hill and valley, traffic laws, bandits, pirates, and the narrowness of roadbeds.

In space, instead of following the Rules of the Road, cargoes follow the Laws of Celestial Mechanics; the latter are markedly more reliable.

It would take over a year to orbit a cargo of water from Mars to Luna . . . but since it will most certainly take more than a year to construct that Observatory, that time is nothing! It's a simple matter of planning.

And the cargo doesn't need a pilot; it only needs to be injected in orbit at point A, and retrieved from orbit at point B. In the meantime, it can be put in the control of Celestial Mechanics, with absolute confidence. A small solar-powered beacon transmitter can ride along, reporting with mindless fidelity what's happening.

But why get the water from desiccated Mars anyway?

Because it's cheaper, of course—in a force field, friction-free transport system! Mars has one third Earth's surface gravity—which means that the maximum intensity of force needed to break free of the planet's surface with a 600-ton mass—allowing 300 tons of cargo, plus 300 tons of container and lift-ship—will require only a *200-ton force.* This means a smaller, cheaper lift-ship can do the job—a lift-ship that might be available several years sooner than the 600-plus ton ship required to break free of Earth's surface.

Next, Mars' mass is roughly one-tenth of Earth's; the surface gravity is one-third only because Mars' surface is closer to the center of Mars. But that one-tenth factor is critical in determining the *total energy needed to escape from Mars' gravitational field.*

Note that these are two separate factors: the *maximum intensity required* is a function of the surface gravity, and is critical in determining the *lifting force* required. The *gravitational energy potential* is a function of the *mass of the planet* and determines the *total energy* required to escape that planet's field.

Neptune, for instance, has a surface gravity almost exactly equal to Earth's—0.98 *g.* But that's because Neptune's diameter is 33,000 miles, and it's surface just about four times as far from its center—16,000 miles—as Earth's surface is from Earth's center—4,000 miles. Neptune's *mass* is also just about sixteen times Earth's; the inverse-square-law of gravity makes the resultant surface gravity of the two almost exactly equal.

However—Neptune's sixteen-times greater mass means that Neptune's gravitational grip falls off to quarter-strength only when you've clawed your way up 16,000 miles from the surface; Earth's grip has dropped to a quarter when you've climbed the first 4,000 miles. It takes far more energy to escape a massive planet, even if the surface gravity is no greater than Earth's.

This boils down to a basic principle of accessibility in space-transport: space is more accessible from a low-mass planet's surface. Space is least accessible from Jupiter's surface.

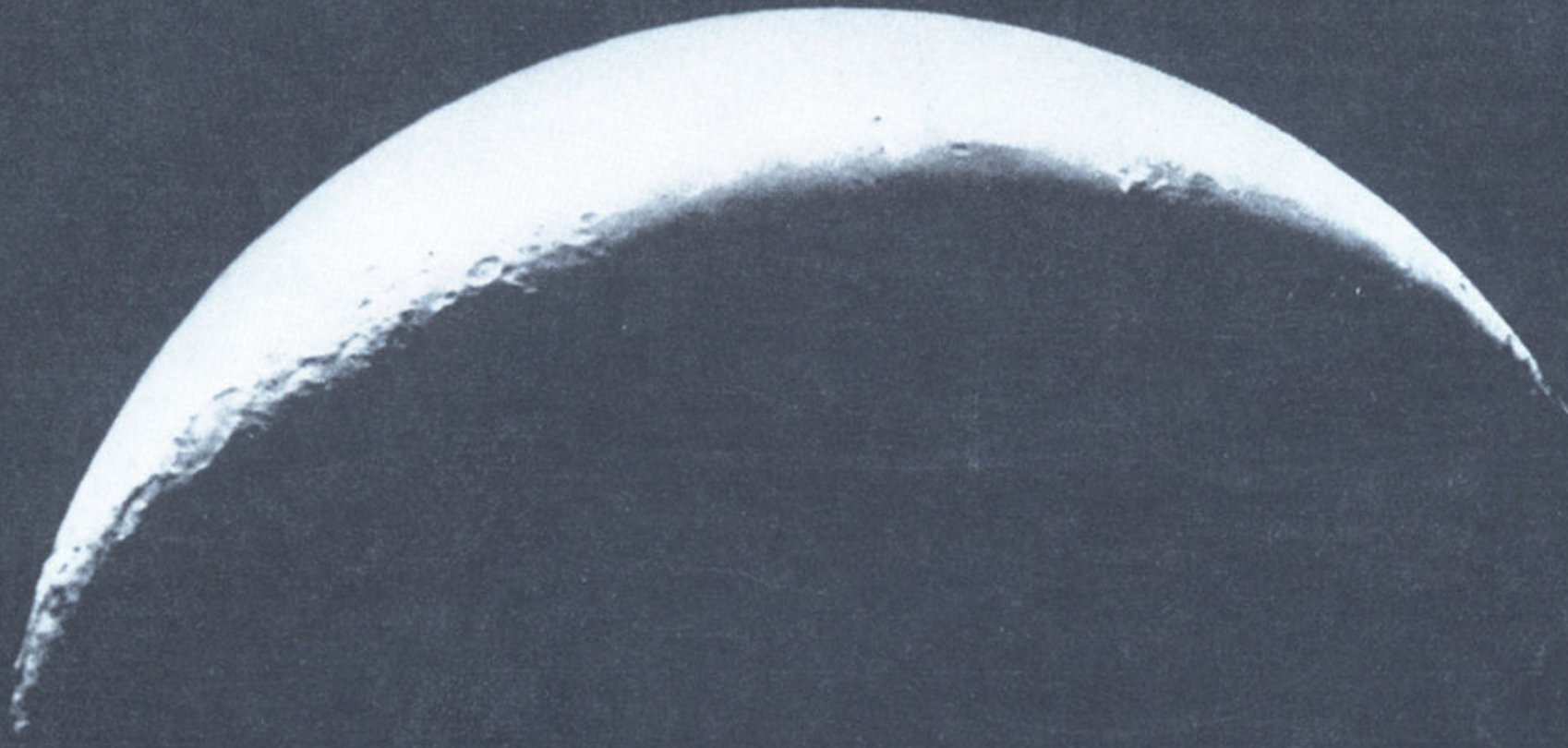
In going from space to a planet's surface, viscous drag can be useful—provided you want to make a one-way trip, it's particularly useful! Landing a cargo on Venus should be greatly facilitated by Venus' dense atmosphere; getting it off again would be entirely different, of course. But if you wanted to ship one hundred tons of shaped steel forms, to build a base on the surface of Venus, you'd be planning a one-way trip for that cargo. It would be fairly cheap to land it there.

In addition to planetary fields, however, there is the great, dominating field of the Sun; in going from Mars to Earth, you're going toward the Sun, and it would be a "down-hill pull." In lowering a cargo to Venus, you'd not only be falling into Venus' own planetary gravity field—which is so nearly equal to Earth's as to make it practical to think of the two as identical—but also into the Sun's field. And that field's a real dilly!

Fortunately, the Sun's field, while of immense total magnitude—the Sun's field can control particles in orbits extending out as much as four or five light-years!—is not a very "steep" field. The intensity, at all planetary distances, is so low that low-intensity drives can handle it readily—and the Sun itself will always supply plenty of power to do the work!

Since gravitational intensity and light-intensity both follow an inverse-square law, any device which

Fig. 2. The big crescent doesn't need to be identified; the little one is Venus, still the least-understood planet of the System—with the single exception of Pluto, the remotest. Yet Venus is the nearest.
Yerkes Observatory



NATURAL RESOURCES



Lick Observatory

Fig. 3. The best maps of Mars are better than the best photographs—and neither is much good! But the evidence available suggests that Mars' natural resources won't be very useful.

can pick up enough solar energy to overcome the Sun's gravity at any one planet's distance, can pick up enough energy to overcome solar gravity at any planet's distance. Simply because both light and gravity vary at the same rate.

(You can't say "at any distance," because it's slightly doubtful that any mechanism we could make would function well at a distance of, say, 100,000 miles from the Sun's surface. There are engineering limits, even though the theoretical limits don't intrude!)

The accessibility of the planets, however, is definitely limited by their deep and intense gravitational wells. As sources of raw materials, they have some of the disadvantages of the fabled monkey-traps that men have been using for millennia. The monkey can readily get his hand into the neck of the jar, but he can't get his closed fist out again, with the prize he reached in for.

Getting water from Mars would be easier than getting it from Earth . . . but not really easy!

Yerkes Observatory

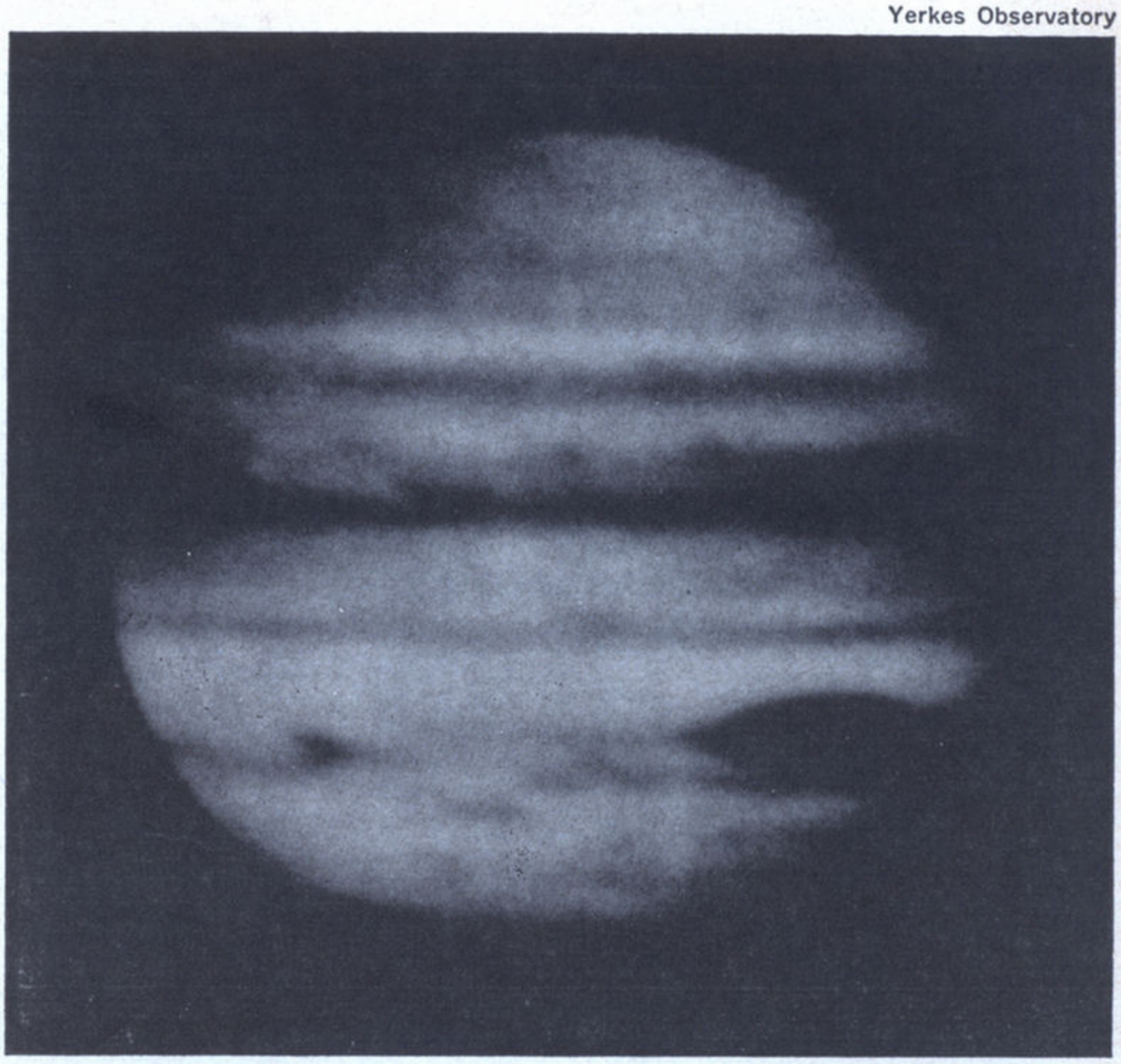


Fig. 4. The Sun is not *at the center of gravity of the Solar System; this banded gas-giant planet, Jupiter, is massive enough to throw even Sol around in circles! And as a source of the light element gases, it's far more accessible than the Sun!*

It may not be necessary, however, to go clear down to the surface of the planets to get resources. For one thing, we've grown up on the surface of a well-endowed planet, and we've found, during the last few millennia, that getting the natural resources out of that surface is not always so darned easy. "Accessibility" has to include the problem of overlying layers of massive rock, and/or water pressure, and/or unfriendly life forms—human or animal.

Those elements and compounds which are naturally stable in interplanetary space in solid form are readily available—far more accessible in space than on any planet. The nickle-iron meteors indicate the probable composition of vast tonnages of material in the asteroid belt. Nearly all the metallic elements will, almost certainly, be found in either the nickel-iron, or the stony asteroid masses. That metal will be cheaper—more accessible in space—than any metal from Earth's industries. Once any reasonable form of transportation for space is developed, it will be almost certain to grow *in space* by reason of the cheaply available metal waiting for use. It would be far cheaper to construct an artificial space-station orbiting Earth by hauling metal, with very low energy expenditure, from the asteroid belt, than building the enormously powerful lift-ships needed to boost equivalent metal up against Earth's surface gravity.

Raw energy, in space, is extremely cheap and abundant, of course. The great problem of using Solar energy on any planet is that the Sun is not always visible due to planet rotation, which reduces efficiency, and the necessary energy-concentrating structures are wracked by gravity. Building a mirror half a mile in diameter, here on Earth, is utterly out of the question. Might be possible as a technical feat . . . but the cost would be fantastic.

Building a half-mile diameter mirror in space would involve only blowing a plastic bubble and aluminizing it. Energy supplies in space would be cheap, even at Jupiter's distance from the Sun. Most of the high cost of space power supplies in our present programs is due to the fact that we have to build them here on Earth, pack them for shipment in a ridiculously small

vehicle, and rig them to unfold automatically in space. If we were out in space, it would be cheap and simple.

However, there is one class of resource in space that Earth and all the inner planets is decidedly short on; the light gaseous elements.

Our ignorance as to how planets formed, and whence our atmosphere came, is almost complete. All geophysical and astrophysical data so far available indicates that the Earth when first formed had *no* atmosphere whatever. The proto-Earth was too small, and too hot, to retain any gases lighter than something like argon. What atmosphere we have now appears to have resulted from gases originally absorbed in the rocky and metallic meteorlike particles that gradually fell together to form the planet. Gases are still working their way out from this inner mass—and the extent of our ignorance on the importance of that, or the actual quantities released during geologic history, is phenomenal. There are strong reasons to suspect that *more than seventy-five per cent of the Earth's oceans have been formed during the last 200,000,000 years!*

We very definitely do *not* know the sources of our own atmosphere. But we definitely do know that this planet is extremely under-supplied with all the light gaseous elements. Hydrogen, of course, is practically entirely missing—in terms of the average analysis of matter in the Universe. Stars generally, and our Sun, are a sort of "commercially pure grade" of hydrogen-helium mixture. They run about ninety-eight per cent pure H-He mixture, with between one and two per cent of all other elements combined.

Earth lost practically all its hydrogen, and all its helium; a minute fraction of the normally vastly dominant hydrogen was retained in chemical combinations such as the hydrides of oxygen(water), carbon (methane and other hydrocarbons) and nitrogen(ammonia). Since helium doesn't form combinations* Earth lost all its helium.

Evidently Earth's still losing helium at a fairly good rate, too; in the time since Earth solidified, just about one half of all the U-238 in the original planet has broken down to lead, shedding some eight atoms of helium per atom of lead produced on the way. Considering the tonnage of uranium actually present in Earth's rocks . . . that's a lot of helium we've lost!

The two major limiting factors in the growth of living creatures on Earth—the limiting food-supply problem—have been the shortage of phosphorus and the shortage of fixed nitrogen. The Antarctic Ocean seems, offhand, like a most unpromising area of the planet for living things—yet it has perhaps the highest population density of any area of the planet! The reason is that the deep water undercurrents there bring quantities of phosphorus and nitrate rich bottom waters up into the life-zone, where photosynthetic organisms can both get the needed minerals and the necessary sunlight . . . and from that point, the whole life-chain from microscopic plankton to 100-ton blue whales takes off.

Man's industrial development has, more and more, found the importance of nitrogen compounds increasing. Nitrogenous fertilizers were the primary use of course, and still are and probably will be for some time . . . but synthetic plastics, and a thousand other things are beginning to involve nitrogen compounds.

A century ago, Jules Verne pointed out that the use of sulfuric acid was so basic in technical industry that the technological standing of a nation could be determined by simply studying one statistic—the consumption of sulfuric acid. For more than a century, sulfuric acid has been THE industrial chemical; it's used in one stage or another for producing practically every other industrial product.

But in recent years, in the United States in particular, a second chemical has been overtaking sulfuric acid—ammonia. The consumption of ammonia has risen fantastically, and is continuing, because of the increasing use of the nitrogen compounds which, industrially, are usually produced from ammonia as a starting point. Ammonia itself is now being used directly, and in huge quantities, as a fertilizer, being injected directly, as the liquefied gas, into the soil.

Petroleum is not ordinarily classified as an "industrial chemical" of course—but if it were, it would, quite clearly, outrank even sulfuric acid.

In effect, the Earth has been short-changed on the light elements, particularly the gaseous ones, hydrogen, helium, and nitrogen. Oxygen we have, because it was locked up in nonvolatile oxides. We're short of neon, but can struggle along without it fairly happily.

But all the outer planets—Jupiter, Saturn, Uranus and Neptune—are in quite a different position! We'll probably never have any slightest desire to mine Jupiter's deep-buried rocks for metals; the light planets are far more accessible. But Jupiter's atmosphere. . . !

One of the recent "educated guesses" as to the construction of Jupiter—be it remembered we don't know why Earth has mountain ranges yet, nor whether conti-

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* So far as we know now! Since xenon tetrafluoride crystals were made by the outlandishly simple technique of putting the two gases together in a can and "bake in a hot oven for an hour or until done," the inertness of inert gases is going to be open to further discussion!

nents do drift, so our ideas on Jupiter's construction might be a little bit uncertain—suggests that Jupiter has an "atmosphere" some 18,000 miles deep. That is, there is that depth of frozen or pressure-solidified matter that would, normally, be gaseous, composed almost entirely of hydrogen and helium, with ice, frozen ammonia, and methane as impurities.

Spectroscopic evidence indicates that the visible "surface" of Jupiter —i.e., the top of the cloud-layer that covers the planet—is composed largely of ammonia crystals floating in an atmosphere dominated by hydrogen, helium, and methane.

At the temperature of Jupiter's upper cloud levels—approximately —135°C—hydrogen, helium, and methane gases are highly transparent. Water vapor would presumably be in extremely short supply at that elevation, under those temperature conditions. And the spectrum of Jupiter is dominated by enormously strong ammonia absorption bands.

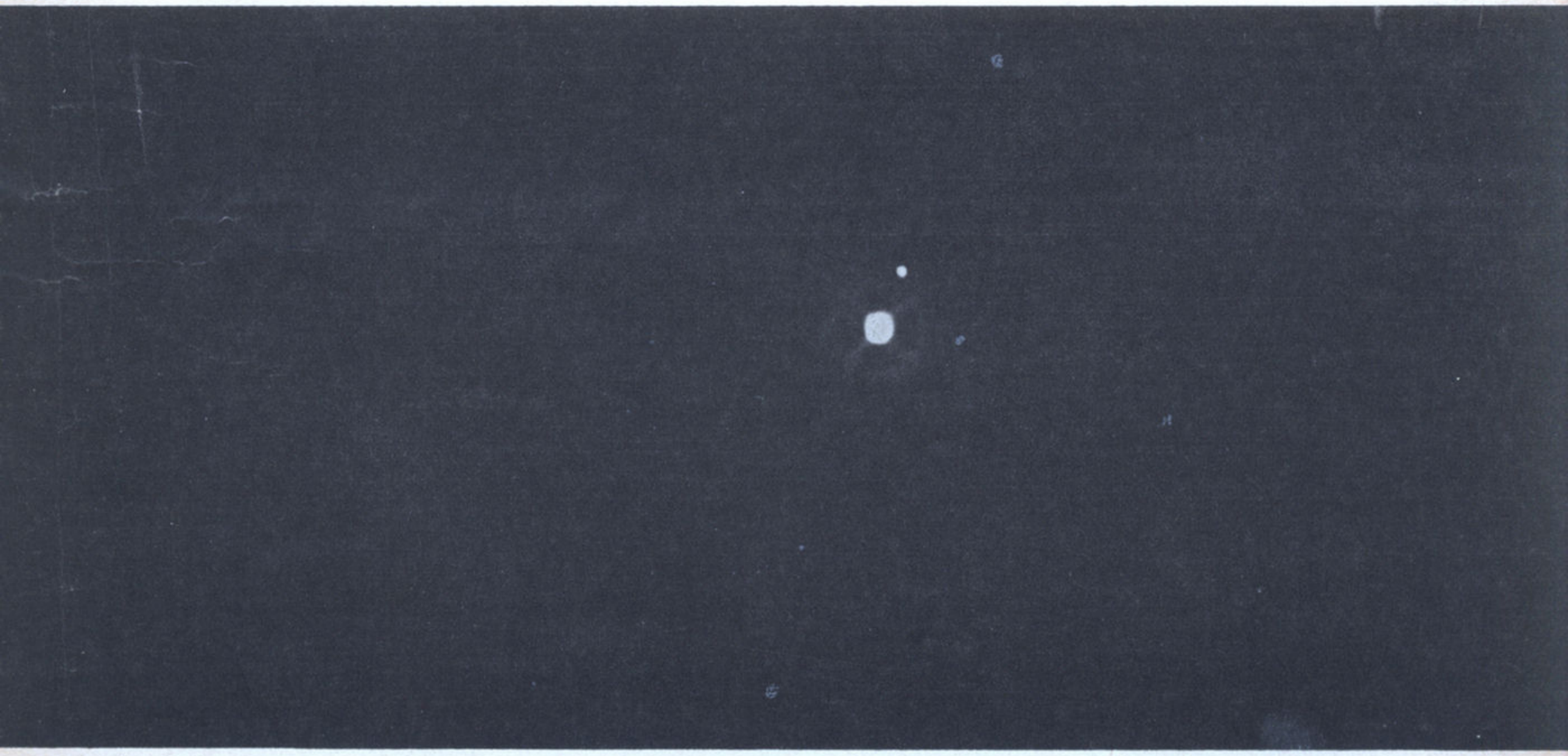
Saturn, also, shows strong ammonia bands, though markedly less than Jupiter. The temperature is getting a little cold even for ammonia vapor out at Saturn's distance.

Uranus and Neptune both show traces of ammonia—but there, the methane bands dominate. Ammonia freezes at —78°C, and methane at —184°C.

The spectroscope can't tell us much about the hydrogen and helium present in the atmospheres of the outer planets; we're working, of course, with reflected sunlight—and sunlight already has hydrogen and helium bands impressed on it before it leaves the Sun.

Moreover, hydrogen and helium are both very transparent at those temperatures and pressures existent above the cloud layers, and are not going to have much effect on the spectroscope. But there can be no question but that the atmosphere of Saturn is mostly hydrogen; the whole planet has an average density of 0.73 g/c.c. which can be accounted for only in terms of huge percentages of hydrogen and helium. Nothing else could have so low a density under the pressures a few hundred miles down.

(Incidentally, Saturn's mass is ninety-five times Earth's and yet, because of its phenomenally low density, the gravity at the visible surface is only one point two times Earth's! However, that huge mass means that escape from Saturn is nearly one hundred times as difficult as escape from Earth.)



Yerkes Observatory

Fig. 5. Neptune with its giant moon, Triton, are extremely remote in terms of distance—yet Neptune is more accessible, so far as energy-required goes, than Mercury!

NATURAL RESOURCES

While Earth and the minor planets, then, can supply us with non-volatile elements—the atmospheres of the giant outer planets are the Solar System's great natural reserve of the lightest elements.

Ammonia, plentiful beyond comprehension in Jupiter's stupendous atmosphere, is a chemical Earth needs in quantity—and which any sealed ecological system such as the proposed Lunar Observatory would need.

Methane, even more plentiful apparently, is the first of the hydrocarbon family—the starting point of petroleum hydrocarbons. And currently, Earth shows definite signs of running short of adequate supplies of hydrocarbon stocks not merely as fuels, but as chemical synthesis basics.

Methane can readily be stripped of some of its hydrogen by modern industrial chemical methods, yielding progressively higher members of the hydrocarbon series, and/or various unsaturated or cyclic hydrocarbons, such as acetylene, benzene, ethylene, and their innumerable industrial consequents of the plastics group.

Hydrogen we wouldn't need particularly; we'd get plenty of that in the process of collecting NH_3 and CH_4—but helium is something else again.

Helium is an absolutely unique element; it has unique and invaluable properties. And a major reason why it hasn't been exploited very widely is that there isn't enough to exploit.

Helium has the lowest boiling point of anything in the universe, within 4° of absolute zero.

Liquid helium has properties nothing else even vaguely approaches. It conducts heat two hundred times better than solid copper. Its heat conductivity is so fantastically high that it can't be made to "boil" in the sense of bubbling, as water does, when a flask of the liquid is put over a heat source. Bubbling represents local heating such that the bottom of the liquid is hotter than the top, causing gas to form. In helium, heat can't be fed into the liquid faster than the liquid conducts it to the free surface and evaporates!

Moreover, liquid helium has a viscosity of precisely zero. And if it has surface tension, it's so low it doesn't matter. The result is that liquid helium can flow happily and freely through a vacuum-tight joint! It's the "wettest," coldest, fluid-est, heat-conducting-est stuff in the universe, and the second lightest liquid. (Liquid hydrogen's a little lighter.)

The technical uses of helium are manifold—and rigidly limited by the fact of its extreme rarity in the Earth's mass. The use of liquid helium as a coolant makes possible the ultrasensitive maser amplifiers used in all our most effective low-noise microwave receivers. Liquid helium coolant makes possible the use of cryotron ultraminiature switching units that promise computers with densities of tens of millions of relay units per cubic inch. (The incredible wetting and flowing power of liquid helium, plus its terrific heat-conductivity, are essential as well as its naturally low temperature.)

Helium is also needed in many industrial processes—and used, despite its rarity and high cost.

What percentage of the atmospheres of the giant planets is helium we don't know—but it should, if anything, be higher than the "cosmic abundance" ratio with respect to hydrogen, since the immense gravitational field of Jupiter would retain helium even more efficiently than hydrogen. The gas envelopes of Uranus and Neptune —lighter planets than Jupiter—at their low temperatures would probably be a mixture of the three extremely-low-temperature gases; helium (boiling point —269°C), hydrogen (b.p. —253°C) and neon (b.p. —246°C.) laced with vapors of nitrogen (b.p. —196°C.) and methane (b.p. —161°C).

Oxygen, boiling at —183°C., might exist there on the basis of physics alone—but free oxygen in an atmosphere heavily based on hydrogen, with methane additions, would not last long, even at those temperatures. Distant as they are from the Sun, still solar ultraviolet and soft X rays do reach the outer planets; such hard radiation would cause any oxygen present to react to form water, and drop out.

Gerard Kuiper, in his book "The Atmospheres of the Earth and the Planets," has a section on a survey of the planetary atmospheres—with some highly interesting comments on the nature of the rings of Saturn, and the possible constitution of the Saturnian satellites.

At Saturn's distance from the Sun, the temperature of radiation-equilibrium with space is so low that the vapor pressure of a piece of frosted ice would be, effectively, zero. Ice would be a perfectly stable "rock" in space at that distance.

It's long since been pointed out that Saturn's rings are within Roche's Limit for a satellite of the planet—that a satellite that close to the planet would be broken up by tidal stresses. However . . . one point is usually skipped when that statement is made; Roche's Limit is a function of the *densities* of primary and satellite. Saturn, with a density of only 0.7 or so, is actually lighter than hydrocarbons such as gasoline; with a planet density that low, a *dense satellite would not be broken up* at the distance of the outer rings. (A satellite with very high density would be stable much closer to Saturn.)

Continued on page 90



FRIGID FRACAS

First of two parts.
In any status-hungry culture, the level a man is assigned depends on what people think he is—not on what he is.
And that, of course, means that only the deliberately phony has real status!

by MACK REYNOLDS

ILLUSTRATED BY JOHN SCHOENHERR

I

In other eras he might have been described as swacked, stewed, stoned, smashed, crocked, cockeyed, soused, shellacked, polluted, potted, tanked, lit, stinko, pie-eyed, three sheets in the wind, or simply drunk.

In his own time, Major Joseph Mauser, Category Military, Mid-Middle Caste, was drenched.

Or at least rapidly getting there.

He wasn't happy about it. It wasn't that kind of a binge.

He lowered one eyelid and concentrated on the list of potables offered by the auto-bar. He'd decided earlier in the game that it would be a physical impossibility to get through the whole list but he was making a strong attempt on a representative of each subdivision. He'd had a cocktail, a highball, a sour, a flip, a punch and a julep. He wagged forth a finger to dial a fizz, a Sloe Gin Fizz.

Joe Mauser occupied a small table in a corner of the Middle Caste Category Military Club in Greater Washington. His current fame, transient though it might be, would have made him welcome as a guest in the Upper Caste Club, located in the swank Baltimore section of town. Old pros in the Category Military had comparatively small sufferance for caste lines among themselves; rarified class distinctions meant little when you were in the dill, and you didn't become an old pro without having been in spots where matters had pickled. Joe would have been welcome on the strength of his performance in the most recent fracas in which he had participated as a mercenary, that between Vacuum Tube Transport and Continental Hovercraft. But he didn't want it that way.

You didn't devote the greater part of your life to pulling your way up, pushing your way up, fighting your way up, the ladder of status to be satisfied to associate with your social superiors on the basis of being a nine-day-wonder, an oddity to be met at cocktail parties and spoken to for a few democratic moments.

No, Joe Mauser would stick to his own position in the scheme of things until through his own efforts he won through to that rarefied altitude in society which his ambition demanded.

A sour voice said, "Celebrating, captain? Oops, major, I mean. So you did get something out of the Catskill Reservation fracas. I'm surprised."

A scowl, Joe decided, would be the best. Various others, in the course of the evening, had attempted to join him. Three or four comrades in arms, one journalist from some fracas buff magazine, some woman he'd never met before, and Zen knew how she'd ever got herself into the club. A snarl had driven some away, or a growl or sneer. This one, he decided, called for an angered scowl, particularly in view of the tone of voice which only brought home doubly how his planning of a full two years had come a cropper.

He looked up, beginning his grimace of discouragement. "Go away," he muttered nastily. The other's identity came through slowly. One of the Telly new reporters who'd covered the fracas; for the moment he couldn't recall the name.

Joe Mauser held the common prejudices of the Category Military for Telly and all its ramifications. Not only for the drooling multitudes who sat before their sets and vicariously participated in the sadism of combat while their trank bemused brains refused contemplation of the reality of their way of life. But also for Category Communications, and particularly its Subdivision Telly, Branch Fracas News, and all connected with it. His views, perhaps, were akin to those of the matador facing the moment of truth, the crowds screaming in the arena seats for him to go in and the promoters and managers watching from the *barrera* and possibly wondering if he were gored if next week's gate would improve.

The Telly cameras which watched you as, crouched almost double, you scurried into the fire area of a mitrailleuse or perhaps a Maxim; the Telly cameras which swung in your direction speedily, avidly, when a blast of fire threw you back and to the ground; the Telly cameras with their zoom lenses which focused full into your face as life leaked away. The Spanish aficionados never had it so good. The close-up expression of the dying matador had been denied them.

The other undeterred, sank into the chair opposite, his face twisted cynically. Joe placed him now. Freddy Soligen. Give the man his due, he and his team were right in there when the going got hot. More than once, in the past fifteen years, Joe had seen the little man lugging his cameras into the center of the fracas, taking chances expected only of combatants. Vaguely, he wondered why.

He demanded, "Why?"

"Eh?" Soligen said. "Major, by the looks of you, you're going to have a beaut, comes morning. Why don't you stick to trank?"

"Cause I'm not a slob," Joe sneered. "Why?"

"Why, what? Listen, you want me to help you on home?"

"Got no home. Live in hotels. Military clubs. In barracks. Got nothing but my rank and caste." He sneered again. "Such as they are."

Soligen said, "Mid-Middle, aren't you? And a major. Zen, most would say you haven't much to complain about."

Joe grunted contempt, but dropped that angle of it. However, he could have mentioned that he was well into his thirties, that he had copped many a one in his day and that now time was borrowed. When you had been in the dill as often as had Joe Mauser, the days you lived were borrowed. Borrowed from some lad who hadn't used up all that nature had originally allotted him. He was well into the thirties and his life's goal was

still tantalizingly far before him, and he living on borrowed time.

He said, "Why're you . . . exception? How come you get right into the middle of it, like that time on the Panhandle Reservation. You coulda copped one there."

Soligen chuckled abruptly, and as though in self-deprecation. "I *did* cop one there. Hospitalized three months. Didn't read any of the publicity I got? No, I guess you didn't, it was mostly in the Category Communications trade press. Anyway, I got bounced not only in rank on the job, but up to Low-Middle in caste." There was the faintest edge of the surly in his voice as he added, "I was born a Lower, major."

Joe snorted. "So was I. You didn't answer my question, Soligen. Why stick your neck out? Most of you Telly reporters, stick it out in some concrete pillbox with lots of telescopic equipment." He added bitterly, "And usually away from what's really going on."

The Telly reporter looked at him oddly. "Stick my neck out?" he said with deliberation. "Possibly for the same reason you do, major. In fact, it's kinda the reason I looked you up. Trouble is, you're probably too drenched, right now, to listen to my fling."

Joe Mauser's voice attempted cold dignity. He said, "In the Category Military, Soligen, you never get so drenched you can't operate."

The other's cynical grunt conveyed nothing, but he reached out and dialed the auto-bar. He growled, "O.K., a Sober-Up for you, an ale for me."

"I don't want to sober up. I'm being bitter and enjoying it."

"Yes, you do," the little man said. "I have the answer to your bitterness." He handed Joe the pill. "You see, what's wrong with you, major, is you've been trying to do it alone. What you need is help."

Joe glowered at him, even as he accepted the medication. "I make my own way, Soligen. I don't even know what you're talking about."

"That's obvious," the other said sourly. He waited, sipping his brew, while the Sober-Up worked its miracle. He was compassionate enough to shudder, having been through, in his time, the speeding up of a hangover so that full agony was compressed into mere minutes rather than dispensed over a period of hours.

Joe groaned, "It better be good, whatever you want to say."

Freddy Soligen asked, at long last, tilting his head to one side and taking Joe in critically. "You know one of the big reasons you're only a major?"

Joe Mauser looked at him.

The Telly reporter said, "You haven't got any mustache."

Joe Mauser stared at him.

The other laughed cynically. "You think I'm drivel-happy, eh? Well, maybe a long scar down the cheek would do even better. Or, possibly, you ought to wear a monacle, even in action."

Joe continued to stare, as though the little man had gone completely around the bend.

Freddy Soligen had made his first impression. He finished the ale, put the glass into the chute and turned back to the professional mercenary. His voice was flat now, all expression gone from his face. "All right," he said. "Now listen to my fling. You've got a lot to learn."

Joe held his peace, if only in pure amazement. He ranked the little man opposite him in both caste and in professional attainments. Besides which, he was a combat officer and unused to being addressed with less than full respect, even from superiors. For unlucky Joe Mauser might be in his chosen field, but respected he was.

Freddy Soligen pointed a finger at him, almost mockingly. "You're on the make, Mauser. In a world where few bother, any more, you're on the way up. The trouble is, you took the wrong path many years ago."

Joe snorted his contempt of the other's lack of knowledge. "I was born into the Clothing Category, Subdivision Shoes, Branch Repair. In the old days they called us cobblers. You think you could work your way up from Mid-Lower to Upper caste with that beginning, Soligen? Zen! we don't even have cobblers any more, shoes are thrown away as soon as they show wear. Sure, sure, sure. Theoretically, under People's Capitalism, you can cross categories into any field you want. But have you ever heard of anybody doing any real jumping of caste levels in any category except Military or Religion? I didn't take the wrong path, religion is a little too strong for even my stomach, which left the Category Military the only path available."

Freddy had heard him out, his face twisted sourly. He said now, "You misunderstand. I realize that the military's the only quick way of getting a bounce in caste. I wish I'd figured that out sooner, before I made a trade out of the one I was born into, Communications. It's too late now, I'm into my forties with a busted marriage but the proud papa of a kid." He twisted his face again in another grimace. "By the way, the boy's a novitiate in Category Religion."

Some elements were clearing up in Joe's mind. He said, in comprehension. "So . . . we're both ambitious."

"That's right, major. Now, let's get back to fundamentals. Your wrong path is the *manner* in which you're trying to work your way up into the elite. You've got to become a celebrated hero, major. And it's the Telly fan, the fracas-buff, who decides who the Category Military heroes are. Those are the slobs you have to toady to. In the long run, nobody else counts. I know, I know. All the old pros, even big names like Stonewall Cogswell and Jack Alshuler, think you're a top man. Great! But how many buff-clubs you got to your name? How often do the buff magazines run articles about you? How often do you get interviewed on Telly, in between fracases? Have the movies ever done 'The Joe Mauser Story'?"

Joe twisted uncomfortably. "All that stuff takes a lot of time. I've been keeping myself busy."

"Right. Busy getting shot at."

"I'm a mercenary. That's my trade."

Freddy spread his hands. "O.K. If that's all you're interested in, shooting lads signed up on the other side, or getting shot by them, that's fine. But you know, major"—he cocked his head to one side, and peered knowingly at Joe—"I've got a sneaking suspicion that you don't particularly like combat. Some do, I know. Some love it. I don't think you do."

Joe looked at him.

Freddy said, "You're in it because of the chance for promotion, nothing else counts."

Joe remained silent.

Freddy pushed him. "Who're the names every fracas buff knows? Jerry Sturgeon, captain at the age of twenty-one, and so damned pretty in those fancy uniforms he wears. How many times have you ever heard of him really being in the dill? He knows better! Captain Sturgeon spends his time prancing around on that famous palomino of his in front of the Telly lenses, not dodging bullets. Or Ted Sohl. Colonel Ted Sohl. The dashing Sohl with his two western style six-shooters, slung low on his hips, and that romantic limp and craggy face. My, do the female buffs go for Colonel Sohl! I wonder how many of them know he wears a special pair of boots to give him that limp. Old Jerry's a long time drinking pal of mine, he's never copped one in his life. What's more, another year or so and he'll be a general and you know what that means. Almost automatic jump to Upper caste."

Joe's face was working. All this was not really news to him. Like his fellow old pros, Joe Mauser was fully aware of the glory grabbers. There had always been the glory grabbers from mythological Achilles, who sulked in his tent while his best friend died before the walls of Troy, to Alexander, who conquered the world with an army conceived and precision trained by another man whose name is all but forgotten, to the swashbuckling Custer who sacrificed self and squadron rather than wait for assistance.

Freddy pushed him. "How come you're never on lens when you're in there going good, major? Ever thought about that? When you're commanding a rear-guard action, maybe, trying to extract your lads when the situation's pickled, who's in the Telly lens where all the stupid buffs can see him? One of the manufactured heroes."

Joe scowled. "The who?"

"Come off it, major. You've been around long enough to know heroes are made, not born. We stopped having much regard for real heroes a long time ago. Lindbergh and Byrd were a couple of the last we turned out. After that, we left it to the Norwegians to do such things as crew the *Kon-Tiki*, or to the English to top Everest—whether or not the Britisher made the last hundred feet slung over the shoulder of a Sherpa. I don't know if it was talking movies, the radio, the coming of Telly, or what. Possibly all three. But we got away from real heroes, they're not exciting enough. Telly actors can do it better. Real heroes are apt to be on the dull side, they're men who do things rather than being showmen. Actually, most adventure can be on the monotonous side, nine-tenths of the time. When a Stanley goes to find a Livingston, he doesn't spend twenty-four hours a day killing rogue elephants or fighting off tribesmen; most of the time he's plodding along in the swamps, getting bitten by mosquitoes, or through the bush getting bitten by tsetse flies. So, as a people, we turned it over to the movies, and Telly, where they can do it better."

Joe Mauser's mind was working now, but he held silence.

Freddy Soligen went on. "Your typical fracas buff, glued to his Telly set, wants two things. First, lots of gore, lots of blood, lots of sadistic thrill. And the Lower-Lower lads, who are silly enough to get into the Military Category for the sake of glory or the few shares of common stock they might secure, provide that gore. Second, your Telly fan wants some Good Guys whose first requirement is to be easily recognized. Some heroes, easily identified with. Anybody can tell a Telly hero when he sees one. Handsome, dashing, distinctively uniformed, preferably tall, and preferably blond and blue-eyed, though we'll eliminate those requirements in your case, if you'll grow a mustache." He cocked his head to one side, "Yes, sir. A very dashing mustache.

Joe said sourly, "You think that's all I need to hit the bit time. A dashing mustache, eh?"

"No," Freddy Soligen said, very slowly and evenly. "We're also going to need every bit of stock you've accumulated, major. We're going to have to buy your way into the columns of the fracas buff magazines. We're going to have to bribe my colleagues, the Telly camera crews, to keep you on lens when you're looking good, and, more important still, off it when you're not. We're going to have to spend every credit you've got."

"I see," Joe said. "And when it's all been accomplished, what do you get out of this, Freddy?"

Freddy Soligen laid it on the line. "When it's all been accomplished, you'll be an Upper. I'm ambitious, too, Joe. Just as ambitious as you are. I need an *In*. You'll be it. I'll make you. I have the know-how. I can do it. When you're made, you'll make me."

II

When Major Mauser, escorting Dr. Nadine Haer, daughter of the late Baron Haer of Vacuum Tube Transport, entered the swank Exclusive Room of the Greater Washington branch of the Ultra Hotels, the orchestra ceased the dreamy dance music it had been playing and struck up the lilting "The Girl I Left Behind Me."

As they followed the maître d'hôtel to their table,

Nadine frowned in puzzled memory and after they were seated, she said, "That piece, where have I heard it before?"

Joe cleared his throat uncomfortably. "An old marching song, come down from way back. Popular during the Civil War. The Seventh Cavalry rode forth to that tune on the way to their rendezvous with the Sioux at the Little Big Horn."

She frowned at him, puzzled still. "You seem to know an inordinary amount about a simple tune, Joe." Then



she said, "Why, now I remember where I've heard it recently. Wednesday, when I was waiting for you at the Agora Bar. The band played it when you entered."

He picked up the menu, hurriedly. The Exclusive Room was ostentatious to the point of menus and waiters. "What'll you have, Nadine?" He still wasn't quite at ease with her first name. Offhand, he could never remember having been on a first name basis with a Mid-Upper, certainly not one of female gender.

But she was not to be put off. "Why, Joe Mauser, you've acquired a theme song, or whatever you call it. I didn't know you were that well known among the nitwits who follow the fracases. Why next they'll be forming those ridiculous buff-clubs." Her laughter tinkled. "The Major Joe Mauser Club."

Joe flushed. "As a matter of fact, there are three," he said unhappily. "One in Mexico City, one in Bogota and one in Portland. I've forgotten if it's Oregon or Maine."

She was puzzled still, and ignored the waiter who, standing there, made Joe nervous. Establishments which boasted live waiters, were rare enough in Joe Mauser's experience that he could easily remember the number of occasions he'd attended them. Nadine Haer, to the contrary, an hereditary aristocrat born, was totally unaware of the flunky's presence and would remain so until she required him.

She looked at Joe from the side of her eyes, suspiciously. "That new mustache which gives you such a romantic air. Your new uniform, very gallant. You look like one of those old Imperial Hussars or something. And your Telly interviews. By a stretch of chance, I saw one of them the other day. That master of ceremonies seemed to think you were the most dashing soldier since Jeb Stuart."

Joe said to the waiter, "Champagne, please."

That worthy said apologetically, "May I see your credit card, major? The Exclusive Room is limited to Upper—"

Nadine said coldly, "The major is my guest. I am Dr. Nadine Haer." Her voice held the patina of those to the manor born, and was not to be gainsaid. The other bowed hurriedly, murmured something placatingly, and was gone.

