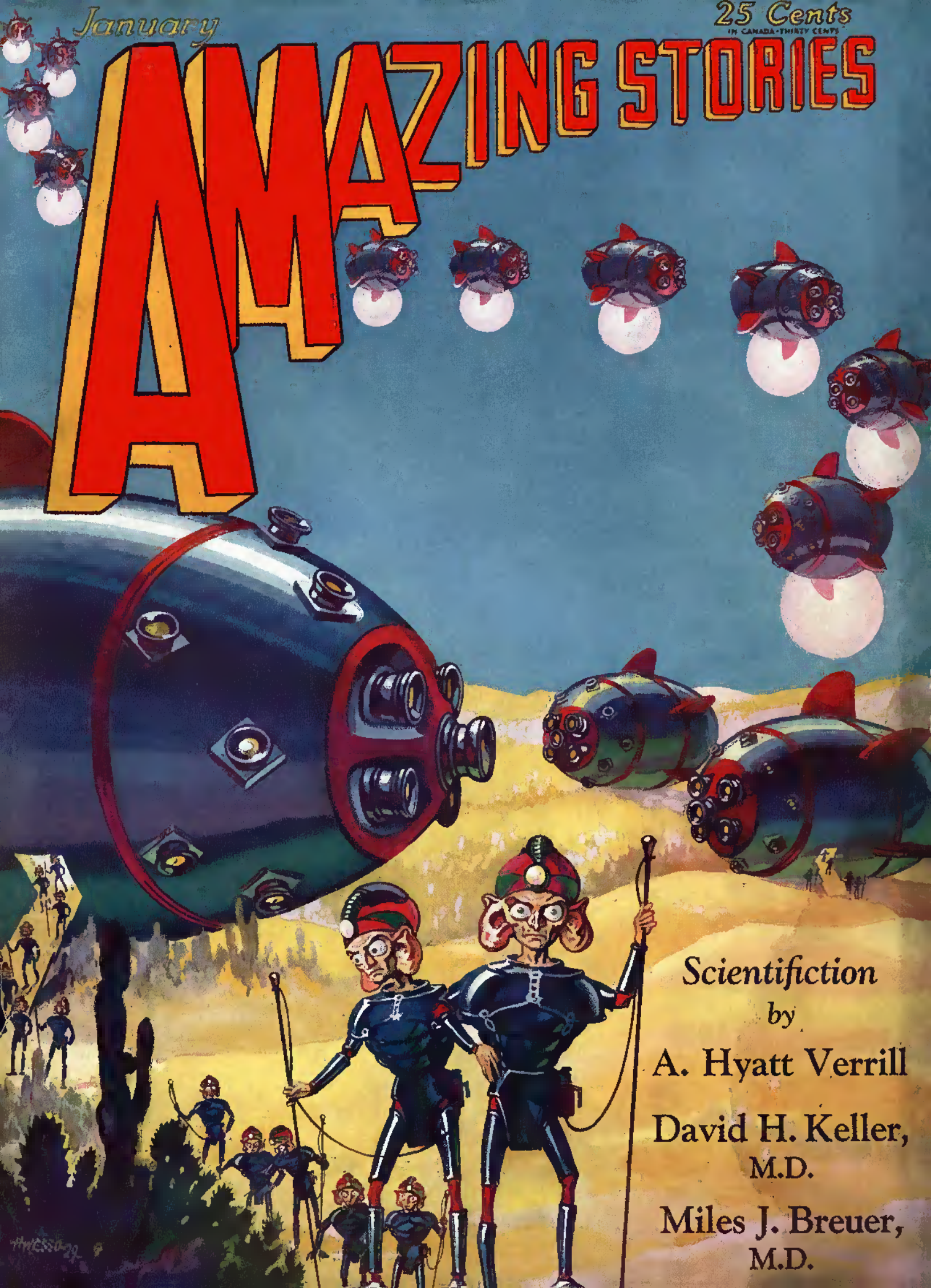


January

25 Cents
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AMAZING STORIES



Scientifiction

by

A. Hyatt Verrill

David H. Keller,
M.D.

Miles J. Breuer,
M.D.