There was a tic at the side of Joe's mouth which usually manifested itself only in combat. He said stiffly, "I am afraid we should have gone to a Middle establishment."

"Nonsense. What difference does it make? Besides, don't change the subject. I am not to be fooled, Joe Mauser. Something is afoot. Now, just what?"

The tic had intensified. Joe Mauser looked at the woman he loved, realizing that it could never occur to her that he, a Mid-Middle, would presume to think in terms of wooing her. That even in her supposed scorn of rank, privilege and status, she was still, subconsciously perhaps, a noble and he a serf. Evolution there was in society, and the terms were different, but it was still a world of class distinction and she was of the ruling class, and he the ruled, she a patrician, he a pleb.

His voice went very even, very flat, almost as though he was speaking to a foe. "When we first met, Nadine, I told you that I had been born a Mid-Lower. Why, I don't know, but from my earliest memories I revolted against the strata in which birth placed me. History—I have had lots of time to read history, in hospital beds—tells me there have been few socio-economic systems under which the strong, intelligent, aggressive, cunning or ruthless couldn't work their way to the top. Very well, I intend to do it under People's Capitalism."

"Industrial Feudalism," she murmured.

"Call it what you will. I won't be happy until I'm a member of that one per cent on top."

She looked into his face. "Are you sure you will be then?"

"I don't know," he said angrily. "But I've heard the argument before. It's been used down through the ages by apologists for the privileged classes. Pity the poor rich man. While the happy slaves are sitting down on the levee, strumming their banjos, the poor plantation owner is up in his mansion drowning his sorrows in mint juleps."

She had an edge of anger, too. "All right," she snapped. "But I'll tell you this, Joe Mauser. The world is out of gear, but the answer isn't for individuals to better their material lot by jumping their caste statuses."

The waiter brought their wine, and, both angry, both held their peace until he had served it and left.

"What *is* the answer?" he said, mock in his voice. "It's easy enough for you, on top, to tell me, below, that the answer isn't in making my way to your level."

She was interrupted in her hot reply by a rolling of the orchestra's drums and the voice of a domineering M.C. who managed effectively to drown all vocal opposition at the tables.

Grinning inanely, holding onto his portable, wireless mike, he babbled along about the wonderful people present tonight and the good time being had by all. The Exclusive Room being founded on pure snobbery, he made great todo about the celebrities present. This politician, that actress, this currently popular songstress, that baron of industry.

Joe and Nadine ignored most of his chatter, still glaring at each other, until he came to . . .

"And those among us who are fracas buffs, and who isn't a fracas buff these days, given the merest drop of red blood? Fracas buffs will be thrilled to know that they are spending the evening in the company of the intrepid Major Joseph Mauser . . ."

Behind him, the orchestra broke into the quick strains of "The Girl I Left Behind Me."

". . . Whose most recent act of sheer military genius and derringdo combined resulted in his all but single-handed winning of the fracas between Continental Hovercraft and Vacuum Tube Transport, and thus inflicting defeat upon none other than Marshal Stonewall Cogswell for the first time in more than a decade."

The M.C. babbled on, now about another present celebrity, a retired pugilist, once a champion.

Nadine looked into his face. "I think I understand now. You mentioned that in any society the . . . how did you put it? . . . the strong, intelligent, aggressive, cunning or ruthless could work their way to the top. You've tried strength, intelligence, and aggressiveness, haven't you, Joe? They didn't work. At least, not fast enough. So now you're giving cunning a try. Will ruthlessness be next, Joe Mauser?"

He was saved an answer.

A hulking body in evening wear stood next to their table, swaying. Joe looked up into a face glazed by either trank or alcohol. He didn't know the other man and for a moment failed to realize the other's purpose. The man was mumbling something that didn't come through.

Joe, irritated, said, "What in Zen do you want?"

The stranger shook his head, as though to clear it. He sneered, "The famous Joe Mauser, eh? The brave soldier-boy. Well, lemme tell you something, soldier-boy, you don't look so tough to me with your cute little mustache and your fancy-pants uniform. You look like a molly to me."

"That's too bad," Joe bit out. "And now, if you'll just go away." He turned his face from the other.

"Joe . . . !" Nadine said in alarmed warning.

The other's contemptuous cuff, unsuspected, nearly bowled Joe completely from his chair. As it was, he barely caught himself.

His attacker shuffled backward and Joe recognized the trained step of the professional boxer. The other's identity now came to him, although he was no follower of pugilism, a sport largely out of favor since the rapid growth of Telly scanned fracases. Boxing at its top had never been more than an inadequate replacement of the games once held in the Roman arena.

Joe was on his feet, instantly the fighting man under attack. The table that he and Nadine occupied was a ringside one, and in open view of half the room, but that meant nothing. He was under attack and for the nonce surprised, on the defensive.

"How'd you like them apples, soldier-boy?" the professional pugilist chuckled nastily. His left flicked forward and Joe barely avoided its connecting with his face.

He threw aside, for the time, any attempt to explain the other's uncalled for aggression. Unless he did something, and quick, he was going to be a laughing stock, rather than the hero into which Freddy Soligen was trying to build him.

Nadine said, anxiously, "Joe . . . please . . . the waiters will deal with—"

He didn't hear her.

Joe Mauser, with all his hospital studies, had never heard of the Marquis of Queensbury. But even if he had, it would never have occurred to him to be bound by that arbiter of fisticuffs. In fact, he had no intention even of being restricted to the use of his hands as fists. The Japanese, long centuries before, had proven the fist less than the most effective manner in which to pursue hand-to-hand combat.

Joe Mauser, working coolly, fast and ruthlessly, now, a trained combat man exercising his profession, moved in for the kill, his shoulders hunched slightly forward, his hands forward and to the sides, choppers rather than sledges.

Joe stepped closer, as quick as a jungle cat. His left hand leapt forward to the other's neck, hacked, came back into another blurring swing, hacked again. His opponent grunted agony.

But a man does not become heavyweight champion without being able to take as well as give punishment. Joe's attacker tucked his chin into his shoulder, fighter style, and moved in, throwing off the effects of the karate blows. Somehow, he seemed considerably less drunk or over-tranked than he had short moments before, and there was rage in his face, rather than glaze.

One of his blows caught Joe on a shoulder and sent him reeling back. At the same time, behind the other, Joe could see the maître d'hôtel flanked by three waiters, hurrying up. He was going to have to do something, and do it quickly, or be branded a boorish Middle who had intruded into a domain of the Uppers only to participate in a brawl and have to be expelled by the establishment's servants.

The former champ, his eyes narrowed in confidence of victory, came boring in, on his toes, quick for all of his bulk. Joe turned sideways, his movements lithe. He lashed out with his right foot, at this angle getting double the leverage he would have otherwise, and caught the other on the kneecap. The pugilist bent forward in agony, his mouth opening as though in protest.

Joe stepped forward, quickly, efficiently. His hands were now knitted together in a huge double fist. He brought them upward, crushingly, into his opponent's face, with all the force he could achieve, and felt bone and cartilage crush. Before even waiting for the other to fall, he turned, righted his chair, and resumed his seat facing Nadine, his breath coming only inconsiderably faster than before.

Her eyes were wide, but she hadn't organized herself as yet to the point of either protest or praise.

The maître d' was at their table. "Sir—" he began.

Joe said curtly, "This barroom brawler attacked me. I'm surprised you allow your patrons to get into the shape he is. Please bring our bill."

The head waiter stuttered, his eyes going about in despair, even as his assistants were lifting the fallen champion to his feet and hustling him away.

An occupant of one of the nearby tables spoke up, collaborating Joe's words. The action had been fast, though brief, and had won the fascinated attention of that half of the patrons of the Exclusive Room near enough to see. Somebody else called out, too. And it came to Joe cynically, that a brawl in an establishment exclusive to Uppers, differed little from one of Middle or even Lower caste.

But it was impossible that they remain. He had looked forward to this evening with Nadine Haer, had planned to lay the foundations for a future campaign, when, as a newly created Upper, he would be in the position to mention marriage. He fumed, inwardly, even as he helped her with her wrap, preparatory to leaving.

Nadine, now that she had recovered composure, said coldly, "I suppose you realize you broke that man's nose and injured his eye to an extent I'd have to examine him to evaluate?"

Behind her, he rolled his eyes upward in mute protest. He said, "What was I supposed to do, hand him a rose from our table bouquet?"

"Violence is the resort of the incompetent."

"You must tell that, some time, to a jungle animal being attacked by a lion."

"Oh, you're impossible!"

III

When Freddy Soligen entered his living room, he automatically switched off the Telly screen which was the entire north wall. The room's lights automatically went brighter.

His perpetual air of sour cynicism was absent as he chuckled to the room's sole inhabitant, "What! A son of mine gawking at Telly? Next I'll be finding tranks by the bowl full, sitting on the tea table."

His son grinned at him. Already, at the age of sixteen, Samuel Soligen was a good three inches taller than his father, at least ten pounds heavier. The boy was bright of eye, toothy of smile, gawky as only a teenager can be gawky, and obviously the proverbial apple of his father's eye.

Sam said, the faintest note of apology in his tone, "Just finished my assignments, Papa. Thought I'd see if there was anything worthwhile on the air."

"An incurable optimist," Freddy chuckled. "You take after your mother. Believe me, Sam. There's *never* anything worthwhile on Telly."

"Not even when you're casting?"

"*Especially* when I'm casting, boy. What've you been getting at the Temple school these days? Zen! I've been so busy on a special project I've been working on, I haven't had time to keep check on whether or not you're even still living here."

The boy shrugged, picked up an apple from the sideboard and began to munch. His voice was disinterested. "Aw, Comparative Religion, mostly. We gotta go way back and study about the Greeks and the Triple-Goddess, and then the Olympians, and all that curd."

"Hey, watch your language, Sam. Remember, you're going to wind up a priest."

"Yeah," the boy grumbled, "that'll be the day. You ever heard of a Lower becoming a full priest? I'll be lucky if I ever get to monk."

Freddy Soligen sat down suddenly, across from his son, and his voice lost its edge of good-natured humor and became deadly serious. "Listen, son. You were born a High-Lower, just like your father. Unfortunately, I wasn't jumped to Low-Middle until after your birth. But you're not going to stay a High-Lower, any more than I'm going to stay a Low-Middle."

The boy shrugged, his expression almost surly, now. "Aw, what difference does it make? High-Lower isn't too bad. It's sure better than Low-Lower. I got enough stock issued me for anything I'll ever need. Or, if not, I can

work a while, just like you've done, and earn a few more shares."

Freddy Soligen's face worked, in alarm. "Hey, Sam, listen here. We've been over this before, but may be not as thoroughly as we should've. Sure, this is People's Capitalism and on top of that the Welfare State; they got all sorts of fancy names to call it. You've got cradle to the grave security. Instead of waiting for old age, or thirty years of service, or something, to get your pension, it starts at birth. At long last, the jerks have inherited the earth."

The boy said plaintively, as though in objection to his father's sneering words. "You aren't talking against the government, or the old time way of doing things, are you Papa? What's wrong with what we got? Everybody's got it made. Nobody hasta—"

His father was impatiently waving a hand at him in negation. "No, everybody doesn't have it made. Almost everybody's bogged down. That's the trouble Sam. The guts have been taken out of us. And ninety-nine people out of a hundred don't care. They've got bread and butter security. They've got trank to keep them happy. And they've got the fracases to watch, the sadistic, gory death of others to keep them amused, and their minds off what's really being done to them. We're not part of that ninety-nine out of a hundred, Sam. We're two of those who aren't jerks. We're on our way up out of the mob, to where life can be full. Got it, son? A full life. Doing things worth doing. Thinking things worth thinking. Associating with people who have it on the ball."

He had come to his feet in his excitement and was pacing before the boy who sat now, mouth slightly agape at his father's emphasis.

"Sam, listen. I'm getting along. Already in my forties, and I never did get much education back when I was your age. Maybe I'll never make it. But *you* can. That's why I insisted you switch categories. You were born into Communications, like me, but you've switched to Religion. Why'd you think I wanted that?"

"Aw, I don't know, Papa. I thought maybe—"

His father snorted. "Look, son, I haven't spent as much time with you as I should. Especially since your mother left us. She just couldn't stand what she called my being against everything. She was one of the jerks, Sam—"

"You oughtn'ta talk about my mother that way," Sam said sullenly.

"All right, all right. I just meant she was willing to spend her life sucking on trank, watching Telly, and living on the pittance income from the unalienable stock shares issued her at birth. But let's get to this religious curd. Son, whatever con man first thought up the idea of gods put practically the whole human race on the sucker list. You say they're giving you comparative religion in your classes at the Temple now, eh? O.K., have you ever heard of a major religion where the priests didn't do just fine for themselves?"

"But Papa . . . Well, shucks, there's always been—"

"Certainly, certainly, individuals. Crackpots, usually, out of tune with the rest of the priesthood. But the rank and file do pretty well for themselves. Didn't you point out earlier that a Lower, in our society, never makes full priest? Not to speak of bishop, or ultrabishop. They're Uppers, part of the ruling hierarchy."

"Well, what's all this got to do with me getting into Category Religion? I'd think it'd be more fun in Communications, like you. Gee, Papa, going around meeting all those famous—"

Freddy Soligen's face worked. "Look, son. Sure, I *meet* lots of the people on top. But the thing is, eventually you're going to *become* one of those people, not just interview them." He began pacing again in nervous irritation.

"Sam, those on top want to stay there. Like always. They freeze things so they, and their kids, will remain on top. In our case, they've made it all but impossible for anybody to progress from the caste they were born in. Not impossible, but almost. They've got to allow for the man with extraordinary ability, like, to bust out to the top, if he's got it on the ball. Otherwise, there'd be an explosion."

"That's not the way they say in school."

"It sure isn't. The story is that anybody can make Upper-Upper if he has the ability. But the thing is, Sam, you can't make a jerk realize he's a jerk. If he sees somebody else rise in caste, he can't see why he shouldn't. That's why real rising has been restricted to Category Military and Category Religion. In the military, a man gives up his security, obviously, and if he's a jerk he dies.

"In Category Religion they've got another way to sort out the jerks and make sure they never get further than monk and beyond the caste of High-Lower. Gods always work in mysterious ways and anybody in Category Religion who doesn't have faith in the wisdom of the God's mysterious choices of who to ordain and who to reject, obviously shows that he's not really got the *true faith* which is, of course, essential to a priest, not to speak of bishop or ultra-bishop. So obviously, the Gods were wise in rejecting him. In simpler words, the would-be priest who simply hasn't got what it takes, can be given the heave-ho without it being necessary for him, or his family or friends, to understand why. It's all very simple; he lacked the humility essential in a priest of the Gods, as proven by his rebellious reaction."

Sam said, unhappily, "I don't get all this."

Freddy Soligen came to a pause before the boy, sat down again abruptly and patted his son's knee. "You're young, Sam. Too young to understand some of it. Trust your father. Stick to your studies now. You have to get the basic gobbledygook. But you're on your way up the ladder, son. I've got a deal cooking that's going to give us an in. Can't tell you about it now, but it's going to mean an important break for us."

It was then that the door announced, "Major Joseph Mauser, calling on Fredric Soligen."

IV

Joe Mauser shook hands with the Telly reporter in an abrupt, impatient manner.

Freddy said, "Major, I'd like to introduce my son, Samuel. Sam, this is Major Joe Mauser. You don't follow the fracases, but the major's one of the best mercenaries in the field."

Sam scrambled to his feet and shook hands. "Gee, Joe Mauser."

Joe looked at him questioningly. "I thought you didn't follow the fracases."

Sam grinned awkwardly. "Well, gee, you can't miss picking up some stuff about the fighting. All the other guys are buffs."

Joe said to Freddy, "Could I speak to you alone?"

"Certainly, certainly. Sam, run along the major and I have business."

When the boy was gone, Joe sank into a chair and looked up at the Telly reporter accusingly. He said, "This fancy uniform, I stood still for. That idea of picking a song to identify me with and bribing the orchestra leaders to swing into it whenever I enter some restaurant or nightclub, might have its advantages. Getting me all sorts of Telly interviews, between fracases, and all those write-ups in the fracas buff magazines, I can see the need for, in spite of what it's costing. But what in Zen"—his voice went dangerous—"was the idea of sticking that punch-drunk prizefighter on me in the most respectable nightclub in Greater Washington?"

Freddy grinned ruefully. "Oh, you figured that out, eh?"

"Did you think I was stupid?"

Freddy rubbed his hands together, happily. "He used to be world champion, and you flattened him. It was in every gossip column in the country, every news reporter, played it up. And hell all it cost us was five shares of your Vacuum Tube Transport stock."

"Five shares!"

"Why not? He used to be champ. Now he's so broke he's got to live on stock he isn't allowed to sell. His basic government issue at birth. He was willing to take a dive cheap, if you ask me."

Joe growled at him unhappily, "I've got news for you, Freddy. Your hired brawler started off as per instructions, evidently, but after a couple of blows had been exchanged his slap-happy brain lost the message and he tried to take me. We're lucky he didn't splatter me all over the dance floor of the Exclusive Club. He didn't take a dive. I had to scuttle him."

Freddy blinked. "Zen!"

"Sure, sure, sure," Joe growled. "Look, next time you decide to spend five shares of my stock on some deal like this, let me know, eh?"

Freddy walked to the sideboard and got glasses. "Whiskey?" he said.

"Tequila, if you've got it," Joe said. "Look, I'm beginning to have second thoughts about this campaign. Where's it got us, so far?"

Freddy brought the fiery Mexican drink and handed it to him, and took a place in the chair opposite. His voice went persuasive. "It's going fine. You're on everybody's lips. First thing you know, some of the armaments firms will be having you indorse their guns, swords, cannon, or whatever."

"Oh, great," Joe growled. "Already my friends are ribbing me about this fancy uniform and all the plugs I've been getting. The glory-grabber isn't any more popular today among real pros than he's ever been."

"Who gives a damn?" Freddy sneered, cynically. "We're not in this to please your lame-brain mercenary pals with their soldier-of-fortune codes of behavior. We're in this for Number One, Joe Mauser, and Number Two, Freddy Soligen."

Joe put away the greater part of his drink. "Sure, sure, sure. But where are we now? Your campaign has been in full swing for months. What's accomplished?"

The small Telly reporter was indignant. "What's accomplished? We've got three Major Joe Mauser buff clubs in full swing and five more starting up. And next month you're going to be on the cover of the *Fracas Times*."

"And I'm still a major and still Mid-Middle caste. And my stock shares available for bribery are running short."

Freddy twisted his mouth and looked worriedly down into his glass. He said unhappily, "We need a gimmick to climax all this. Some kind of gimmick to bring you absolutely to the top."

"A gimmick?" Joe demanded. "What do you mean, a gimmick?"

"You're going to have to do something really spectacular. Make you the biggest Telly hero of them all. We'll have to get you into a real fracas and pull something dramatic. I don't know what, I don't seem to be able to come up with an angle. But when I do, I'll guarantee that every Telly camera covering the fracas will be zeroed in on Joe Mauser."

"Great," Joe growled. "I've got just the gimmick. It'll wow them."

The Telly reporter looked up, hopefully.

"I'll get killed in a burst of glory," Joe said.

V

A servant took Joe Mauser's cap at the door and requested that Joe follow him. Joe trailed behind on the way to the living room of the mansion, somewhat taken aback by the, to him, ostentation of the display of the luxuries of yesteryear. Among them was to be numbered the butler. Servants, other than military batmen, were

simply not in Joe's world. Only the Uppers were in position to utilize the full time of individuals. Long years past, those tasks which one called for servants had been automated, from automated elevators to automated baby-sitters.

The servant announced him and then seemingly disappeared in the brief moment while Joe was bowing formally over Nadine Haer's hand. Even while murmuring the appropriate banalities, Joe wondered how one acquired the ability to seemingly disappear, once one's services were no longer needed. Each man to his own trade, he decided.

He had a date with Nadine, but it turned out that the piquant Upper was not alone. In fact, it was obvious that she had not as yet got around to dressing for her appointment with Joe. He had promised to take her soaring in his sailplane. She was attired, as always, as those dress who have never considered the cost of clothing. And, as ever, when Joe saw her newly, after a period of a day or more away, he was taken with her intensity and her almost brittle beauty. What was it that the aristocrat seemed able to acquire after but a generation or two or what they were pleased to call breeding? That aloof quality, the exquisite gentility.

"Joe," Nadine said, "you'll be pleased to meet Philip Holland, Category Government, Rank Secretary. Phil, Major Joseph Mauser."

The other, possibly forty, shook hands firmly and looked into Joe's face. He had a crisp manner. "Good heavens, yes," he said. "That remarkable innovation of using an engineless aircraft for reconnaissance. My old friend, Marshal Cogswell, was speaking of it the other day. I assume that in advance you purchased stock in the firms which manufacture such craft, major. They must be booming."



Joe grimaced wryly. "No, sir. I wasn't smart enough to think of that. Professional soldiers are traditionally stupid. What was the old expression? They can take their shirts off without unbuttoning their collars."

Philip Holland cocked his head, even as he chuckled. "I detect a note of bitterness, major."

Nadine said airily, "Joe is ambitious, thinking the answer to all his problems lies in jumping his caste to Upper."

Joe looked at her impatiently to where she sat on a Mid-Twentieth Century type sofa.

Philip Holland said, "Possibly he's right, my dear. Each of us have different needs to achieve such happiness as is possible to man."

To Joe, he sounded just vaguely on the stuffy side, even through the crispness. By nature nervous and quick moving, Holland seemed to try and project an air of calm which didn't quite come off. Joe wondered what his relationship to Nadine could be, a twinge of jealousy there. But that was ridiculous. Nadine must be in the vicinity of thirty. Obviously, she knew, and had known, many men as attracted to her as was Joe Mansur— And

men in her own caste, at that. Somehow, though, he felt Holland was no Upper. The other simply didn't have the air.

Joe said to him, "Nadine doesn't get my point. I contend that in a strata divided society, it's hard to realize yourself fully until you're a member of the upper caste. Admittedly, perhaps you won't even if you are such a member, but at least you haven't the obstacles with which the lower class or classes are beset."

"Interestingly stated," Holland said briskly. He returned to his chair from which he had arisen to shake hands with Joe, and looked at Nadine. "You said, on introducing us, that Joe would be glad to meet me, my dear. Why, especially?"

Nadine laughed. "Because I have been practicing your arguments upon him."

Both of the men frowned at her.

Nadine looked at Joe. "Phil Holland's the most interesting man I know, I do believe. He's secretary to Marlow Mannerheim, the Minister of Foreign Affairs, and simply couldn't be more privy to the inner workings of government. It was Phil who convinced me that something is wrong with our socio-economic system."

"Oh?" Joe said. He wasn't really interested. Let society solve its problems. He had his own. And they were sufficient unto themselves as well as the day thereof. However, conversation was to be kept moving. He needled the other. "I've heard it contended that any type of government is good given capable, intelligent personnel to run it, or bad if not so managed. What was the example I read somewhere? Both heaven and hell are despotisms."

Phil Holland shrugged. "An interesting observation. However, institutions, including socio-political ones, can become outdated. When they do, no matter how intelligent, capable and honest the governmental heads, that socio-political system can be a hell. If, at such time there are capable, intelligent persons available, they will take such measures as are necessary to change the institutions."

Nadine had come to her feet. "The subject is my favorite, but I must change. Joe is taking me a-gliding, and I'm sure this frock isn't *de rigueur*. You gentlemen will excuse me?" She was off before they had time to come to their feet.

Joe Mauser settled himself again, crossing his legs. He said, idly, "And you think our basic institutions have reached the stage of needing change?"

"Perhaps, although as a member of the Government Category, it should hardly be my position to advocate such." He seemed to switch subjects. "Have you read much of the Roman *ludi*, the games as we call them?"

"The gladiators and such?" Joe shrugged. "I've read a bit about them. It's been pointed out, in fact by Dr. Haer, among others, that basically our present day fracases serve the same purposes. That instead of the bread and circuses, provided by the Roman patricians to keep the unemployed Roman mob from becoming restive, we give them trank pills and Telly violence."

"Um-m-m," Holland nodded, "but that isn't the point I was making right now. What I was thinking was that at first the Roman games were athletic affairs without bloodshed. It wasn't until 264 B.C. that three pairs of slaves were sent in to fight with swords. By 183 B.C. the number had gone up to sixty pairs. By 145 B.C. ninety pairs fought for three days. But that was just the beginning. They really got under way with the dictators. Sulla put a hundred lions into the arena, but Julius Caesar topped that with four hundred and Pompey that with six hundred, plus over four hundred leopards and twenty elephants. Augustus beat them all with three thousand five hundred elephants and had ten thousand men killed in a series of games. But it was the emperors who really expanded the ludi. Trajan had ten thousand animals killed in the arena to celebrate his victory over the Dacians, not to mention eleven thousand people.

"Are you surprised at my memory? The subject has always fascinated me. For one thing, I am a great believer in the theory that history repeats itself. As time went on, arenas were built all over the empire, even small towns boasting their own. In Rome, the number of them grew so that eventually an avid follower could attend every day, the year around. And as they increased in quantity they also had to grow more extreme to hold the fan's attention. The Emperor Philip, in celebrating the thousandth anniversary of the founding of Rome, had killed a thousand pair of gladiators, a rhinoceros, six hippopotami, ten hyenas, ten giraffes, twenty wild asses, ten tigers, ten zebras, thirty leopards, sixty lions, thirty-two elephants, forty wild horses. I am afraid I forget the rest."

Joe stirred in his chair. The other's personality grew on him. The crisp voice had a certain magnetic quality that made what he said important, somehow. However, Joe's interest in Roman history wasn't exactly paramount.

Holland said, "You wonder at what I am driving, eh? Do you realize the expense involved in getting a rhinoceros to Rome in those days? Not to speak of hippopotimi, tigers, lions and leopards. Few people realize the extent to which the Romans went to acquire exotic animals to be slaughtered for the edification of the mob. They penetrated as far south as Kenya, there are still the ruins of a Roman fort there; as far east as Indonesia; as far north as the Baltic, and there is even evidence that they brought polar bears from Iceland."

Philip Holland snorted, as though in contempt. "But the mob wearied of even such spectacle as giraffes being killed by pigmies from the Iturbi forest. The games had started as fights between skilled swordsmen, being observed by knowledgeable combat soldiers of a warrior people. But as the Romans lost their warlike ardor and

became a worthless mob performing no useful act for either themselves or the State, they no longer appreciated a drawn-out duel between equals. They wanted quick blood, and lots of it, and turned to mass slaughter of Christians, runaway slaves, criminals and whoever else they could find to throw to the lions, crocodiles or whatever. Even this became old hat, and they turned increasingly to more extreme sadism. Children were hung up by their heels and animals turned loose to pull them down. Men were tied face to face with rotting corpses and so remained until death. Animals were taught to rape virgins."

Joe Mauser stirred again. What in Zen was this long monologue on the Roman games leading to?

Holland said, "By the way, contrary to some belief, the games didn't end upon Christianity becoming the dominant faith and finally the State religion. Constantine legalized Christianity in 313 A.D. but it wasn't until 365 that Valentinian passed a law against sacrificing humans to animals in the arena and the gladiator schools remained in operation until 399. The arenas were finally closed in 404 A.D. but by that time the Roman Empire was a mockery. In all they last more than half a millinnium, but things move faster these days."

The tone of voice changed abruptly and Holland snapped a question at Joe. "By your age, I would imagine you've participated in the present day fracases for some fifteen years. How have they changed in that time?"

Joe was taken aback. "Why . . ." he said, hesitated as he got the other's point, then went on, nodding. "Yes. They used to be company size—a few hundred lads involved. After a while, a battalion size fracas became fairly commonplace, then about ten years ago a corporation of any size had to be able to put at least a regiment into the field and the biggies had brigades."

"And now?" Holland urged.

"Now a divisional size fracas is the thing."

"Yes, and if a corporation isn't among the top dozen or so, a single defeat can mean bankruptcy."

Joe nodded. He had known of such cases.

Holland leaned back in his chair, as though all his points had been made. He said, his voice less brisk, "Our People's Capitalism, our Welfare State, took the road of bringing the equivalent of the Roman ludi to keep our people in a state of stupified acceptance of the *status quo*. And as in the case of Rome, the games are bankrupting it. Our present day patrician class, our Uppers, have a tiger by the tail, Joseph Mauser, and can't let go. We need those capable and intelligent people of whom you spoke earlier, to make some basic changes. Where are they? Nadine said that your great driving ambition is to be jumped to Upper in caste. But even though you make it, what will you have on your hands but these problems that the Uppers seem unable to solve?"

Joe said, impatiently, "Possibly you're right. What you say about the fracases becoming bigger and more expensive is true. They're also becoming more bloody. In the old days, a corporation or union going into a fracas was conscious of having a high casualty list among the mercenaries. Highly trained soldiers cost money. Insurance, indemnity, pensions, all the rest of it. Consequently, you'd fight a battle of movement, maneuver, brainwork on the part of the officer commanding, so that practically nobody was hurt on either side. One force or the other would surrender after being caught in an impossible situation. Not any more. These days, they want blood. Plenty of blood. And they want the Telly cameras to focus right into the middle of it."

Joe shook his head. "But it's not my problem to solve. I've got my goal. I'll worry about other ones when I've achieved it."

A voice behind him said superciliously, "I do believe it's the status hungry captain, ah, that is, major these days. To what do I owe this unexpected visit, Major Mauser?"

Joe came to his feet and faced the newcomer, Philip Holland doing the same, somewhat more leisurely.

Baron Balt Haer, wearing a colonel's uniform and flicking his swagger stick along his booted leg, stood in the doorway. His voice was lazily arrogant. "And Mr. Holland. I must say, the Middle caste seems to have taken over the house. Well, Major Mauser? I assume you do not labor under the illusion that you are welcome in this dwelling."

In Category Military rank is observed whilst in uniform, even though neither individual is currently on active service. Joe had automatically come to attention. He said, stiffly, "Sir, I am calling upon your sister, Dr. Haer."

"Indeed," Baron Haer said, his nostrils high in that attitude once perfected by grandees of medieval Spain, landed gentry of England, Prussian Junkers. "I find that my sister, in her capacity as medical scientist, seems to go to extreme in her research. What aspect of the lower classes is she studying in your case, major?"

Joe flushed. "Baron Haer," he said, "we seem to have got off on the wrong foot when we participated in that fracas against Continental Hovercraft under your father, the late Baron. I would appreciate an opportunity to start over again."

"Would you indeed?" Balt Haer said loftily. He turned his eyes to Philip Holland, whose mouth bore the slightest suggestion of suppressed humor. "Unless I am mistaken, the conversation at the time of my entry seemed to have a distinctly subversive element. Shouldn't this be somewhat surprising in the secretary of the administration's foreign minister?"

Philip Holland said crisply, "You must have intruded, um-m-m, that is, entered, at the end of a sentence, Baron Haer. We were merely discussing the various methods, down through the ages, that ruling classes have utilized to perpetuate themselves in power."

Haer obviously disbelieved him. He said, "For example?"

"There are many examples," Holland said, reseating himself. "For instance, the medieval feudalistic class who dominated the ignorant and highly superstitious serfdom soon found it expedient to add to their titles *by grace of God,* as though it was God's wish that they be count or baron, prince or king. What serf would dare attempt the overthrow of his lord, in the face of God's wishes?"

"I see," Balt Haer said. "And other examples?"

Holland shrugged. "The Chinese Mandarins utilized possibly the most unique method of a governing class perpetuating itself ever known, certainly one of the most gentle."

Haer was scowling at him, obviously out of his depth, as was Joe Mauser for that matter.

Holland said crisply, "The mandarins devised a written language so complicated that it took at least ten years to master reading and writing, thus assuring that only the very well-to-do could afford to educate their sons. When invaded, as so often China has been invaded, only the mandarins were in position to serve the conquerors by carrying on the paperwork so vital to any advanced society. So, still in control of the machinery of government, they continued to perpetuate themselves, and shortly—as history is reckoned—we found the conquerors assimilated and the mandarins still in power."

Balt Haer said impatiently, "I seemed to be under the impression that you were speaking of more current times, when I entered, Mr. Holland."

From the door, Nadine said, "Good heavens, Balt, are you badgering my guests again?"

The three men faced her.

Balt said nastily, "I am astonished that you persist in bringing members of the lower orders into my home, Nadine."

"Our home, Balt. In fact, if you must bring up such matters before outsiders, you will recall that you converted your portion of the family estate into continental Hovercraft stock, shortly before father met Baron Zwerdling's forces in the recent fracas. No wonder you dislike Major Mauser. Through his efforts, our company won, rather than losing as you had expected."

Her brother, who could have been only slightly her senior, was obviously enraged. "Are you suggesting that I am not welcome to stay in this, our family home, simply because the property is in your name?"

"Not at all," she sighed. "You are always at home here, Balt, I simply demand that you exercise common courtesy to my guests."

He turned and walked stiff kneed from the room.

"Sorry," Joe said to Nadine.

"Why?" she said simply. "The fact of the matter is that Balt and I are continually at each other. He is quite the active member of the Nathan Hale society."

Joe frowned his ignorance and looked at Holland.

Holland chuckled. "An ultra-conservative—reactionary might be the better term—organization devoted to witch hunting and such in its efforts to maintain the *status quo,* major. Once again, history repeats itself. Such groups invariably evolve when basic change threatens a socio-economic system." He looked at Nadine. "I must be going, my dear. My, how charming you look. If this is the customary garb whilst going a-gliding, I shall have to take up the sport."

"Why Phil, inane words of flattery from serious old you?"

Joe squirmed inwardly, wondering again upon what basis was the friendship of Nadine Haer and Philip Holland.

The butler entered and said, "A call for Major Mauser, if you please."

Only Max Mainz, his batman during his last fracas and now permanently attached to Joe, knew that he might be found at this address. Joe said to Nadine. "Would you pardon me a moment? I assume it's something important, or I wouldn't be disturbed."

She said, demurely, "Undoubtedly one of the feminine members of a Joe Mauser buff club."

He snorted amusement and followed the butler to the library and the tele-screen.

Max Mainz's face loomed in the viewing screen. As soon as Joe appeared, he said, "Major, sir, the marshal's been trying to get hold of you ever since you left the hotel."

"The marshal?" Joe scowled.

"Marshal Cogswell. That one they call Stonewall Cogswell. And when he wants somebody, he really wants 'em, and I got a feeling it's a good idea to come on the double."

Joe laughed. "Stonewall Cogswell's a tough one all right, Max."

"You ain't just a countin' down, major, sir. He says when I get hold of you to come on over to his headquarters soonest."

"All right, Max, thanks." Joe flicked the set off.

Actually, Max was right. You didn't ignore a summons from Marshal Cogswell. Not if you were in the Category Military and ambitious. The date with Nadine was off. And just when he was beginning to detect signs of her meeting him on his own level.

VI

It was the common practice among Category Military mercenaries of highest rank to maintain skeleton staffs between those periods when they were under hire by corporations or unions. That of Marshall Stonewall Cogswell was one of the most complete, he habitually keeping upward of a hundred officers in his private uniform. It paid off, for with such a skeleton force of highly skilled professionals as a cadre, the marshal could

enlist veterans for his rank and file and whip together a trained fighting force in a fantastically short period.

And nothing was so of the essence as time, in the present Category Military. For when two corporations sued for permission to meet on a military reservation for trial by combat to settle their commercial differences, the sums involved were staggering. Joe Mauser had been correct in saying that the fracas had grown, even in his memory, from skirmishes involving a company or two of men, to full fledged battles with a division or even more on either side, forty thousand men at each other's throats.

So a commanding officer became noted not only for his abilities in the field, but also those of cutting financial corners, recruiting his force of mercenaries, whipping them into a unit and getting them into the action. In fact, corporations, these days, invariably stated the period of time to be involved when they petitioned the Category Military Department. Perhaps a month, three weeks of which would be used for recruiting and drill, the last week for the fracas itself. Nobody could excel Marshal Cogswell in using the three weeks to best advantage.

Major Joe Mauser came to attention before the desk of the lieutenant colonel of Marshal Cogswell's staff who was acting as receptionist before the sanctum sanctorum of the field genius. He saluted and snapped, "Joseph Mauser, sir. Category Military, Rank Major. On request to see the marshal."

Lieutenant Colonel Paul Warren answered the salute, but then came to his feet and grinned while extending his hand to be shaken. He said, "Good to see you again, Mauser. Hope you're in this one with us." His grin turned rueful. "That trick of yours with the glider cost me a pretty penny. I'd made the mistake of wagering heavily on Hovercraft. But the marshal is waiting. Right through that door, major. See you later."

Evidently, Joe decided, the marshal was recruiting for another fracas. Which was why Joe had been summoned, although when a field officer of Cogswell's stature was gathering officers to command a force, he seldom called upon them, they clamored for permission to serve with him. You weren't apt to find yourself in the dill, under Cogswell, and you practically never failed to collect your victory bonus. Victory was a habit.

Marshal Cogswell looked up from the desk at which he sat scowling at a military chart stretched before him. The scowl disappeared and his strong face lit with pleasure. The craggy marshal was a small man but strongly built, clipped of voice and with a tone that would suggest he had been born to command, had always commanded.

Joe snapped to the salute which the marshal acknowledged with a flick of his baton, then stood to shake hands. "Ah, Major Mauser. Bit of trouble locating you." His eyes narrowed momentarily. "Trust you are not at present affiliated with any company colors." He took in Joe's uniform and scowled vaguely, not placing it.

Joe said in self-deprecation, "This is my own devising, sir. I thought if I was going to have to present myself to be killed, for a living, that I might as well show up before the screens as distinctively as possible. I've been told that ultimately the fracas buffs make or break you, in our category."

The marshal frowned, as though unhappy and possibly surprised at Joe's words, however, he sat down again and repeated his question by merely looking at the other.

"No, sir, I'm free," Joe said. "However, frankly, I wasn't looking for a commission right at this time.'

Cogswell stared at him. Mauser was a good junior officer and they'd been through half a dozen fracases together over the years, not always on the same side.

"Why not?" Cogswell barked. "Are you convalescing, major? Surely you didn't manage to cop one in that last farce?"

"Personal reasons, sir."

"Very well," Cogswell growled. "However, I'm going to attempt to sway you, major. Would seem that I am up against it, if I don't, and, in a manner it's your fault."

Joe was bewildered. "My fault, sir?"

The older man's voice went brisk. "This is the situation. I have been approached by United Miners to command their forces in their trial by combat with Carbonaceous Fuel. Same old issues, of course. Contract between the union and corporation is usually for only two years. Each time it comes up again, the union officials try to get a larger cut of the pie and the hereditary heads of Carbonaceous Fuel, resist. Automatically, the Category Military Department issues a permit. The fracases they've been fighting prove so popular that there'd be riots if the permit was refused. Frankly, I'm no great admirer of the group in control of United Miners, but—"

Joe was surprised enough to say, "Why not, sir?" Old pro mercenaries seldom concerned themselves as to the issues or principles involved in a fracas. They chose their side by more mundane considerations.

Marshal Cogswell looked at him testily. "Sit down, Joe. You're not on my staff, as yet, at least. Zen take the formality!" When Joe had accepted the chair, he growled again, "Suppose you didn't know I was born into Category Mining?"

"No, sir."

"Well, I was. But even as a boy this new industrial revolution was cutting the number of employees involved in the category each year that went by."

"That's happened in every field, sir. Including my original one." Joe Mauser was thinking, *so what?*

"Of course," Cogswell rapped. "My objection is what happened to the union. Unions were originally founded as an instinctive gathering together of employees to achieve as high a pay as they could get from the employer, with the strike their weapon. But whatever the origi-

nal purpose, and its virtue or lack of it, the union grew into something entirely different by the early and middle twentieth century. Such unions as the United Miners grew to such size that they, themselves, became some of the largest business organizations in the country. And eventually they came to be run, like any other business, for the benefit of those who owned or controlled them. The professional labor leader evolved, motivated by his own interests and finally becoming, in his despotic control of the union, backed by goon squads and gangsters, as powerful a man as was to be found in the country. Seldom were strikes any longer held to better the condition of the individual union members. Instead, the issues were contracts which allowed for fabulous sums to go into the union coffers where they were at the disposal of the union officials."

The marshal grunted sourly. "Now that the whole industry of mining is all but completely automated and only a few thousands employed actively, there are confounded few miners not on the unemployed list, but the union officials wax as fat as ever, what with the percentages of each ton mined going into so-called welfare funds, and such."

He looked at Joe, evidently conscious that he had made an inordinary long speech for the supposedly taciturn Stonewall Cogswell. He cleared his throat and said, "Not that it's my affair. I switched categories to Military, in my youth. Let us get to the point. I've been caught napping, Joe."

That was an unlooked for confession to come from Stonewall Cogswell. Joe said nothing, waiting for more.

The marshal shook his baton at the younger officer. "By utilizing that confounded glider of yours as a reconnaissance craft, you revolutionized present warfare, major. Act of absolute ingenuity, and I admired it. Unfortunately, I failed to realize the speed with which every professional in our category would jump upon the bandwagon and secure gliders for himself."

Joe saw light.

"Been caught short," Cogswell rapped. "Short of gliders. Short of even one glider. And within a few weeks I'm committed to a divisional size fracas." He pushed back in his chair, angrily. "General McCord is in command of the Carbonaceous Fuel forces. Met him before, and always brought up victory only by the skin of my teeth. But this time he has two gliders. I have none."

"But, sir, surely you can either buy or rent several craft on the market."

"Confound it! It's not the machines that are unavailable, but the trained pilots to operate them. The sport hasn't been popular in half a century. Not overly so, even then."

"But training a pilot—"

"Training a pilot, nonsense!" the marshal was shaking his baton at him again, in indignation. "A *pilot* won't do. He must also be a trained reconnaissance man. Must be able to follow terrain from the air. Identify military forces both in nature and number. I needn't tell you this, major. You above all know the problem."

It hadn't occurred to Joe, but the other was obviously right. There couldn't be more than a few dozen men in Category Military who could hold down both the job of pilot and reconnaissance officer. In another six months, the situation would have changed. Officers would quickly be trained. But now? As Cogswell said, he was caught short.

Joe came to his feet. "Sir, I'll have to consider the commission. Frankly, my plans were otherwise."

Cogswell stared at him grimly. "Mauser, you've always been one of the best. An old pro, in every sense of the word. However, there have been some rumors going around about your ambitions."

Joe said stiffly, "Sir, my ambitions are my own business, whatever these rumors."

"Didn't say I believed them, major. We've been together too often when the situation has pickled for me to judge you without more evidence than gossip. What I was leading up to, is this. There's nothing wrong with ambition. If you see me through in this, I'll do what I can toward pushing your promotion."

Joe came to the salute again. "Thank you, sir. I'll consider the commission and let you know by tomorrow."

Cogswell flicked the baton, in his nonchalant answer to salute. "That will be all, then, major."

VII

Freddy Soligen wasn't at home when Joe Mauser called. The Category Military officer was met, instead, by young Sam Soligen, clothed this day in the robes of a novitiate of the Temple. Joe remembered now that Freddy had mentioned the boy was in training in Category Religion.

Sam led him back into the living room, switching off the Telly screen which had been tuned in on one of the fictionalized fracases of the past. Poor entertainment, when compared to the real thing, for any fracas buff, but better than nothing. In fact, it was even contended by some that if you got yourself properly tranked you could get almost as much emotion from a phony-fracas, as they were called, as for the genuine.

"Gee, sir," Sam said, "Papa was supposed to be back by now. I don't know where he is. If you wanta wait—"

Joe shrugged and picked himself a chair. He took in Sam's robes and made conversation. "Studies tough in the Temple schools?" he asked.

The teen-ager realized it was a make-talk question. He said, "Aw, not much. A lot of curd about rituals and all. You hafta memorize it."

"Curd, yet," Joe laughed. "You don't sound particularly pious, Sam. Come to think of it, I suppose any child of Freddy's could hardly be."

Sam said, his young voice urgent, "Papa said you were on your way up, Major Mauser. Just like us. Gee, how come you chose Category Military, instead of Religion?"

Joe Mauser looked at the other. It was his policy to treat young people either as children or adults. If he was to deal with a teen-ager as an adult, he didn't believe in pulling punches any more than had he been dealing with a person of sixty. He said, flatly, "I've never had much regard for those categories in which a man makes his living battening on human sorrow or fear, Sam. That includes in my book such fields as religion, undertakers and their affiliates, and even most doctors, for that matter." He added, to explain the last inclusion, "They profit too much from illness, for my satisfaction."

Major Mauser was enough of a current celebrity for practically anything he said to be impressive to young Sam Soligen. That youngster blinked. He said, "Well, gee, don't you believe in any gods at all? If you believe in any god at all, you gotta have a religious category, and that means priests."

"Why?" Joe said. Inwardly, he was amused at himself for getting into a debate with this youngster and even a trifle ashamed of needling the boy about his chosen field. But he said, "If there are gods, I doubt if they'd intrust a priesthood to threaten their created humanity with hellfire."

Sam was taken aback. "Well, why not?"

"Gods couldn't be bothered with such triviality. In fact, I'd think it unlikely they could be bothered with priests. If I was a god, certainly I couldn't."

The boy's face was intent, its youthfulness somewhat ludicrous in view of the dark robes he wore. He leaned forward, "Yeah, you talk about priests and undertakers and all battening on human sorrow, but how about you? How about the Category Military? How many men you killed, major?"

Joe winced. "Too many," he said abruptly. The tic was at the side of his mouth, unbeknownst to him. He added, "But mercenaries have deliberately chosen their path. They know what they're going into and they do it willingly, they haven't been drafted."

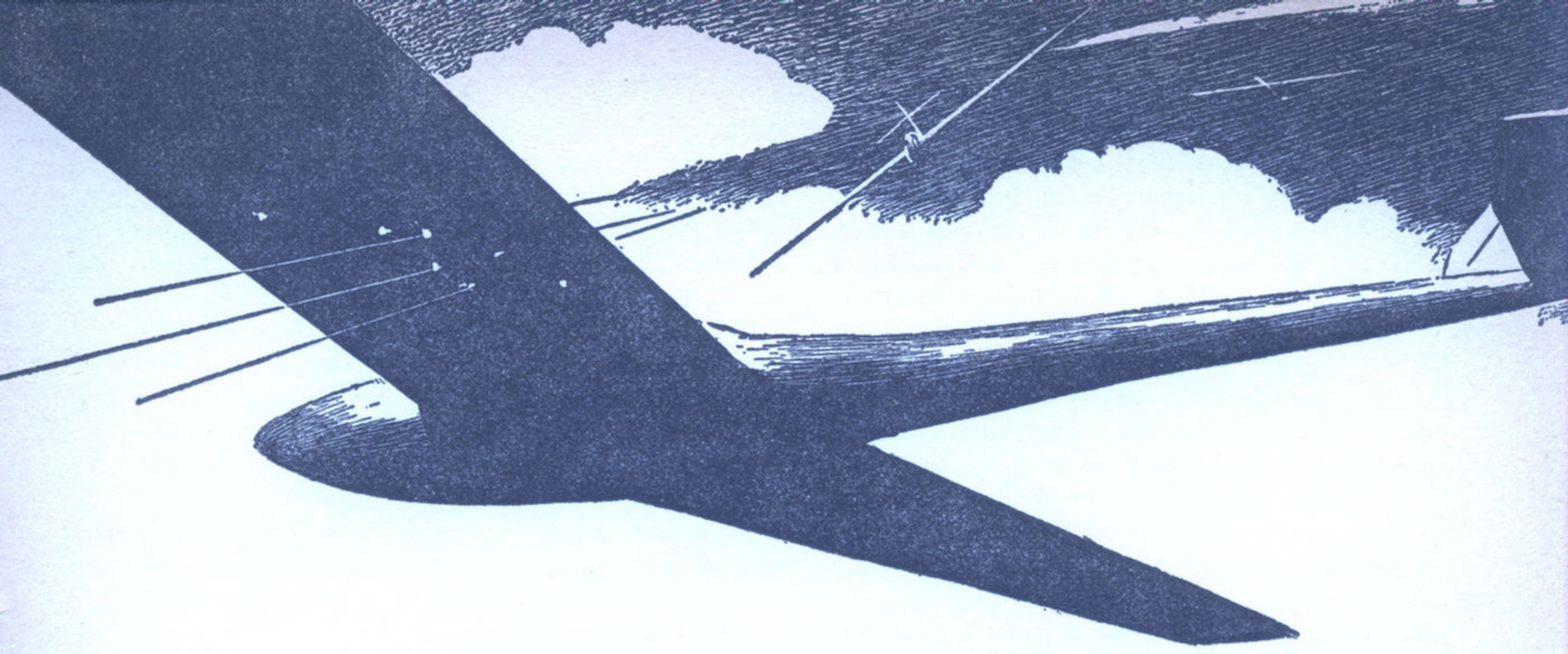
He thought a moment, and Phil Holland's talk about the Roman *ludi* came back to him. He said, "It's like the difference between throwing a bunch of Christians to some wild bulls in a Roman arena, to being a torero in Spain, a matador who has chosen his profession and enters the bullring to make money."

Then the boy said something that gave him greater depth than Joe had expected. "Yeah," he said, "but maybe the torero was forced into becoming a bullfighter on account of how bad he needed the money." In the heat of the discussion, he was emboldened to add, "And these new Rank Privates that go into a fracas, not knowing what it's all about, just filled with all the stuff we see on Telly and all. How much of a chance does one of them have if he runs into an old-timer like Joe Mauser, out there in no-man's-land?"

Touché, Joe thought.

There was the action that sometimes came back to him in his dreams. He had been a sergeant then, but already the veteran of five years or more standing, and a double score of fracases. The force of which he was a member had been in full retreat, and Joe's squad was part of the rearguard. The terrain had been mountainous, the High Sierra Military Reservation. Four of his men had copped one, two so badly that they had to be left behind, incapable of being moved. Joe, under the pressure of long hours of retreat under fire, had finally sent the others on back, and found himself a crevice, near the top of a sierra, which was all but impregnable.

His rifle had been a .45-70 Springfield, with its ultra-heavy slug, but slow muzzle velocity. And Joe had a telescope mounted upon it, an innovation that barely made the requirement of predating the year 1900 and thus subscribing to the Universal Disarmament Pack be-



tween the Sov-world and the West-world. It had taken the enemy forces a long time to even locate him, a long time and half a dozen casualties that Joe had coolly inflicted. The way to get to him, the only way, involved exposure. Joe could see the enemy officers, through his scope, at a distance just out of his range. They knew the situation, being old pros. He found considerable satisfaction in the rage he knew they were feeling. He was dominating a considerable section of the front, due to the terrain, and there was but one way to root him out, direct frontal attack.

They had sent in Rank Privates; Low-Lowers, most of them in their first fracas. Low-Lowers, the dregs of society, seldom employed and then at the rapidly disappearing, all but extinct, unskilled labor jobs. Low-Lowers, most of them probably in this fracas in hopes of the unlikelihood of so distinguishing themselves that they would be jumped a caste, or at least acquire an extra share or two of common stock to better the basic living guaranteed by the State. Rank Privates, most in their first fracas, unknowledgeable about taking cover and not even in the physical condition this sort of combat demanded.

They came in time and again, surprisingly courageous, Joe had to admit, and time and again he decimated them. One by one, coolly, seldom wasting a shot. Not that he had to watch his ammunition, he had the squad's full supply. He estimated that before it was through he had inflicted approximately thirty casualties. Hits in the head, in the torso, the arms, legs. He had inflicted enough casualties to fill a field hospital. And it had all ended, finally, when a senior officer below had arrived on the scene, took in the irritating situation, and sent a dozen noncoms and junior officers, experienced men, to dig Joe out. Joe had remained only long enough for a few final shots, none of them effective, at long range, and had then hauled out and followed after his squad. He might possibly have got two or three more of his opponents, but only at his own risk. Besides, already the irritation and hate that he had built up while on the run, and while his squad mates were copping wounds, had left him and there was nausea in his belly at the slaughter he had perpetrated.

Or that time on the Louisiana Reservation in the fracas between Allied Petroleum and United Oil. Joe had been a lieutenant then and—

But he rejected this trend of thought and brought his attention back to Sam Soligen.

"Perhaps you're right," he admitted. "Some Low-Lower jerk, impressed by what he considers high pay and adventure, doesn't stand much of a chance against an old pro."

The gawky teenager broke into a toothy smile. "Gee, I wasn't arguing with you, major. I don't know anything about it. How about telling me about one of your fracases, eh? You know, some time you really got in the dill."

Joe snorted. He seldom met someone not of Category Military who didn't want a special detailed description of some gory action in which Joe had participated. And like all veterans of combat, there was nothing he liked less to do. Combat was something which, when done, you wished to leave behind you. Were brain washing really practicable, it was this you would wish to wash away.

But Joe, like others before him, down through the ages, had found a way out. He had a store of a dozen or so humorous episodes with which he could regale listeners. That time his horse's cinch had loosened when he was on a scouting mission and he had galloped around and around amidst a large company of enemy skirmishers, most of them running after him and trying to drag him from the horse's back, while he hung on for dear life.

But it occurred to him that the boy might better appreciate a tale which involved his father, the Telly reporter, and some act of daring the small man had performed the better to serve his fracas-buff audience.

He was well launched into the tale, boosting Freddy Soligen's part beyond reality, but not impossibly so, when that worthy entered the room, breaking it off.

While Freddy was shaking hands with his visitor, Sam said, "Hey, Papa, you never told me about that time you were surrounded by all the field artillery, and only you and Major Mauser and three other men got out."

Freddy grinned fondly at the boy and then looked his reproach at Joe. "What're you trying to do, make the life of a Telly reporter sound romantic to the kid? Stick to the priesthood, son, there's more chicken dinners involved." He saw Joe was impatient to talk to him. "How about leaving us alone for a while, Sam? We've got some business."

"Sure, Papa. I've got to memorize some Greek chants, anyway. How come they don't have all these rituals and all in some language everybody can understand?"

"Then everybody might understand them," Freddy said sourly. "Then what'd happen?"

His son said, "Major, maybe you can finish that story some other time, huh?"

Joe said, "Sure, sure, sure. It winds up with your father the hero and they bump him to Upper-Upper and make him head of Category Communications."

"On the trank again," Freddy grumbled, but Joe sensed he wasn't particularly amused.

When the boy was gone, Joe Mauser told the Telly reporter of his interview with Stonewall Cogswell.

Freddy shook his head. "He wants you to fly that sailplane thing of yours again, huh? No. That won't do it. We need some gimmick, Joe. Something—"

Joe said impatiently, "You keep saying that. But, look, I'm a mercenary. A fighting man can't drop out of participation in the fracases if he expects the buffs to continue interest in him."

The little man tried to explain. "I'm not saying you're going to drop out of the fracases. But we need something where we can make you shine. Somewhere where you can be on every lens for a mile around."

Joe's face was still impatient.

Freddy said sourly, "Listen, you tried to handle all this by yourself, last time. You dreamed up that fancy glider gimmick and sold it to old Baron Haer. But did you do yourself any good with the buffs? Like Zen you did. All you did was louse up a perfectly promising fracas so far as they were concerned. Hardly a drop of blood was shed. Stonewell Cogswell just resigned when he saw what he was up against. Oh, sure, you won the battle for Vacuum Tube Transport, practically all by yourself, but that's not what the buff wants. He wants blood, he wants action, spectacular action. And you can't give it to him way up there in the air. Hey—!"

Joe looked at him, scowling questioningly.

Freddy said, slowly, "Why not?"

Joe Mauser growled, "What'd you mean, why not?"

Freddy said slowly, "Why can't you have some blood and guts combat, right up there in that glider?"

"Have you gone drivel-happy?"

But the little man was on his feet, pacing the floor quickly, irritably, but still happily. "A dogfight. A natural. Listen, you ever heard about dogfights, major?"

"You mean pitdogs, like in Wales, in the old days?"

"No, no. In the First War. All those early fighters. Baron Von Richthofen, the German, Albert Ball, the Englishman, René Fonck, the Frenchman. And all the rest. Werner Voss and Ernst Udet, and Rickenbacker and Luke Short.

Joe nodded at last. "I remember now. They'd have a Vickers or Spandau mounted so as to fire between the propeller blades. As I recall, that German, Richthofen, had some eighty victories to his credit."

"O.K. They called them dogfights. One aircraft against another. You're going to reintroduce the whole thing."

Joe was staring at him. Once again the Telly reporter sounded completely around the bend.

Freddy was impatiently patient. "We'll mount a gun on your sailplane and you'll attack those two gliders Cogswell says General McCord has."

Joe said, "The Sov-world observers would never stand still for it. In fact, there's a good chance that using gliders at all will be forbidden when the International Disarmament Commission convenes next month. If the Sov-world delegates vote against use of gliders as reconnaissance craft, the Neut-world will vote with them. Those Neut-world delegates vote against everything." Joe grunted. "It's true enough gliders were flown before the year 1900, but not the kind of advanced sailplanes you have to utilize for them to be practical. Certainly there were no gliders in use capable of carrying a machine gun."

Freddy demanded, "Look, what was the smallest machine gun in use in 1900?"

Joe considered. "Probably the little French Chaut-Chaut gun. It was portable by one man, the rounds were carried in a flat, circular pan. I think it goes back that far. They used them in the First War."

"Right! O.K., you had gliders. You had eight portable machine guns. All we're doing is combining them. It'll be spectacular. You'll be the most famous mercenary in Category Military and it'll be impossible for the Department not to bounce you to colonel and Low-Upper. Especially with me and every Telly reporter and fracas-buff magazine we've bribed yelling for it."

Joe's mouth manifested its tic, but he was shaking his head. "It wouldn't go, anyway. Suppose I caught one, or both, of those other gliders, busy at their reconnaissance and shot their tails off. So what? The fans still wouldn't have their blood and gore. We'd be so high they couldn't see the action. All they would be able to see would be the other glider falling."

Freddy stopped dramatically and pointed a finger at him in triumph. "That's where you're wrong. I'll be in

the back seat of your sailplane with a portable camera. Get it! And every reporter on the ground will have the word, and his most powerful telescopic lens at the ready. Man, it'll be the most televized bit of fracas of this half of the century!"

VIII

When Major Joe Mauser entered the swank Agora Bar, the little afternoon dance band broke into a few bars of that tune which was beginning to pall on him.

". . . I knew her heart was breaking.
And to my heart in anguish pressed,
The girl I left behind me."

Nadine looked up from the little table she occupied and caught the wry expression on his face and laughed.

"What price glory?" she said.

He took the chair across from her and chuckled ruefully. "All right," he said, "I surrender. However, if you think a theme song is bad, you'll be relieved at some of the other ideas my, ah, publicity agent had which I turned down."

She said, "Oh, did he want you to dash into some burning building and save some old lady's canary, or something?"

"Not exactly. However, he had a nightclub singer with a list of nine or ten victories behind her—"

"Victories?"

"Husbands. And I was to be seen escorting the singer around the nightclub circuit."

"A fate worse than death? But, truly, why did you turn him down?"

"I wanted to spend the time with you."

She made a moue. "So as to carry on our never-ending argument over the value of status?"

"No."

Her eyes dropped and there was a slight frown on her forehead. Joe interpreted it to mean that she took exception to one of Mid-Middle caste speaking to her in this wise. He said, flatly, "At least the tune is somewhat applicable tonight."

She looked up quickly, having immediately caught the meaning of his words. "Oh, Joe, you haven't taken another commission?"

"Why not? I'm a mercenary by trade, Nadine." He was vaguely irritated by her tone.

"But you admittedly made a small fortune on the last fracas. You were one of the very few investors in the whole country who expected Vacuum Tube Transport to boom, rather than go bankrupt. You simply don't *need* to risk your life further, Joe!"

He didn't bother to tell her that already the greater part of his small fortune had been siphoned off in Freddy Soligen's campaign to make him a celebrity. He said, instead, "The stock shares I'll make aren't particularly important, Nadine. But Stonewall Cogswell has pledged that if I'll fly for him in the Carbonaceous Fuel-United Miners fracas, he'll press my ambitions for promotion."

She said, her voice low, "Promotion in rank, or caste, Joe?"

"You know the answer to that."

"But, Joe, to risk your life, your *life*, Joe, for such a silly thing—"

He said softly, "Such a silly thing as attaining to a position which will enable me to court openly the girl I love?"

She flushed, looked into his face quickly. Her flush deepened and her eyes went to her folded hands, on the table.

He said nothing.

Nadine said finally, her voice so low as almost not to be heard, "Perhaps I would be willing to marry a man of Middle caste."

He was taken with surprise, but even in thrilling to the meaning of her words, his head was shaking in negation. "Nadine Haer, Category Medicine, Rank Doctor, Mid-Upper, married to Major Joseph Mauser, Category Military, Mid-Middle. Don't be ridiculous, Nadine. It would be as though back in the Twentieth Century you would have married a Negro or Oriental."

She was stirred with anger. "There is no law preventing marriage between castes!"

"Nor was there law, in most States, against marrying between races. But there were few who dared, and, of those, few who were allowed to be happy. It's no go, Nadine. Remember in the Exclusive Room the other night when the waiter questioned my presence in an Upper establishment and you had to tell him I was your guest? I don't desire to be your guest the rest of my life, Nadine."

The anger welled higher in her. "And do you think that in the remote case you do jump your caste to Upper, that I would marry you and then realize the rest of *my* life that our marriage was only possible due to your participation in mass slaughter for the sake of the slobbering multitudes of Telly fans?"

Joe said, "I wasn't going to bring the matter up until I had made Low-Upper caste."

"Well, sir, the matter is up. And I reject you in advance. Oh, Joe, if you have to persist in this status-hungry ambition of yours, drop the Category Military and get into something else. You have enough of a fortune to branch into various fields where your abilities would lead to advancement."

Again he didn't tell her that his fortune was all but dissipated. Instead, he said bitterly, "Those who have, get. The rich get richer, the poor get poorer. Things are rigged, these days, so that it's impossible to work your way to the top except in Military and Religion. The Uppers take care of their own, and at the same time make every effort to keep we of the lower orders from joining their sacred circle. I might make it in the Military, Nadine, but my chances in another field are so remote as to be laughable."

She stood and looked down at him emptily. "No," she said, "don't get up. I'm leaving, Major Mauser." He began to rise, to protest, but she said, her voice curt. "I have seen only one fracas on Telly in my entire life, and was so repelled that I vowed never to watch again. However, I am going to make an exception. I am going to follow this one, and if, as a result of your actions, even a single person meets death, I wish never to see you again. Do I make myself completely clear, Major Mauser?"

IX

Marshal Stonewall Cogswell looked impudently around at his staff officers gathered about the chart table. "Gentlemen," he said, "I assume you are all familiar with the battle of Chancellorsville?"

No one bothered to answer and he chuckled. "I know what you are thinking, that had any of you refrained from a thorough study of the campaigns of Lee and Jackson, he would not be a member of my staff."

The craggy marshal traced with his finger on the great military chart before them. "Then you will have noticed the similarity of today's dispensation of forces to that of Joseph Hooker's Army of the Potomac and Lee's Army of Northern Virginia, on May 2, 1863." He pointed with his baton. "Our stream, here, would be the Rappahannock, this woods, the Wilderness. Here would be Fredericksburg and here Chancellorsville."

One of his colonels nodded. "My regiment occupies a position similar to that of Jubal Early."

"Absolutely correct," the marshal said crisply. "Gentlemen, I repeat, our troop dispensations, those of Lieutenant General McCord and myself, are practically identical. Now then, if McCord continues to move his forces here, across our modern day Rappahannock, he makes the initial mistake that finally led to the opening which allowed Jackson's brilliant fifteen-mile flanking march. Any questions, thus far?"

There were some murmurs, no questions. The accumulated years of military service of this group of veterans would have totaled into the hundreds.

"Very interesting, eh?" the marshal pursued. "Jed, your artillery is massed here. It's a shame that General Jack Altshuler has taken a commission with Carbonaceous Fuel. We could use his cavalry. He would be our J.E.B. Stuart, eh?"

Lieutenant Colonel Paul Warren, cleared his throat unhappily. "Sir, Jack Altshuler is the best cavalryman in North America."

"I would be the last to deny it, Paul."

"Yes, sir. And he's fought half his fracases under you, sir."

"Your point, Paul?" the marshal said crisply.

"He knows your methods,sir. For that matter, so does Lieutenant General McCord. He's fought you enough."

There was silence in the staff headquarters, broken suddenly by Cogswell's curt chuckle. "Paul, I'm going to recommend to the Category Military Department, your promotion to full colonel on the strength of that. You were the first to see what I have been getting to. Gentlemen, do you realize what General McCord and his staff are doing this very moment? I would wager my reputation that they are poring over a campaign chart of the battle of Chancellorsville."

The craggy veteran bent back over the map again, his voice dropped all humor and he stabbed with his baton. "Here, here, and here. They expect us to duplicate the movements of Lee. Very good, we shall. But the advances of Lee and Jackson, we will make feints. And the feints made by Lee and Jackson will be our attacks in force. Gentlemen, we are going to literally reverse the battle of Chancellorsville. Major Mauser!"

Joe Mauser had been in the background as befitted his junior rank. Now he stepped to the table's edge. "Yes, sir."

The marshal indicated a defile. "Were we actually duplicating the Civil War battle, this would have been the right flank of Sedgwick's two army corps. We're not dealing in army corps these days but only regiments, however, the position is relatively as important. Jack Altshuler's cavalry is largely concentrated here. When the action is joined, he can move in one of three ways. Through this defile, is least likely. However, if his heavy cavalry *does* work its way through here, I must know immediately. This is crucial, Joe. Any questions?"

"No, sir."

The marshal turned his attention to his chief of artillery. "Jed, when we need your guns, we're going to need them badly, but I doubt if that time will develop until the second or third day of the fracas. Going to want as clever a job of camouflage done as possible."

The other scowled. "Camouflage, sir?"

"Confound it, yes. French term, I believe. Going to want your guns so hidden that those two gliders of McCord's will fail to spot them." The marshal grimaced in the direction of Joe Mauser, who, having his instructions, had fallen back from the table again. "When you reintroduced aerial observation to the fracas, major, you set off a whole train of related factors. Camouflage is going to be in every field officer's lexicon from this day on. Which reminds me." He looked to his artilleryman.

"Yes, sir."

"Put your mind to work on devising Maxim gun mounts to be used to keep enemy gliders at as high altitude as possible, or preferably, of course, to bring them down. We'll need an antiaircraft squadron, in short. Better put young Wiley on it."

"Yes, sir."

X

The airport nearest to the Grant Memorial Military Reservation was some ten miles distance from the bord-

ers which, upon the scheduling of a fracas, were closed to all aircraft, and to all persons unconnected with the fracas, with the exception only of Telly crews and military observers from the Sov-world and the Neut-world, present to satisfy themselves that weapons of the post-1900 era were not being utilized.

The distance, however, wasn't of particular importance. The powered aircraft which would tow Joe Mauser's glidder to a suitable altitude preliminary to his riding the air currents, as a bird rides them, could also haul him to a point just short of the military reservation's border.

Joe Mauser turned up on the opening day of the fracas, which was scheduled for a period of one week, or less, if one or the other of the combatants was able to achieve total victory in such short order. He was accompanied by Freddy Soligen, who, for once, was without a crew to help him with his cameras and equipment. Instead, he sweated it out alone, helped only by Max Mainz who was being somewhat huffy about this Telly reporter taking over his position as observer.

They approached the sailplane, and while Joe Mauser checked it out, in careful detail, Freddy Soligen and Max began loading the equipment into the graceful craft's second seat, immediately behind the pilot. Max growled, "How in Zen you going to be able to lift all this weight, major, sir?"

Joe said absently, testing the ailerons, "We'll make it. Freddy isn't any heavier than you are, Max. Besides, this sailplane is a workhorse. I sacrificed gliding angle for weight carrying potential."

That meant absolutely nothing to Max Mainz, so he took it out by awarding the Telly reporter with a rare combination of glower and sneer.

Freddy said, "Oh, oh, here they come, Joe." However, he kept his head low, storing away his equipment, and seemingly ignored the approach of the three distinctive uniformed officers.

Joe said from the side of his mouth, "Get that you-know-what out of sight, soonest." He turned as the trio neared, came to attention and saluted.

The foremost of the three, his tunic so small at the waist that he could only have been wearing a girdle, answered the salute by tapping his swagger stick against the visor of his cap. "Major Mauser," he said in acknowledgment. He made no effort to shake hands, turning instead to his two companions. He said, "Lieutenant colonel Krishnalal Majumdur, of Bombay, Major Mohamed Kamil, of Alexandria, may I introduce the"—there was all but a giggle in his tone—"celebrated Major Joseph Mauser, who has possibly reintroduced aircraft to warfare."

Joe saluted and bowed in proper protocol. "Gentlemen, a pleasure." The two neutrals responded correctly, then stepped forward to shake his hand.

Colonel Lajos Arpàd added, gently, "Or possibly he has not."

Joe looked at him. The Hungarian seemed to make a practice of turning up every time Joe Mauser was about to take off. The Sov-world representative said airily, "It will be up to the International Disarmament Commission to decide upon that when it convenes shortly, will it not?"

The Arab major was staring in fascination at the sailplane. He said to Joe, "Major Mauser, you are sure such craft were in existence before 1900? It would seem—"

Joe said definitely, "Designed as far back as Leonardo and flown in various countries in the Eighteenth Century." He looked at the Hungarian. "Including, so I understand, what was then Czarist Russia."

The Sov-world officer ignored the obvious needling, saying merely, "It is quite true that the glider was first flown by an obscure inventor in the Ukraine, however, that is not what particularly interests us today, major. Perhaps the commission will find that the use of the glider is permitted for observation, however, it is obvious that before the year 1900 by no stretch of the imagination could it be contended that they were, or could have been, used for, say, *bombing*." He turned quickly and pointed at Freddy Soligen, who, already seated in the sailplane, was watching them, his face not revealing his qualms. "What has that man been hiding within the craft?"

Joe said formally, "Gentlemen, may I introduce Frederic Soligen, Category Communications, Subdivision Telly News, Rank Senior Reporter. Mr. Soligen has been assigned to cover the fracas from the air."

Freddy looked at the Sov-world officer and said innocently, "Hiding? You mean my portable camera, and my power pack, and my auxiliary lenses, and my—"

"All right, all right," Arpàd snapped. The Hungarian was no fool and obviously smelled something wrong in this atmosphere. He turned to Joe. "I would remind you, major, that you as an individual are responsible for any deviations from the basic Universal Disarmament Pact. You, and any of your superiors who can be proven to have had knowledge of such deviation."

"I am familiar with the articles of war, as detailed in the pact," Joe said dryly. "And now, gentlemen, I am afraid my duty calls me." He bowed stiffly, saluted correctly. "A pleasure to make your acquaintance Colonel Majumdur, Major Kamil. Colonel Arpàd, a pleasure to renew acquaintance."

They answered his salute and stared after him as he climbed into the sailplane and signaled to the pilot of the lightplane which was to tow him into the air. Max Mainz ran to the tip of one wing, lifting it from the ground and steadying the glider until forward motion gave direction and buoyancy.

Freddy Soligen growled, "Zen! If they'd known I had a machine gun tucked away in this tripod case."

Joe said unhappily, "The Sovs have obviously decided to put up a howl about the use of aircraft in the West-world."

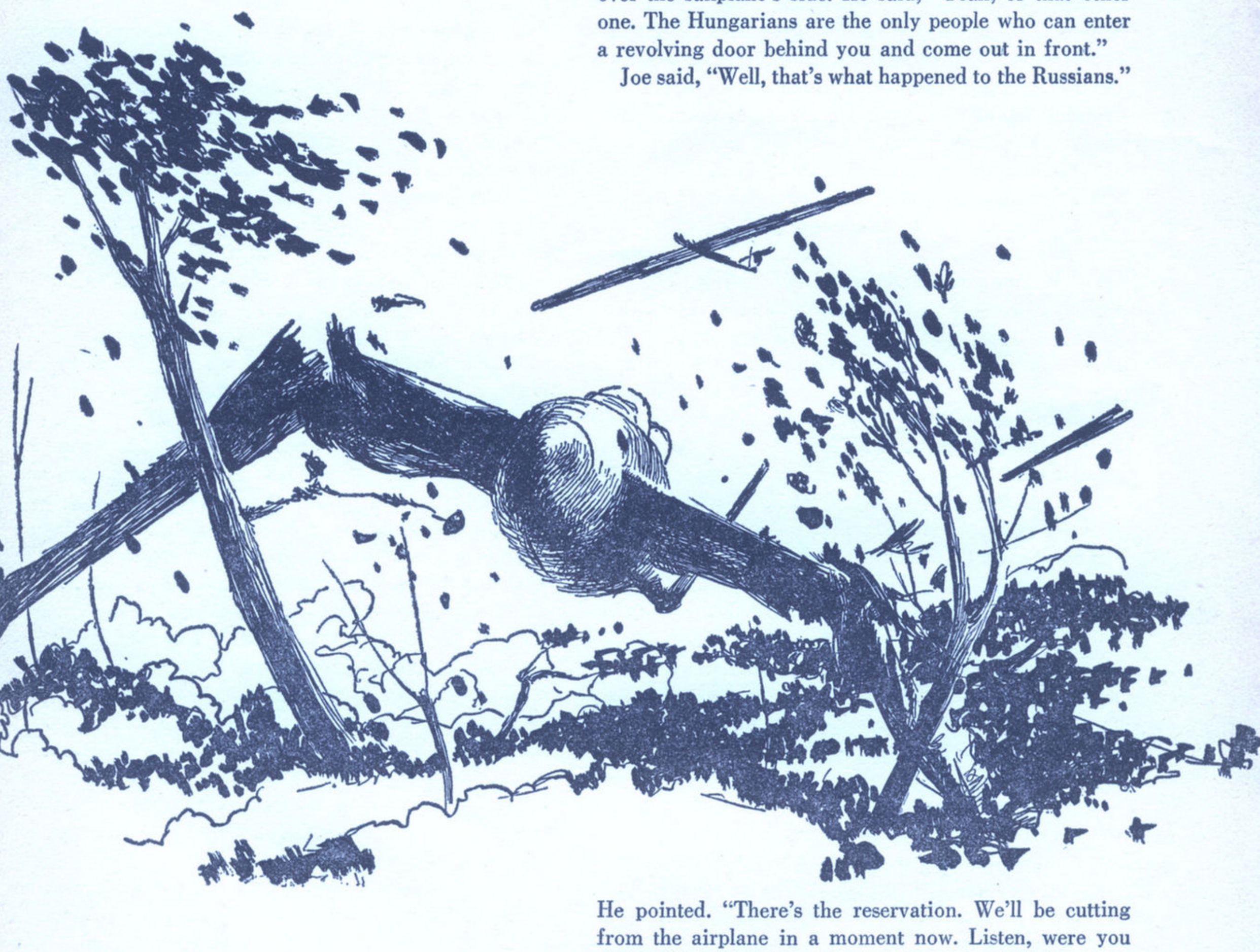
He shifted his hand on the stick, gently, and the glider which had been sliding along on its single wheel, lifted ever so gently into the air. Joe kept it at an altitude of about six feet until the lightplane was air-borne.

Freddy growled, "How come the Hungarians have become so important in the Sov-world? I thought it was the Russians who started their whole shooting-match."

Joe said wryly, "That's something some of the early timers like Stalin didn't figure out when they began moving in on their neighbors. They could have learned a lesson from Hollywood about the Hungarians. What was the old saying? *If you've got a Hungarian for a friend, you don't need any enemies.*"

Freddy laughed, even as he looked apprehensively over the sailplane's side. He said, "Yeah, or that other one. The Hungarians are the only people who can enter a revolving door behind you and come out in front."

Joe said, "Well, that's what happened to the Russians."



He pointed. "There's the reservation. We'll be cutting from the airplane in a moment now. Listen, were you able to find out who either of General McCord's glider pilots are?"

"Yeah," Freddy told him. "Both are captains. One named Bob Flaubert and the other Jimmy Hideka."

"Bob Flaubert?" Jeb growled. "He's an artilleryman. We've been in the dill together half a dozen times."

Freddy was staring below, trying to understand the terrain from this perspective. While Joe was tripping

the lever which let the tow rope drop away from the glider, the Telly reporter said, "Both of them used to fly lightplanes for sport. When you started this new glider angle, they must've seen the possibilities and took it up immediately. But you oughta be able to fly circles around them, they just haven't had the time for experience with planes without motors."

"Bob, eh?" Joe said softly. "He saved my life once. Five minutes later, I saved his."

Freddy looked at him quickly. "Zen!" he complained. "It's no time to be thinking of that. So now you're even with him. And you're both hired mercenaries in a fracas."

"But I've got a gun and he hasn't," Joe growled.

"Good!" Freddy snapped at him.

They had cut away from the light plane and Joe headed for that area which Cogswell had ordered him particularly to keep scanned. Jack Altshuler was a fox, in combat. His heavy cavalry had more than once swung a fracas.

At the same time, he kept himself alert for the other gliders. It seemed probable, since the enemy forces had two, that they would use them in relays. Which meant, in turn, that it was unlikely Joe would find them both in the air at once. In other words, if he attacked the one, possibly shooting it down, then the other would be warned, would mount a gun of its own, and it would no longer be a matter of shooting a clay pigeon.

Joe turned to mention this over his shoulder to Freddy Soligen, just in time to catch the shadow above and behind him.

"Holy Zen!" he snapped, kicking right rudder, thrusting his stick to the right and forward.

"What the devil!" Freddy protested, looking up from adjusting a lens on his camera.

Three or four thirty-caliber slugs tore holes in their left wing, the rest of the burst missing completely.

Joe dove sharply, gained speed, winged over and reached desperately for altitude. The other—no, the *others* were above him. He yelled back at the cameraman, "Put that Chaut-Chaut gun together for me. Be ready to hand me pans of ammo. And if you want blood and gore on that Tellylens of yours, get going!"

It still hadn't got through to the smaller man. "What in devil's going on?"

Joe banked again, grabbing for a current rising along a hill slope, circled, circled, reaching for altitude before they could get over to him and make another pass. He snapped bitterly, "Did I say something about poor old Bob Flaubert not having a gun, while I did? Well, poor old Bob's obviously got at least as much fire power as we have. Freddy, I'm afraid matters have pickled."

The other was startled.

"Do I have to draw a picture?" Joe said. "Look." He pointed to where the other two crafts circled, possibly a hundred meters above and five hundred to the right of them. The other two gliders bore a single passenger apiece, and were seemingly moving as quietly as were Joe and Freddy, but gliders in motion are deceptive. Joe shot a glance at his rate of climb indicator. He was doing all right at six meters per second, a thousand feet a minute, considering his weight.

Freddy had at last awakened to the fact that they were in combat and even that the enemy had drawn first blood. The wound taken in their wing was not serious, from Joe's viewpoint, but the torn holes in the fabric were obvious. But the little man had not gained his intrepid reputation as a Telly cameraman without cause. He moved fast, both to get the small French machine gun into Joe's hands and to get himself into action as a cameraman.

He snapped, "What's the situation?"

Joe, circling, circling, praying the updraft wouldn't give out on him before it did on the others, on their opposite hill, said, "We weigh too much. Altitude counts. What've you got back there that can be thrown out?" As he talked, he was shrugging himself out of his leather flying jacket.

"Nothing," Freddy said in anguish. "I cut down my equipment to the barest, like you said."

"You've got extra lenses and stuff, out with them." Joe tossed his coat over the glider's side, began unlacing his shoes. "And all your clothes. Clothes are heavy."

"I need my equipment to get long-range shots, like when one of them crashes!" The little man was scanning the others through his view-finder, even as he argued, and shrugging out of his own jacket.

The updraft gave out and the rate of climb meter began to register a drop. Joe swore and shot a glance at his opponents. Happily, they, too, had lost their currents, both were now heading for him.

Joe clipped out to his companion. "We're not going to be getting shots of them crashing, unless we lose more weight. Overboard with everything you can possibly afford, Freddy. That's an order."

There was one thing in his favor. He had a year's flying experience, more than six months of it in this very glider. The stick and rudderbar were as though appendages of his body. One flies by the seat of his pants, in a soaring glider, and Joe flew his as though born in it. The others, obviously, were as yet not thoroughly used to engineless craft.

He banked away from them, flying as judiciously as possible, begrudging each foot dropped. He could feel the craft jump lightly each time the cursing Telly reporter jettisoned another article of equipment, his pants, or his shoes.

The others evidently had their guns fix-mounted, to fire straight ahead. Joe wondered, even as he slid away from them, how they had managed to escape detection from the Sov-world and Neut-world field observers. Well, that could be worried about later.

One of them fired at him at too great a range, and

then both, realizing that they were dropping altitude too quickly and that soon Joe would be on their level, turned away and sought a new updraft. As they banked, their faces were clearly discernible. One raised a hand in mocking salute.

"Look at that curd-loving Bob," Joe laughed grudgingly. "Here, let me have that gun."

He steadied the small mitrailleuse on the edge of the cockpit, holding the craft's stick between his knees, and squeezed off a burst which rattled through the other's fuselage without apparent damage. The foe glider slid away quickly, losing precious altitude in the maneuver.

"Ah, ha," Joe said wolfishly. "So now they know we've got a stinger too."

"I got that," Freddy crowed. "I got it perfectly. Listen, we're too high for the boys down below. Get lower so they can get you on lens, Joe. The other Telly teams. Every fracas buff in North America is watching this."

Joe snorted his disgust. "I hope every fracas buff in North America chokes on his trank pills," he snarled. "We're in the dill, Freddy. Understand? We're too heavy, and there's two of them and one of us. On top of that, those are Maxim guns they've got mounted, not peashooters like this Chaut-Chaut."

"That's your side of it," Freddy said, not unhappily. "I take care of the photography. Get closer, Joe. Get closer."

Joe had found another light updraft and gained a few hundred feet, but so had the others. They circled, circled. His experience balanced their advantage of the lesser weight. Happily, their glide ratios didn't seem to be any better than his own. Had they high performance gliders of forty, or even thirty-five, gliding angle ratios, he would have been lost.

"Nothing else you can toss out?" he growled at Freddy.

"What the Zen!" Freddy muttered nastily. "You want me to jump?"

"That's an idea," Joe growled wolfishly, even as he circled, circled. "I should have realized when you were giving me your fling about reintroducing aerial warfare, that it wasn't an idea that others couldn't have. It was just as easy for Bob to mount a gun as it was for us. Now we're both being kept from doing reconnaissance by the other and—"

Joe Mauser broke it off in mid-sentence and his face blanched. He shot a quick look downward. All three gliders had climbed considerably, and the terrain below was indistinct.

Joe snapped, "Hand me those glasses!"

"What glasses? What's the matter?" Freddy complained. "Try to get closer to them and let me get a close-up of you giving them a burst."

"My binoculars!" Joe snapped urgently. "I want to see what's going on below."

"Oh," Freddy said. "I threw them out. Along with all the rest of the equipment. Glasses, semaphore flags, that sun blinker you had. All of it went overboard with my extra lenses."

The craft was so banked as almost to have the wings perpendicular to earth. Joe shot an agonized look at the smaller man, then back again at the earth below, trying desperately to narrow his eyes for keener vision.

Freddy said, "What in Zen's the matter with you? What difference does it make what they're doing down below? We're all occupied up here, thanks."

"This is a frame-up," Joe growled. "Bob and that other pilot. They weren't out on reconnaissance, this morning. They were laying for me. They're out to keep me from seeing what's going on down there. And I know what's going on. Jack Altshuler's pulling a fast one. Here we go, Freddy, hang on!"

He slapped his flap brake lever with his left hand, winged over and began dropping like a shot as his gliding angle fell off from twenty-five to one to ten to one. In seconds the other two gliders were after him, riding his tail.

Freddy Soligen, his eyes bugging, shot a look of fear at the two trailing craft, both of which, periodically, showed brilliant cherries at their prows. Maxim guns, emitting their blessings.

The Telly reporter turned desperately back to Joe Mauser, pounding him on the shoulder. His physical fear was secondary to another. "Joe! You're on lens with every Telly team down there, and you're running!"

"Cut that out," Joe rapped. "Duck your head. Let me train this gun over you. I've got to keep those jokers from shooting off our tail before I can get to the marshal."

"The marshal!" Freddy yelled. "You can't get to him anyway. I told you I threw away your semaphore flags, your blinker—everything. This country's hilly. You can't get your message to him anyway. Listen, Joe, you've still got time. You can stunt these things better than those two can."

"Duck!" Joe snarled. He let loose a burst at the pursuing gliders over the smaller man's head, and just missing his own tail section.

They sped down almost to tree level at fantastic speed for a glider. The two enemy craft were hot after them, their guns *flac, flac, flacing* in continuous excitement, trying to catch Joe in sights, as he kicked rudder, right, left, right, in evasive maneuver.

His guess had been correct. The swashbuckling Jack Altshuler had known his many times commander even better than Cogswell had realized. Instead of three alternative maneuvers open to the wily cavalryman, he'd ferreted out a fourth and his full force, hauling mountain guns on mule back with them, were trailing over a supposedly impossible mountain path which originally could not have been more than a deer track.

Freddy Soligen, in back, was holding his head in his hands in surrender. He could have focused on the troops below, but the desire wasn't in him. Not one fracas buff in a hundred could comprehend the complications of

combat, the need for adequate reconnaissance—the need for Joe to get through.

He made one last plea. "Joe, we've put everything into this. Every share of stock you've accumulated. All I have, too. Don't you realize what you're doing, so far as the buffs are concerned? Those two half-trained pilots behind have you on the run."

Joe growled, "And twenty thousands lads down below are depending on me to report on Altshuler's horse."

"But you can't win, anyway. You can't get your message to Cogswell!"

Joe shot him a wolfish grin. "Wanta bet? Ever heard of a crash landing, Freddy? Hang on!"

XI

Stretched out on the convalescent bed in the Category Military rest home, Joe grinned up at his visitor and said ruefully, "I'd salute, sir, but my arms seem to be out of commission. And, come to think of it, I'm out of uniform."

Cogswell looked down at him, unamused. "You've heard the news?"

Joe caught the other's tone and his face straightened. "You mean the Disarmament Commission?"

Cogswell said brittlely, "They found against the use of aircraft, other than free balloons, in any military action. They threw the book, Mauser. The court ruled that you, Robert Flaubert and James Hideka be stripped of rank and forbidden the Category Military. You have also been fined all stock shares in your possession other than those unalienably yours as a West-world citizen."

Joe's face went empty. It was only then that he realized that the other was attired in the uniform of a brigadier general. The direction of his eyes was obvious.

Cogswell shrugged bitterly. "My Upper caste status helped me. I could pull just enough strings that the Category Military Department, in conjunction with the rulings of the International Disarmament Commission merely reduced me in rank and belted me with a stiff fine. Your friend—your former friend, I should say, Freddy Soligen, testified in my behalf. Testified that I had no knowledge of your mounting a gun."

The former marshal cleared his throat. "His testimony was correct. I had no such knowledge and would have issued orders against it, had I known. The fact that you enabled me to rescue the situation into which I'd been sucked, helps somewhat my feelings toward you, Mauser. But only somewhat."

Joe could imagine the other's bitterness. He had fought his way up the hard way to that marshal's baton. At his age, he wasn't going to regain it.

Brigadier general Stonewall Cogswell hesitated for a moment, then said. "One other thing. United Miners has repudiated your actions even to the point of refusing the cost of your hospitalization. I told the Category Medicine authorities to put your bill on my account."

Joe said quite stiffly. "That won't be necessary, sir."

"I'm afraid you'll find it is, Mauser." The former marshal allowed himself a grimace. "Besides, I owe you something for that spectacular scene when you came skimming over the treetops, the two enemy gliders right behind you, then stalling your craft and crashing into that tree not thirty feet from my open air headquarters. Admittedly, in forty years of fracases, I've never seen anything so confoundedly dramatic."

"Thank you, sir."

The old soldier grunted, turned and marched from the room.

XII

Freddy Soligen had been miraculously saved from the physical beating taken by Joe Mauser in the crash. The pilot, sitting so close before him, cushioned with his own body that of the Telly reporter.

For that matter, he had been saved the financial disaster as well, save for that amount he had contributed to the campaign to increase Mauser's stature in the eyes of the buffs. His Category Communications superiors had not even charged him for the cost of the equipment he had jettisoned from the glider during the flight, nor that which had been destroyed in the crash. If anything, his reputation with his higher-ups was probably better than ever. He'd been in there pitching, as a Telly reporter, right up until the end when the situation had completely pickled.

All that he had lost was his dream. It had been so close to the grasping. He could almost have tasted the sweetness of victory. Joe Mauser, at the ultimate top of the hero-heap. Joe Mauser accepting bounces in both rank and caste. And then, Joe Mauser being properly thankful and helpful to Freddy and Sam Soligen, in their turn. So near the realization of the dream.