THYSSO-29

4 of the 40 Easy Ways to Make \$3⁰⁰ an Hour

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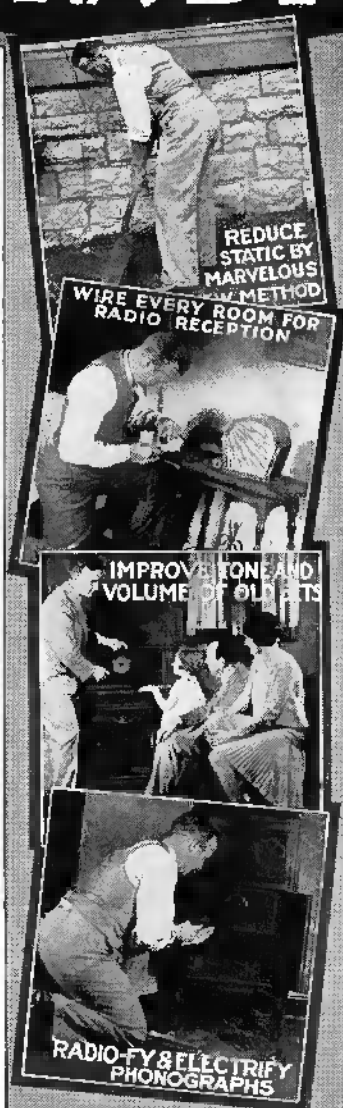
\$1,100.00 in 6 Weeks J. R. Allen, Calif. — "Have done over \$1,100.00 worth of business in the last 6 weeks. Next month I am going to open up a store of my own. I never knew that money could come so fast and easy."

\$25.00 a Week Spare Time N. J. Friedrich, N. Y.—"I have averaged \$25.00 a week for the last 7 months even though I am not a graduate but just learning."

Training Lands Him Job R. C. Kirk, N. C.—"Your training has been very valuable to me. I landed a job with the big department store out here a few weeks ago because I had my membership card with me. There were a large bunch of applications ahead of me."

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Gentlemen: Please send me by return mail full details of your Special No-Cost Membership Plan, and also a copy of your Radio Handbook.

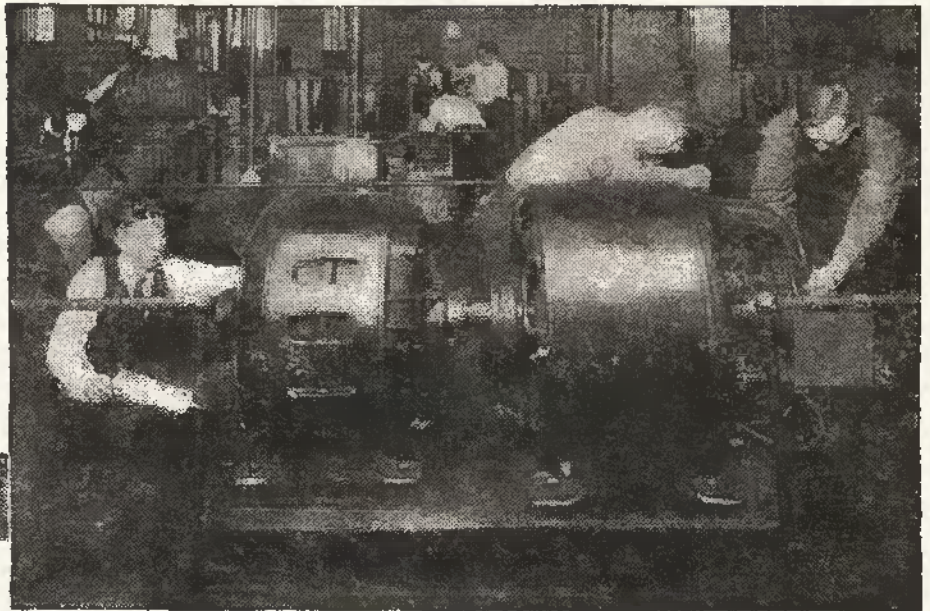
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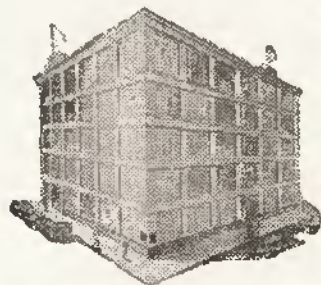
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JULES VERNE'S TOMBSTONE AT AMIENS
PORTRAYING HIS IMMORTALITY

AMAZING STORIES

January, 1930
Vol. 4, No. 10

In Our Next Issue:

REMOTE CONTROL, by Walter Kateley. The author shows great ingenuity in treating the subject of the control of intellects of animals from a center of dissemination. Basing our assumption on present-day findings, we can hardly say that the conception of "Remote Control" is impossible. We know you will be even more pleased with this than with Mr. Kateley's previous contributions.

THE EXPLORERS OF CALLISTO, by Harl Vincent. Generations of men have lived their span of life, but no one has ever seen the other side of our satellite. This well-known author has proved his ability to write of space travel before and he easily holds his reputation with this story. We can also promise a sequel for it.