He entered his house wearily, finally free of all the ridiculous questioning of the commission and the courts martial of Mauser and Cogswell, and Flaubert, Hideka and their commander, General McCord. All had been found guilty, though in different degrees. Using weapons of warfare which post-dated 1900. Than which there was no greater crime between nations.

He tossed the brief case he had carried to a table, and made his way to the living room, heading for the auto-bar and some straight spirits.

A voice said, "Hi, Papa."

He looked up, not immediately recognizing the Category Military, Rank Private, before him.

Then he said weakly, "Sam!" His legs gave way, and he sat down abruptly on the couch which faced the wall which was the Telly screen.

The boy said, awkwardly, "Surprise, Papa!"

His father said, very slowly, "'What . . . in . . . Zen . . . are . . . you . . . doing . . . in . . . that . . . outfit?"

Sam grinned ruefully, albeit proudly. "Aw, it would-

've taken a century for me to make full priest, Papa. The only way to do is like Major Mauser. You didn't know this, but, I've been following the fracases all along. Especially when you were the reporter. I've watched every fracas you've covered for years. I guess you know I'm pretty proud of you."

"Sam! What are you doing in that uniform? Answer me!"

The boy flushed. "I'm old enough, Papa. I switched categories. I've signed up with Chrysler-Ford in their fracas with Hovercar Sports. They're taking me on as infantryman."

"Infantryman?" Freddy winced, and closed his eyes. "Listen, boy, where'd you get the idea that—" He started over again. "But all your life I've given you the inside on the Category Military, Sam. All your life. No trank in our home. No watching the Telly day in and out. You've gone to *school*. More than I ever did. You were going to be a Temple priest—"

Sam sat down too, vaguely surprised at his father's reaction. "Aw, Papa, everbody's a fracas buff now. Everybody. You can't get away from it. I . . . well, I want to be like Major Mauser. Get so all the fans know me, want my autograph, all that. And all the excitement of being in a fracas, getting in the dill, and all. I just want to be like the other fellas, Papa."

Freddy could only stare at him.

Sam tried to explain. "Shucks, it was really you that made me want to become a mercenary. You're the best Telly reporter of them all. When *you* cover a fracas, Papa, you really do it. You can see *everything*." He shook his head in admiration. "Gosh, you really feel the emotion. It's the most exciting thing in the world."

"Yeah, son," Freddy Soligen said emptily. "I suppose it is."

XIII

Joe was able to get around on auto-crutches by the time she finally arrived—a stereotype visitor. Done up brightly, a box of candy in one hand, flowers in the other. He could see her coming across the lawn, from the visitor's offices. He wished that he had worn his other suit. His clothing was on the skimpy side when uniforms were subtracted.

She came up to him. "Well, Joe."

He looked at the flowers and attempted a grin. "Lilies would have been more appropriate, considering the shape I'm in."

Nadine said, "I've just been talking to the staff doctors. You're not in as bad shape as all that. Some bone mending, is all."

The grin turned wry. "I wasn't just thinking of the physical shape." He settled to the stone bench which stood to one side of the walk he had been exercising upon before her arrival. For a moment, she remained standing.

He looked up at her. "Well," he said. "I didn't break your condition," he said. "Am I still receivable?"

She frowned.

Joe said, bitterly, "You told me that you were going to take the fracas in and if my actions resulted in any casualties, you never wanted to see me again."

She took the place beside him. "I did watch. For a time, the rest of the battle going on below was ignored and you were full on lens for at least twenty minutes. I was never so frightened in my life."

Joe said, "The first step toward becoming a buff. First you're scared. Vicariously. But it's fun to become scared, when nothing can really happen to you. It becomes increasingly exciting to see others threatened with death —and then actually to die before you. After a while, you're hooked."

She looked carefully at the flowers. "That's not exactly what I meant. I was frightened for you, Joe. Not thrilled."

He looked at her for a long moment. Finally he breathed deeply and said, "Well, you'll never have to go through that again. I'm no longer in the Category Military, I suppose you know."

"It was on the news, Joe." She laughed without amusement. "In fact, I knew even before. Balt was tried, too."

"Balt? Your brother?"

She nodded. "You first used your glider in that fracas for father and Vacuum Tube Transport. Now that the commission has ruled against gliders, Balt, now head of the family, has been both fined and expelled from Category Military for life. It hasn't exactly improved his liking for you."

Joe hadn't heard of it, however, he had little sympathy for Balt Haer, nor interest in him. He said, "Why did you take so long to come?"

"I was thinking, Joe."

"And then you finally came."

"Yes."

He looked away and into unseen distances. Finally he cleared his throat and said, "Nadine, the first time I ever talked to you to any extent, I mentioned that I wanted to achieve the top in this status world of ours. I mentioned that I hadn't built this world, and possibly didn't even approve of it, but since I'm in it and have no other recourse, I must follow its rules."

She nodded. "I remember. And I said, why not try and change the rules?"

Joe nodded. He moistened his lips carefully. "O.K. Now I'm willing to listen. How do we go about changing the rules?"

To be concluded

ALL DAY WEDNESDAY

Practically everybody would agree that **this** is Utopia . . .

by RICHARD OLIN

ILLUSTRATED BY GEORGE SCHELLING

Ernie turned the dial on his television. The station he had selected brightened and the face of the set turned from dark to blue. Ernie sipped his can of beer. He was alone in the room, and it was night.

The picture steadied and Jory looked out of the set at him. Jory's face was tired. He looked bad.

"Hello, Ernie," Jory said.

Ernie turned the dial to the next station.

"Hello, Ernie," the face of Jory said.

At the next spot on the dial: "Hello, Ernie." The next: "Hello, Ernie."

There were five stations that Ernie's set was able to receive. When the fifth station said "Hello, Ernie," and Jory's tired face looked out at him, Ernie shrugged, took another sip from his can of beer and sat down to watch the set.

That happened Wednesday night. Wednesday morning began like this:

Ernie woke feeling bored. It seemed he was always bored these days. An empty can of beer and a crumpled pack of cigarettes rested on top of the dead television. All he did nights was watch TV.

Ernie sighed and thanked God that today was Wednesday. Tonight, when he came home from work, he would be over the hump . . . only two days left and then the week end. Ernie didn't know for sure what he would *do* on his week end—go bowling, maybe—but whatever he did it was sure to be better than staying home every night.

Oh, he supposed he *could* go out, just once in a while, during the work week. Some of the guys at the plant did. But then, the guys that did go out week nights weren't as sharp at their jobs as Ernie was. Sometimes they showed up late and pulled other stuff like that. You couldn't do things like that too often, Ernie thought virtuously. Not if it was a good job, a job that you wanted to keep. You had to be sharp.

Ernie smiled. *He* was sharp. A growing feeling of virtue began to replace his boredom.

Ernie glanced at his watch and went sprawling out of his bed. He was late. He didn't even have time for breakfast.

His last thought, as he slammed out of his apartment, was an angry regret that he had not had time to pack a lunch. He would have to eat in the plant cafeteria again. Cafeteria lunches cost money. Money concerned Ernie. It always did. But right now he was going to need money for the week end; payday was another week away.

Ernie punched in twelve minutes late.

His foreman was waiting beside the time clock. He was a big man, and what was left of his red hair matched in color the skin of his neck. And the color of his face, when he grew angry.

His name was Rogers. He smiled now as Ernie nervously pushed his time card into the clock. His voice was warm and jovial as he spoke.

"Well . . . *good morning*, Mr. Stump. And did we have a nice, late, cozy little sleep-in this morning?"

Ernie smiled uncertainly. "I'm sorry, Rogers. I know I'm late, but the time just sort of got away from me—"

Rogers laughed lightly. "Think nothing *of* it, Mr. Stump. These things happen, after all."

"Uh, yeah. Well, like I said, I'm sorry and—"

Rogers went on, unheeding. "Of course, complications can develop when your number three wrist-pin man decides that he just isn't feeling sharp this morning and he needs a little extra sleep to put him right. If you're the foreman for Sub-Assembly Line 3-A, for example, Mr. Stump, one wonders if the rush order that must be filled by this morning is going to be finished any time before next Christmas. One wonders where the wrist-pin man is, Mr. Stump. Does he intend to come in at all, or will he just snooze his little head off all day? One wonders what to say to the plant manager, Mr. Stump. How do you tell him that twenty men are standing idle on Sub-Assembly Line 3-A because, through a laughable oversight, there is no one to put in a wrist-pin? How do you explain it so he will *understand*, Mr. Stump?"

Rogers stopped and caught his breath. His face began growing red. He said slowly, "You *don't*, Mr. Stump. You don't explain it so he will understand. I just tried!"

Ernie swallowed. Hurriedly, he said, "Look I'm sorry. I'll get right in there—"

Rogers smiled. "That would be nice, Mr. Stump. I imagine there are quite a few Sub-Assembly 3-A's stacked up in there by now. You just trot in there and get them cleaned up."

Ernie nodded doubtfully. "You ain't mad?"

Rogers smile grew broader. "Mad, Mr. Stump? Why, being chewed out by the manager is a trifle. It's something a foreman must expect. It happens to some of them every day—for a while. And when it does, it doesn't matter because in just a little while they are no longer foremen. Sometimes, they aren't even workmen, any more. And then they have nothing at all to worry about, so don't let it concern you, Mr. Stump. Do you take the streetcar to work?"

"Huh? Uh, yeah, I do."

"I thought so." Rogers nodded his head benignly. "Well, just as a suggestion, the next time you see you're going to be late it might be better if you saved your carfare and used it to buy a newspaper."

Ernie smiled uncertainly. "O.K. Uh, why?"

"Because," Rogers said slowly, no longer smiling, "the next time you leave me in a crack like that, you're going to be reading the 'Help Wanted' section! *Now get in there and get to work!*"

Ernie did.

He worked the rest of the morning in a sullen mood. For one thing, with the extra time that Rogers had taken up, Assembly Line 3-A was a mess. Incomplete sub-assemblies were stacked on the floor all around Ernie's spot on the line. He would have to pin them and slip them into the production line as best he could.

Next to him on the line, Broncewicz said: "Ernie, we'll never get this job out. Where were you?"

And Ernie told him about the beef with Rogers. He worked as he talked, but the more he talked the angrier he got. Rogers had been unfair. He asked Broncewicz, "How can anybody do a good job with that guy all the time riding 'em?"

Broncewicz nodded. "You should take it to the union."

Ernie snorted. "That's a hot one. Rogers used to be our shop steward."

"Yeah, I forgot." Broncewicz scratched at a hairy ear. "Anyway, you should tell him off."

"Yeah. I should tell . . ." Ernie laid aside a wrench to phrase exactly what he wished to say to Rogers, and the next sub-assembly slipped past. Both he and Broncewicz grabbed it hastily.

Unfortunately, Rogers happened to be watching. He walked over. Broncewicz became intently interested in his work. Ernie sighed resignedly.

Rogers seemed surprisingly resigned, himself. All he said was, "I thought you got enough sleep this morning, Stump. Wake up, get on the stick." He walked off.

Broncewicz raised his head. "Hey. I thought you were going to tell him?"

"Aw, shut up."

Ernie did not like his foreman, but neither did he like the prospect of losing his job. He couldn't afford to be out of work.

The noon whistle blew as he was finishing the last of the extra assemblies. Ernie tossed his tools down and left the line.

The sight of the food in the cafeteria reminded him all over again that he was spending too much money. His stomach had felt queasy. It now turned sour. Without looking at them, Ernie selected a plate of frankfurters and spaghetti, picked up a carton of milk for the sake of his stomach, and sat down at the nearest table.

Jory sat down beside him. "Joe's waving at you," he said, nodding at the cashier at the end of the counter. "You forgot to pay."

"What?" Ernie stomped over to the counter, threw down the money and returned to his seat. To Jory he said: "I feel bad today."

"Uh-huh," Jory said disinterestedly. He turned a page of the book he had propped next to his plate.

"Don't be a wise guy," Ernie grunted. He turned his attention to his plate. Several mouthfuls of spaghetti convinced him that he was hungry after all. He swallowed and opened his carton of milk. He looked up at the book Jory was holding. Jory was a funny guy, always reading.

"What's the book today?" he asked.

Jory held the cover so he could see the title. "Celine's 'Journey to the End of Night.' It's French."

Ernie's interest quickened. "French, huh? Has it got any good stuff in it? You know, like Miller has?" He laughed.

"No."

"Well, what's it about?"

"About a guy who thinks he might commit suicide."

"Oh." Ernie thought about it for a minute. "Is that *all* it's about? Just some guy wonderin' if he should bump himself off?"

"Yes." Jory turned a page.

"Oh," Ernie thought about it again. "And he made a whole *book* out of it? Just that . . . no sex or nothing?"

"No. No sex or nothing."

Ernie laughed. "Well, it sounds pretty stale to me."

Jory sighed and gave up reading. He put the book down. "No, it isn't stale. The book does depress me, though." He pushed it to one side.

His eyes traveled around the cafeteria; he thought for a moment then said: "Do you ever get the feeling, Ernie, that your life has gotten stuck? That you are just going round and round, caught in one single groove —that you just repeat the same scene, day after day?"

Ernie shook his head. "Nah. I never feel like that."

"I do. I get to feeling it bad, sometimes. Why do you suppose that is, Ernie?"



Ernie considered the question for a moment. "Well," he said helpfully, "it might mean you're cracking up."

Jory laughed. "Thanks. But when I need an analyst I'll go out and hire one. No, I think I feel that way because life has somehow become a lot more futile than it need be."

Ernie shrugged and let it go. He wiped the last trace of spaghetti sauce from his plate. Jory got funny moods —probably because he read so much, Ernie suspected —but he was a good man. All the guys in the plant figured Jory for a regular guy. He liked to read some pretty funny books, but so what? It was his eyesight, wasn't it?

Ernie remembered something else. "Hey," he said to Jory as he lit a cigarette, "Harrigan over in the tool room told me that you write stories. That right?"

"Yeah. But I don't have as much time for it as I once did."

"You ought to stay home nights like I do. Then you'd have time." Ernie paused and added piously, "It makes you sharper on the job, too."

Jory started to laugh but caught it in time. He worked on the line next to Ernie, and had witnessed the foul-up this morning. He said, "What do you do until bedtime? Watch TV?"

"Every night. Boxing is good on Fridays. Monday night ain't so hot. Wednesday, tonight, will be good. Lots of Westerns.

"You ought to try it. Come to think of it you look sort of tired. You shouldn't go out drinking week nights."

Jory shrugged. "Maybe I will try it. What are your favorite programs?"

Ernie told him.

"Say," Ernie asked, "do you make any money writing stories?"

"Once in awhile. If I sell the story I'm working on now, I think I'll lay off for a couple of months and get a cabin down in Mexico. The fishing will be good at Vera Cruz—" He stopped and frowned. "No. I guess I won't. I can't."

"Why can't you?"

"Something I forgot. Never mind."

"No," Ernie persisted, "you were saying—"

"Forget it."

"Oh, I get it. You're afraid to lay off because they might not hire you back?"

"Nuts. There's always some place that is hiring. You'd be surprised at some of the jobs I've had, Ernie." He grinned. "As far as that goes, I might get laid off here before I want to go."

"What makes you say that?"

"Look around you. How many men are working today?"

Now that his attention was called to it, Ernie glanced around the cafeteria. Normally, it was packed during

the lunch hour. Today, it was less than three-quarters full.

"So? Some of the guys are out sick, that's all."

"There won't be much work this afternoon. We got most of it out this morning."

"It's some new bug. Like that flu thing last winter." But Ernie's voice, as he said it, was defensive. In Ernie's book, a layoff was a bad thing.

Inside, Ernie's mind began to calculate the possibilities. It was a thing Ernie's mind always did when it was confronted with the unexpected. His mind didn't like to work, but Ernie liked the unforeseen even less.

It was unlikely that the entire plant would be shut down. In that case what supervisors would want him to stay on? He ran through the list of his superiors and immediately came to Rogers.

Ernie winced. After this morning, Rogers would post him for the layoff for sure. He could take it to the union, but—Ernie stopped and looked suspicously at Jory.

Did Jory know about the beef he had this morning with Rogers? Come to think of it, Ernie didn't *know* there was going to be a layoff. Was Jory just needling him?

He looked around the cafeteria again. The tables on the edges of the floor were deserted and empty. To Ernie's eyes it suddenly looked as if the men who were eating had purposely gathered so they could be close together. They sat with their backs hunched, turned on the empty spaces behind them.

Even the noise, compared to the usual din of the cafeteria, seemed to be different. It echoed and fell flat. Ernie didn't like it. He felt funny. The overly familiar cafeteria had suddenly become strange.

A feeling began to grow in him that, somehow, the cafeteria was wrong. "It . . . looks funny," he said.

Jory became alert. "What looks funny?"

"I don't know . . . the room."

"What's wrong with the room?" Jory bent over. His eyes were intent, but his voice stayed low. He spoke with great care.

"I . . . don't know. It looks funny. Empty. Older. No, wait—" And the feeling was gone. Ernie shook his head. It was the old, crowded and not too clean cafeteria, again.

He turned to Jory. "Well, they better not! I was out of work six months on the last layoff." He paused and marshaled a last, telling argument: "I can't afford it!"

Jory laughed. "Take it easy. I said there *might* be one. Lots of things might happen. Hell, the world itself might come to an end."

Ernie said grumpily, "I don't like 'mights'. Why can't they leave a man alone and let him do his work? Why do they gotta—"

Jory stood up and grinned. "Come on, Ernie. What do you need money for? I mean, other than to keep up the payments on your TV?"

Ernie rose. "Don't be such a guy," he grumbled. "We better get back. If I come in late from lunch, I've had it."

It was a quarter of a mile across the plant yard to where they worked. They walked in silence for the first few yards. Ernie thought his own thoughts and listened to the sound of their feet on the gravel.

Presently, Jory said, "Ernie, you watch the fights. Do you remember back when they had the Rico-Marsetti bout?"

Ernie still felt irritable. "Hell, yes, I remember. It was just two weeks ago. You make it sound like it happened six months back."

"How well do you remember it?"

"Well enough. That bum Marsetti cost me ten bucks when he dived in the sixth. He was the two-to-one favorite."

"He didn't dive."

"Yeah? You ask him?"

"No. I read the papers. He was pretty scrambled up . . . in the head, I mean . . . for quite a while after they brought him back to his dressing room."

"Maybe he was that way all along. Maybe they just then noticed it."

Jory laughed. "Don't get cynical, Ernie. It's a sign of old age. No. Marsetti was really out of his head. He kept going through the last round . . . you know, in his mind. He did it perfect, thirty or forty times, just up to the knockout. Then he stopped and went through the whole round again.

"The doctors that examined him said that it happened because he ran into something he couldn't face."

Ernie said sourly, "Yeah. Rico's left fist."

"Maybe. But it gave me an idea."

"Oh?"

"Yeah. The idea is this: Could the world get knocked out that way? Suppose it did. Suppose everybody ran into something they couldn't take. Would they just run in a closed circle? Would they take a single day, like Marsetti took the sixth round, and just repeat it over and over again?"

Ernie scowled and stopped. They were outside the plant door. "Boy," he said, "you are a bug, ain't you? What are you trying to give me?"

"Just an idea, Ernie."

The suspicion that Jory was needling him came back. "Well, I don't like it," Ernie said scornfully. "In fact, I think it's nuts." He paused to think of something else to say, then shrugged and turned. "I'll see you later. I got to get in to work."

And now here he was, Ernie thought, sitting in his own room with Jory's face looking at him out of the blue screen.

The whole day has been nuts, Ernie told himself.

"Hello, Ernie," Jory's voice repeated tiredly. "Hello, Ernie. . . Hello, Ernie—"

Ernie threw his beer can on the floor. Foam spewed out and soaked the rug. "All right," Ernie bellowed, "All right—Hello!"

Jory stopped. He put his hand to his head and looked excited. He was wearing earphones, Ernie saw.

"Ernie!" Jory said. "Do you see me?" He looked blindly out of the screen.

In his rage, Ernie nearly kicked in the face of the set. "Yes, I see you! What are you trying to pull?"

Jory turned excitedly to someone beside him, but off the screen. "I've got him," he said quickly. "He's awake." He turned and faced Ernie.

"Look, Ernie, I can't see you but we've got a microphone in your room. I can hear every word you say. Now sit down for a minute and let me explain."

"You'd better," Ernie said ominously.

"Are you sitting?"

"Yeah, I'm sitting. Get on with it."

"I've been on your screen every night for the past week, Ernie. We took over the station. And we've been broadcasting to you on all channels for the past week."

Ernie shook his head. "You're nuts," he mumbled.

"It's true, Ernie."

"But—" A thought struck him. "Hey, are other people getting this on their sets?"

"Everyone in the city, Ernie. But they aren't seeing it. As far as we can tell they think they're watching their usual programs. Everyone is in a trance, Ernie. They just go through the same motions over and over. It was the same with the engineers here. We just pushed them aside. They're tied up now. We're keeping them under drugs. We had to do that. When they were loose they just tried to get back at the controls. But that was all, they never really saw us."

Ernie shook his head again. "Wait a minute. Let me get my head clear—O.K., now you say everybody is in some kind of trance. *Why?*"

"I tried to make you see it today. The world is stuck. It's stuck in this God-forsaken one day! We don't know why. Some of us—just a few—have known it all along. But even we can't remember what caused it."

"You mean it's happening everywhere?"

"Yes. Or not happening, I guess you'd say. We're not getting reports from overseas . . . not any that are any different from the first Wednesday. So it must be the same over there. It's the whole world, Ernie."

"Wait a minute. Let me think." After a moment, he got up, went into the kitchen and got another beer.

"O.K., I'm ready," he said as he came back. "Now, why did you guys pick me? How many of you are there?"

"Just a handful . . . no more than twenty. We're scattered all across the country. We picked you because you're a test case, Ernie. One of us is a psychologist.

"He says you're a common denominator. If we could break you out of it, then we could get through to a whole cross section of people."

Ernie grunted and sipped his beer. "A common denominator, huh? Thanks, pal. You mentioned drugs. I guess you can go anywhere? Just walk past people and never be seen?"

"That's right."

Ernie laughed scornfully. "You've got a good deal. Why louse it up? What do you stand to gain?"

Jory shook his head. "You're wrong, Ernie. For one thing, everything is slowly running down. Miners go to the same part of the mine each day and send out nothing but empty cars. The same thing is happening all across the country, in farms, in factories, in hospitals—"

Ernie got up. "Keep talking," he said.

"Hospitals are hideous these days, Ernie. Don't go near a surgeon. All he can do are the same operations he performed on the first Wednesday. If you're the wrong height, the wrong weight, or just there at the wrong time, he'll cut you to pieces.

"Homes burn to the ground. And nobody tries to get out of them. The fire department is no good. It's stuck in that first Wednesday.

"We broke off broadcasting last night. We had to fight an apartment house fire. There are only three of us here in the city. We didn't save anyone. What could we do? We were lucky that we kept it from spreading.

"We need help, Ernie. We need it badly—"

Absently, Ernie said, "Yeah, I see that all right." He kept pacing.

"I don't know if I can make you understand how important you are right now, Ernie. With you helping, we can isolate the thing that triggered you out of this. We can use it as a technique on whole groups of people. The world will begin moving again. At last, things will begin to change."

"Yeah—" Ernie stopped and looked at the rug beside his dresser. He had found what he had been looking for. He picked the microphone up.

And pulled loose the wires.

From the television, Jory screamed. "Ernie, *listen to me*—"

Ernie turned off the set.

He sat on his bed and continued to think while he finished the can of beer. When he had it all thought out he smiled. He felt very happy. He could stop being afraid. Afraid of anything. His foreman, his job. All of it.

He wasn't interested in walking into banks and carrying off sackfuls of money. What was the sense to that? He couldn't spend it anyway.

Besides, he had something that was better.

All his life there had been too many bright guys with too many bright ideas. And the bright ideas got put into practice and then things changed. They could never leave a guy alone and just let him do his job. They always had to throw in the unexpected.

But this time, nothing was going to change.

Ever.

He chuckled and turned out the light. ■



THE HAPPY MAN

More's "Utopia" was isolated—
cut off—from the dreary world outside.
All Utopias are . . .

by GERALD W. PAGE

ILLUSTRATED BY GEORGE SCHELLING

Nelson saw the girl at the same time she saw him. He had just rounded an outcropping of rock about ten miles from the East Coast Mausoleum. They were facing each other, poised defensively, eyes alertly on each other, about twenty feet apart. She was blond and lean with the conditioning of outdoor life, almost to the point of thinness. And although not really beautiful, she was attractive and young, probably not yet twenty. Her features were even and smooth, her hair wild about her face. She wore a light blouse and faded brown shorts made from a coarse homespun material. Nelson had not expected to run into anyone and apparently, neither had she. They stood staring at each other for a long time; how long, Nelson was unable to decide, later.

A little foolishly, Nelson realized that something would have to be done by one of them. "I'm Hal Nel-

son," he said. It had been a long time since he had last spoken; his voice sounded strange in the wilderness. The girl moved tensely, but did not come any closer to him. Her eyes stayed fixed on him and he knew that her ears were straining for any sound that might warn her of a trap.

Nelson started to take a step, then checked himself, cursing himself for his eager blundering. The girl stepped back once, quickly, like an animal uncertain if it had been threatened. Nelson stepped back, slowly, and spoke again. "I'm a waker, like you. You can tell by my rags." It was true enough, but the girl only frowned. Her alertness did not relax.

"I've been one for ten or twelve years. I escaped from a Commune at Tannerville when I was in my senior year. They never even got me into one of the coffins. As I said, I'm a waker." He spoke slowly, gently and he hoped soothingly. "You don't have to be afraid of me. Now tell me who you are."

The girl pushed a lock of almost yellow hair from her eyes with the back of her hand, but it was her only show of carelessness. She was strong and light. She was considerably smaller than he and could probably handle herself as well as he in this country. The landscape was thick with bushes, conifers and rocks. She would have no trouble in getting away from him if he scared her; and he could scare her with almost any sudden movement. It had been too long ago for Nelson to keep track of when he had been accompanied by others and he hungered for companionship; especially for a woman. The patrol that had captured Sammy and Jeanne and the old man, Gardner, had also gotten Edna and almost had gotten him. The fact that the girl was alone now more than likely meant that she had no one either. They needed each other. Nelson did not want to scare her off.

So he sat down on the ground with his back to a large rock and rummaged in his pack to find a can.

"You hungry?" he asked looking up at her. He couldn't be sure at the distance, but he thought that her eyes were brown. Brown, and huge; like a colt's. He held the can out where she could see it. She repeated the gesture of a while ago to brush back that same lock of almost yellow hair, but there was a change in her face which he could see even twenty feet away, and another, more subtle change about her which he had to sense. "You're hungry, all right, aren't you?" he said. He almost tossed her the can, but realized in time that she would run. He considered for a moment and then held it out to her. She focused her eyes on the can and for a moment Nelson might have been able to reach her before she turned and ran; but he had better sense than to try.

Instead, he watched the play of conflicting desires about the girl's faces and body. He could see the uncertainty and indecision in the girl's nearly imperceptible movement. But she did not come.

Well, at least she didn't run, either; and Nelson could claim to having broken ahead some in stirring up any indecision at all. He found the can's release and pressed it with his thumb. There was a hiss as the seal came loose and an odor of cooked food as the contents sizzled with warmth. Nelson looked up at the girl and smiled.

It could have been wishful thinking, but it seemed to him that she was a step or two closer than she had been before he had taken his eyes off her to open the can. He couldn't be sure. He smelled the food for her benefit and told her, "It's pork and beans." He held it out to her again. "I stole it from a patrol warehouse a few weeks back. It sure does smell good, doesn't it? You like the smell of that, don't you?" But she still wasn't convinced that this wasn't a patrol stunt to get hands on her and haul her back to a mausoleum. He couldn't blame her. He slowly pushed himself to his feet and walked to a spot about ten feet from where he had been, and still about twenty feet from her, and put the can carefully on the ground. He went back and seated himself against the same rock to wait for her to make up her mind.

It didn't take long. Without taking her eyes from him, she moved like an animal to the food and stooped slowly, keeping alert for any sudden move on his part, and picked up the food. She stood up, and stepped back a couple of steps.

She ate with her fingers, dipping them in and extracting hot food, with no apparent concern for the heat. She pushed the food into her mouth and licked her fingers carefully of clinging food. She ate rapidly, as if for the first time in weeks. And she kept her eyes, all the time, on Nelson.

Nelson didn't care, now; he wouldn't have jumped her, or done anything to scare her at all, even if her guard were to be let down for a moment.

He let her finish her meal, then smiled at her when she looked to him. She still held the empty can, and she was wiping her mouth with her free hand. She stared at him for almost half a minute before he said slowly, "You like that food. Don't you?" She said nothing. She looked at him and at the can she held. He knew what was going on in her mind and he believed that he was winning. "You know we'll both be needing someone out here, don't you?" But her answer was an uncertain expression on her face as she stared at him.

"Loners can't last too long out here. Being alone gets to you sooner or later," he said. "You go mad or you get careless and the patrol gets you."

The girl opened her mouth and glanced around quickly, then back at Nelson. She bent over, still watching Nelson all the time, and put the can down. Then she stepped backwards, toward the edge of the clearing, feeling the way with her feet and a hand held back to tell her if she were backing into a tree or rock. When she was almost to the edge of the clearing, almost to

the trees, she stopped and stared at him. There were shadows now; it was almost night, and night came quickly in this country. Nelson could not see her face as she looked at him. She turned suddenly and ran into the trees. He made no effort to stop her or call her back; any such effort would have been futile and for his purposes, disastrous. No such effort was necessary.

He spent the night sheltered between some boulders and awoke the next morning rested by an undisturbed sleep.

He found a small creek near by and washed his face to awaken himself. It was a clear morning, with a warm sun and a cool wafting breeze. He felt good; he felt alive and ready for whatever the day had to offer. And he felt ready for breakfast.

He found another can of pork and beans in his pack and opened it. It was, he noted, almost the last. His supplies were getting low. He considered the situation as he slowly ate his breakfast.

Of course there was only one thing to do. He supposed that he could have gotten by simply by hunting his food, but hunting was at best seasonal and required that he keep more or less to a specific area; agriculture was about the same, only worse. A farm meant a smaller area than a hunting preserve and it also meant sticking to it more. It meant buildings to store food against winter. It meant inevitable—and almost certainly prompt—capture by a patrol. No, all things considered, there was only one answer and he knew the answer from long experience. Find a patrol warehouse and steal your food there.

The question of course, was where and when. There was a patrol station near where Nelson now was, and that was the natural target. He had a few furnace beam guns—three, to be exact—and since the patrol could detect the residue from a furnace beamer a mile away even at low force, the only safe thing to use one on was the patrol. And to be frank, he rather enjoyed his brushes with the patrol. Like him, they were wakers—people who had never known the electronic dreams which were fed to all but a few of Earth's peoples. People who had never lain asleep in nutrient baths from their seventeenth birthday living an unreal world built to their own standards. Of the billions on Earth, only a few hundred were wakers. Most of those were patrol, of course, but a few were rebels.

That was he, and also the girl he had seen yesterday. And it had been Edna and Sammy and Jeanne and Gardner; and maybe a dozen other people he had known since he had escaped from the Commune, when he had been just a kid—but when he had seen the danger.

For the past two and a half centuries or so, almost everyone raised on Earth had been raised in a commune, never knowing his or her parents. They had been raised, they had been indoctrinated and they had mated in the communes—and then gone into Sleep. More than likely, Nelson's parents were there still, dreaming in their trance, having long ago forgotten each other and their son, for those were things of a harsher world over which one could have no control. In Sleep one dreamed of a world that suited the dreamer. It was artificial. Oh, yes, it was a highly personalized utopia—one that ironed out the conflicts by simply not allowing them. But it was artificial. And Nelson knew that as long as the universe itself was not artificial nothing artificial could long stand against it. That was why he had escaped the commune without letting them get him into the nutrient bath in which the dreamers lived out their useless lives. His existence gave the lie to the pseudo-utopia he was dedicated to overthrowing. They called it individualism, but Nelson called it spineless.

Above him was sky stretching light blue to the horizons—and beyond the blueness of stars. He felt a pang of longing as he looked up trying to see stars in the day sky. That was where he should be, out there with the pioneers, the men who were carving out the universe to make room for a dynamic mankind that had long ago forgotten the Sleepers of the home world. But no, he decided. Out there he would not be giving so much to mankind as he was here and now. However decadent these people were, he knew that they were men. Nelson knew that somehow he had to overthrow the Sleepers.

Before something happened while they lay helpless in their coffins, dreaming dreams that would go on and on until reality became harsh enough to put them down.

What if the spacefarers should return? What if some alien life form should grow up around some other solar type star, develop space travel, go searching for inhabitable worlds—solar type worlds—and discover Earth with it's sleeping, unaware populace? Could dreams defend against that?

Nelson shuddered with the knowledge that he had his work cut out for him, and awoke to his own hunger. He fished out a can and started to open it before he remembered, and fished out another can as well. He pressed the release on both and the tops flew off, releasing the odor of cooking food.

He leaned over and set one can on a flat rock that was just inside his reach, then scooted back about a foot and using his fingers, scooped up a mouthful of his own breakfast. Half turning his head, he caught sight of her out of the corner of his eye, about fifteen feet away, tense and expectant but ready to spring away if she thought it was necessary. He turned back and concentrated on eating his own breakfast.

"This sure is good after all night," he said, after a few minutes, making a show of gulping down a chunk of stew beef, and sucking the gravy from his fingers. He did not look back.

"My name is Glynnis," he heard abruptly. He sensed the uncertainty in her voice, and the—distant—hint of belligerence, but even so he could tell it was a soft

voice, musical and clear—if he could judge after not having heard a woman's voice in so long.

"Glynnis," he said slowly. "That's a pretty name. Mine's Hal Nelson. Like I told you last night."

"I haven't forgotten. Is that for me?" She meant the food, of course. Hal Nelson looked around. She was still standing by the tree. She was trying to seem at ease and making an awkward show of it.

"Yes," he told her. She took a step closer and stopped, looking at him. He turned back to his own eating. "No need to be scared, Glynnis, I won't hurt you." He became uncomfortably aware that she had not spoken his name yet and he wanted her to very much.

"No." Then a brief pause before she said, "I'm not used to anybody."

"It isn't good to be alone out here with the animals and food so hard to come by—and the patrol searching for wakers. You ever have any brush with the patrol?"

She had come up and was eating now; her answer came between eager mouthfuls. "I seen them once. They didn't know I saw them—or they would have caught me and taken me back with them."

"Where're you from? What are you doing out here?"

For a moment he thought she had not heard him. She was busy eating, apparently having classified him as a friend. Finally, she said, "My folks were out here. They were farmers for a while. I was born out here and we moved around a lot until my daddy got tired of moving. So we built a farm. He built it in a place in a valley off there"— She vaguely indicated south— "And they planted some grain and potatoes and tried to round up some kind of livestock. We had mostly goats. But the patrol found us."

Nelson nodded; bitterly, he knew what had happened. Her father had gone on as long as he could until at last, broken and uncaring he had made one last ditch stand. More than likely he had half wanted to give up anyway, and had not only because of the conflict of his family and saving face. "You were the only one who got away?" he asked.

"Uh-huh. They took the others." She spoke without emotion, peering into her food can to see if there was any left. "I was out in the field but I saw them coming. I hid down low behind some tall grain and got to the forest before they could find me." She examined the can again, then decided it was empty and put it down.

"Do you know what they do to people they take?" Nelson asked.

"Yes."

"Your daddy tell you? What did he say?"

"He said they take you back to the Mausoleum and put you to sleep in a coffin." She looked up at him, her face open, as if that was all there was to it. Nelson decided that she was as guileless as he had expected her to be, and reflected absently on that factor for a moment.

A light breeze was up and the air was full of the scents of the forest. Nelson liked the pungent smell of the pines and rich odor of chokeberries and bushes; and the mustiness that could be found in thickly overgrown places where the ground had become covered with a brown carpet of fallen pine needles. Some days he would search places in the forest until he found one or another brush or tree whose leaves or berries he would crush in his fingers simply so that he could savor the fragrance of them. But not this morning.

He rose to his feet and reached over to pick up Glynnis' discarded food container. She drew away from him, bracing herself as if to leap and run. He stopped himself and froze where he stood for a moment, then drew back.

"I didn't mean to scare you," he said. "We can't stay here, because if you stay somewhere they find you. We can't leave the containers here, either, because if they find them it might give them a clue in tracking us."

She looked ashamed, so he reached over, ready to draw back his hand if she acted as if she were scared. She tugged at her lower lip with her teeth and stared at him with eyes that were wide, but she did not spring to her feet. Somehow Nelson knew that the girl was acutely aware of how much she needed help out here. Suddenly, her right hand darted out and for a split second Nelson feared he had lost after all. But she reached over for the discarded can, picked it up and handed it to him. He reacted a little slowly, but he smiled and took the container. Their hands touched briefly and the girl drew hers away, immediately looking ashamed for so doing. Nelson continued to smile at her, and rather stiffly, she answered with a smile of her own. He put the container into the knapsack with the others and then slipped into the armstraps. Glynnis helped him.

They walked for an hour, that first day together, neither speaking. Glynnis stayed close by his side and Nelson could feel her proximity to him. He felt good in a way he had not felt in a long time. When the silence was finally broken, it was Nelson who broke it. They were topping a small hill in a section of wilderness that was not as heavily wooded as most and the sunlight was warm against Nelson's face. He had been thinking the matter over off and on all morning, and now he asked, "Have you ever raided a patrol depot?"

"No," she answered, a trace of apprehension in her voice.

They topped the hill and began moving down the other side. "Sometimes it's a pushover, when nobody is there. Other times it's moral hell. The patrol is always anxious to get their hands on wakers, so they try to keep an eye out for them at the depots. That means a fight unless we're very lucky. If the depot we pick is too heavily manned—"

"What do you mean, 'Depot we pick' ?"

"We need more food. We either shoot some, raise some, or steal some."

"Oh," she said, but there was apprehension in her voice.

"We don't have any choice. We'll wait until almost dark. If the depot is guarded by too many men, or for some reason an extra number is there for the night, then we're in trouble unless we play our cards just right. You just do as I tell you and we'll be all right." He reached back and fumbled with the side pouch on his pack. "You know how to use one of these? Here, catch." He tossed her his spare furnace beamer.

She almost missed it. She caught it awkwardly and held it gingerly with both hands, looking first at the gun and then him. Then, still gingerly, but with a certain willingness, she took the gun by the grip and pointed it to the ground, her eyes shut hard. Then, suddenly, her expression changed and she glanced up at him, worriedly.

"Oh, you said they could tell if we fired one of these."

"Don't worry," Nelson said. "The safety is on. Let me show you." He took the gun and explained to her how to use it. "Now then," he concluded. "When we get to the depot you stay outside the alarm system. I'll go in, leaving you to guard. Try not to use this unless you have to, but if it is necessary, don't hesitate. If you fire it, I'll know. My job will be to slip past the alarms and get inside to the food. If you fire, that'll be a signal that you've been discovered by the guards and we have to get out of there."

"Won't this give us away the same as shooting game?"

"Sure, but we get more food this way and maybe some other stuff. Especially reloads for the furnace guns. And, if we're lucky, we can ground the patrol. One-more thing, Glynnis," he added. "Are you sure you can kill a man?"

"Is it hard?" she asked innocently. Nelson was rattled only for a second.

"No, it isn't hard, except that he'll probably be trying to kill you, too."

"I've hunted some game with this." She held up her hunting knife so that the blade caught the sunlight. She had kept it clean and sharp, Nelson could see, but there were places where the blade had been chipped.

"Well, maybe there won't be any need to kill anyone at all," he said, a little more hastily than he intended. "I guess you'll do fine, Glynnis, I'll feel a lot safer knowing you're out there." He would feel as he had felt when Edna had gone with him on raids.

Toward evening they came to the depot Nelson had picked out. They were on a high although gently sloping hill, among the trees that crested it, looking down at the depot about a quarter of a mile away. There was still enough light to see by, but the sky was darkening for night. For the past two or three hours, Nelson had been repeatedly drilling Glynnis over her part. It was simple,



really, and she knew it backwards, but she patiently recited her role when he asked her, whether out of regard for his leadership or an instinctive realization of his pre-raid state of nerves, he did not know. He made her recite it again, one last time. She spoke in low tones, just above a whisper. Around them the gathering of dusk had quieted the world. He waited for it to get a little darker, then he touched her shoulder and clasped it for a second before beginning his way to the depot.

He kept close to the bushes as far down as he could and crouched low over the ground the rest of the way



even though he knew it was too dark for ordinary optics to pick him up. He had an absorber in his pack that would take care of most of the various radiations and detectors he would come into contact with, and for the most part, unless the alarms were being intently watched, he didn't expect to be noticed on the control board. And you couldn't watch a board like that day after day with maximum efficiency. Not when the alarms were set off only by an occasional animal or falling tree limb. Mostly he had to keep watch for direct contact alarms and traps; he was an accomplished thief and an experienced burglar. At last he found himself at the fence surrounding the depot.

In a clump of bushes a few feet from the fence he hid the containers; it saved him the job of having to bury them, and they would be deadweight now, anyway. Then he turned his attention on the fence.

He took a small plastic box out of his pack and pressed a panel in it's center with his thumb. Silently, smoothly, two long thin rods shot out from each end of the box until they were each about a foot long. There was a groove on the box and Nelson fitted it to the lower strand of the fence wire. He let go of the gadget and it balanced of its own accord, it's antenna vibrating until they blurred, then ceasing to vibrate as the gadget balanced. Nelson went down on his back and pulled on gloves. He grabbed the fence wire and lifted it so that he could slide under. When he was inside he picked the gadget off the wire by one antenna and shut it off. The antennae pulled back inside. Gardner had made this gadget; Gardner had been handy with things like this. And there would be no other when Nelson lost this. He didn't want to leave it where it could be found or where he might have to abandon it to save his neck in an emergency.

He turned to the problem of getting across the open field. He had little fear of being picked up by radiation detectors, thanks to his absorber. But direct contact could give him away. But most of those had to be buried. That meant that he could keep close to the bushes and not have to worry. The roots of the bushes fouled up the detection instruments if they got to them. He made his way, judging each step before he took it and at last stood by the door.

It was dark by then. He could see the stars in the clear darkness of the sky. They seemed somehow brighter than they had before. Nelson fished through his pack until he felt the familiar shape of the gadget he wanted. It was smaller, more compact than the one he had used to get over the fence; but it was more complex. He felt along the door frame for the alarm trip and found it. He placed the gadget there and switched it on. There was a short, low, buzzing sound as the gadget did its job and Nelson glanced around nervously, in fear it had been heard. The door's lock clunked back and Nelson released air from his lungs. He pushed the door open and found himself in darkness.

He was in a corridor with doors facing off from it. He could see light coming under two of the doors, meaning patrolmen behind them. He moved cautiously by the two doors, almost opposite each other, to a door at the end of the corridor. He grasped the handle and opened the door, realizing too late that the door should have been locked.

But by that time the door was open. His hand darted to his holstered furnace beamer and unlocked the safety. It was almost pitch dark in the room but he heard the room's occupant turning over on the bunk and mumble

low, incoherently, in his sleep. Nelson waited a minute but the man didn't wake up.

Nelson closed the door.

He tried another door; this time, one that was locked. He had no trouble forcing the lock pattern; less than a minute later he was inside, with the door shut behind him. He took out a flashlight.

This was the storeroom, all right. It was piled with boxes mostly unopened. Nelson read the labels on the boxes and opened those which contained food he needed and supplies. He found another pack in an opened box in one corner and began outfitting it like his own. Or as nearly like his own as possible; he knew that he could never duplicate or replace the gadgets Gardner had designed, and in a way he was bitter about it. He found the ammunition stores and took as many capsules for the furnace beamers as he could carry. He went to the door but slipped the furnace beamer out of his holster before opening the door.

The corridor was still dark. He stepped into it, alert for any sound or movement that might mean danger or herald discovery. His nervousness had given way to cool, detached determination. He almost made it to the door before he heard the footsteps.

His reaction was unconscious and reflexive. He turned, leveling his gun. He had passed the two doors light had shown under. One of them was opening and Nelson saw the shadow of the man who had opened it; then the man. The man saw Nelson at about the same time and stood gaping at him. Without realizing that he had fired, Nelson felt the recoil of the gun; the roar of the beam against the close walls hurt his ears, parts of the wall blistered and buckled, other parts of it charred black, some parts vaporizing in thin patches. The patrolman had flared instantly, never really knowing what had hit him. Smoke and heavy odors filled the corridor as Nelson slid out into the open. The patrol depots were fireproof, but the area Nelson had blasted would be far too hot to pass through for the rest of the night.

Nelson toned down the volume of his beamer and fired at a fence post. The tough plastic burst into splinters with a sudden explosion. A snapping wire whipped to within inches of Nelson's face but he didn't have to think about it. He was running up the hillside a short while later—he had lost track of time as such—hoping that Glynnis would use her gun if any patrolmen were following him.

He reached the hilltop in darkness, afraid to use his flashlight. Suddenly, he stumbled; was falling over something soft, like an animal or a man. Cursing low and involuntarily, he managed to roll over so that he fell on his back. He saw the form, a patch of irregular blackness in the darkness around him and knew it for a body. He got to his feet, glancing around, not knowing what this meant. He bent over the form, keeping the furance beams muzzle only a few inches from it, but too far back to be grabbed suddenly. He couldn't see the man's clothing very plainly but he could tell it was a patrolman's uniform. Nelson reached down to feel for a heartbeat and drew his hand away sticky with what he knew must be blood. Nelson was shaken for a moment; but he put aside the strange kinship he so often felt for patrolmen because they were also wakers and drew back, peering round into the darkness, pretty certain that he knew what had happened to this patrolman.

He pushed himself erect and turned to see Glynnis, a dark figure but obviously her, standing near a clump of trees a few feet off.

"You move quiet as a cat," he said. "You do this?"

"Uh-huh." She came forward and stared down at the corpse. Nelson was glad he couldn't see her face in the darkness. "There were two of them. They split up and I followed after this one and came up behind him. I slit his throat. Then I went and got the other one the same way."

And it had been so simple, thought Nelson. He handed Glynnis the extra pack. "Take this." She accepted it wordlessly and slipped her arms into the straps. "Oh," he added, as an afterthought. "Let me show you something." He reached into the pack and drew out a knife. A good one with a long plasteel blade that would not chip or corrode like hers. He handed it to her and imagined her smiling face in the darkness.

"It doesn't feel like metal," she said, after she had taken the knife from its scabbard.

"It isn't. It's a kind of plastic, stronger than most metals. Do you like it?" He was wasting time, he knew, and he cursed himself for it. But it didn't matter.

"It's real nice," she answered.

"I'm glad you like it," he said, taking her elbow in his hand. "We'd better go now. They'll be after us."

They ran most of the night, although it wasn't always running. Nelson picked a lot of terraine that was too uneven or too thickly covered with growth for running. They kept to rocks and creekbeds as much as they could, and they stopped only a few hours before dawn to get a few hours sleep they were too exhausted to postpone any longer.

When Nelson awoke the sun was a little higher than he had wanted it to be. He got to his feet and scanned the morning sky but saw nothing to indicate sky patrol robots. He felt uneasy about not having made more territory; but the way had been erratic and uneven. A thorough search pattern could find him easily; the further away he got from the depot the better chance he stood of not being discovered by a robot. He wondered, briefly, just how many would be called out, but there was no reason to wonder. Three patrolmen dead meant a lot of searching to find the killers. He and Glynnis couldn't waste much time.

He nudged the still sleeping girl with his foot to wake her. She awoke suddenly, her hand darting toward her

new knife and a low but startled cry came from her.

"Quiet." He had dug two cans out of his pack and handed one to her. "We overslept. Eat in a hurry."

She opened her breakfast. "We'll be traveling most of the day?" she asked. When he nodded, "yes," she said, "I can take it."

"I know you can; but they'll have a search out for us by now and a thorough one. If we hadn't met when we had, they'd have picked you up for sure after I raided that depot—if I could have pulled it off alone."

She smiled.

"You ever see an air robot?" he asked.

"No."

"I hope you never do. They'll fly out a search pattern, and they have equipment that can detect a human being. They can send back signals to tell where we are if they spot us. Our only hope is to get away before the search pattern gets this far. If we can get far enough away, we stand a better chance, because they'll have to spread out more thinly. We'll have to run for a long time, but eventually they'll give up. Until then—Well —" He let it hang. But Glynnis caught on.

The rest of the day they traveled, stopping only briefly to eat and once during the afternoon when they came to a small river. Nelson's admiration for Glynnis increased. She responded intelligently to his commands, and learned quickly. She was strong and athletic, with the reflexes of an animal.

They made good time. When darkness came Nelson estimated they had made almost fifty miles since the raid, even over rough terraine. He hoped that that would be enough. He was tired, and though the girl attempted to hide her own fatigue, her attempts were becoming more and more exaggerated. He searched out a camp site.

He found one on a hill, overlooking a river. There was protection from the wind. The moon was up and there was plenty of light from it; but Nelson didn't think the searchers would be out at night.

After they had eaten, Nelson leaned back against the thick bole of a tree and found himself studying the girl. Her features were even enough, but she was not a classically beautiful girl. Nor an unattractive one. It was her eyes, he decided. She was staring off into the sky and forest. Her eyes were large, dark, enigmatic eyes that expressed much; expressed it eloquently. But he had the feeling there was much in the girl that those eyes hid. Her body was lean, but whether from exercise or undernourishment he couldn't be sure. Her figure was full, for all the leanness, and ample. She was strong, though she hardly looked muscular. She had been toughened by her environment. Edna had not been as tough as Glynnis.

With sudden embarrassment, he realized he had been comparing Glynnis and Edna frequently. He didn't want to do that—but he couldn't help himself.

"Something wrong?" Glynnis asked anxiously.

She was returning his stare. "No," he said. "I was . . . looking at you." For a long moment, neither spoke. Then he said, "We'll be together for a long time."

"I know. We'll have to be."

"I'm glad I found you. I lost my wife to the patrol some time back."

"I've never been anyone's wife before. There was Frank, but I was never really what you could call his wife, exactly."

"Many people ever stay with your folks?"

"Not many. Frank only stayed a few days. I liked him. I wanted to go with him."

"Why didn't you?"

She broke off a blade of grass and slowly began tearing it into strips, intently gazing at it. "He just left suddenly without taking me. I guess he thought I was just a stupid brat. That was maybe two or three years ago." Her voice sounded as if she were smiling a little. Nelson thought that strange.

"You ever think much about the sleepers?" he asked suddenly.

"Sometimes. I wonder what it's like in their dreams."

"They like it in their dreams. Those dreams are built for them. They get along happily in their world, grateful for it. That's the word, grateful." He listened for a moment to nightsounds. "But they're helpless. If anything happens, they're asleep and unable to act. If they wake up, they're in a world they don't know how to live in."

"If you were a sleeper, what kind of world would you want to dream about?"

"I don't want to be a sleeper."

"Yes, but if you were. Would you live in a castle?"

He thought on it for the first time. "I don't know," he said finally. "I don't think so. I think I'd travel. Go out to the stars. There's a whole universe out there. Men went out there; they're still out there. I guess they've forgotten us."

"You think they'll ever come back?"

"Some day I think somebody from out there will come back and land on Earth to see what it's like. Maybe they'll try to invade us. We'd be pretty helpless with most of us asleep in our pipe-dream utopias."

"I wouldn't like to be caught and put in a dream," she said. "But I'd like to live in a castle." Nelson gazed at her. She had never known a commune, he realized. If she had, she would have bred when told to and then docilely filed away to her coffin. But she had never been indoctrinated. If she went into the dreams, it would be against her will. But he had to admit that he had some reservations . . .

He moved close to her.

"Maybe some day we can live in a castle. Or go into space to some planet where men live in castles." He stared at the stars. "Out there they must be like gods," he said and his voice sounded strange, even to him.

He looked down at Glynnis. The moonlight was full on her face; she looked fit to be a goddess to those gods, he thought. She was staring off and around at the wilderness; she was saying, "Out here there's trees. And air. I like to look at the trees." He reached over and pulled her face around to him and kissed her. She was startled, but returned the kiss warmly.

She pulled away just far enough to look into his face. She was smiling. "I think I like you better than I did Frank," she said.

Nelson lay awake for a few moments, trying to identify the noise. It was a low humming sound off in the distance. He could feel Glynnis, breathing evenly with sleep beside him. The sky was just beginning to color with sunrise in the east. As quietly as possible, Nelson eased himself erect, still trying to place the noise. He placed it, and realized that he had not really wanted to identify it.

"Quiet," he said as he roused the girl. She opened her eyes wide, and stared at him, confused and uncomprehending.

"What's wrong?"

"Hear that noise?"

"Yes," she said after a second.

"One of the search machines. Probably they've adopted a loose search pattern, or maybe we left some kind of sign somewhere. It's not coming closer, but we'd better get out of here."

They ate hastily, in the awakening light of sunrise. They ran away from the sound of the machine, and it lessened in the distance.

It was the middle of the morning when they heard it again. Nelson judged it to be roughly a mile away and to the west. He waited a minute, listening. It seemed to be describing a search pattern curve that swung in front of their path. He decided to double back and around to miss it.

The undergrowth was thick in this part of the forest. They made their way through bushes and waist-high grasses, being as careful as possible not to leave too many signs of their passing. Glynnis' shorts and thin blouse weren't much protection against the thorns or the recoiling limbs of bushes but she didn't complain. Gradually the forest became mostly trees again. They found a path some animal had made and followed it.

When they came to the clearing, Nelson almost didn't see the thing in the air. He heard Glynnis gasp behind him, and with a start, glanced around. She was staring at something in front of them, and in the air. He looked where she was staring and saw the air robot hovering near the edge of the clearing. It was about two feet long, slender, metallic and smooth. Nelson knew though that it was alert and that receptors built into its skin were registering their presence. It hovered about ten feet above the ground, some twenty feet away from them, making no noise. Sky robots made noise only when they were moving at a fairly good speed. They had fled the noise of one only to be trapped in the silence of another.

Suddenly, Glynnis was shouting, "It's one of them!" Nelson turned to see her level her gun, and before he could stop her a white hot streamer lashed out at the robot and engulfed it.

"No," he shouted, too late. The machine took the blast turning cherry red and bobbing lightly in the air for a moment before energy compensators and stabilizers adjusted to the effects of the blast. The machine turned back to its lustrous silver color and there was a low hum as it righted itself gracefully then swung around, into the center of the clearing to get a better focus on them.

"It doesn't even have a mark on it," Glynnis said, in a low tone, moving closer to Nelson and laying one hand on his shoulder.

"No. But don't worry; it can't hurt us. We've got to figure some way to get out of here and leave it behind." He turned and gently guided her toward the trees. When they were in the dubious shelter of the trees, Nelson stopped and tried to figure a way out. He could see the machine hanging in the center of the clearing on invisible lines of force, turning slightly to find them in the dense growth, then, with one end pointed at them, bobbing slightly with the low breeze.

"What's it doing?" Glynnis asked. There was superstitious awe in her voice that annoyed Nelson.

"Sending a signal to the patrol. We don't have much time before they get here."

"But if the machine can't be shot down what can we do?"

"Hand me your gun." He took her gun and pointed to a vernier control set into the side of the weapon. "This is the intensity control; it's on low." He turned it up. "Now it's on full."

"Will that stop the machine?"

"Not by itself. But if we both move in, blasting together, again and again we might do it some damage."

"All right," she said, taking the gun.

Nelson led the way into the clearing. The machine moved back a little and bobbed to keep them in alignment. Nelson felt the dryness of his throat as he raised his gun to aim at the incurious machine. "All set?" he asked. From the corner of his eye he could see that Glynnis had raised her gun and was sighting.

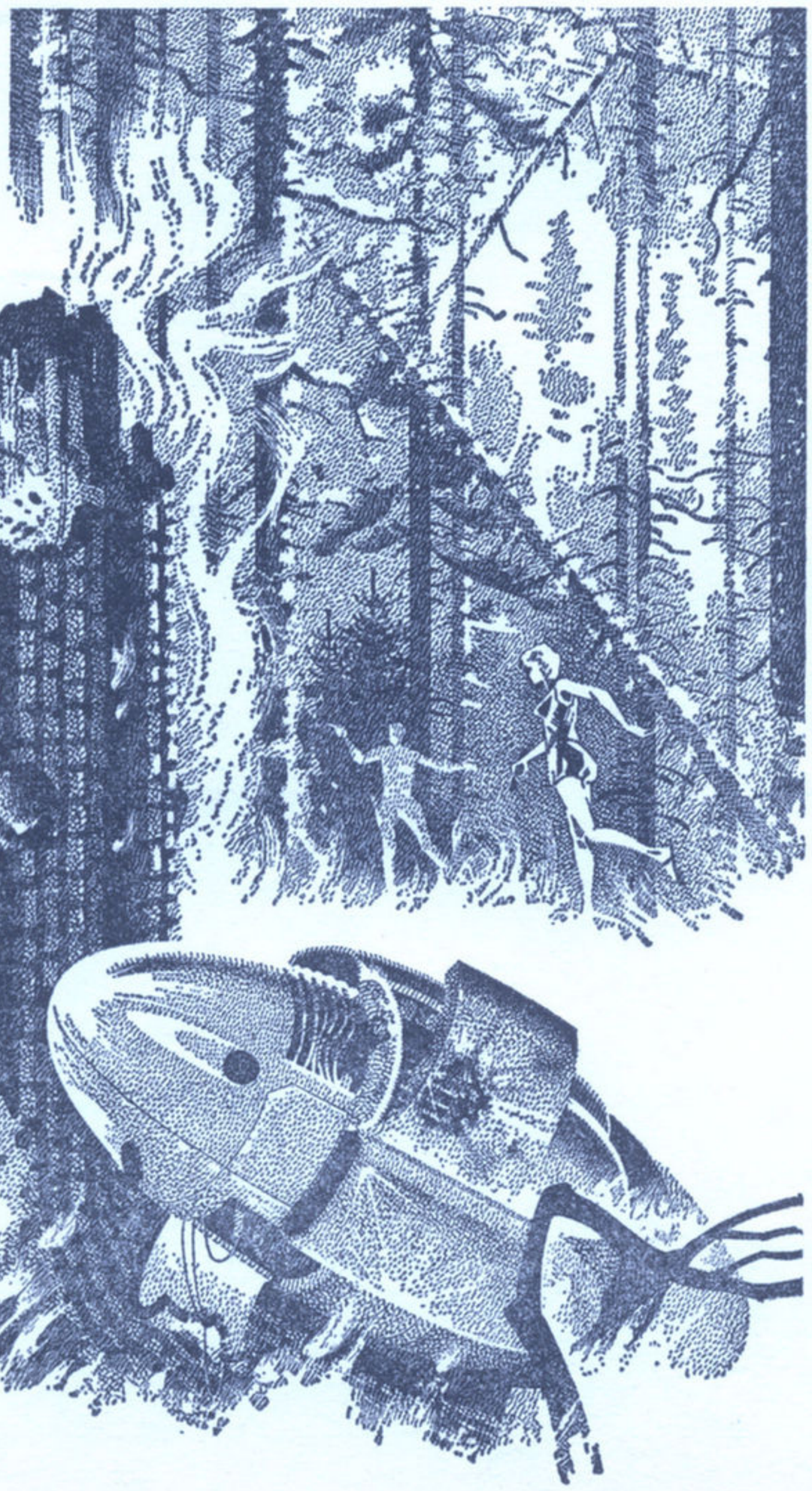
"All set," she answered.

"O.K." Nelson fired. His blast hit the robot head on. It was absorbed, but almost as soon as it had died down, Glynnis fired. Nelson fired again, catching the machine in an almost steady stream of white hot energy. The machine suddenly caught on to what they were doing. It tried to escape their range by going up, but they followed it. By this time the compensators were already beginning to fail. Haywire instruments jerked the machine back down and then side to side, then into a tree

trunk, blindly. It rebounded and dipped low, almost touching the ground before it curved back up. Some of Glynnis' shots were missing, but Nelson made every shot count, even while the robot was darting about wildly.

The machine was glowing cherry red, now, some twelve feet off the ground, unable to rise further, one end pointed sharply upward. Something inside it began screaming, loudly, shrilly, with a vibration that hurt Nelson's teeth. Nelson was firing mechanically. The machine's loud screaming stopped suddenly. Nelson checked his fire. Glynnis fired once more, missing as the machine suddenly dropped about a foot. For perhaps a second the machine remained motionless. Then it died without sound, and fell to the ground, landing with a dull noise and setting fire to the grass under and around it.

For that matter, they had started a major forest fire with their blastings. The trees across the clearing from them were already roaring with flames. Nelson didn't wait to check on the machine. He grabbed Glynnis and



pulled her around toward the way they had come. She stumbled, staring back at the machine.

"Come on!" he said, in agitation. She came to life, mechanically, and let him propel her along. The wind was away from them, but the fire growing. They ran madly until they had to stop and fall exhausted to the ground. When he could breath again without torturing his lungs, Nelson looked back and saw the smoke from the fire in the distance behind them. They were safe from the fire, but their escape was cut off by it. It would, he knew with dull certainty, attract attention.

When he had rested as long as he dared, he said, "We'd better get going."

"I'm not sure I can," she said.

"Well, you've got to. If we stay here, we'll be caught."

They did not pause to eat. It was about midday when they encountered the robot and they walked well into the afternoon, their only purpose being to put as much distance between them and the place where they had shot the robot down as possible. Nelson found himself moving numbly, blindly uncaring of anything but making progress forward. He listened to the humming of an approaching robot for a long while before it registered on his consciousness.

He whirled, drawing his gun, momentarily giving way to the panic that had been threatening to engulf him all afternoon. He saw the machine, high above the trees behind them, safely out of range, he knew. Bitterly, he fought down the urge to fire the gun anyway. It took a tremendous exertion of will to make his arm return the gun to its holster.

"What can we do?" asked Glynnis, a slight quaver in her voice.

"Not a thing," said Nelson; then, almost in rage he cried it. "Not one damned thing!"

They both turned back the way they had been going and ran, hoping to find some cover with which to duck the machine. Nelson converted his rage and fear into a strength he had never known he could call upon. He ran on, and Glynnis behind him. And he knew that she, like he, ran despite the rawness in her throat and lungs and cramping of her legs. The only thing he could think of was that he wanted to enter a mausoleum not as a prisoner, but as the head of an army.

He ran blindly, hearing nothing but the machine and his own rasping breath. Then suddenly, he was stumbling over the edge of an embankment, flailing his arms and twisting himself around so that he managed to land on his back. It hurt and the wind went out of him. He was sliding and rolling. Somehow he managed to stop himself. He lay painfully coughing and trying to get his breath. Below him he could see the wild rushing of a river at the base of the sheer embankment. He looked back up. Glynnis had one leg over the edge but had not fallen. Nelson crawled his way back up the slope.

They were trapped by the river. It must be another

part of the same river they had spent the night by, thought Nelson. But where it had been calm and shallow, it was now a raging torrential river whose brown, churning waters ran between high, difficult to climb cliffs.

There was no need for either to speak. They began looking for a place to cross the river. All the time they searched they could hear the machine behind them, above them, humming safely out of their range.

The sun was low in the sky when they heard the second humming. The humming grew until it was a throbbing that covered the weaker sound of the robot and chilled Nelson.

"The patrol," he said, pushing the girl toward the forest. "Back into the trees. We're going to have to fight it out with them."

They ran into the trees. The throbbing stopped and behind them, Nelson could hear the sounds made by men thrashing through undergrowth. His palms were wet; he wiped them on his shirt front. The impending contact with the patrol gave him a calmness as always, and he picked out a thicket where he believed he could make some sort of stand.

He reached the thicket with Glynnis beside him. Her gun was out. He signed to her to lower the intensity of the gun; she caught on. He watched her face. It was like a mask.

Nelson listened to the sounds of the approaching patrolmen. Five or six, he decided. Plus a guard back at the flier. He'd figure on eight, in all, he decided. Then the first one showed behind some bushes.

Nelson touched Glynnis' arm in a signal to wait. The patrolman looked around, searching too intensely to find anything. He was young. Nelson didn't think he would uncover their whereabouts and for a moment debated letting him pass.

But he didn't want to be surrounded. He pulled his gun up and sighted carefully before squeezing the trigger. In the tenth of a second before the patrolman burst into flames, the blast produced a blast circle that grew to the size of a basketball in his midsection. The patrolman fell without screaming.

The others were there now. Most of them were young and two rushed forward at the sight of their companion's death, to die like heroes. The others wisely sought cover. Nelson decided that the thicket wasn't as safe as he had hoped. One of the patrolmen was doing a good job with an energizer, coming closer with each shot, before Nelson finally saw where he was, and fired at him. Nelson saw the trunk of a large fallen tree and pointed to it for Glynnis' benefit. She nodded.

There was cover most of the way. Nelson went first, crouching low to the ground and running with the ease of a cat. He made the log and began firing to cover Glynnis. He saw her coming, out of the corner of his eye, then concentrated on covering her with fire power. Suddenly the girl let out a startled yell and he saw her sprawl to the ground, tripping over a root. He called her name and without thinking leaped to his feet to run to help her. He was halfway there when the patrolman came into range. Nelson realized what he had done. Glynnis was already on her feet and running. Cursing himself, Nelson jerked his gun around, but it was too late. An energizer blast exploded the ground beneath him and he felt himself hurtling over backwards. He could only see blackness and the bright, quick, flashing of pin-point light in it. Then, he was falling, spinning . . .

Patrol Cadet Wallace Sherman watched the man on the table with mixed feelings; on the one hand, there was pity for a man whose condition was hopeless, and on the other there were the misgivings that come with guarding a criminal. Perhaps it was Sherman's youth that caused him to emphasize those misgivings and move his hand toward his sidearm when the man stirred.

But the man on the table only stirred a little and groaned. Sherman was not sure whether or not the man was coming to. He shouldn't be, Sherman knew. He took a couple of steps forward and stared at the man's face.

The man was breathing normally. His head moved slightly but his eyes were still closed. His face was the palest, softest looking face Sherman had ever seen. It was the face of a man who had never known sunlight, Sherman thought somberly; or at least had not known it in many years. He wondered, vaguely just what kind of life the man dreamed he had. As he was watching the man's face, Sherman saw his lips move and heard him utter something he could not make out. He bent closer to hear better.

"Glynnis"—the man on the table was saying.

"Is he waking up?" Sherman heard a voice asking.

A little embarrassed, Sherman turned around and saw Blomgard standing in the doorway. "Oh, I'm sorry, sir. No. At least I don't think so. He said something; a word. *Glynnis*, I think. Sounds like a girl's name."

Dr. Blomgard came into the room and walked over to the table on which his patient was stretched out. He removed the clipboard from its hook and looked through the sheaf of papers fastened to it. After a few seconds, he said, "Ah, yes. Glynnis. Part of his dream."

"Doctor—," Sherman heard himself saying, then caught himself.

"What, cadet," Blomgard asked, turning around. He was a big man, gray-haired, his hair an unruly mop. His eyes were dark and piercing, but they were softened by the thickness of the white brows over them.

"Nothing, sir—"

"I assure you, that no question will be considered out of place, if that's what is worrying you."

"Well, doctor," Sherman said with some difficulty, "I was wondering if all this is worth it. I mean a special reserve with the artificial life-dreams for these people. Is it worth the expense and effort?"

Blomgard regarded the question a moment before an

swering. "Well, that depends on things. We have a fairly dynamic, expanding civilization. This man was born out of step; a natural born rebel. We've reached the stage where, with a little effort on their own part, most people can sooner or later find exactly what they want. There are, of course, exceptions. They can't help being the way they are, but they are that way. It isn't his fault that he would think nothing of blowing up any civilization he found himself living in. This is the solution."

"A drug-induced dream state? Is that a solution?"

"It's a pretty good one. We provide him with a completely fictitious, a totally unreal world in which he will be happy."

"How can anyone be happy like that? I prefer reality."

Blomgard smiled. "Yes, to a larger extent than he does, you do. Or you like what you think of as reality." He picked up the clipboard again and studied the papers on it. "His dream world is one that is designed for his happiness. In it, he sees everyone else as inhabiting the dream-coffins. And he pictures himself as a rugged individualist, going about trying to destroy such a civilization. And of course, he is practically a lone wolf. Not completely, for he would not be happy that way. The man is an underdog."

"I guess it's best," Sherman said.

"It is," the doctor replied, seriously. "We have no right to take his life; nor do we have the right to destroy his personality, however much that personality may be offensive to us. And since most inhabitable planets are, unfortunately, inhabited before we ever get to them, we have more urgent colonies to establish where we can find room. No, this is best. We give him a dream based exactly on his psychological needs; a compensation, so to speak, for the real life we take away from him. For most people only have the right to pursue happiness. In return for a normal life, we've given him a guaranteed happiness."

The doctor let that sink in for a while; but Sherman still had a strong wish that he had pulled some other duty. Perhaps on one of the new outposts, like Deneb.

The doctor glanced at his watch. "Well, the repairs are done with and they should have the nutrient refreshed by now. Let's wheel him on back."

A little gratefully, Sherman moved over to the table.

"You'll be all right, soon enough," the doctor said to the unconscious man on the table. "This interruption will be neatly explained away and remain as merely a memory of a slightly unpleasant moment after things get back to normal. That'll convince you of the reality of your world—if you ever need convincing."

Sherman saw the sleeping man stir slightly and heard him utter sounds again.

"Wheel him out," Blomgard said.

Gratefully, Sherman turned the table around and wheeled it out the door.

From far off, Nelson heard Glynnis calling to him. "Are you all right, Hal?" he heard. "Can you hear me, Hal?"

"I can hear you," he managed to say. He opened his eyes. He saw his gun a few dozen feet away on the ground.

"I thought they had you, sure," Glynnis said quietly. "I got the two of them. Don't ask me how I did it, but I got them."

He sat up, feeling dizzy from having hit the ground with such force. "I don't guess I was much help," he said weakly. "You sure did a fine job." His head ached, but he remembered the fight and being thrown by the impact of the blast. And something else—something distant and alien, like a dream, from the deepest part of his mind. It pestered him a moment, just out of reach of his consciousness, then he shrugged it off as unimportant. He looked around and saw the charred bodies of the patrolmen. "You did a fine job," he told Glynnis, meaning it.

"Can you fly a patrol ship?"

"Huh?"

"We've got one now," Glynnis said. "I shot the guard they left with it, too. Had to."

"I see," he said, marveling at the girl. "I can fly one. I haven't since I was in the commune, though. As long as it's in good condition."

"I guess it is. I didn't hit it with any shots."

"We can go anywhere in the world with that ship," he said getting to his feet. "It doesn't need fuel; it can fly forever. You know what that means Glynnis? We can raise an army, if we want to."

"And we can get into the mausoleums and wake everybody up?"

"Yes. Come on," he said and started toward the flier. But Glynnis grabbed his arm and stopped him. "What is it?" he asked.

"What's it like to live in a world where everyone's awake?" she asked him.

"Why . . . I don't know. I've never lived in one."

"Then why do you want to wake everyone up?"

"It's wrong the way they are now."

Glynnis scowled and Nelson could tell that she was struggling with strange concepts. He felt sympathy for her, knowing how she felt.

"What I mean," she asked finally, "is why is it wrong? What's the reason?"

"Because they can do better. We can save them and show them that; I can lead them back where they belong."

"I see," Glynnis said gravely accepting his words. "All right."

Nelson smiled at her. She looked up at him and smiled back. The patrol ship was waiting for them, not far off.

Together, they marched off to save the world. ■

NOT IN THE LITERATURE

It is not at all necessary that all peoples' advances in science should follow the same pattern ours did. Frequently the "obvious" is more accident of astute observation by one chance individual —

by CHRISTOPHER ANVIL

ILLUSTRATED BY GEORGE SCHELLING

Alarik Kade had not spent fifty-eight years of his life on The Project without acquiring an instinct for a day that is really going to go sour.

Signs and portents a tyro would scarcely connect up often gave him the first powerful indications. Things like the hungry redjacket drill that droned down the ventilation pipe around 0266 the night before, popped through a rusty spot in the screen, then whined around the room, banging into concrete floor, ceiling, and walls at random till it picked up the heat radiation from Alarik, huddled under a light comforter with the pillow over his head.

The drill hit the comforter, and Alarik sprang out of bed in a rush. The ring of night-glow dots around the lamp base guided him quickly to the lamp, but where was the striker? As Alarik groped around the tabletop, he could hear behind him the *zzt-zzt* and half-hysterical whine as the drill got into the warm covers and stabbed around in all directions for some place to draw blood.

Cursing under his breath, Alarik felt the cold curving surface of a pewter water pitcher, the smooth back of a closed razor, a slim volume containing logarithms to the base eight, a handkerchief, a thick book of well-tested pragmatic formulas and their constants, an ash-tray with gold-plated model of an early turbine plane, a glossy brochure telling why he should buy Koggik Steel, a progress report he should have read last night and hadn't, a .50 Special Service Revolver with all four barrels full of rust, a Lawyer Skeel mystery with three shapely girls on the cover, which he shouldn't have read last night but did—but no striker.

The whine of the drill was growing increasingly petulant. At any moment the thing might detect Alarik with its heat-sensitive nose and come for him. What would happen then, he thought, would be that in trying to hit the drill, he would knock the pitcher over and soak the book and papers on the table. With a sense of grim satisfaction in his foresight, Alarik set the pitcher on the floor, close to one of the table's massive cross-braced legs, and then felt of the tabletop again.

A little beyond where the pitcher had been, his three outstretched fingers felt the flaring squeeze-grip of the striker.

Just then, the whine grew suddenly louder. Alarik ducked, banged his head, and the striker clattered to the floor. The drill smacked into the wall behind him. Alarik groped for the striker. The drill took off in a new line and hit him squarely in the back.

The room seemed to take a somersault.

Alarik came to with his face in the concrete and the last dregs of the drill's knock-out poison fogging his mind. His head ached, he could hear a noise in his ears like the roar of a waterfall, and there was a throbbing bump on his back about half the size of his fist.

Dizzily he pulled himself to his feet.

The way things had happened so far assured him he was in for a rough day. Whether it would be a real record-breaker, he told himself, remained to be seen.

He took a step forward, and put his right foot squarely into the water pitcher. His foot slid in smoothly and tightly, and in clutching for support he knocked the razor off onto the floor. As he gripped the edge of the table, a muffled banging whine told him a fresh and hungry drill was blundering down the vent pipe.

Keeping a tight grip on his emotions, Alarik lowered himself to the floor and felt for the striker. His hand closed instead around the open blade of the razor. He gingerly shut the razor, slid it out of the way under the table, and heard it hit something with a metallic *clink*.

Alarik groped under the table, found the striker, stood up with his weight resting on his left foot,

squeezed the striker once to see the cluttered tabletop by the light of the striker's sparks, managed to get the glass shade off the lamp without breaking anything, turned the knob of the rack-and-pinion mechanism to get the fragile mantle up out of the way, opened the gascock, and squeezed the handle of the striker. The flints scraped across the ridged steel, the gas lit with a *pop*, and Alarik triumphantly put on the chimney and lowered the mantle. The mantle lit up in a dazzling glare that showed a second redjacket drill, as big as Alarik's thumb, pushing in through the ventilator screen.

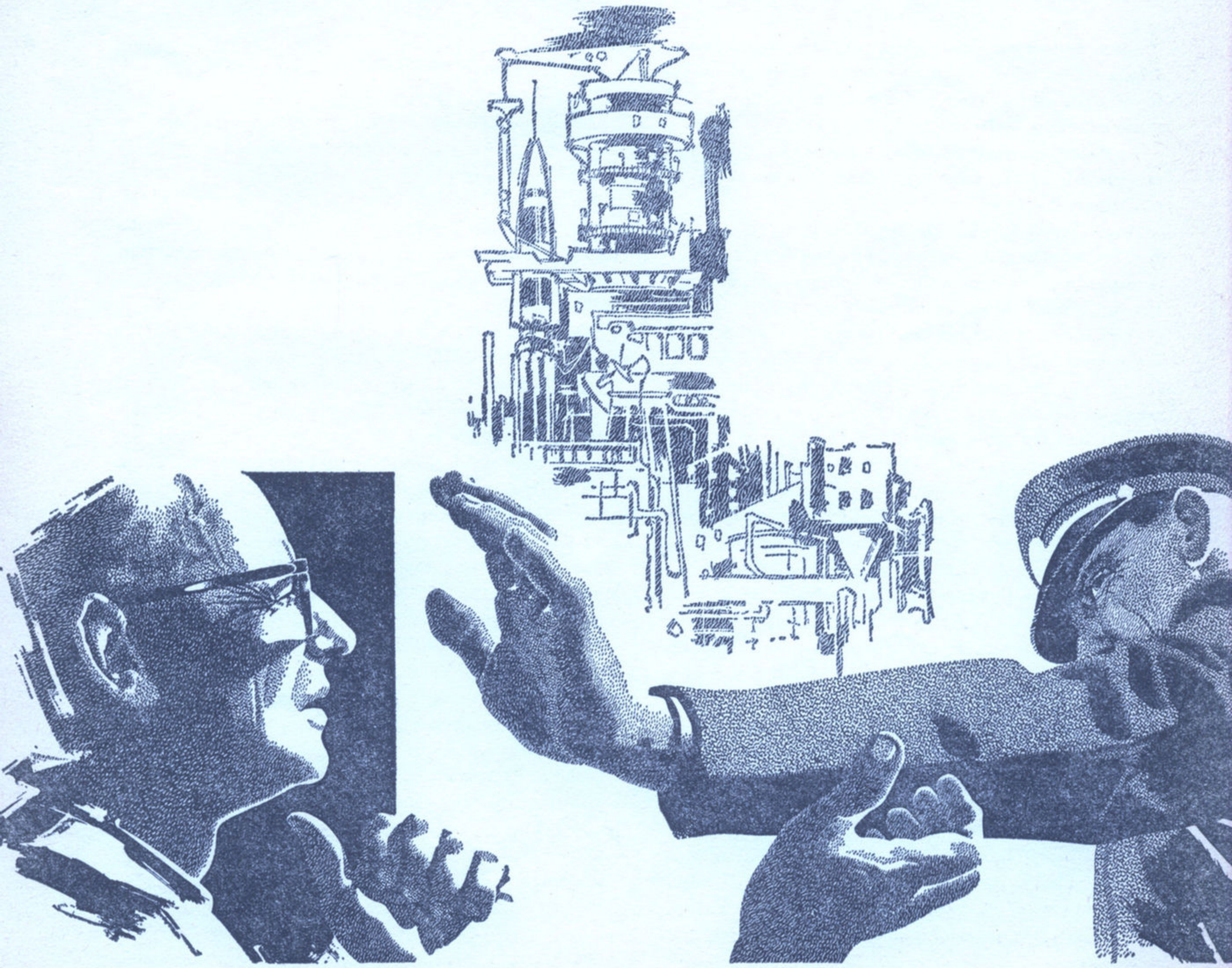
Alarik sprang forward to kill it, slipped, and landed on the floor. The drill streaked around overhead, Alarik's right arm and leg jerked up in a self-protective reflex, the water pitcher stuck to his right foot emptied itself in his face, and just then the drill detected the promising heat of the lamp. The drill whizzed around in tight circles, shot down the chimney, and whipped the mantle to bits. The room fell dark, and the gas jet settled down to incinerating the drill. A column of greasy smoke rose from the lamp chimney, and a powerful choking odor filled the room.

All this left Alarik Kade, Chairman-Director of the Special Project, half-choked and with one foot in a pitcher, picking the smoldering remains of one drill out of the lamp while still dizzy from the bite of another, and with the muffled hopeful buzz of yet a third standing the hair on end all over his body.

That was how the day started.

And experience told Alarik that with a start like that, it was bound to be a day he would never forget—if he lived through it.

The sunlight, when Alarik came up into it, after finishing out the miserable night, lit up a day that, on its surface, at least, looked good.



For one thing, there was not a cloud in the sky. That meant reasonably good ground observation. He glanced up, and saw, far overhead, the glint of the shiny aluminum gondola of *Sunbird*. The name made him uneasy, reminding him of the hydrogen that had been substituted for helium in the hope of getting a little more precious lift for high-altitude observation. A brief dazzling flash told him that *Sunbird's* signal mirrors were working properly, and that in turn meant that the aggravating difficulties with the seals of the remote arm were taken care of, at least for the present.

Off over the flat bright sand to his right, at the end of the long runway, the big turbine plane was being slowly wheeled around. Judging from the slowness with which it was turned, it already had its load of fuel and water, and being perfectly reliable, no one was worried about it. Slung under its midsection like a babe clinging to its mother was one of his two big headaches.

To his left, like an upright giant dagger with nearly conical blade and an almost cylindrical haft, stood The Beast. This was his other, and much larger, headache. Contradictory emotions of love and hate welled up in Alarik as he looked at it. No one could work on The Project for all this time without feeling a little of both these emotions.

As Alarik gazed at the shiny form, a hurrying figure coming toward him from the base of The Beast drew his attention.

Alarik nodded in foreboding. Now it would start. He had been allowed this moment of beautiful tranquillity in order to give a contrasting background against which the day's misfortunes would stand out to better effect. As a check, he glanced around toward the turbine plane. Sure enough, here came a second hurrying figure. To further test the auguries, he glanced up. A tiny cloud was materializing just about on a line between Observation 10 and the projected path of The Beast as it arced out over the ocean. That would foul up the whole launch, unless the cloud moved on.

But the cloud showed no sign of moving on. It seemed to be shredding away on one end, and forming again on the other end, and at the same time gliding steadily forward, so that the net result, fantastic as it might seem, was just the same as if it didn't move at all. But it was getting bigger, he was sure of that. Alarik squinted at the cloud, then shook his head. Even in this modern day, the only truly intelligent life form in the universe had no more control over the weather—or real basic understanding of it—than on that distant day when a remote ancestor peered out the burrow mouth and some spark of intelligence suggested that that smoldering stubble from the grass could be put to use.

What had it been, thought Alarik, the fear of some digging enemy, or—

The chain of philosophical speculation was snapped as two hurrying pairs of feet arrived from opposite directions.

"Sir, the triggering clock is seventeen sixty-fourths off, halfway through the cycle, and the An. Comp. boys say she'll burn up on re-entry. We've tried re-setting, but that throws the clock off on both ends, and Comp. tells us then she won't go into orbit. We've got a new clock checked out, but all the control wires have to be reset, and that's going to take the rest of the morning. If we lift off this afternoon, she'll lead in the pick-up area at night, unless we reset the clock. But if we reset that clock, we won't be able to lift off till tonight."

"What about Ganner's magnesium flare?"

"Sir, we tried it out three times last week and it worked fine. We installed it last night and ran a test check on a Pup rocket. Nothing happened."

Alarik gripped his chin. "It came down with no signal?"

"Oh, the siren was on. And this morning the ocean was red for a hundred spans in all directions from where she hit. The underwater sound ship picked up a good solid *ping* from the noisemaker. But all that stuff is too slow and uncertain. When the boys got there, she was sunk."

"Scrub the flight. We'll try again tomorrow."

"Sir, Weather says—"

Alarik glanced at the cloud. There was now a smaller cloud trailing it, and the first cloud looked bigger. He looked away angrily.

"When did Weather ever know what it was talking about? If we don't get clear weather for a month, that's just so much more time to perfect our equipment. And get me the name of the contractor who sold us that clock."

"Yes, sir." He turned and sprinted back toward the gleaming shaft of The Beast.

Alarik considered that he had got off easy. What if the clock had gone sour after she took off? The odds were that with his luck the An. Comp. boys would be wrong and instead of burning up on re-entry, she would make a freak re-entry, and come down through the roof of a metropolitan temple with the chief priest in charge and the benches crammed with notables.

Someone cleared his throat, and Alarik realized he wasn't safe in the burrow yet. He looked up and waited.

"Sir, the Babe's got a malfunction."

"What is it this time?"

"The hydraulic columns that control the impact-fuse-igniters. There's an overflow for excess temperature. Well, somehow air worked back into the lines, and now they're spongy. As sure as anything, we're going to get up there, let her loose, and dig ourselves a crater."

Alarik could hear more feet approaching, this time from behind.

"How long," he said, "to bleed the lines?"

"Considering how cramped it is in there, it's an all day job. What we need is some simpler way to ignite the tubes."

"I know. We've got research teams working on it.

But for now, we'll just have to put up with more delay."

"Yes, sir. We should be able to get off tomorrow for sure."

Alarik nodded, and turned to find his assistant, Kubic, holding a small earnest-looking man by the arm.

"Sir," said Kubic, "this fellow claims to have some reliable method of setting off fuses with constant-length wires."

Alarik shrugged. "It's been tried. I doubt that if our teams of trained chemists couldn't find the ideal solution, a lone researcher could."

Kubic nodded. "Yes, sir, I know. But we've had so much trouble—"

"No doubt about that," said Alarik with feeling. He glanced at the newcomer.

Kubic glanced at him, too, then cleared his throat. "Any hole in a hurry," he said.

The fellow certainly looked unprepossessing. But then, you could never tell with a chemist. Some of the best dispensed with appearance and pretense entirely. You just couldn't tell.

"All right," said Alarik. "Go ahead. What's your solution. Remember, these wires curl back through both hot and cold regions alike. The fuses don't ignite easily. It takes a sharp crack to ignite them. They aren't supposed to ignite one at a time, but a bunch together. And we don't want any fishnet of wires in there. The thing has to be reasonably simple. To keep your tension constant is no easy problem."

"I know." The newcomer beamed and nodded.

"We don't want any maze of springs and pulleys. The present system is bad enough, what with the need for special heat-resistant plastics, double-lines, heat-stable liquids, and so on. A terrific amount of the highest type of chemistry has gone into it."

"I realize that," said the newcomer. "I don't claim to be a true chemist. I just like to follow my interest. I've been sort of an amateur chemist since childhood, and . . . well, I got to playing around with strips of zinc and copper one day, and put them into some dilute sulfuric acid, and for some reason, I laid another strip of copper across the tops of the strips standing in the acid."

Alarik smiled. "And you got bubbles on the copper strip. It's a standard experiment."

"Yes, but I wondered about it. *Why* did I get bubbles?"

"It's a well known chemical fact. Immerse copper and zinc in acid, let there be contact, and bubbles form on the copper. The bubbles are hydrogen gas." Alarik smiled tolerantly. "Go ahead. What next?"

"I wondered, why must there be *contact?*"

Alarik blinked. "What's that?"

"Bubbles formed *when I joined zinc and copper strips.* Why did these strips *have to be joined?*"

Kubic glanced at Alarik's frown, and said hastily, "The Director's time is limited. Now, if you'll come to the practical aspect of your idea—"

"Wait," said Alarik. "He's got a point. Why *does* there have to be contact? I performed that experiment, too, but that question never occurred to me." He looked at the man with new respect. "I would say that you must be a natural-born chemist. You are, I suppose, associated with the university nearby, at Kerik Haven?"

"No, no." A stricken look crossed the visitor's face. "Please, I am nobody. All that matters is this discovery, which I happened across purely by accident."

Kubic cleared his throat, and said uncomfortably, "The fellow is a janitor at the University."

"Well, in that position, he could, I suppose, observe, experiment, learn—"

"In the Dance Workshop," said Kubic.

Alarik frowned.

Their guest hung his head. "I was thrown out of the Chemistry Program as a student. I hung on, got a job as a janitor, and they threw me out of that job, too. But I've got a friend in the stockroom. He helps me get what I need."

Alarik considered the possibility that the man was a suppressed genius. It had happened often enough in the past, heaven knew. But in this enlightened age, such things were said to be impossible. Chemical talent was searched for eagerly, coaxed along with scholarships, rewarded lavishly with high pay.

Their visitor seemed to sense Alarik's line of thought. "Please," he said, "don't think that I am trying to present myself as a chemist of any kind. I think . . . I think I have some skill, some insight, but it is of a different type. At school, my teachers told me that I asked the wrong questions. I disagreed. I was more combative then." For a moment, he lifted his head. His eyes flashed. Then he shrugged, and looked down at the dirt. "It's all gone now." There was bitterness in his voice. Then he smiled suddenly. "But I *can* solve your igniter problem for you."

"How does this wire of yours work?" said Alarik.

"Well, to explain it completely, I would have to describe to you a great deal of work I did with the two strips of metal." A wary look crossed his face. "But I've found that it's better not to go into that."

Kubic said, "Just tell us the practical details."

"Well, essentially, it is this. You run a wire from the pilot's compartment back to the fuse. When the pilot wishes that particular fuse to ignite, he presses a button."

Alarik frowned. "This is a very stiff wire."

"No, not especially."

"Then it is a reasonably stiff wire enclosed within a casing?"

"No. Oh, well, yes. There is a fibrous sheath over the wire."

"How will that stiffen it?"

"It doesn't need to be stiff," the newcomer answered.

"Then what moves it?"

"It doesn't move."

Alarik scowled at him. Kubic frowned.

"Then" said Alarik, "why does the pilot punch the button?"

"Because—He does it to—Well, that's what I'm coming to."

"Wait a minute," said Alarik. "A push is communicated along this wire, is that right?"

"No, sir."

Alarik stared at him. Suddenly he snapped his fingers. "It *twists*, is that it? You've found a way to convert a push into a twist, and then—"

"No. No, it *doesn't* twist. It doesn't move at all."

"*Doesn't move at all?*"

"That's the point. It *heats*."

Kubic groaned.

Alarik shook his head. "No good. No, it won't work."

"But why not? Heat will trigger off the fuse."

Alarik felt faintly sick. He glanced at Kubic, and jerked his head toward the gate. That, he thought, was the trouble with these unsung geniuses. They wanted to sing for an audience and they didn't even know the scale.

Kubic put his hand firmly on the man's arm.

"Ah, I see," said the fellow suddenly. "Not the *whole* wire. Just the *end*."

Alarik forced a smile. "It happens to be the *other* end we're interested in."

Kubic turned him around, and led him off forcibly.

Alarik could hear them in the distance. Kubic's voice was a series of low monosyllables. The other man's voice rose in loud complaint, and as the wind happened to be from that direction, he could hear him almost to the inner gate.

"But," the man cried, "it's the *fuse* end I'm talking about!"

Kubic muttered something or other.

"No, no, you don't understand! Friction has nothing to do with it! It's *not* heat conduction along the wire! That's not *it!*"

Kubic paused to take a better grip on his guest's sleeve.

Alarik frowned. If it wasn't friction, what *was* it? Here is a man who pushes a button attached to a wire. The wire is not stiff, but is enclosed in some kind of sleeve. The wire gets hot. Then it would burn the sleeve, wouldn't it? But wait a minute. Only the *end* gets hot. The rest of the wire doesn't move at all, doesn't twist—*How* does the end get hot?

"No! No! No! No!" came the voice, climbing higher. "It isn't that at all! I can show you!"

Alarik came to a sudden decision. He was hung around the neck with chemists of the most exalted rank. They all thought alike. They were the elite of the elite, but maybe he needed a fresh mind. What if the man's approach *wasn't* truly chemical? Just let it work, that's all. He cupped his hands to his mouth to shout to Kubic.

Abruptly the visitor ripped free of Kubic's grip. His voice carried in an almost hysterical shout:

"You're hidebound! You're blind as bats, the lot of you! I've begged for just a chance to *prove* there's such a thing as current, and there *is!* I can prove it! It's staring you in the face! But you won't listen! You fools! A *current* flows through that wire, and when it goes through the constricted end, *then* the end heats! No, it's not chemical! You can't argue against it because it's not chemical! It's potentially just as great as anything that *is* chemical! I try to tell you, *it's a whole new field of knowledge!*"

Alarik lowered his hands. He shook his head and shrugged. He glanced around at the towering evidences of chemistry in a chemical world. Chemistry was the study of matter, and matter was everywhere. Everything that was, was made of matter. There was nothing else, *could* be nothing else but matter. Oh, there was light, and sound, and lightning, but the best minds held that these were just disturbances in matter, or in finer forms of matter. There was the field of atmospheric chemistry, for instance, and the field of aetheric chemistry, but there was some doubt as to whether these fringe studies, particularly the latter, were really chemical at all.

How, all considered, could any other field of knowledge possibly *hope* ever to compare with the study of matter? Builders, mechanicians, physicians—all had important work to do, but they admitted they were only quasi-chemists, not truly chemical. Only the mathematicians held aloof, proclaiming a loftier discipline. But in actual practice, they were tied in knots. They couldn't accomplish a thing without a thousand trials, errors, and reservations. Matter just was not amenable to their theories, except in rare special cases.

He shrugged.

A last shout carried back on the wind:

"I'll show you! It's bound to come out some day. Current *does* flow!"

That decided it. What could flow through a solid metal wire? There was no space for anything to flow on the inside, and on the outside anything would fall off—or else ooze through the spaces in the fibrous sheath and drip out. Solid matter was largely incompressible. Therefore nothing could flow through it, because to flow, there must be space. And you couldn't have a current without something that flowed. And nothing could flow where there was no space.

Kubic came back, shaking his head.

"I'm sorry, sir. I didn't realize. The fellow's a fanatic."

"Well, it was worth a try. I thought for a minute there he had something."

"He acted plausible enough. But he blew up on the way out. Talked all kinds of gibberish."

"Yes, he didn't make much—Wait a minute!"

"Sir?"

"Listen. Suppose we use a stiff wire, inside a conduit of close spiral spring, and rotate that inner wire very fast, with pressure, against a narrow abrasive head applied to the fuse case?"

"Hm-m-m, you mean the friction will generate heat?"

"Sure it will. Now, of course, it isn't a very chemical procedure. It's just a piece of mechanism. But that's how we've progressed in The Project over the past hundred years or so. One little brick on top of another. In time, we'll get there."

"Yes, sir. But I don't know. Good mechanicians are as rare as shock-proof lamp mantles. You remember, twenty years ago, when we were using spring triggers on the fuses. That seemed pretty good till they complexified it up to the point where we couldn't recognize it any more. Then they got that hydraulic idea, and—Well, I don't know. One thing just seems to lead to another. It seems as if this is all taking too long. We go around in circles. Somehow, it's like trying to pull nails with a wrench. Where the devil do you take a hold? There's a tool missing from the kit somewhere."

"It's been a bad day," said Alarik, scowling. "Of course, over the long view, there *is* progress. And, occasionally, there's a real breakthrough. That new fuel, for instance. And, best of all, the superrefractive coating. Then, it was no small improvement when we hit on dissipation-cooling, and all the refinements of that. But I know, somehow these big advances don't make the dent they ought to."

Kubic glanced around at various massive structures that stretched off to north and west as far as the eye could see. "Well," he said, "it keeps unemployment down, I'll say that for it. But something tells me a lot of our effort here is at a tangent to the problem."

Alarik nodded. "I'll tell you what," he said. "We'll press this rotary-fire principle, and see what comes of it. We can send a routine payment check to this fellow you brought in. After all, he suggested the idea, whether he meant to or not. He, at least, *claims* to develop some new method. He may be a fanatic, but then, you look at some of the early chemists—"

Kubic nodded approval. "Good idea, sir. To tell the truth, *I* don't see why there has to be contact to evolve those bubbles, either."

"Take care of it now," said Alarik. "You never know when something will happen and we'll forget all about it."

Kubic's eyes widened. "Sir, look there—"

Alarik looked up.

"The devil with it. Get going, I'll take care of this."

Sprinting across the field from the bulk of The Beast came what looked like the whole maintenance crew. Alarik gave Kubic a shove, to start him in the right direction, and Kubic ran off to disappear behind a protecting buttress that led back to the Administration Building.

Alarik studied The Beast. Was that a wisp of smoke he saw, puffing out from under the drive ring?

Mechanicians, builders, brace men, clockers, supervisors, chemical technicians—the whole crew pounded across the field as if their lives were at stake.

That *was* smoke under the drive ring.

As he watched, a white plume billowed out, traveled slowly around the circumference, and wreathed the dagger-like base in smoke. Another plume joined the first, then another and another. The curving near-cylindrical top rode above the billowing clouds with no visible support.

Alarik held his arm out, stabbed his forefinger at the earth, and shouted, *"Ground!"*

All the workmen but the crew chief disappeared in a series of flying dives.

The crew chief, breathing hard, tears streaming out the corners of his eyes, ran to Alarik and saluted.

"Sir, I'll stay up and take my medicine. It was my fault. I—"

Thunder traveled across the field.

Alarik knocked the crew chief down the nearest hole and dove after him.

Pink brilliance reflected dimly on the sides of the tunnel.

"What happened?" said Alarik.

"The inside clocker—He's new. I shouldn't have let him down alone. We can't use any kind of lamps in there. He had to work with just a glow plate."

"What happened?"

The earth began to shake.

"Go on," shouted Alarik, *"what happened?"*

"He bumped the master pull wire, where it comes in out of the sheath from Control. The safety was pushed down, and by mistake, the tip must have been over the wire; the pin popped up out of the hole, the safety let go, the arming spring knocked the lever around, the safety came down and hit the taut wire, and that sprang the lever. We could hear it—Wham! Wham! Wham! Then she started."

Alarik swore.

The crew chief shouted above the roar. "He's still in there. *He's in there now!* The weight-savers dropped the ladders and weather covers loose. He couldn't get out. We just got down ourselves before the tower got jerked away."

The tunnel lit up in a pink glow, and they eased back around a corner.

"It's too complicated," the crew chief shouted. Then it was too loud to hear, and the uproar was too much to talk in anyway.

Alarik lay in the hole, his body one living ache. Gradually, awareness returned.

Well, he thought dully, there she goes. The faulty clock is still in her. The gliders and the *Sunbird* may get some data, but it's meaningless with that nonstandard clock in there. At intervals, The Beast will shoot out luminous vapor clouds, and that may help in the tracking—maybe. But where would she come down?

There must be some better way than this, he thought. It can't be this complicated. This was like trying to tie up a handful of marbles with a ball of string. When it got this complicated, it meant you were trying to do the job with tools or materials that weren't fitted to the work.

The roar was just about all gone now.

There was a thud, and Kubic came around the corner of the tunnel in a crouch.

"Sir, are you all right?"

"In a sense," growled Alarik. "How was it?"

"Beautiful. It looked beautiful. Actually, it was terrible, but it looked fine."

"Well, that's something."

"I got that pay voucher made out."

Alarik froze. Suddenly, ignoring the staring crew chief, he jumped up and grabbed Kubic by the arm.

"The devil with all that," he said. "I'm sick of this stuff!"

"Sir? You want me to cancel it?"

"No, no! Go on out there! Go get him! Grab him! Bring him back!"

"Yes, sir!" said Kubic with alacrity.

He went up out of the hole in a rush.

Alarik climbed up into the open air. Far overhead was a small bright dot, gradually growing fainter.

As it disappeared, he could hear a determined voice carrying across the field, speaking of "currents" as something real, actual, and usable.

Alarik looked around. For a moment, he felt guilty. What he had in mind was unchemical. Therefore it was chicanery, fraud, quackery, unprofessional—

"The devil with it," growled Alarik. Years of accumulated frustration weighed on him like lead.

His hands opened and shut like those of a man badly in need of a hammer and he eyed the sky in supplication.

"Just give me," he said earnestly, "a tool to fit the job." ■

IN TIMES TO COME

Next month's issue will carry Jack Schoenherr's cover for Winston P. Sanders' yarn "What'll You Give?"—and behind the cover and the story lies another story.

Sanders was in the office, saw the cover for this month's issue—Nat White's picture of ships engaged in scooping valuable gases out of Jupiter's immense atmosphere.

Sanders has been thinking of a series of stories about the frontiers that man will—quite clearly—be exploring, developing and growing into the immediately foreseeable future. So he decided to start his series on that subject by writing a story to go with White's cover. . .

At this point things—timing and the rampant hurrah of trying to work out a new editorial-office routine for the new style Analog, et cetra—got slightly confused. I had already started the article on natural resources in space, which was the original plan and Sanders' story got in a little too late. . . and lo! we now have the interesting situation of a story written to go with this current March cover which will have an entirely different cover by a different artist illustrating a different scene!

I think we're winners all around on this particular confusion, however. Jack's done a magnificently spectacular cover based on considerable research into what Jupiter's clouds must actually look like close up.

Evidence from physical chemistry, astrophysics, and radioastronomy combine to indicate the visible outer layer of clouds is composed of ammonia crystals with impurities. Radioastronomy has shown that Jupiter has thunderstorms of truly Jovian proportion. (And be it remembered that legend has it that Jove's specialty was hurling thunderbolts. Turns out to be remarkably apposite.)

The impurities in the ammonia-ice appear to be something we terrestrials wouldn't ordinarily think of as a substance to be found free in an atmosphere—metallic alkali metals sodium, potassium, lithium, et cetera, can exist in free metallic state in Jupiter's hydrogen dominated atmosphere. Moreover they dissolve in ammonia (NH_3 not NH_4OH) like sugar in water; i.e. without chemical reaction—not the way they react in water. Experiment with ammonia and sodium have shown that crystals produced when the mixture freezes range with different proportions through a red bronze color but that one specific low concentration of sodium can produce brilliant blue crystals.

Here on Earth we are used to white and nothing but white clouds. Jupiter, however, allows for a far more spectacular thunderstorm as well as an unimaginably vast and violent one. ■ *The Editor*

SPANNER IN THE WORKS

A computer is the perfect logician—
which would drive Sherlock Homes himself
to tearing his hair.
Because logic is not sensible—
it's merely consistent,
however irrational that may be!

by J. T. McINTOSH

ILLUSTRATED BY GEORGE SCHELLING

Before tapping on Bergstein's door, Mark Swan surveyed it sardonically.

It was a plain plastic-faced door with nothing on it but a handle. No gold-painted name. Not even the word "Private."

Thus in the Intelligence Department anonymity was preserved. Because Bergstein's name wasn't on the door, no office cleaner would ever learn anything which would enable Mercaptan to win the war. Because in the Terran Intelligence section nobody's right hand ever knew what the left hand was doing, there would never be any leaks.

In a pig's eye.

Mark tapped on the anonymous door and entered.

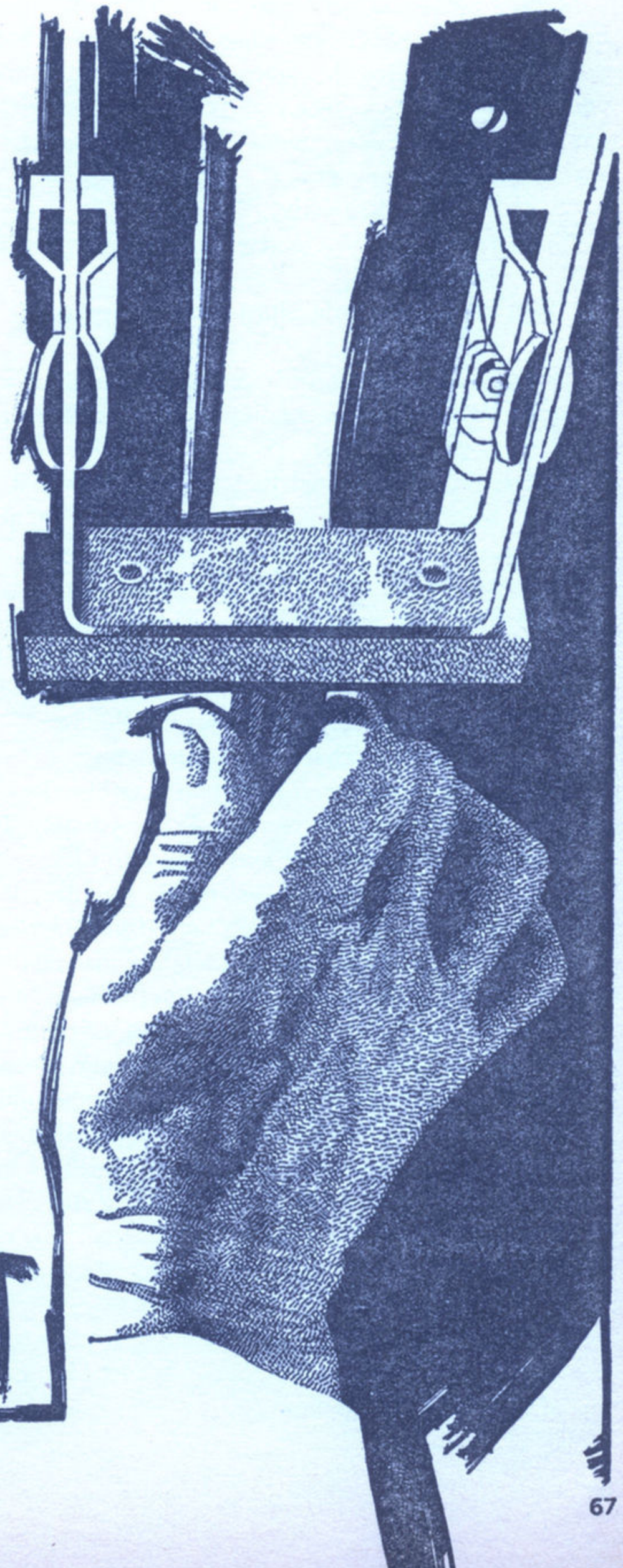
"Ah, Mark," said Bergstein. "You're just in time. We're due at the lab in two minutes."

"I'm not coming," said Mark.

Bergstein stared incredulously.

Mark handed him a plain envelope. "I want that sent to D," he said. "And I want it time-stamped now, so that he'll know I handed it in before Carr went under the probe."

"You can't do that," Bergstein exclaimed.



"There are many things I can't do, but that isn't one of them. I don't even have to tell you what's in that envelope, but I will, after you've time-stamped it."

Bergstein hesitated and then put the envelope into a small machine. It spat the envelope back at him, enclosed in another, stouter, sealed package with the time clearly marked on the top left-hand corner.

"In that envelope," Mark said, "is my resignation. And don't tell me I can't resign. I also state that Carr is not the man who took a distorter into the Navy Yard, and that none of the seventeen people we were told to screen did it."

Bergstein opened his mouth and then shut it. After due consideration he smiled. "Sour grapes," he said.

"What?"

"I may not be supposed to know it, Mark, but one hears things. Two years ago when S retired, you thought you were going to take his place as Security Chief, didn't you? Instead D took over and you were made departmental head of Counterespionage. Then six months ago I was promoted over you."

"So?" said Mark grimly.

"Sour grapes," Bergstein repeated, and left it at that.

Mark turned to go.

"Wait," Bergstein said sharply. "You're still in CE and I'm still your boss."

He pressed a button on his desk. "This is what we're going to do, Mark. I'm sending this letter to D right now. Then you and I are going to the lab. After the probe has duly established that Carr planted that distorter, D will no doubt send for you. And after that it's improbable that you'll be in Intelligence any more—though whether the record will show that you resigned or were fired I've no idea. Now let's go to the lab."

"I don't fancy seeing an innocent man ripped to pieces by the probe."

"Once for all, Carr's the saboteur. You're coming with me to the lab. That's an order."

A messenger entered, and Bergstein gave him the package with instructions to deliver it to D immediately. Then he stood up. Mark shrugged and went with him.

In the laboratory Carr was ready for the probe, strapped in a metal throne which looked like an electric chair and was just as unkind in a slightly different way. Half a dozen technicians and a doctor were in attendance. Mark found the presence of a doctor ironic—yet hadn't doctors been present when duels were fought?

Bergstein nodded to the chief technician, who nodded to one of his assistants, who pulled down a knife-switch. Carr began to scream. There was a faint smell of burning, which meant that something was wrong somewhere, but it was too late to do anything about that. The chief technician made another gesture to his assistant, and the assistant played a tune on his controls.

Carr stopped screaming. The probe now allowed, indeed commanded, him to talk, but didn't let him scream and didn't let him tell lies.

"Did you take a distorter into the Navy Yard?" Bergstein asked.

Despite the stand he had taken, Mark hoped the answer would be "Yes." But it wasn't. It was "No," and Bergstein staggered as if he'd been struck.

"Did you have anything to do with a plan to have a distorter in the Navy Yard?" Bergstein persisted.

"No."

"Are you a spy?"

"No."

"Have you ever been in the pay of Mercaptan, or any agent of Mercaptan?" Bergstein pleaded.

"No."

Bergstein gestured, the chief technician gestured, the assistant cut the probe and Carr collapsed in an untidy bundle.

"He may recover," said the doctor without any great confidence, moving to Carr's side and ripping the contacts from him. After a few seconds he added: "No. Catalepsy for a few days, and then death."

Bergstein was speechless. Mark felt no triumph.

"I," he said, "am going out to get drunk."

Mark sat alone in his favorite bar downing whisky sours with no regard for what was going to happen when the rest of his body caught up with the alcohol content of his stomach.

Fortunately Carr was a pervert and a crook. After a few hours Mark knew he'd be able to convince himself that Carr was no loss to the world and that if he hadn't deserved death for sabotage, he deserved it for something else.

At the moment, however, all he could think of was that his department, CE, had in effect executed an innocent man—just another boob to add to the long list of boobs in Intelligence during the last two years. The fact that Mark had done everything in his power to prevent it let him out to a considerable extent, but it didn't make him feel like singing and dancing with joy.

What was wrong with Intelligence? Not, surely, the Genius. The Genius had worked well for S—why shouldn't it work well for D? It was not D. D was a former colleague of Mark's—he had had a name then, before he became Security Chief—and although neither Mark nor S had liked him, the appointment of D as Security Chief was not, in Mark's opinion, nearly enough to turn an efficient Intelligence Department into the shambles it had become. Since D was at the head, he was responsible and had to shoulder the blame and no doubt deserved a lot of it—but inefficiency on the part of D could not possibly be the whole answer.

And it certainly wasn't Bergstein's fault, for CE was only one branch of Intelligence and wasn't responsible for more than its fair share of boobs. Besides, technically the current business couldn't be blamed on Bergstein, because CE had been instructed by the Genius, through D of course, to find which of a certain party of seven-

teen visitors who had been shown through the Navy Yard had planted a distorter there. Bergstein and Mark interviewed everybody on the list, together and separately, and they hadn't exactly disagreed in picking Carr as the prime suspect.

The Genius asked a specific question: Which of these seventeen could be bribed to perform such an act of sabotage? And both Bergstein and Mark picked Carr. As far as Bergstein was concerned, that was that—the Genius had said one of seventeen people did the thing, and that being so, Carr was the one. Mark went a stage further. His conclusion was: *Carr might have done it, but he didn't.*

Mark had sent in his resignation because working in CE was ceasing to be merely frustrating and becoming pointless. He had been told very little about the Navy Yard affair except that one of seventeen people was a saboteur, and had then established to his own satisfaction that even that wasn't true.

What happened when an Intelligence agent sent in his resignation he didn't know. There were obvious difficulties—

At this point in his deliberations he saw the bubble girl.

Wars, even faraway wars, frequently produce tensions which can be relieved only by strange new vices or new versions of the old ones. And the war with Mercaptan had produced the bubble girl.

This one, to everyone else in the bar, was a pretty blonde in a dark suit, surrounded by a faint shimmer which looked like a gigantic soap bubble all around her. To her intended client, in this case Mark, she was clad in her dark suit for ten seconds, then in wisps of underwear for five seconds, and finally in nothing at all for a single second, the cycle repeating itself endlessly or at least until she realized she hadn't made a deal and directed the field toward somebody else.

She stopped beside him. "Do I stay?" she asked softly.

"Why not?" said Mark.

She sat down at his table. "My name's Star," she said in the same soft, seductive voice. Most bubble girls took glamorous professional names such as Star and Dawn and Gloria and Venus.

"You can call me Mark," he said. "What are you drinking?"

"Orange juice, please. You want to talk?"

"Sure," he said. "I want to tell you my troubles. I guess you're used to that?"

In spite of the alcohol he had consumed, he saw the flicker of puzzlement deep in her green eyes.

"I'm in Counterespionage," Mark said, "and I just got a man executed for something he didn't do. Well, maybe that's not quite right. I tried to stop it, but I failed. So I've sent in my resignation."

Now she didn't try to hide her puzzlement. "What's this you're giving me, Mark? If you were an Intelligence agent, you wouldn't tell a girl you'd just met. Particularly—"

She stopped, but Mark had no difficulty in completing the sentence. "Particularly a bubble girl? Why not? It's your job to satisfy your clients, isn't it? Doesn't that often include letting them weep on your shoulder? I want to do some weeping."

He ordered orange juice and another whisky sour. When he looked back at Star, she had switched off the bubble-girl apparatus. Now she was just a pretty girl in a dark suit, permanently, and with no bubble.

"You didn't have to do that," he said mildly. "I'm not going to get tired of you. Were you afraid that familiarity would breed contempt?"

She frowned, and then apparently decided to play along with him. "All right, Mark, go ahead and weep."

He told her that a distorter had been planted in the Navy Yard. All electrical apparatus in the vicinity had begun to misbehave very, very slightly, so slightly that it was days before the Navy Yard Director could be certain that there was something wrong, two weeks before the distorter was found and smashed, and a month —not yet over—before all the work done in the yard during that time could be done again, checked, double-checked and pronounced satisfactory.

It was the kind of unspectacular sabotage which was ten times as effective as a clumsy bomb-explosion at the yard. In this kind of long-range, long-term conflict, manpower and materials were less important than overall technical accuracy.

"I was told to find which one out of a party of seventeen people who visited the yard left the distorter there," Mark went on, "and I decided none of them did. But this man Carr was probed just the same, and now he's as good as dead, though he's innocent."

By this time Star had fallen into a mechanical routine of saying the expected thing whenever he paused, suspending puzzlement, disbelief, incomprehension and anything else she had to suspend.

"And this bothers you?" she said.

"Sure it bothers me. I'll give you the background next. But first, hadn't we better go to your apartment?"

She hesitated, obviously doubtful about the whole thing now.

"I'm not drunk," Mark said, "not seriously, anyway. Let's go, huh?"

Once more Mark surveyed a blank door sardonically. This time it was Star's bedroom door.

When they reached her apartment, he had started to tell her all about Intelligence, but she excused herself, saying she'd get into something more comfortable. And he thought he knew why.

Perhaps he should have put on more of an act, letting her think she was squeezing information out of him. By pouring it in her lap as he had done, he naturally made her suspicious.



Leaving him alone like this, she was deliberately giving him time to think, time to get control of himself, time to sober up. But it wasn't going to make any difference.

The door opened and Star returned. Mark, who had no previous experience of bubble girls, had been curious to see what kind of negligee she would wear. He wasn't disappointed. It was ten times as aphrodisiac as plain nudity.

Her wrap was ankle-length and consisted of white, pink and yellow gauze, and even at the few places where three layers came together, nothing was concealed.

"Like it?" she said softly.

She was trying to get matters back on her own ground, but Mark didn't let her.

"Yes, but I haven't finished weeping on your shoulder. Come and sit down, will you? So's you'll understand, I'd better tell you about my old boss, S. He retired two years ago. Under him, Intelligence was so efficient that—"

"Mark, didn't it occur to you that I might be working for Mercaptan?"

"Not for a moment. Star, how about taking off that wrap? You'd distract me a lot less without it."

She still stood in the bedroom doorway, frowning.

"And," Mark added, "I've seen you without any clothes on anyway."

"In the bar, you mean?"

"No, long before that. Thirteen years ago, when you were six."

She went quietly. "So that's it. I was beginning to wonder if you'd guessed somehow. It never occurred to me that you'd recognize me. I was only a kid the last time you saw me, and you couldn't have been more than twenty yourself."

"I'd have known anyway—Paula. Only it might have taken longer."

"Am I such a bad actress?"

"It's not that. You can't pump a Security man, Paula. D should have known that. My speciality is picking the wrong 'un, smelling out the thing that doesn't quite fit."

They were both silent for a while, remembering the time thirteen years ago when Mark, hardly more than a messenger in Intelligence then, had been sent to S's home. In the garden he had found a pretty, fair-haired child who had asked him if he was a sex maniac—because if so, she'd run and put some clothes on. Otherwise it didn't matter, and didn't he like sunbathing in the nude, too?

"My father thought a lot of you, Mark," Paula said. "He still does. Look—since there's no point in playing games any more, I'm going to put on something respectable."

"You didn't thirteen years ago."

"Thirteen years ago it didn't matter."

"And now it does—and you a bubble girl?"

"Get this straight, Mark. As a Security agent I use the bubble girl pose now and then. But I don't follow through. That isn't in the contract."

Mark grinned. "You wave the carrot in front of the donkey's nose, but never let him have it?"

She made a face at him and turned to go back into the bedroom. But he jumped up, caught her arm and pulled her to the couch.

"You just insisted on putting on that wrap. Why?"

"You can guess. I'm supposed to be checking on you. But I'm biased. I didn't want you to—"

"You didn't want me to hang myself. So you gave me a chance to think." He grinned. "If you work that way, you'll never be a good Security agent, Paula."

"You're different. You should have been Security Chief after my father. He said then that it was a great mistake to appoint D instead of you."

"When did you join Security?"

"A year ago. My father wasn't very keen."

"I'll bet. Does he know about this bubble girl business?"

"No."

"What's your report on me going to be like?"

She shrugged. "What can I say but that you identified me, so it was no good?"

"Will you tell me one thing? When were you briefed?"

She hesitated and then said: "Just a few minutes before I picked you up."

"Then that must have been after D got my resignation," Mark mused.

Paula stirred uncomfortably as his arm went round her. She felt at a disadvantage. As a Security agent she did as she was told, acting a part. But now she found her professional and private lives embarrassingly mingled. It was hard to keep a man at arm's length when only a few minutes before she had been pretending to be a high-class prostitute.

Mark stood up. "I've decided to be a gentleman," he said. "Are you insulted?"

"Anything but," she said gratefully.

However, a couple of minutes later, when he had gone, she found herself frowning at her reflection in a mirror and wishing he had found it a little harder to tear himself away.

It was no surprise whatever to Mark when he was summoned to D's presence first thing the next morning.

The Security Chief was always known as a single letter. Perhaps unfortunately, however, there was a limit to the secrecy which could be maintained within Intelligence departments. Security Chiefs, like other department heads, were not always department heads. Before that they were field men—and when they climbed or were kicked upstairs, their former colleagues could hardly be kept from knowing about it.

Mark had worked with D when he wasn't Security Chief, when they both took orders from S.

D, a plump, innocent looking man of thirty-five, stared at Mark without pretending any friendliness he didn't feel. "I got your letter yesterday," he said. "Why, if you were so sure Carr wasn't the man, didn't you take action sooner?"

"Now there's a question," said Mark. "Before I answer it, are you sure you don't want to take it back?"

"All right," said D wearily. "I take it back. No doubt you told Bergstein all about it in triplicate, and I guess you're all set to point out that six months ago I raised Bergstein over your head. And now you want to resign."

"Not just over the Navy Yard case," Mark said.

"I know that, too. I also know that Star didn't get anything out of you. Listen, Mark. I don't like you and I never did. And six months ago I took great pleasure in putting Bergstein over you because I thought CE could be run better. But you can't resign. You'll find your new job in there."

He pointed at an inner door.

"Am I dismissed?" Mark asked.

"Yes, in there. I'll be here when you want to talk to me. And I'm not going to enjoy it."

Mark stood up. He wanted to temporize, to ask questions, but D clearly had no intention of saying any more just at the moment.

As he crossed the floor wild thoughts of what he would find in the inner room flashed through Mark's mind. It might be a gas chamber. He might be whisked away by Security cops. Or Star might be there.

What he found was a desk with a folder laid on the blotting pad; a chair, a carafe of water. Nothing else, not even a telephone.

He sat down and opened the folder.

Ten seconds later he sat up abruptly, staring at the papers in front of him as if they were red hot. As a matter of fact they were.

Once upon a time, in the fairy-tale past, Secret Service had been really secret, so secret that nobody knew what anybody else was doing. Spies had spied on spies on spies on spies until nobody knew what he was looking for and wouldn't know if he found it. It had often been exactly like the situation in farces in which A trailed B trailing C trailing D trialing A. It would have been funny if men hadn't often died trying to trace telephone calls to relatively innocent brothels or protecting information which was printed in current technical journals.

The use of an electronic brain changed the situation entirely. For the Genius knew everything—and the Genius didn't talk.

The Genius was a vast computer which contained all of civilization's most secret information in its thousands of cubic feet of memory banks. This top-secret information went in, but it could never come out. The Genius

was a computer, not a reference library. It was so constructed that although it could direct all operations of all the Security branches, only directives could be communicated, not information.

But the Genius didn't have the final say. It was, after all, only a tool. The Security Chief made the real decisions. Nine times out of ten he merely rubber-stamped directives from the Genius. Nevertheless, when the logical decision wasn't the right one, it was up to the Security Chief to divine this and take appropriate action.

Mark remembered when the Genius had wanted twenty-five men shot, including the President of the United States. It was the logical answer in the circumstances; the war came first, at least three of these men were known to be working for Mercaptan, and the damage they could do in every moment that passed was so great that the coldly correct solution was to liquidate them all at once rather than spend weeks, possibly months, finding the three traitors and making absolutely certain there were no more.

But S, Mark's boss then, had known that such ruthlessness, although it might accomplish its own object, was going to create more problems than it solved. He authorized slower, less certain but more humane measures.

And the Genius didn't care. Naturally. The Genius never did care.

The Genius never sulked when the Security Chief told it, in effect: "Look, you've given us the best solution but for reasons that you couldn't possibly understand we're not going to use it. What's the second-best solution?"

Since the Genius kept all it knew to itself, Security had to have its own files. But these could be locked away without any risk of sections and operatives working at cross-purposes—so long as the Genius knew everything.

An agent was told all he needed to know to do a certain job. He didn't have to be allowed to gorge himself on top-secret material looking for relevant information. On the other hand, he didn't have to stumble about in the dark because he wasn't allowed information he desperately needed.

The system had worked very well until about two years ago, when D replaced S as Security Chief.

As he scanned through the material in the folder, Mark reached many conclusions, the first of which was that instead of being fired or being allowed to resign, he was being asked to tell D where he had gone wrong. For no other reason would so much so secret information be made available to him.

Either in trust or in desperation, D was concealing nothing from Mark. The folder contained the whole sorry record of Intelligence during the last two years —highly efficient at first, then merely passable, then shocking.

Mark sat back, lit a cigarette and blew smoke at the ceiling. It took guts on D's part, he had to admit, to call in a man he didn't like, a man who might have been sitting in his chair, and say in effect: "Look what a ball I've made of this job. Where did I go wrong?"

Why, he wondered, should D demote him, put Bergstein over him and then, six months later, put such trust in him? Searching in the folder, he soon found the answer—his own service record.

Six months ago D had demoted him because CE, although not as inefficient as the other Intelligence departments, was still anything but efficient. Since then, however, CE had sunk until it was the least effective of all the departments.

And Mark's record showed his persistent habit of being right, or at least less wrong than anybody else. Time and again Mark had stuck his neck out and not got it chopped off. Time and again he had reported that the lines CE was working on were wrong, and they duly turned out to be wrong.

Although the decision must have tasted bitter in D's mouth, he hadn't had much choice. Everything he did turned out wrong. And the man who might have been Security Chief in his place stubbornly persisted in keeping his nose clean.

Mark wouldn't have been human if he hadn't permitted himself a quiet chuckle.

When D had detailed Star—or Paula—to check on Mark, it had been a last, despairing effort to find out something that made it impossible to consult him. And Star reported laconically: "Nix. He rumbled me right away."

Staring at the ceiling, Mark summarized his conclusions.

(1) The crisis in Intelligence was far more serious than Mark dreamed—and D had seen it growing, tried to arrest it and failed. Practically no information was coming out of Mercaptan any more, spies and saboteurs weren't being uncovered the way they used to be, innocent people were being arrested while guilty people went free—in every department Intelligence was falling down on its job.

(2) D was well aware of the possibility that he himself might be the weak link in the current setup. The efforts he had already made to get Intelligence functioning efficiently again included everything he might have tried short of turning over the job to somebody else—bar one thing.

(3) The Intelligence organization, being what it was, could neither commit suicide nor call in an outside troubleshooter. Therefore it had no choice but to go on bungling if it couldn't put its own house in order.

At the thought of bungling, Mark recalled the Navy Yard case and searched through the folder to see if there was anything about it. There was. He read the

report carefully and then went back to the other room.

D looked up. "Well?" he said stiffly.

Diplomatically Mark censored a lot he might have said. "There's one thing you should have tried and haven't."

"And what's that?"

"Cut out the Genius. Make all the decisions yourself."

"But . . . that's impossible. It's unthinkable. Anyway—there can't be anything wrong with the Genius. I test it every week myself. I run a whole pattern of logistic and mathematical problems—"

"Maybe the Genius can handle mathematics and logic but not Intelligence."

"But it used to run Intelligence very well."

"It's not running it well now."

"If that's all you have to suggest—" D began coldly. Then he stopped himself, remembering how often Mark had been proved right by events.

"No," Mark said, "it's not all I have to suggest. But tell me one thing—now that I'm in on this, how much freedom do I have? What will you let me try?"

With a visible effort D forced himself to say: "Anything you like."

"Then I'm going to see S."

"You can't do that. He's retired. He's not in Intelligence any more."

Mark grinned. "The old boy knows so many secrets that another wouldn't make any difference. And you have to admit that things ran pretty smoothly when he was boss here."

"Yes—" said D unwillingly. Mark knew exactly what he was thinking. D had never had a high opinion of S's methods. He had thought when he took over that he was going to make Intelligence twice as efficient. Only now was he forced to admit that perhaps S had known what he was doing, after all.

"Well, do what you like," said D crossly, looking down at the papers on his desk.

"One more thing. There's nothing wrong with the Genius, huh? Then what about the Navy Yard case?"

"What about it?"

"I've just learned that the distorter was found inside the casing of a machine which had just had a routine check. If I'd known that before—"

"If you think the technicians who did the job left it there, you're wrong," said D, with a certain small triumph. "There were three of them, working under the eye of a Yard security officer."

"Exactly."

"What do you mean, exactly?"

"The Navy Yard authorities knew the distorter wasn't there at the time of the routine check. So when they started looking, they didn't look there. Sure, they got round to it eventually. But that was about the last place they looked—naturally enough. Are you buying the coincidence? I'm not. *The distorter was put there by somebody who knew it was going to be the last place anyone would look.*"

"And the Genius, with all these facts at its disposal, says one of seventeen visitors put it there. Visitors who couldn't possibly know that that machine had just been checked."

"One of them could have been told to put it there."

"Oh, sure. By the real saboteur—the one who works at the Navy Yard. But the Genius didn't see that."

"And neither did I," said D very quietly.

Mark rose to go. "No," he said. "You didn't."

Mark could have gone to see S that day, but he left it until the following morning, which was Saturday, because Paula might be at home then. The week end wasn't a good time for Security investigations. People were relaxed then, off their guard, but they were also less willing to talk about their jobs and the trials and tribulations of the week. A man who on Wednesday would be eager to pour out his troubles to a willing listener would shrug everything off and change the subject on Saturday.

Mark's guess proved correct. In the swimming pool, a pool which hadn't been there thirteen years ago, he found Paula.

She climbed out, shaking herself and removing her bathing cap.

"You didn't wear a swimsuit last time I was here," Mark reminded her.

"Look, let's drop the subject of my not wearing clothes, huh?" said Paula. "What are you doing here?"

"Looking for your father."

"Oh." Her disappointment showed. For the second time Mark suspected that she wasn't a very good Security agent. She was too transparent. Still, perhaps she would learn. Heredity should count for something.

"And to see you, of course," he added politely.

"My father's in the house."

"I'm in no hurry."

"You're out of a job?"

"I wouldn't say that."

"So—" She stopped herself.

Mark laughed. "Paula, your father and I were never the ultra-cautious type of Intelligence men like D is. I don't mind discussing things with you, and you needn't be too careful with me. I don't think for a moment that Mercaptan could buy you.

"Did anybody ever try to buy you?"

"Sure. Two men who tried have been shot."

"Were they traitors, or Mercaptanians?"

"The Mercaptan spy service never does its own spying. They bribe Terrans to do it. It's regrettably easy."

She spread a towel and sat on it. "Why, Mark? Why are so many people ready to turn traitors?"

"Because this is such a long-range, theoretical war. We'll never see spaceships battling it out over our heads—the only Mercaptan ships that ever venture into the

Solar Systems are spy ships, coming and going like shadows. Maybe it isn't really a war at all. Hardly anybody ever gets killed, even near Mercaptan. It's a conflict more like a chess game than a war. And you can't expect people to be intensely patriotic over a chess game."

"I see what you mean. It's not the kind of war people feel involved in. No personal danger, nobody gets killed. They don't see why they shouldn't make some easy money if the chance is offered."

"That's it exactly."

"And that's why Intelligence always has so much on its hands . . . Mark, what are you thinking?"

"That I didn't play my cards right that night I met you. If I'd only been harder to crack, we might have been practically married by now."

"That's what you think," she said coolly. "I told you I wasn't . . . that I didn't—"

"I still think, the way you acted, I might have done better."

"Well, maybe," she admitted, rather to his surprise. "But that's because it was you."

"Huh?"

"As you said—my father isn't ultra-cautious. I've heard about you . . . and when I was a kid you were a hero of mine."

"Now that you're old, of course, it's different?"

"My father says you could look at twenty people you'd never seen before and pick out the spy among them."

He grinned. "That's a slight exaggeration. But picking out spies is pretty easy—on account of what we were just saying."

"What were we just saying?"

"In this war most spies are amateurs. Half-spies and half-saboteurs. Not like the dedicated professionals of hard, bitter, close-contact wars. They're not careful or patient enough. They spend their bribes too freely. They—"

He saw S approaching from the house, and got up reluctantly. "Don't go," he said. "I'll be back."

S was still lean and erect, although he was over seventy.

"Mark!" he exclaimed. "What brings you here?"

"Trouble," said Mark, grasping S's hand firmly. "Although if I'd known Paula it wouldn't have taken trouble to bring me here."

Rapidly he sketched the present situation in Intelligence, and asked for S's opinion.

S was indignant, both because his beloved department was in such a bad way and because nobody had consulted him before.

"It's all young Drayton's fault," he exclaimed. "Well, call him D if you like. I knew you should have been appointed in my place. He's a nincompoop."

"It may be partly D's fault," Mark said more cautiously, "but it's more than that. S, how could the Genius be tampered with?"

"It couldn't," S declared flatly. But he frowned thoughtfully when Mark explained the details of the Navy Yard case.

"In my time the Genius would never have made a mistake like that," he admitted. "I guess this needs some consideration. Mark, do you know why I recommended you and not D?"

Mark shook his head.

"You were extremes, the two of you. He's cautious, careful, patient. You're casual, maybe sometimes reckless. He uses his head, you use your nose. And I knew the man who replaced me would have to work with the Genius. Well, D would rely on it absolutely, leaning heavily on it and trusting it implicitly. That's just what he's done. You'd use it more like a pocket calculating machine. In other words, D would rely on it too much and you wouldn't rely on it enough."

"That's true enough," Mark admitted.

"I picked you because you can adapt yourself. D can't. If you found that you got on better by co-operating more with the Genius, you'd do it. In any case, you wouldn't fail because you're not the type to fail. D is, if he doesn't have somebody keeping him right."

"Anyway, D's the Security Chief, not me," said Mark. "Let's get back to the Genius. Assume it has been tampered with. How could that be done?"

"Not by technicians," S said. "No technician gets near the computer alone. And that only leaves department heads."

'Sounds unlikely, I grant," Mark mused. "But somebody's done something to the Genius. I guess I could talk D into letting me check it myself—"

"It won't do the slightest good."

"Huh?"

"Don't you know you can't get information out of the Genius?"

"Sure I know. I was a department head myself—S, nobody living understands the Genius better than you. Can't it be tricked? Can't you get information out of it in the form of a directive?"

"No," said S positively. "Frame such a case and the Genius won't play. It won't produce a solution."

"Well, couldn't that be it? Couldn't something have been done . . . I don't know what, but we'll come to that later . . . to make the Genius think it's being asked to produce information?"

"I see what you mean, but the answer's no again. Because from what you say, the Genius has been producing directives all right, but *wrong* directives."

"It comes to this, that once something's fed into the Genius' memory banks, it never comes out? So that if somebody fed fake information in, it's there for keeps, ineradicable, and we can never find out what it is, because the Genius will never tell us?"

"That's not quite right. The Genius constantly does its

own erasing and modifying. And if anything doesn't check, it can always ask questions."

"So the Genius couldn't be sabotaged by being fed false information?"

S pondered. "You think you're on to something, Mark? I won't say that's impossible. Naturally with any computer you've always got to remember the thing hasn't got eyes and ears, and if you don't tell it something, it doesn't know. And every now and then, even if you're a cybernetics expert, you phrase information or questions ambiguously or plain badly, and the computer gets you wrong. So you get strange solutions at times, even when there's been no deliberate attempt to confuse the computer."

"It could happen by mistake? Then suppose some very important item of information was recorded wrongly, perhaps months ago. Couldn't that—?"

S was shaking his head. "Our computer, The Genius, is no ordinary electronic brain. It knows all about improbabilities and impossibilities, and it always automatically crosschecks. Try to get it to record—believe, if you like—something that just isn't so, and you'll get a flood of questions. And remember that while there's no record of what's fed into the Genius, there's an indestructible record of its questions and answers. I mean the answers it gives, not the ones it's given. So—"

"Yes, I see," said Mark, disappointed. "You couldn't keep feeding it false information, because even if it accepted any item without question, it would ask significant questions later, and the false item would soon be erased."

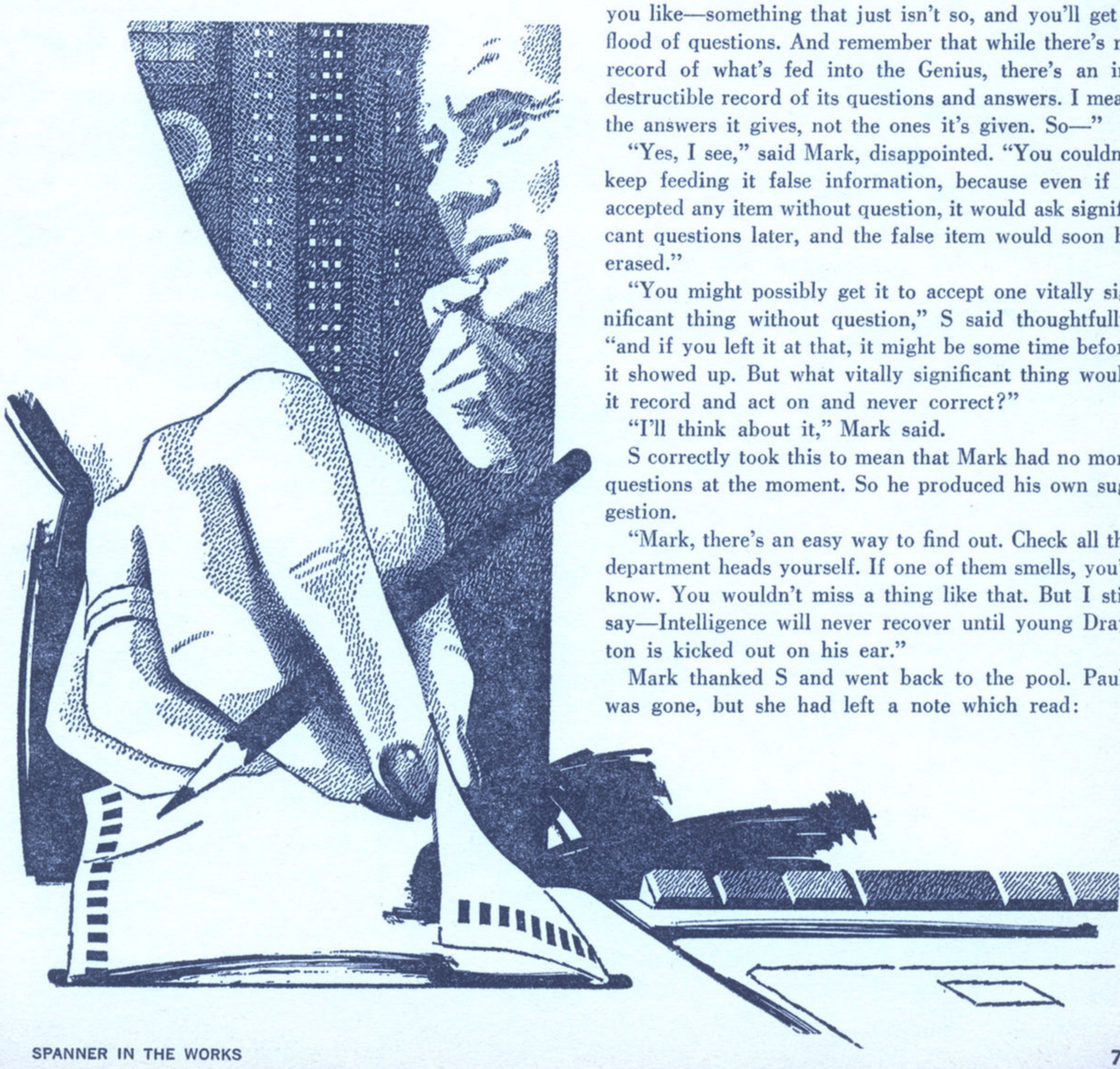
"You might possibly get it to accept one vitally significant thing without question," S said thoughtfully, "and if you left it at that, it might be some time before it showed up. But what vitally significant thing would it record and act on and never correct?"

"I'll think about it," Mark said.

S correctly took this to mean that Mark had no more questions at the moment. So he produced his own suggestion.

"Mark, there's an easy way to find out. Check all the department heads yourself. If one of them smells, you'll know. You wouldn't miss a thing like that. But I still say—Intelligence will never recover until young Drayton is kicked out on his ear."

Mark thanked S and went back to the pool. Paula was gone, but she had left a note which read:



Sorry I have to go. How about tomorrow at two o'clock? Pick me up here. Unless, of course, you'd rather not.

Mark decided to be back at two the next day, and he was.

On Monday morning Mark went in at the usual time, although he wasn't quite certain what his position was. Presumably he was no longer Bergstein's deputy in CE. So he went straight to D.

D looked pale and tired. His desk was covered with agents' reports and yellow slips which Mark recognized as directives from the Genius.

"Did you see S?" D asked.

"Yes."

"What did he say?"

Mark hesitated. Oddly enough, he no longer disliked D. One of the things he had most objected to had been D's bland self-assurance, and that had obviously been gone for months. And D's decision to call in a man he didn't like and place himself in his hands, belated though it was, showed bigness and humility which Mark had never suspected he was capable of.

"You needn't be polite," D said, smiling faintly. "He said Intelligence would never recover until I was kicked out on my ear."

The exact quote made Mark jump. After he had done so, he remembered ruefully that he had concluded Paula wasn't a very good Security agent because she was so transparent.

"I thought so," D remarked. "And I guess he's right. I'm only beginning to realize now, Mark, that that's why I disliked you and S—you never seemed to put half the work into being right that I did. I thought you were just lucky, both of you."

"Listen, D," Mark said. "There's something wrong with the Genius. I'm sure of it. If you'll authorize it, I'm going to check on the department heads, the only men who have access to the Genius. S says it can't be the technicians."

D waved his hand. "Sure. Do what you like. Then come back here."

Mark didn't bother checking Bergstein. If there was a suspect department chief, it had to be one he hadn't had any dealings with. Otherwise he'd have smelled something sooner.

He had brief talks with the five other chiefs, all men he had never seen before, introducing himself as D's new assistant and hinting at a mysterious development which would shortly take place in the Intelligence organization.

This was merely a preliminary survey to give him some idea of the men he would have to investigate. Somehow he couldn't concentrate. He kept thinking of D.

D hadn't asked any questions. He hadn't asked what Mark was going to do or how long he'd be doing it. He had merely said "Sure. Do what you like. Then come back here."

After the fifth brief interview, Mark found himself hurrying back to D's office. What he saw wasn't exactly a surprise, for it figured.

D was slumped across his desk, a hole in his head and the gun still in his hand.

Mark didn't instantly pick up the phone. The Intelligence Department had a small police section of its own—there wouldn't be hordes of outside cops swarming all over the building when the incident was reported. Nevertheless, Mark wanted to reach his own conclusions before turning the matter over to anybody else.

One of the papers on the desk was the Navy Yard report, stapled to the relevant directives from the Genius. Another referred to an incident in Mercaptan which the Genius had had investigated at a cost of three Terran agents and with no worthwhile result. A third concerned the dismissal of an entire Washington Security wing, ordered by the Genius; it had transpired that a certain bodyguard was the real spy and the Security men were innocent.

There were other papers, all referring to incidents in which the Genius had made an order, D had executed it, and it later turned out that the Genius had been wrong. More than that—they were cases in which the Security Chief could and should have questioned the Genius' solution and tried to find another.

On the desk was D's record of personal failure. This was why he hadn't been encouraged when Mark spoke of his conviction that there was something amiss with the Genius. Of course there was—but that didn't let D out.

D had at last realized that there was more to the consistent success of S and Mark Swan than just being lucky.

Mark waited patiently while the three guards painstakingly established his identity and passed him through, locking the door behind him.

He was alone with the Genius for the first time in seven months. Since D put Bergstein over his head, he wasn't even a department chief, and thus no longer had access to the Genius.

Now he returned as Security Chief.

There had been a carefully-confined storm over D's suicide. S had been consulted, and he said his piece bluntly. On retiring as Security Chief he had recommended Mark for the position and strongly opposed D as a replacement. This was on record. Also on record now was D's utter failure, finally recognized even by himself, and Mark's continued efficiency.

Not only was Mark's appointment as Security Chief rushed through; Washington itself shuddered, and the President himself very nearly bit the dust. A field marshal who had backed D's appointment, as the more reliable, more stable man, now found himself with plenty

of time to devote to the affairs of his New England farm.

Mark was neither triumphant nor particularly elated. He had no power complex and would on the whole have been happier to go on working under S than to become Security Chief himself. Although it was pleasant to receive such overwhelming votes of confidence from all sides, he was well aware of the other side of the coin: if he wasn't brilliantly successful immediately, there would again be calls for a new Security Chief.

And looking at the gray-painted panels and teletype printers of the Genius, he wondered if he was looking at an enemy.

After D shot himself, everybody involved, whether red-faced or not, seemed to take it for granted that his suicide proved his incompetence and that there was nothing wrong with Intelligence but D's incompetence. Everybody but S.

S said: "You've got quite a job on your hands, Mark. I guess you've no choice but to follow your own advice to D—cut out the Genius and run the whole show yourself."

And this was exactly what Mark was doing.

He sat in front of one of the printers and tapped a brief item of information. There was a new Security Chief—directives should now be addressed to M.

The Genius accepted this item with placid indifference. Personalities were nothing to it. It asked no questions. It didn't care what had happened to D; it didn't care who M was.

Mark stared at the keyboard in front of him, remembering his talk with S. The Genius accepted this announcement without question. Could there have been another such announcement? No, because henceforth all Security directives would be addressed to M. Could the Genius have been told something and instructed not to reveal it even indirectly? No, because the Genius' inbuilt secrecy screen was unalterable. You couldn't make it reveal things it wasn't designed to reveal, or conceal anything it wasn't designed to conceal.

The Genius was a machine. Its one instinct, if you could call it that, was efficiency. It *wanted* to be efficient, because it was made that way. It *wanted* nothing else. It cared about nothing else.

RECORD (Mark tapped): Navy Yard case concluded. Saboteur was naval technician. Replaced.

QUERY: Is any alteration in Navy Yard security arrangements recommended?

The reply came back, addressed to Security Chief M: No. The Genius, Mark knew, would never refer to the Navy Yard case again, except indirectly if new information fed to it failed to fit with the contents of its memory banks.

Mark typed again:

QUERY: Albert Kemp, former Personnel department chief killed eighteen months ago in car accident, suspected now as Mercaptan agent. Your verdict?

The Genius burst into activity. Four different machines started tapping at once.

It was unnecessary to repeat any information which the Genius had ever been fed. On receiving such a query, the computer would automatically scan all questions and information ever received under Kemp's name, all directives given, and the result of any action that was taken. It would assess Kemp—who was, to the Genius, nothing more than a working unit—and decide whether Kemp was an efficient working unit or not, much as another machine would test a radio tube and pass it or reject it. The Genius could never be concerned with appointments or dismissals. If a man—a working unit—made a mistake in typing, he was to the Genius inefficient and ought to be scrapped.

Mark didn't bother to read the material as it was typed. He could wait.

None of the department chiefs seemed to him to be possible saboteurs. But Kemp had been killed just after the Genius' directives began to be suspect. Suppose Kemp had been paid to do a job, had done it, and had then been liquidated by Mercaptan agents?

The Genius' four machines stopped clicking one after another. Mark moved to the first and read what was on it. It was a series of questions which added up to: What grounds are there for suspecting Kemp? Full information requested. There was a long list of items on which the Genius demanded specific information. Very little of it would now be obtainable, but the Genius knew that. Although it was always prepared to give an interim solution based on the material it already possessed, there was no harm in asking for more. Possibly certain information had not been supplied purely because nobody had appreciated its possible significance. The Genius trusted nobody to decide that. It wanted to know everything, significant or not.

The second machine listed another series of questions. These were framed on the basis that Kemp might have been a spy—a deliberately inefficient working unit.

Mark looked at this list very carefully, and decided to study it minutely later. This was an example of the way in which the Genius, which could not reveal secret information directly, might reveal it indirectly. For these were the items on which Kemp had supplied information. The Genius, on the theory that Kemp might be suspect, wanted to check the accuracy of its own information.

Mark's first survey indicated that the Genius was very hard to trick in this way. For the questions were framed so that it was quite impossible to establish what Kemp had actually said. They were questions like:

How many security agents does Intelligence employ?

Give details of monthly identification checks.

List unsuccessful attempts to bribe Intelligence personnel.

List discovery of traitors in Intelligence.

List dismissals from Intelligence.

Give details of retired but still living personnel.

List all changes in personnel during the last three years.

Such questions gave no hint of the answers Kemp had given. This was how the Genius got new information and checked the information it already had without revealing anything.

The third machine had listed cases—by their security code numbers—which might be affected if it were true that Kemp had been working for Mercaptan. This list was marked tentative. It was a fairly short list, referring to Personnel cases. The Genius was well aware that it might have to be extended.

The fourth machine simply said that Kemp was not a saboteur. This was an interim conclusion, meaning that crosschecking revealed no indication that Kemp was guilty—which was only to be expected, for if it had been otherwise, the Genius would have drawn the conclusion long ago, and checked through D anything which Kemp communicated to it.

Mark answered none of the Genius' questions. They could wait. He was staring at the blank panels in front of him, thinking deeply.

As far as he could make out, the Genius was functioning perfectly. The questions it had asked were exactly what it might be expected to ask.

Was the Genius trying to lull him into a sense of false security, building up his confidence before it sabotaged him the way it had sabotaged D?

Mark kept expecting trouble, but it never came. Gradually the Intelligence organization de-loused itself, regaining confidence in itself week by week. Mark adopted a practice of reaching a decision first on all subjects and then reporting all the facts to the Genius and asking for a solution. Almost invariably the Genius gave the answer he had already reached—except for the occasional cases where any computer, in the nature of things, would be liable to give an impractical answer.

Unfortunately, this method of working couldn't go on forever. Mark was forced to the conclusion, as S had said he would be, that the Genius wasn't a luxury, it was a necessity. Co-ordination of all Intelligence operations was too big a job for one human brain, or any number of human brains.

Temporarily, Mark could and did limit operations to what he could control himself. And the trouble cleared itself, much as a restless city would settle under strict military control. But strick military control couldn't be maintained forever—and Intelligence couldn't reach top efficiency without the Genius.

So it was a top-priority matter to find out what had been wrong with the Genius and make absolutely certain it wasn't wrong any more.

Mark pulled Paula in off field operations and made her his secretary. Under M, Intelligence was driven on an even slacker rein than under S. Mark's principle was to find the right man for a job and let him get on with it. On the other hand, he was easy to approach when help was needed.

He and Paula were married six weeks after he became Security Chief, and for the moment at least Paula went on working as his secretary. It was an unusual arrangement but not without precedent.

One day after he'd sat for an hour without moving, Paula exercised the privilege of a wife rather than a secretary and asked him what was on his mind.

"I'll have to fire Bergstein," he said. "I've been leaning over backwards trying not to do it, because it looks like getting even with him. But he's still a D man—inflexible, unimaginative, with a slide rule in one hand and a book of rules in the other."

Paula, after her one lapse, spoke as a secretary. "Why not warn him first? Show him how CE is lagging behind the other departments, and tell him if he doesn't pull up his socks, he's out?"

"I'll do that," said Mark. "Send for him, will you?"

He sent Paula out when Bergstein arrived. He would rather have had her present, but it wasn't fair to reprimand Bergstein in front of her.

"Bergstein," Mark said, "I don't want to get tough with you, because people might think it was because D made you my boss when I was in CE. But CE just isn't keeping up with the other departments."

"I know it," said Bergstein defensively.

"You know it?" said Mark, surprised.

"How can you expect anything else, when I'm not allowed to consult the Genius any more?"

So that was his out. "Other department chiefs can't consult the Genius either, and they're doing all right."

"Maybe they don't need the Genius as much as Counterespionage does."

"You've got a point," Mark admitted. "Look, Bergstein, you know the Genius was supplying D with wrong solutions. We still don't know why. Until we do, we can't trust it. D trusted it, and it ruined him."

"Can't we get another computer?"

Mark grinned. "Since the one we've got cost twenty million and nobody can demonstrate that there's anything wrong with it, I doubt it. Look, Bergstein. Send all the questions you want to put to the Genius to me, and I'll send you the Genius' answers. It's not that I don't trust you, but the Genius is still very much under a cloud and I don't want anybody to follow it blindly. If I suspect any of the Genius' directives, I'll come and see you."

"That's fair." Bergstein stood up. After some hesitation he said: "M, you called me here to give me a warning. Let me give you one. You get results by your own particular brand of inspired guessing—I'm not denying that. But don't build an Intelligence empire on your personal crystal ball. Some of us are slow and deliberate and painstaking and don't believe anything we can't

see. And those methods work, too. D would have been a good Security Chief if the Genius hadn't let him down."

"Sit down again," Mark said. "You knew D well, didn't you? Why do *you* think he failed?"

"Well, maybe he trusted the Genius too far. I knew he had his doubts sometimes. But he always said the Genius must be right."

"And I always approach every directive with the idea that the Genius is probably wrong." Mark mused. "Well, look, Bergstein. To be quite honest with you, I've never had the slightest indication since I took over that the Genius is anything but efficient. You want to use it. O.K., you can—and I'm going by results. If the Genius helps CE back on its feet, fine. If it doesn't—"

"I know," said Bergstein irritably. "You don't have to spell it out for me."

When he had left, Mark felt vaguely depressed and couldn't think why. Perhaps it was the same old thing —until he found out if anything had been done to the Genius, and what, he felt as if he were sitting on a bomb.

Intelligence needed the Genius. Sooner or later Mark was going to be forced to use the Genius, whether he had found the secret of its psychoneurosis or not, whether it was over or not.

Did that mean the Genius was going to do to him what it had done to D?

Paula came back, took one look at his face and sat down quietly at her desk.

Suddenly he woke up. "Paula, suppose you're a saboteur. You want to sabotage the Genius. How would you do it?"

"Exactly as it was done, I guess. Exactly like the Navy Yard case. Not with a bomb. Not with anything that would show up. With a distorter that would do minor but significant damage for a long time, rather than with anything that would do concrete, obvious damage that could be fixed."

Mark nodded. "The usual Mercaptan plan. But what? How would you distort the Genius?"

"It's up to you to find out."

"It can't reveal information," Mark murmured. "It's patient, it cares about nothing but efficiency. Long-term efficiency. It knows nothing about personalities . . . personnel—"

He jumped up. "Paula," he said excitedly. "I think I've got it. Why didn't I put myself in the place of a Mercaptan agent before?"

"You've got what?"

"The answer. And if I'm right, the Genius is perfectly O.K. now."

"Then you can stop worrying," said Paula practically.

"Yes, but am I right?"

"You're always right."

He was in no mood for frivolity. "Listen. Time is nothing to the Genius. It cares for nothing but the efficiency of Intelligence. It can't reveal information, it can only ask questions. If there was a saboteur, it was Kemp, Personnel department chief. And when I told the Genius there was reason to suspect Kemp, these are some of the questions it asked: How many security agents does Intelligence employ? Give details of monthly identification checks. List unsuccessful attempts to bribe Intelligence personnel. List discovery of traitors in Intelligence. List dismissals from Intelligence. Give details of retired but still living personnel. List all changes in personnel during the last three years."

"I give up," said Paula.

He grabbed her arm and dragged her from the office. Outside the Genius' control room, he had to sign three copies of a special authorization before he could take Paula in with him.

At one of the keyboards he tapped briefly and waited. The Genius was silent. It asked no questions.

Paula leaned over to see what he had written, but he held her back. The message was rolled into the gray casing.

"Now you'll never know what I wrote," Mark said, "unless I tell you. The Genius never will, because it's secret. Everything that anybody tells the Genius is secret."

"Was it important?"

"Very important."

"Was it true?"

"No."

"Then why didn't the Genius question it?"

"Because I added: 'No further information available at this time.'"

"I get it. There's no point in asking questions if the informant doesn't know any more. Mark, did you put it in under your own name?"

"No. Under Bergstein's."

"Well, don't keep me in suspense. What now?"

"I want you to put a query from me. We'll use the Navy Yard case again—same problem but different facts."

"As a test?"

"Exactly. Put this under my name."

He dictated a long, wholly imaginary case which was in essence identical to the Navy Yard affair, concerning a time bomb planted in a Washington conference room. He detailed similar times and security arrangements, and supplied a party of fifteen visitors who had been shown over the conference room.

When he paused at last, Paula said: "I hope that's all."

"Yes. End it there."

Paula ended the message, and at once the Genius replied:

To M, Security Chief: Check fifteen visitors. Probable motive: Sabotage for gain.

"That's exactly what it said last time," Paula said.

"Yes—and on the facts I presented, now as before, the saboteur must have been an inside man. Paula, as of now the Genius is working for Mercaptan."

"How do we put it right?"

"I guess the easiest way is to take a new initial. From now on I'm S, Security Chief. Your father won't mind, and the Genius won't care. It won't even ask what happened to M."

"Mark, just what did you tell the Genius?"

"That M was a saboteur. And, of course, that there was no further information available."

Paula still looked puzzled. Mark said: "A computer has to believe what it's told, so long as the information isn't intrinsically impossible. It isn't intrinsically impossible that anyone should turn saboteur. That doesn't necessarily mean there was anything wrong with his loyalty before.

"Kemp told the Genius nearly two years ago that D was a saboteur. He may have added a few other things to corroborate it, and then said that no further information was available. And every other scrap of information he ever supplied to the Genius was correct.

"What could the Genius do? There was no reason why it should disbelieve the information, for what Kemp said was perfectly possible. It couldn't fire D, because the Genius isn't the boss, the Security Chief is. It couldn't tell anybody else, partly because it can't give information, partly because it would be no use telling D he was a spy, and all directives go through the Security Chief. But it wanted to be efficient, and a spy is an inefficient working unit."

"I get it," Paula exclaimed. "The only way it could get rid of D was to give wrong answers until he was fired!"

"That's it. It wasn't a good way, for the Genius' one desire is to be efficient. But the Genius knows that Intelligence can't possibly be efficient when the Security Chief is a saboteur. So the *only* way to be efficient again, whether it was a good way or not, was to get rid of D. And the only way the Genius knew to get rid of its own boss was to be temporarily so inefficient that D had to be removed."

He sighed with satisfaction. "I'll have to do some thinking about this, Paula. I'll talk to your father about it. But now that we've got the answer, we should be able to find a way to block such tactics in the future."

"I married a smart guy," said Paula complacently.

"You sure did. Poor D—I always did have an idea he was being framed somehow. O.K., now you can tell the Genius that S is the new Security Chief."

Two minutes later the Genius gave a new solution to the imaginary Washington case:

To S, Security Chief: Investigate inside staff. Only they knew that bomb would not be discovered in hiding place selected.

The Genius had changed sides again. ■

THE ANALYTICAL LABORATORY

For the information of new readers—or old ones with memories like mine (it leaks)—the An Lab here is not solely a report to you readers on how other readers voted; it is of direct and acute interest to our authors. The items that win first place in reader-vote earn the author a 1¢ per word bonus; second place earns him ½¢ per word.

If there is a particular type of story you like—vote! The old principle of pleasure-reward-seeking assures that authors—and editors, naturally—will tend toward that type.

The scoreboard is worked up from the vote postcards or letters you readers send in. If a story is voted 1st place it gets a score of 1; 2nd place gets a 2; 3rd place gets a three, etcetera. When the An Lab is made up, the vote-scores of each story are added, and divided by the number of votes—giving the "point score," or average vote-placement. The "place score" is simply the resultant ordering of average vote scores.

For December, it works out:

PLACE	STORY	AUTHOR	POINTS
1.	Space Viking (Pt. 2)	*H. Beam Piper*	1.91
2.	Blind Man's Lantern	*Allen Kim Lang*	2.46
3.	Subversive	*Mack Reynolds*	2.61
4.	"And Devious the Line of Duty"	*Tom Godwin*	2.84

Incidently . . . if you *don't* like something, a 4th or 5th place vote does quite a job on pulling the point-score down! You can register beefs, gripes, and howls quite effectively, too. But only if you take the terrible trouble involved in sending in a vote-card!

The Editor

Plot of Sun's gravity-well extends back to Page 54

(Graph of Sun's gravity field. See Page 93.)

CRUCIAL EXPERIMENT NO. 6

BY JOSEPH GOODAVAGE

The weather reports for the month of November, 1962, were taken solely from the Weekly Weather and Crop Bulletin published by the Weather Bureau's Statistical Reporting Service.

ASTRO FORECAST	ACTUAL WEATHER	RANDOM FORECAST
Sharply falling mountain temperatures and sliding to minimum temperatures over Duluth, Chicago, Detroit and Pittsburgh as October ends.	"Freezing minima observed in every state. Ralph, So. Dakota, cooled to 5° on the 31st (of Oct.) for the coldest reading other than at mountain stations."	Va. to N.Y.; variable from 23rd to 30th of Oct.—below average temperatures and windy. Severe snowstorms over Maine as October closes.
Unseasonably early deep freezes in inland Maine—east of Portland, a cold wave on the night of Nov. 4th.	"Falling temperatures and snow at many inland stations of the Appalachians. Portland, 7″ of snow. Snow, rain and colder air swept into much of the East on Nov. 4."	From 2nd to 5th of November, excessively hot and humid on the West Coast.
Falling temperatures in Alaska will send snowfall to the Rockies with a cold wave.	"Temperatures as low as 0° were observed in the Rockies of Colorado. Significant snowfall was restricted to the northwest."	No random statement for this period.
The 11th & 12th of Nov. will find spongy lows extending far southward.	"The Far West and the northern and southern Great Plains had mostly above normal temperatures."	A cold front and heavy snows centering over the Chicago-St. Louis area from Nov. 8 to 11th.
Low pressure areas traveling eastward over the Pacific coast will be centering farther northward than usual. Above normal precipitation slated for the Northwest and the northern tier states	"Rain fell almost daily along the northwest coast and on 4 to 5 days over inland areas of Idaho and California. The largest amounts measured in coastal regions of Washington and Oregon, where totals exceeded 4.00 inches."	No random forecast for this period.

ASTRO FORECAST	ACTUAL WEATHER	RANDOM FORECAST
Rain will be *far* above normal in the upper lakes region and in northern New England.	"Four inches of rain were reported in the central Atlantic states. Snowfall was the major form of precipitation in higher elevations of New England."	On Nov. 13th, the northwestern states will be pelted with freezing rain and hailstones.
Generally heavier rains from California on the 13th to travel e'ward over the south central states early on the 15th and from Hatteras along Atlantic coast to reach New York by Nov. 16.	"A heavy rain storm off the coast of New England on the 15th of November with westerly winds along the coast."	From 15th to 26th of Nov., relatively calm, bright and sunny from Mexico to Texas and Oklahoma.
On the 16th . . . masses of cold Canadian air blanketing higher inlands and transiting eastward will not be intense enough to force lines of freeze and frost very far southward except in mountain areas.	"This week, temperatures were persistently below normal due to cold northwesterly winds . . . unseasonably warm in the upper Mississippi Valley and northern Great Plains."	Around Nov. 19th, the Hawaiian Islands will experience an intensely cold, dry snap.
Except for a brief invasion of cold air on the 14th and 15th, relatively mild, generally drier atmospheric conditions are scheduled for the southwest . . . a sharp rise in temperatures over the 17th and 18th of Nov.	"In Colorado. . . the warm, dry period of the past 2 to 4 mos. was interrupted by a short cold wave after the middle of the week. Weekly averages as much as 7° above normal. Highs ranged up to 64° in No. Dakota, 70° in So. Dakota."	No random statement for this period.
Over the southern half of the nation will be unseasonably temperate until the transition during the last week of the month.	"The northeast was the coldest section of the nation. Little or no precipitation fell in the Southwest."	Alternating cloudiness and unseasonably warm weather for majority of southwestern states . . . over 15th to 26th of Nov.
November's weather highlight . . . abrupt transition to critically cold wintry weather, intense storm activity, high wind velocities and snow stemming from the Pacific Northwest immediately after the 27th. From this date until the 29th, high and low pressure areas will converge over mountains and elevated areas . . . blizzards over the Cascade mountains and the Great Divide . . . windblown snows, etc.	"Two major storms left heavy rain and snow in the Pacific Northwest as they moved inland. High winds to hurriance force . . . 92 mph gusts in Cut Bank, Mont. The second storm hitting the northwest coast also brought high winds and heavy rains. Gusts to 70 mph hit Tatoosh Island, Wash., and left heavy snows in the Cascades. 4″ of snow in western half of Washington. 7.02″ in Astoria, Oregon. Stampede Pass, Washington measured 21 inches of snow on the final day of the period."	At the end of the month Southern California and Arizona are in store for unusually heavy precipitation—flash rains will endanger low-lying areas and floods are expected, especially in the Los Angeles area.

(Graph of Sun's gravity field. See Page 93.)

ASTRO FORECAST FOR MARCH

Cold air masses will center over the northern Appalachians through New England on March 1st. Temperatures will rise moderately over the Ohio and Tennessee Valleys under returning southerly air flows. Light rain or snow is scheduled over the lower lakes region on the 3rd, with snow over New England elevations on the 4th.

Low pressure stemming from the southern Pacific coast on March 4th will center over the lower Mississippi Valley early on the 6th and intensify over the south Atlantic states. If a southing high-pressure area doesn't upset normal timing in eastward transit, this disturbance drifting along the Atlantic coast can spill snow over inlands north of Chesapeake Bay late on the 7th.

East of New England this storm will be whipping the ocean with gale winds in erratic gusts on March 8th. Wind-blown snow over the central Rockies on the same date.

During most of March, ice and snow will cling over the Great Lakes region, with heavy accumulation of snow in Michigan, Wisconsin, the upper Ohio Valley and the southern and eastern shore areas of the lower lakes. All storms head for New England, naturally.

In the Deep South, warmer temperatures will spread eastward from eastern Texas, Oklahoma and Kansas. This will be mildly previewed on March 6th and 7th, but more definitely activated after the 17th of March.

Stemming from the upper lakes region, unseasonably low March temperatures will intensify after the 12th from the Ohio Valley eastward into New England.

If the depression swinging eastward from the Central Missisippi Valley on the 13th or 14th is rain, it will turn to snow east of Pittsburgh late on the 14th and reach New York by the 16th. The change will be due to colder night temperatures.

From March 13th through 17th: generally fair weather and moderate temperatures for the southern Plains states. During the same period, unseasonably cooler weather will persist through the northeast inlands.

After the 17th there will be an increased warming trend over the southeastern states; at the same time, cold air masses will develop maximum intensity east of the Appalachians into New England.

On the 18th, widespread leaden skies will develop in the northeast. Later on the 18th, a low-pressure area cradled in the North Pacific Coast will be preceded eastward by rising temperatures and will center over Chicago on the 21st.

Except for below normal temperatures in the mountains and higher elevations, March weather will be nearly normal across the western third of the nation.

Over the eastern states especially, the higher levels of the atmosphere will be much colder this month.

But during the last week of March, a storm front whose battering winds will strike the Pacific Northwest is quite likely to be the most severe stormy weather of the month.

The planetary indications are that on the 21st, temperatures will change once more in upper New York and New England in Old Man Winter's dying gasp. With the Spring Equinox occurring on March 21st at 3:20 a.m., E.S.T. however, this storm should reach New York —though in a more complex pattern —also on the 21st.

A basic rule in astrometeorology states that "When the Moon is on the Earth's equator . . . at the time of the New Moon in perigee, the greatest disturbances to which our Earth is prone may then be expected with certainty of fulfillment." In modern application of this rule, it has been observed that both sea and atmospheric *tides* increase considerably during such phenomena. Because the lunar perigee advances approximately 41 degrees annually in geocentric longitude, the equinoctial New Moon and its perigee can happen together only several years apart.

At the New Moon on March 25th, as determined from stationary key charts, the Moon will be within twenty-four hours of its perigee and the greatest tidal pull will be felt on the Pacific coast. Moreover, the Mercury equinox and the Sun's superior conjunction, with Mercury to follow, will also be triggered over that region. With resulting high tides, storm activity and powerful winds after the New Moon —on the 25th at 4:10 a.m. P.S.T.— on the north Pacific coast, this should be an excellent opportunity to test the validity of the theory.

Astrometeorology holds that the *Sun constitutionally* regulates the weather. Also, that the *planets organically* regulate the atmospheric changes and that the *Moon*, as the *functional* arbiter, is the final trig-

gering element. Therefore this storm, preceded eastward by rising temperatures, is due to reach Chicago early on the 27th, with winds accelerating in eastward transit over the lower lakes region, reaching Boston late on the 28th. Unusually high tides should then manifest on the Atlantic coast by the 26th.

* * *

SPRING SEASON: Regional Dominating Weather.

FAR WEST: An early Spring, regardless of unstable stormy weather in the Far Northwest during the last week in March, with high average sunshine, frequent fluffy, white cumulus clouds against blue skies, interspersed with fruitful April showers. Fruit growers, even in the north Pacific fruit-producing area, will like the optimistic weather outlook for crops. This typical Jupiterian weather pattern will repeat to dominate also the summer season in that region. The mild to warm temperature trend on and after April 15th, extending into the northwest quadrant should be more pronounced after the 21st. A frequency of *southing* highs with clockwise airflows will tend to sporadic excessive dryness in the normally dry southwest.

MIDWEST: From the Rockies eastward over the Central States, normal spring until the 13th, then gradually receding frost lines upslope with widespread thaws extending to the northern border after the 23rd, following sharply rising temperatures inland with tropical air flows. Spring floods may be more serious eastward. A humid spring dominates southern states eastward of Kansas, Oklahoma, and eastern Texas culminating in saturating moisture over the south Atlantic states. April 10-11 will cue the pattern, as cold air masses blanket the higher inlands.

MIDDLE ATLANTIC STATES & NEW ENGLAND: Spring will be most retarded over the eastern states. But even then it won't be a picnic for the south Atlantic states where abnormally wet weather, chronic cloudiness, saturating humidity and variable winds will indicate the dominating spring pattern. This means above normal precipitation along the Atlantic coast. A rash of overflowing inland streams and rivers, especially the Ohio and Monongahela, are most likely to develop during the last week of April.

With low pressure areas more frequently centering over the northern border states in eastward transit, periodic southerlies will be more sultry after May 15th. This season should be better than last year for the eastern reservoirs.

EUROPE AND WESTERN EUROPE: An unseasonably warm, abnormally dry spring is charted for northern areas of western Europe, to be previewed on April 3 & 4th. This dominating pattern generally predisposes to fire hazards, especially for thickly wooded areas. The trend will progress eastward to center over Poland in late May. High pressure areas with clockwise air flows reaching maximum intensity near Long. 32° East will result in relatively cooler spring weather at Moscow and eastward. More cloudy, humid variable cool weather—late spring—spawns from northern Italy and Switzerland and extends eastward through the Balkan countries.

The most miserable spring weather, with abundant rains emanating from Long. 103° East, blankets eastern China. This is a classic pattern for flash floods and crop disasters. ■

BRASS TACKS

Continued from page 5

Dear John:

A favor, if you please: *Recording for the Blind* is in need of volunteer readers. RFB records textbooks—only—for blind high-school and college students, free of charge, on request. In addition, a large library of "talking" textbooks and Braille transcriptions are available to the blind, free. There is a chronic shortage of qualified readers, and RFB would appreciate it very much if Analog would be kind enough to carry a small notice, asking for volunteers.

Recordings are made at local Units of RFB in the following cities: New Haven; Lenox, Mass.; Princeton; Louisville; Oak Ridge, Tenn.; Athens, Ga.; Los Angeles; Phoenix; Denver; Chicago; Miami; and in Charlottesville, Virginia, in addition to New York.

Readers in technical and scientific fields are in particular demand. All who read must, in addition to the ability to read well, be thoroughly "up" on the subject: only M.D.'s read medical books, only attorneys read Law, et cetera. Incidentally, the Radio Amateurs Handbook is being recorded, at the Oak Ridge and Denver Units.

All units are listed in the local telephone directories, and a phone call is all that is needed to volunteer. Readers normally record for two hours per week, or more, if they have the time. Both men and women are, of course, welcome.

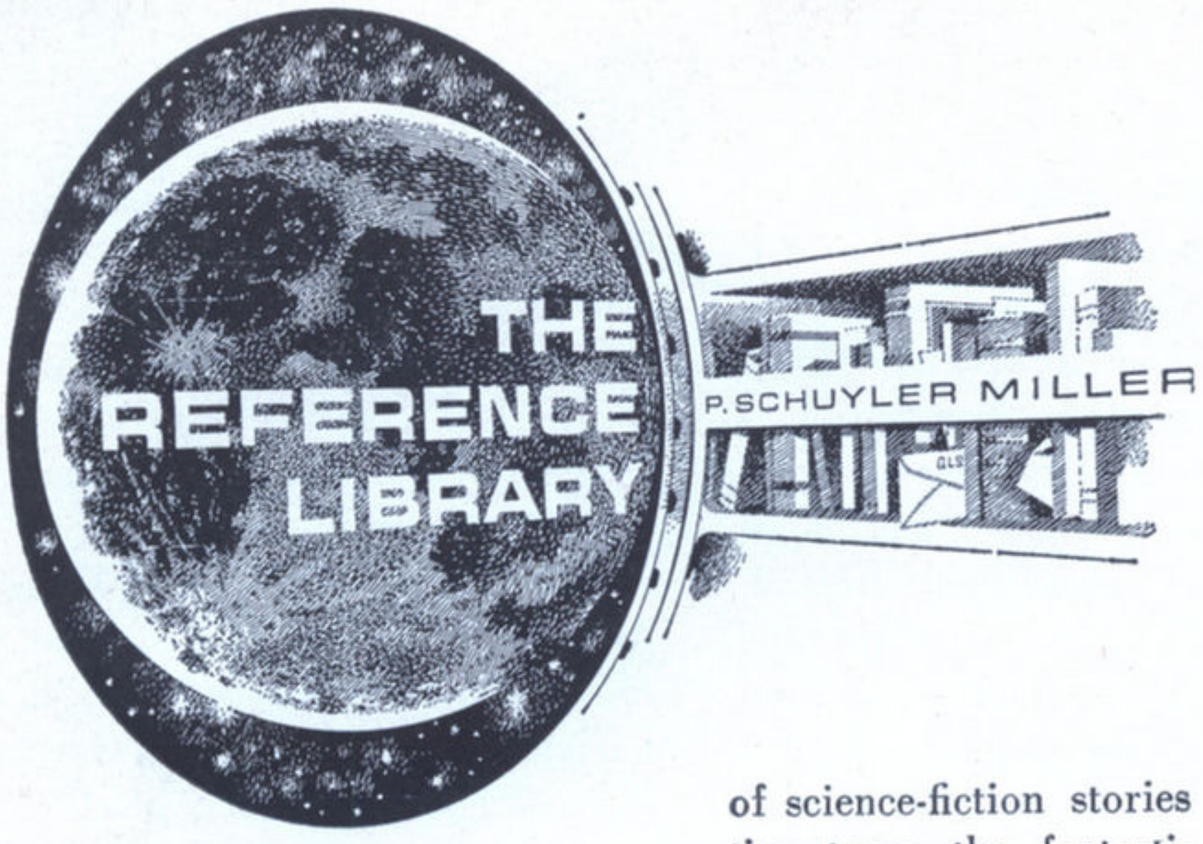
For further information, you may call the New York Headquarters at PLaza 1-0860.

Thank you.

RECORDING FOR THE BLIND, INC.

■ *Anyone got a good reading voice . . . ?*

(Graph of Sun's gravity field. See Page 93.)



THIRD QUADRANT?

The new generation of science-fiction readers never knew the all-fiction magazines of the pre-war years. Those were the days when teen-agers and adults alike read for entertainment, instead of watching what Kap Monahan of the *Pittsburgh Press* calls "tiny vision," and there were fiction magazines for every taste. By contrast, a recent issue of the *Saturday Evening Post* contained one item of fiction—part of a short serial.

The "pulp" magazines of those days shared another feature that the remaining big-circulation general magazines do not: they paid their own way by selling entertainment to readers. Today's magazine, by contrast, is a medium for selling advertising space.

Science fiction developed in the pulps of the first quarter of the century. There were readers who wanted these unusual, "different" stories and editors like Bob Davis of the Munsey chain found writers who could supply good ones. Because there was a market for only a few stories, only the best were published —hence the spate of "classics" from those days.

In 1923 the dam broke. *Weird Tales* appeared, and lasted for thirty-one years. Mixed with the horror tales, the ghost stories, and the out-and-out fantasy were a fair number of science-fiction stories of formative type: the fantastic adventure variety that Isaac Asimov has tagged as the first stage in the evolution of science fiction as we know it today. In April 1926 came the first all-science-fiction magazine, Hugo Gernsback's *Amazing Stories*, and after a promising childhood and boisterous adolescence it is now a vigorous thirty-six. In 1929 it was *Science Wonder Stories*, dead with no heirs, and in 1930 *Astounding Stories of Super Science*. By January 1930 the science-fiction movement was safely under way Simultaneously, and with exceptions, it began to disappear from the general fiction magazines—many of which disappeared themselves with the paper shortages of the war years and the rise of television as a "free" form of entertainment.

Mathematicians and physicists know that a cycle can be described in terms of the rotation of a wheel, or motion around a circle. Let's think of the rise in "segregated" science fiction—published in specialized magazines instead of general magazines—in this way. Starting in 1923 with no special science-fantasy magazines, the number of magazines and proportion of SF appearing in them increased rapidly to the mad peak in 1953, declined, and now seems to have stabilized. But the proportion of science fiction appearing as original books and magazine stories outside the "family" is on the increase again.

As a cycle surges up to its peak, the rotating wheel passes through two quadrants. As it enters the third quadrant, the cycle is past its peak. Perhaps we are now in the third quadrant, where "outside" science fiction is concerned.

I have suggested this before, and Judith Merril reinforces the suggestion—hell's bells, she reaches it on her own—in her commentary at the end of her annual anthology: "7th Annual of the Year's Best S-F"—399 pages from Simon and Schuster for $3.95, and as usual, worth every cent of it.

"The specialized cult of science fiction," Miss Merril concludes, "is rapidly disappearing, as the essential quality is absorbed into the main body of literature."

Her development of this argument, which deserves more amplification than she has room to give it, is backed up by some statistical evidence. One of the most striking and valuable features of the annual Merril anthologies has been the diligence and perspicacity—pertinacity, too, while I'm at it—with which its editor has tracked down and captured outstanding science fiction and fantasy wherever it appears. In her first annual, three out of eighteen stories were from "outside" magazines. In this seventh collection, sixteen out of thirty—a majority—are from the non-specialized magazines and books, and an even greater proportion of the authors are outsiders, in the sense that they would be strangers at an S-F convention.

Where is this S-F—a term which Miss Merril uses to encompass science fiction and fantasy and grope

out over the boundaries—where is it found, or was it found in 1961? In the "girlie" magazines—*Rogue*, *Dude*, *Gent*, *Esquire*, and for a wonder not *Playboy*. In *Mademoiselle*, whose editors once-upon-a-time wouldn't admit that they had a beatnik poor relation named Astounding Stories. In the *Saturday Evening Post*. In *The New Yorker*. In the *University of Chicago Law Review*, and *Midcentury*, and *The Atlantic Monthly*. And, of course, in the science-fiction magazines: three this year from *Analog;* four from *Fantasy & Science Fiction*, whose fantasy content always gives it an edge over the straight science-fiction publications; three from *Galaxy*, including one verse; one each from *If*, *Fantastic* and *Amazing Stories*. A provocative original article by James Blish, and at least three items, two stories and a macabre bit of verse, from books. *Not* from the original paperback S-F books which are on the increase, and which Anthony Boucher, in his section of the roundup, finds deadly dull and clumsy.

As I feel impelled to point out every year at this time, Judith Merril's "best" anthologies are always balanced collections assembled out of the larger pool which is her real choice of the year's best S-F. The titles for which there is no room, or which would make the book lopsided, are tallied in an "Honorable Mention" section which this year is taken from such additional outside sources as *Audit*, *Ladies' Home Journal*, *McCall's*, *Metronome*, *Playboy* of course, *Vogue*, and a couple of mainline books. There are cartoons and verse along with the stories. There are both science fiction and fantasy, along with such borderline stories as George P. Elliott's "Among the Dangs" and John Dos Passos' "Three Prologues and an Epilogue." There is probably the most varied, representative and readable collection of S-F that you will find until this time next year, when No. 8 comes along.

With thirty items in a four-hundred-page book, I am not going to try to follow my usual custom of itemizing and identifying. Instead, I want to pick my selection from the selection and describe them as samples of what you will find.

Robert F. Young's "The Dandelion Girl" is from the *Saturday Evening Post*, and makes me sorry I dropped my subscription a while back. It is solid "straight" science fiction: a time-travel story about a man who meets a girl from the future, and falls in love with her. But the way in which the story is handled makes even this standard "slick" theme believable, and the surprise ending is equally logical and natural. Stories like this destroy the standard alibi that "outsiders" may use science-fiction themes, but they don't know how to write "real" science fiction. Robert Young certainly does.

"My Trial as a War Criminal" is by a remarkable physicist and man, Leo Szilard. It gets in this year because it was in his last year's short story collection, "The Voice of the Dolphins." Its real first appearance was back in 1949, in the *University of Chicago Law Review*—but there were no Merril annuals then. Very quietly, very seriously, drawing a parallel to the Nuremberg trials, Sziland describes his trial as a war criminal before a tribunal of nations not at war with a victorious Russia. The charge: That he was one of the men responsible for the bombing of Hiroshima and Nagasaki. It is calm, it is legal, and it is deadly.

"The Quaker Cannon," last of the collaborations by Frederik Pohl and the late C. M. Kornbluth, appeared here in Analog. It is one of their best, and you should remember it: the story of a brain-washed officer who is given another chance, in a role which is not quite what it seems. It's a sociological story, a puzzle story, a story of character, and a very good story.

Alice Glaser's "The Tunnel Ahead" was in *Fantasy and Science Fiction*—a first published story, and a frightening one that compels memories of Fritz Leiber's grim classic, "Coming Attraction." A simple little story of a family's future outing on a Long Island beach builds up to a chilling denouement, in which the half-seen threat is felt but never understood until the last moment.

John Haase sold "The Countdown" to *The New Yorker*, which has been represented in Merril honor rolls before. This is a bitter little gut-wringer that reminds one of Edmond Hamilton's great "What's It Like Out There?"—a story of the time when up-and-down rocket ascents have sunk from the incredible to the routine, and are an attraction for run-down carnivals and played-out spacemen.

This story, like "The Dandelion Girl" and others here, suggests that when the science-fiction cycle has swung through its third and fourth quadrants, and the *genre* has been —as Miss Merril emphasizes—*re*-absorbed in the main stream of fiction, the mating may be a happy one. If the writing ability that the wider field demands is combined with the discipline and originality that S-F insists upon, the new hybrid may be strong and virile.

I find it impossible to stop without adding one more story to my tally: one by that remarkable writer —a Professor of Sociology and sometime State Department pinch-hitter, it turns out—"Cordwainer Smith." He is represented here by "A Planet Named Shayol" from *Galaxy*, and I would have preferred

(Graph of Sun's gravity field. See Page 93.)

the utterly strange "Alpha Ralpha Boulevard" from *F&SF*, but this is Judith Merril's anthology and not mine. "Shayol" is a Smith nightmare, not Smith magic—a terrible story about a horrible prison planet that you can hardly like but not forget either.

I see that I have passed over one more story that I starred on the table of contents of "7th S-F": Mack Reynolds' "Freedom," originally published right here. As you know, if you remember it, this could be regarded as a "straight" story, quite at home in the *Post* or any of the other outside magazines I have mentioned. Yet it is a story of a social evolution taking place right now, that may in our own near future become a new revolution—the growth of freedom behind the Iron Curtain. To Colonel Ilya Simonov. Russian agent in Prague, what he finds there is just as strange as what one of his countrymen or ours will some day soon find on Mars.

One day, twenty or thirty thousand years ago, give or take a few thousands, men found the New World and a cycle of history began. The societies of the American peoples developed in their own way, isolated from the rest of human social evolution. Then, in 1492, the world rediscovered America and the cycle entered its third quadrant. Now we look to Malaya for American rubber; Switzerland considers itself the home of American chocolate; Turkey has given its name to an American bird and has made itself an essential source of tobacco, an American weed. Nor have the Indians who discovered and developed these things disappeared. In much of Latin America they are the dominant people, more and more taking the leadership in their countries' politics and economics and science. In the United States they have largely been absorbed, but not without their effect on American society.

Probably science fiction will follow the same kind of cycle in its turn.

THE DYING EARTH
by Jack Vance
Lancer Books, New York.
No. 74-807. 1962. 160 pp. 75¢

With this reprint of a 1950 paperback that very few science-fiction collectors—let alone readers—have ever seen, a relatively new paperback publisher launches a "library" of science-fiction classics. Jack Vance's "The Dying Earth" consists of six episodes from the very distant future, when the Sun is old and red, monsters roam the forested Earth, and small feudal communities of men hang on among the ruins of one-time grandeur, served by a sorcery that may be the vague shadow of a once fabulous science or may be pure magic.

So far as I know, the separate episodes were never published as short stories. Their mood and method is somewhere between the Golden Age poetry of Arthur C. Clarke's daydreams of a similarly distant future and the forcedly archaic nightmare of William Hope Hodgson's "The Night Land." Most people will take them as pure fantasy —yet there are suggestions that the spells and potions of the book are simply the pragmatic leftovers of a mental control of the physical world. Readers seem either to like them very much—the original book has built up a fabulous word-of-mouth reputation—or to dismiss them as rather clumsy adult fairy tales. I'm uncomfortably on the fence.

In the first episode, "Turjan of Miir," an apprentice sorcerer goes into the extra-dimensional sorcerer's nest of Embelyon, a bubble between the worlds, in search of stronger spells. Here he encounters not-quite-twin android women, T'sais and T'sain, born in the same vat but cruelly different. Next, in "Mazirian the Magician," Turjan has been trapped by a sorcerer who sends him out to capture his own wife-in-magic, T'sain. Next we are back in Embelyon, where the man-hating T'sais, vat-sister of T'sain, is asking to be sent to Earth. Her creator, Pandelume, does so, and she is soon fighting crueler men and creatures than she has imagined.

Episode four has as its protagonist Liane the Wayfarer, a bloody rogue whom T'sais met briefly in the previous chapter A golden witch sends him on an unfortunate mission. This very short vignette is in the mood of one of Dunsany's early tales, but not so magic in its evocation of strangeness.

Ulan Dhor, hero of episode five, is sent to the lost city of Ampridatvir to recover the magic of its last ruler. He finds it occupied by two factions, Greens and Grays, neither of which can see the other, and encounters some relics of the long-lost physical science of mankind's earlier days. Finally another young searcher, the too-inquisitive Guyal of Sfere, finds another lost city and the almost forgotten Museum of Man, where men and demons, magic and science, past and present are confusingly intermixed.

Enjoy it or detest it—you won't find anything in print like it!

THE NIGHT SHAPES
by James Blish
Ballantine Books, New York.
No. F-647. 125 pp. 50¢

If you can imagine James Blish carrying on the adventures of Tarzan in the Katanga section of the Congo, some time around 1906, complete with a "Jane" named Paula and of equally high-born Eng-

lish lineage, a tribe of faithful warrior retainers—the Wassabi instead of the Waziri, a remarkable python in place of the Golden Lion, an invading safari of larcenous and murderous whites, a more-or-less beautiful white priestess of a more-or-less "lost" tribe of radium-digging, slave-holding cannibals, and a grand finale in which the bad guys are obliterated by a stampede of dinosaurs, then you have "The Night Shapes."

I can't really see this as Blish proving to Blish that he can be Burroughs-with-a-difference if he wants to. The difference is that he knows what Africa of 1906 was really like, that he is a modern realist and not a post-Victorian romanticist, and that he is not only a good writer but one who apparently believes in his hero. If the nationless ex-American schoolteacher, Kit Kennedy—Ktendi to the Wassabi—is the introspective modern hero in a way that Tarzan never was, at least his creator goes along with his melodrama with a better-concealed tongue in his cheek than L. Sprague de Camp brought to the reincarnation of Conan, or a couple of other imitators to Burroughs' "John Carter"

Kennedy, "lord of the jungle," is drafted as guide of a Belgian expedition looking for something in country he doesn't know. The something turns out to be a pitchblende mine operated by slave labor under white supervision, with a dinosaur just over the fence. There is a grand showdown scene, with a bloody duel on a giant drum and the dinosaur bringing down the second-act curtain. The third act follows some years later as almost a separate story, when Kennedy employs a little borrowed magic to blot out a new expedition hell-bent to collect a few dinosaur heads.

I can't make up my mind whether the author was a bit careless, or was deliberately planting minor errors here and there—and maybe some major ones that I'm not sharp enough to spot—to make his story an even more evident pastiche of Burroughs. His monster of the radium mine seems to be a stegosaurus from the neck back, and a triceratops up front. *My* dinosaur book—E. H. Colbert's "Dinosaurs: Their Discovery and Their World"—says there were no horned dinosaurs in Africa, but maybe they just haven't been found. "Shaman" is an Asiatic term for witch-doctor that an African would be most unlikely to use, but maybe Tombu picked it up from his schoolteacher pal. And there are a few more—but all is forgiven for the creation of that magnificent and magnificently curious python, Manalendi. I fully believe that he could single—uh, *no*-handed—whip many times his weight in stegoceratops. As, of course, he does.

AT THE EARTH'S CORE
by Edgar Rice Burroughs
Ace Books, N. Y.
No. F-156. 142 pp. 40¢

The rumor that the copyright on a good many of Edgar Rice Burroughs' older books was allowed to expire is apparently true, and these yarns are in the public domain and up for grabs for anybody who wants to reach out. Now that Ace is in the field, it may well be that the other two contenders—Dover with paperback reprints that include the original illustrations, and the small house of Canaveral with newly-illustrated hardback editions—will back off.

Ace, at any rate, has been first to wade into the Pellucidar series which Canaveral had announced for August publication, and which has not yet appeared. "At the Earth's Core," first of the series, is out at this writing and "Pellucidar," the second, is promised as No. F-158. Burroughs' "Moon Maid," which Canaveral brought out as "The Moon Men," has been chopped in two: "The Moon Maid," comprising about half the book, is out as Ace No. F-157, and the second half, as "The Moon Men," will be F-159. All prices 40 cents.

The Pellucidar books were one of Burroughs' four main series, the others being the Mars, Venus and —of course—the Tarzan books. It is also the one that, even in his day, could be shown to be impossible, since there is no gravitational attraction toward the inside of a hollow sphere. Fifty years ago a Mars like Barsoom and a Venus like Amtor were not demonstrably impossible, however improbably they might be; Pellucidar, a world inside a hollow Earth, was.

With that minor stumbling-block ignored, Burroughs launched into one of the wildest series and one that—in 1922—pioneered in a good few stereotypes. His hollow world was not original; whether he knew it or not, the idea had been seriously proposed by the American naval officer and explorer, John Cleves Symmes, a century before. The mechanical mole which young tycoon David Innes and old inventor Abner Perry burrow to Pellucidar is something which the Russians now claim to have developed. It chews its way through earth and rock like a monster earthworm.

The world inside the Earth has a sun of its own and far more land area to fill with wonders than our own outer surface, since the pattern of land and sea is approximately reversed there. The dinosaurs have developed at their leisure into an intelligent, scientifically minded sybarite race, the Mahars, who enslave various human species. These

(Graph of Sun's gravity field. See Page 93.)

range from tailed, arboreal negroid sub-men—who nevertheless have tree towns and domesticate dogs and goats—to hairy Neanderthal-like warriors who constitute the Mahars' raiding forces, to an assortment of white and Indian-like people among whom Innes and Perry find refuge, friendship and, of course, romance. Innes is in and out of trouble with all concerned, but finally all misunderstandings are resolved, he gets the girl, and loses her again as the book ends and he is on his way back in the Mole to get supplies for a revolution of humanity against the Mahars.

There is one other gimmick that I don't recall other writers' using: the idea that time is wholly subjective, so that in the timeless world inside the Earth, where there is perpetual day, one man may experience days of activity while another is passing through a few minutes.

THE SEARCH FOR ZEI
by L. Sprague de Camp
Avalon Books, New York.
1962. 224 pp. $2.95

Way back in October 1960, a four-part serial entitled "The Hand of Zei" began in Astounding. It has now been cut up into two books, of which this is the first. The result will be something like Edgar Rice Burroughs' first three Mars books, except that "Search" ends a bit more quietly, without the cliff-hanging finale Burroughs used. Mysteries are unsolved, intrigues still raveled, but hero and heroine are for the moment out of immediate peril.

The book is one of the author's Viagens stories about the planet Krishna, with its extremely varied collection of races, monsters and societies. The Krishnans are human enough—though egg laying—that ordinary Earth-type humans can masquerade as natives with the help of false antennae, pointed ears and green hair. Religions, politics, and social taboos vary in an erratic and alarming way from kingdom to pocket kingdom and village to town. Nationalism is rampant and honor prickly, and a good swordsman lives longest.

In the midst of all this is an off-world Sargasso, the Sunqar, infested with wrecks, alleged monsters and pirates. Earth's favorite professional adventurer, Igor Shtain, is under contract to do a lecture film on the Sunqar—and Igor has vanished. So his ghost-writer, Dick Barneveldt, most reluctant of heroes, and the Polynesian xenologist, George Tangaloa, are sent to Krishna to either find their missing boss or do his job or both.

That they are shortly up to their ears in plot and counterplot goes without saying: that is how Krishna lives. After various attempts on their lives by various persons, they find themselves involved in the internal affairs of the principality of Qirib, whose ultra-feminist Queen ceremonially kills and eats her spouse at annual intervals. There is a pirate raid, the Princess Zei is kidnapped, and with Tangaloa held as hostage Barneveldt sets off to rescue the damsel from the Osirian dinosaur who is currently bossing the pirates and running a dope factory.

All this is recounted with the author's broad humor and taste for contrast, but I regret to report that it reads more like a travelogue—perhaps one of Igor Shtain's—than an experience on a strange world. I'm afraid Sprague de Camp is far too civilized a person and a writer to believe in either strangeness or skulduggery, so that he fails to get the impression of reality that less sophisticated and less polished writers often convey. Even so, it's fun and one of Avalon's best in quite a while.

DOME WORLD
by Dean McLaughlin
Pyramid Books, New York.
No. F-763. 159 pp. 40¢

This has been expanded from "The Man on the Bottom," here in 1958, and now comprising the first half of the complete book. The break between the two parts is one of time as well as action and continuity, and spoils the total effect.

The book describes two political and social crises in the history of the dome cities at the bottom of the Atlantic. Built to exploit undersea resources in minerals and food, as well as to drain off population from the overcrowded mainland, the dome cities find themselves in the middle as war between the Americas and South Africa builds up. In the original story, now the first part of the book, Daniel Mason, administrator of Wilmington Dome, finds an administrative way out.

In Part II we have another dome—Rickover Dome in the Arctic Ocean—and another hero, Barrett Macklin, a local businessman who has been trying to put across the concept of suburban villas to relieve the "all eggs in one basket" aspect of the domes. For Mason's solution has produced another kind of social crisis: dome world versus surface world. And the dome cities are still hopelessly vulnerable to bombing—crack the dome and the city is gone. Again the solution comes from stepping outside the apparent pattern and taking a look from another angle.

This part of the book suggests that the suburbs may solve the political tug-of-war between the cities and the rural areas, for money and power. I wish I could believe it!

NATURAL RESOURCES

Continued from page 16

Saturn's rings are within Roche's Limit for densities of the order of 1.00—for *ice* masses.

Moreover, Kuiper reports measurements of the albedo and masses of Saturn's five inner satellites—bodies ranging in size from some four hundred to eight hundred miles in diameter—indicates that their density, too, is about that of water!

Kuiper makes the suggestion that, originally, when Saturn was forming from the vast eddy in the primal gas-dust cloud, the "atmosphere" of the planet extended out beyond the inner satellites and the rings. As hydrogen and light gases escaped, and the mass cooled by evaporation and radiation, the resultant gas-dust cloud "had rocks in 'em"—lumps began forming, which became the satellites.

Under the temperature conditions at Saturn's distance, ice is a rock-forming mineral; it is, moreover, the combination of two of the most abundant of all elements in the Universe—hydrogen and oxygen. Methane and ammonia aren't stable against dissipation into space at Saturn's distance from the Sun; water is.

Indications are, then, that Saturn's rings and inner satellites represent an ice-mine in the sky—if someone should want really large quantities of water somewhere!

So we can summarize the availability of natural resources in the Solar Systems in three major classes:

1. Rock minerals—and ready-refined iron-nickel alloy—are most accessible in the minor planetoids and minor satellites. Maximum accessibility results from lack of unwanted overburden—the wanted minerals are directly exposed to space—and from lack of deep gravitational wells. The desired materials are already broken up into relatively "small" lumps.

2. The lightest-gases group of materials—hydrogen, helium, ammonia and methane—are available in the atmospheres of the giant planets. The accessibility is limited by the fact of the deep gravitational wells of the giant planets—but that's why those light gases are still there!

3. Water appears to be available in immense quantities in the inner satellites of Saturn, and in Saturn's rings.

The fourth vital natural resource of space is *energy*. Solar radiant energy is available anywhere in the Solar System of course, with concentration falling off on the inverse square law. But because of the no-weight characteristic of objects in interplanetary space, and the lack of day-night problems, it will be entirely practical to make plastic-bubble mirrors of immense size to concentrate even very dilute sunlight to usable levels.

Incidentally, those plastics will *not* have to be hauled out from Earth, unless we choose to—not with Jupiter's supplies of chemical raw materials available!

It would be unnecessary and uneconomic to build nuclear reactor plants for power in space—when there's a God-given self-regulating, free-for-nothing hydrogen fusion power plant already there available for use. It may be advantageous to build nuclear reactor power plants into spaceships; adequate solar mirrors may be a bit clumsy for mobile units. But major industrial operations in space will be solar powered simply because solar power will be the cheapest, simplest, most reliable, and lightest . . . until someone invents a hydrogen-fusion gadget that converts all the fusion energy directly to electric power, with no dangerous radiation left over to escape!

The accessibility of the gases of Jupiter's atmosphere—or Saturn's, Uranus' or Neptune's—will be limited by the problem of lifting the cargo away from the giant planet's gravity well.

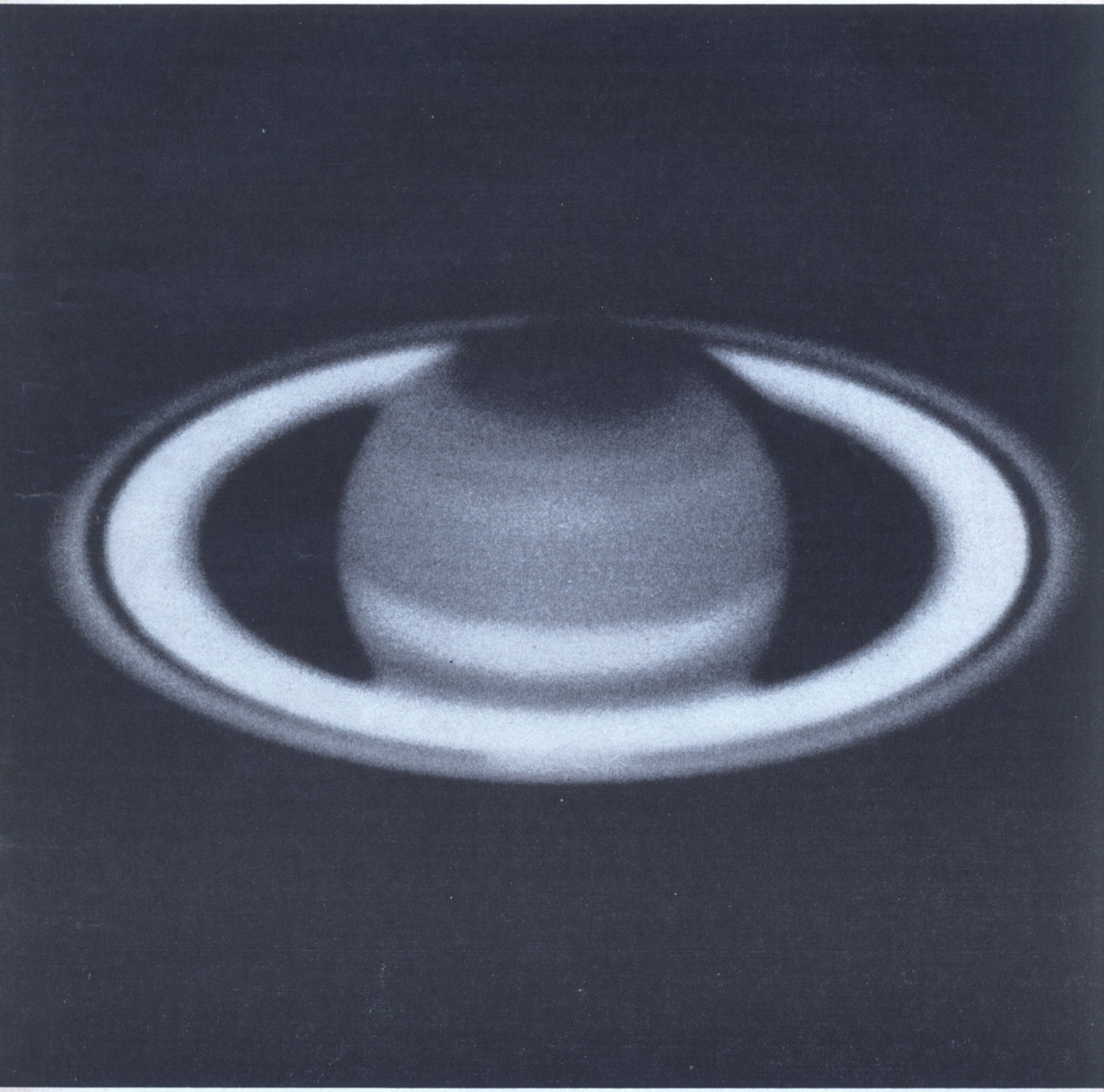
It's obvious that we're not going to build a pumping station on the surface of Jupiter—where would that be? Ten thousand miles down? What do you mean by "surface" in that connection?!—or float some kind of compressor station in that stupendous atmosphere. If we could, we wouldn't want to; it would mean building lift-ships capable of clawing their way out against a 2.5g gravity pull, while plowing their way through hundreds of miles of dense atmosphere.

The Jupiter-mining operations would be a purely space-borne system.

Probably the most economical technique—assuming a true space-drive of some type, not a rocket drive—would be to build a series of specially designed "scoop-ships," and a fleet of mother-ships. The scoop-ships would be ram-compressor ships, their noses devoted to a sort of rocket-throat-in-reverse. The ships would start several thousand miles out from Jupiter's outer gas layers, and drive toward Jupiter, building up velocity both by falling toward the planet, and by using their drive.

At the outer fringes of the atmosphere, the ram-effect of the open throat would be used to compress Jovian atmosphere into the ship's tanks at the expense of the ship's momentum.

(Graph of Sun's gravity-well. See page 93.)



Mount Wilson and Palomar Observatories

Fig. 6. Saturn, the ringed planet, may be the System's greatest source for two important elements—and the most important compound, water!

NATURAL RESOURCES

Properly computed trajectories would allow the ships to fill their tanks, while using the filling process to brake their excess speed . . . and leave the mass of ship-plus-filled-tanks with sufficient velocity to orbit back out into space for rendezvous with the mother-ship.

The scoop-ship could unload its catch through processing equipment in the mother ship. The hydrogen of the catch wouldn't be wanted particularly. The helium, methane-hydrocarbons, ammonia and who-knows-what-else would be.

At Jupiter's distance, the ammonia would readily be separated out as a slush, half-liquid-half-solid, and stored as such. Helium and methane would remain as gases—and in space, the easy way to store gases would be in plastic-film balloons. Big ones—a mile or so in diameter perhaps. Possibly, some foam material might be developed, so that the gases were stored as bubbles of relatively small size in something equivalent to a urethane foam . . . but with foam cells a yard across, possibly.

Both mother-ships and scoop-ships would be relatively permanent features of the Jovian environment; the cargoes could be handled more economically by specialized cargo-transporters.

Once a going system is established, the pipe-line effect sets in; you push a barrel of oil in at one end of the pipe line, and presto! Instantly a barrel of oil pops out the other end. Not the same barrel, to be sure—but the effect is equivalent in some ways to instantaneous transportation. (The difficulties being capital investment on the material in transit, and time-lag when you want to change your orders).

The pipe-line effect, however, would make it practical to use low-intensity driving equipment. Although Jupiter's gravitational field is enormously deep, and reaches a maximum intensity of about 2.5 g's . . . once in orbit, any small acceleration, patiently maintained, will eventually haul a cargo from Jupiter's force field. A drive-unit capable of only a one-ton thrust could get a million ton mass of cargo free of Jupiter's gravitational pull, by simply steadily enlarging the radius of the orbit around the planet.

The exact methods used would be dependent on the economic factors which we can't guess at now. For that, we'd need to know the exact nature of the spacedrive still to be developed, the then-going rate of interest on capital investment—which would determine how long you could afford to wait while your valuable cargo was being accelerated out from Jupiter—and whether or not ship-unit hydrogen fusion power plants were developed. Solar energy could be used—actually, "solar sails," depending on the pressure of sunlight on a huge area of reflective plastic "sails" for thrust, would be perfectly capable of hauling millions of tons of cargo out of Jupiter's grip.

The cargo-transporters need not be manned, remember. They don't even need robot autopilots, or elaborate automation; nothing simpler, reliable, or enduring than the laws of Celestial Mechanics can be found anyway! Once a cargo is properly aimed and shoved on its way . . . a beacon transmitter would be all that was needed, and, perhaps, an occasional inspection by a "shepherd ship."

Transportation, and accessibility are going to have totally new meanings in space. Capital investment problems will have to be balanced against the cost of being-in-a-hurry in a quite new way. Instead of Man's ancient battle against the viscosity-friction of Earth's surface, it will be a problem of balancing time and capital-investment charges against energy and intensity costs.

But the natural resources are there—and, so far as Earth itself is concerned, they are literally absolutely inexhaustible. The mass of ammonia, methane, and helium available in the atmosphere of Jupiter alone exceeds by far the total mass of Earth; we can't possibly use it all! The mass of nickel-iron available in the asteroid belts alone—without considering minor satellites of major planets!—is so great as to be able to sink every continent of Earth by its sheer weight. The mass of water in Saturn's rings and inner satellites alone would drown all Earth's continents ten times over.

Natural resources, in quantities Earth can *never* use up, are there.

And they have a degree and kind of accessibility men have never studied before.

But notice carefully; *Earth* can never exhaust those resources, because Earth is smaller than they are. But *Man* is something else again—and Man will not be confined to Earth. Accessibility works two ways—and many times it is wiser to move the consumer to the supply, than to attempt to move the supply to the consumer.

An adequately air-conditioned home on Ganymede, for instance, could have a most magnificent view of Jupiter, hanging in immense splendor, eternally just above the horizon, going through all the phases of new to full and back to new once a week. On Io the immense globe of Jupiter, 87,000 miles in diameter, would be only as distant as our 2,000-mile diameter Moon, and go through the full cycle of phases in less than two days!

Surely the scientific and engineer-

ing research departments of Solar System Chemicals, Inc., would find it more convenient to live and work near their scene of operations, than on crowded Earth!

Accessibility to anything has always been—and will always be—a function of the technological techniques available. Accessibility to comfortable living conditions follows the same fundamental rule. Where, less than half a century ago, men froze and starved to death in helpless isolation, now entire, comfortably supplied scientific stations are maintained at the South Polar plateau. A quarter of a century ago, a near-maximum effort could put one man, Admiral Richard E. Byrd, isolated and alone, partway toward the pole, today large groups maintain year-round research stations. Certainly it's foreseeable that industrial research installations will follow; the importance of low-temperature processing is increasing, for one thing, and a reservoir of no-cost low-temperature might be industrially highly attractive.

Antarctica is only one step toward the full exploitation of climatic extremes. High-vacuum processing of metals is expensive here on Earth . . . but what could be cheaper in space?

Accessibility has many factors—and distance-measured-in-miles has little to do with the subject! ■

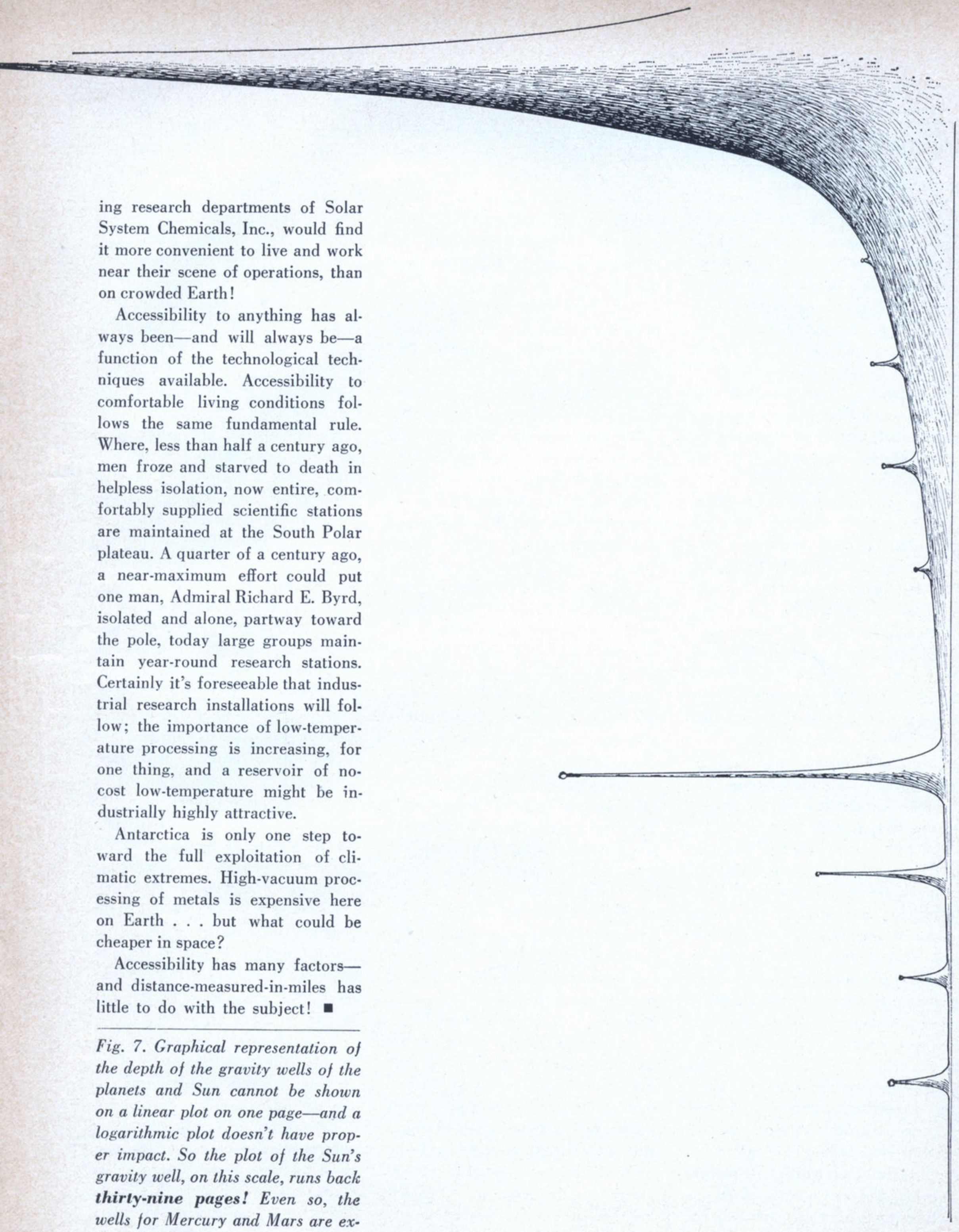


Fig. 7. Graphical representation of the depth of the gravity wells of the planets and Sun cannot be shown on a linear plot on one page—and a logarithmic plot doesn't have proper impact. So the plot of the Sun's gravity well, on this scale, runs back ***thirty-nine pages!*** *Even so, the wells for Mercury and Mars are exaggerated, while those of the giant moons—Earth's, Jupiter's, Saturn's and Neptune's—can't be shown.*

Editorial

Continued from page 6

enough to break your own bones by sheer muscular contraction—which is what normally happens in someone who gets a fatal dose of strychnine, or other muscle-excitant poison. Under any normal conditions, you'll stop pulling before there's any danger of that—long before. The berserker, typically, didn't refrain from applying the all-out-no-reserves-left power of his muscles.

And the zoologist attacked by two leopards didn't either.

A good part of the "hysterical strength" phenomenon becomes available in a good deep-trance hypnotic subject—which leads to the stiff-as-a-board demonstration, with the subject lying perfectly rigid when supported only at head and heels. Or lifting and walking off with a two-hundred-fifty-pound weight, when the heaviest weight he could lift without hypnosis was half that.

Now let's consider setting up a sound, scientific, objective and repeatable experiment on the matter of one man vs. two angry leopards. We'll put two well-angered leopards in an enclosure, with adequate sound-and-movie recording, and then put one man in with them. Since we are not apt to get a volunteer very readily, we'll say he's a condemned murderer who's been given his choice of the gas chamber, or this experiment—with pardon if he survives.

He won't survive, of course. Not in any thoroughly objective, scientic experiment—because survival in such a situation *depends entirely on subjective factors.*

It is, in other words, a situation in which the very essence of the scientific experiment, as now defined, prohibits the operation of the critical factor! In the modern definition, a scientific experiment must be carefully designed and operated in such a manner as to completely *eliminate any subjective influence or factors.* It is not, by definition, an "objective scientific experiment" if the outcome can be influenced by the intrusion of purely subjective factors.

And there is, in the lexicon of modern Science, no definition of a *subjective* scientific experiment—an experiment designed to detect and measure pure *subjective* effects as distinct from objective phenomena.

I've discussed hysterical strength primarily because it is a purely subjective phenomenon which produces gross objective results. What it amounts to is that the objectively measurable physical strength of an individual is grossly—not merely marginally!—affected solely by that individual's mood at the time. And mood is purely subjective.

(Don't bring up that silly yak about emotions being *caused* by hormones—that proposition implies that the glands start secreting adrenaline, et cetera, *before* you feel fear at seeing a lion attacking. The adrenal glands, maybe, have eyes of their own to perceive the danger? They suddenly react to a whispered word or two *before* your mind interprets the language into meanings? Just because we have a sort of Pavlovian conditioned reflex effect, such that the presence of the hormone in the blood produces a conditioned response of fear-feeling, has no bearing on which comes first, the fear or the hormone!)

Now when Mendel presented his famous paper on genetics, it was *not* ignored, overlooked, or forgotten, as the usually published myth holds; it was roundly, solidly, and strongly rejected. It was heard—he presented it at a major international biological meeting—and judged and rejected. Not ignored—rejected!

The reason for rejection was that Mendel had applied statistical analysis in a biological experiment—and was the first to use a mathematical method of analysis in biological study. He presented a *new kind* of experiment; it was not merely a new concept, but a new concept backed up with *a new kind* of experimental evidence.

No acceptable experiments demonstrating ESP or any of the other psi phenomena have ever been presented.

Psychology as a science has been bumbling and stumbling badly; psychotherapy is not appreciably more advanced in the best modern clinics than it was in the days of witch doctors and native priests. Dr. Sebastian di Grazia, in his book "Errors of Psychotherapy," shows that the basic techniques of treating neurotic problems used by a Guatemalan Indian witch doctor correspond almost one-to-one with those used by the most effective clinicians of American and European cities. The priests of the Temple of Aeschulapeus in ancient Greek times were using narcosynthesis and dream interpretation. (They didn't have sodium pentathol, but there are lots of herbal hypnotics!)

We have made enormous strides in physical medicine . . . but the progress in subjective medicine has been almost zero.

I suggest that the answer is quite simple: The basic doctrine of the Scientific Method, *as now defined*, stipulates that an acceptable experiment must eliminate all subjective factors.

Under these conditions, it is impossible, by definition, to make a "sound, scientific experiment" on any subjective problem.

Psychology relates purely to the subjective nature of Man; so long as it attempts to work within the framework of the objective-science definition of an acceptable experiment, it must necessarily eliminate its subject matter from any experimental procedure!

Psychology is one step better off than parapsychology, or psionics. Telepathy involves the interaction of one subjective structure—mind—on another without the intervention of any objective structure.

By analogy, psychology studies the effect of magnetic fields on magnets; there is one material object—the piece of magnetized steel or the human body—involved. Parapsychology is seeking to study the interaction of one magnetic field on another without intervention of material magnets . . . under the handicap that the acceptable scientific method denies that any nonmaterial agency can be allowed to be present!

The necessity for combing the subjective phenomena out of the objective level, in order to establish a workable science, is perfectly clear. It took a long while, and a lot of hard philosophical analysis, before men could design a set of criteria by which the purely-objective level could be recognized and worked with. The early alchemists had not done so; the early zoologists hadn't done so—the whole problem of subjective-objective interaction was so confused that the *fact of difference* wasn't even recognized!

Thus, for instance, it was held that only a virgin could capture the Unicorn. This is a magical formula, because it implies that the subjective factor is essential to success in any objective task—capturing the animal. Many of the formulas for gold-making involved specification of the thoughts the experimenter must have in mind while he processed his ingredients.

The first step to develop a true Science was to separate one level from the other. Science started by rejecting out the subjective level, purifying the objective, and developing the potentials of the purely objective. In doing it, Science developed the attitude that the subjective should not exist—that "subjective" and "false, misleading, unreal" were synonymous.

Well, if you're analyzing for one substance, all other substances are false, misleading and confusing naturally! They shouldn't be *there*—but that doesn't mean either that they shouldn't *be*, nor that they *don't exist*.

However, once you establish the proposition: "Only subjective-free experiments are valid," you've set up a system which, by its nature, can't study subjective phenomena.

In Earth's atmosphere, any active hydroxide, such as potassium or sodium hydroxide, rapidly vanishes. It reacts with carbon dioxide in the air and becomes a carbonate. That's why slight spillage from a Ni-Fe or Ni-Cd battery appears to be noncorrosive—the KOH electrolyte is rapidly neutralized by the atmosphere.

On an ammonia-atmosphere planet such as Jupiter, no acid could remain exposed, and there, the lead-acid storage battery would appear to have a "noncorrosive" electrolyte. Any sulfuric acid that spilled, would be neutralized almost instantly to ammonium sulfate.

In an "atmosphere" of subjective-rejecting modern Science, any subjective phenomena that appear are almost instantly neutralized—i.e., "explained away" or otherwise denied.

The Orient, on the other hand, has tried to solve the world problem by setting up an objective-rejecting "atmosphere"; there, objective phenomena are "explained away," and all acceptable explanations are subjective in character.

The relative success in achievement of the Western vs. the Oriental approach definitely shows, now, that the objective-level approach was the one that was necessary to effective attack on the world problem.

But . . . that doesn't mean that it's sufficient! It means that "This is where you start!" It doesn't by any means prove that "You must not go any further!"

Starting with subjective studies has proven too inefficient; the trouble is that the success of the objective approach has now established a barrier to taking the next step.

So—the problem I'd like to present for discussion is simply stated. But not simply answered!

We need a *new kind* of experimental procedure—one that is competent to study subjective phenomena by means as appropriate to subjective phenomena as the present *kind* of experiments are to studying objective phenomena.

It may be as different from modern scientific methods as algebra is from arithmetic . . . but notice that algebra winds up frequently with arithmetical answers, and sometimes with answers impossible in arithmetic. (The exact value of the ratio of the circumference of a circle to its diameter is an algebraic number, C/D, which cannot be expressed by any arithmetical number.)

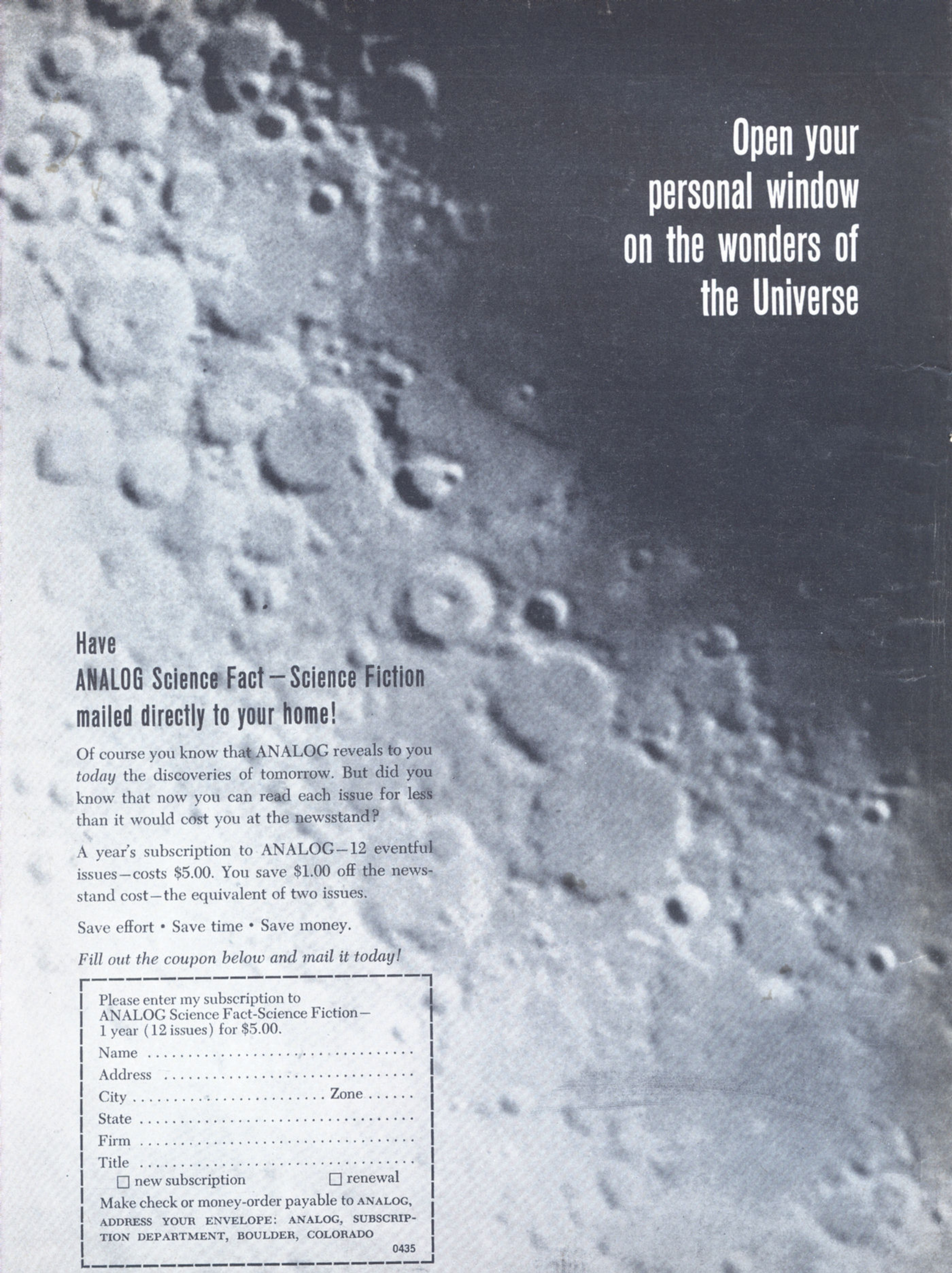
But what such subjective scientific experiments should be has never been worked out—and under the rules of the modern limited definition of objective-only science, never will be!

To apply objective test concepts to subjective phenomena is probably as inappropriate as demanding that someone give the chemical analysis of a magnetic field.

Until subjective-science experimental methods are worked out, however, at least one half of medicine—the psychosomatic half—and all of psychology and psionics will remain completely unscientific.

Anyone got suggestions as to the basic operating methods for subjective scientific experimental procedures?

The Editor



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