BEYOND THE GREEN PRISM, by A. Hyatt Verrill. (A Sequel to "Into the Green Prism." In 2 parts.) Part II. Mr. Verrill not only answers satisfactorily all the questions raised in the first story and in the first instalment, but has built another tale of ancient Indian civilization, which is of absorbing interest. Concluded in this issue.

THE ICE MAN, by William Withers Douglas. We have had a number of stories dealing with the impressions of a possible future civilization and we have always thought it would be interesting to know what reactions a Roman, for instance, of ancient Rome, would experience if he were suddenly brought into the midst of our "modern civilization." Our new author gives us his idea of this in a cleverly written story, which, among other things, has a good touch of Edgar Allan Poe about it.

VITAMIN Z, by William Lemkin, Ph.D. The author of "Cold Light" now treats the most important subject of calories. And because he is a scientist, has a good imagination and the art of story-telling, you will like learning about calories and you won't think his Vitamin Z impossible. The story reads exceedingly well and is quite plausible.

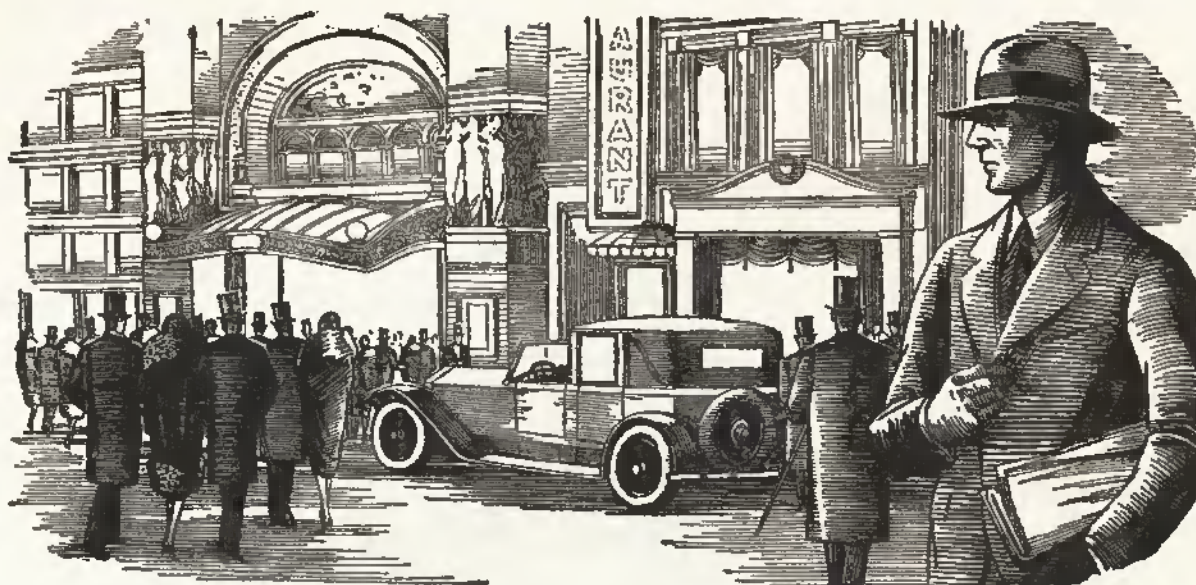
In Our January Issue:

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- When the Atoms Failed**
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Our Cover

this month depicts a scene from the story entitled, "When the Atoms Failed," by John W. Campbell, Jr., in which the visitors from Mars are shown arriving in their interplanetary cruisers, fitted out for attack with atomic weapons hanging from the bottoms of their ships.

AMAZING STORIES MONTHLY. Published at 184-16 Jamaica Avenue, Jamaica, N. Y. Entered as second-class matter at Jamaica, N. Y., under the act of March 3, 1879. Title Registered U. S. Patent Office. Copyright, 1929, by E. P. Inc., N. Y. European Agents, S. J. Wise et Cie., 40 Place Verte, Antwerp, Belgium. Printed in U. S. A. Subscription price is \$2.50 a year in U. S. and Possessions; \$3.00 a year in Canada and Foreign Countries; single copies, 25 cents each. Editorial and Executive Offices, 381 Fourth Avenue, New York, N. Y. Publishers are not responsible for mat. lost, although every care is taken for their safety.



Always outside of things—that's where I was just twelve short months ago. I just didn't have the cash, that was all. No theatres, no parties, no good restaurants. No real enjoyment of life. I was just getting by, just existing. What a difference today! I drive my own car, have a good bank account, enjoy all the amusements I please.

I Couldn't Get the Good Things of Life Then I Quit My Job and "Found" Myself!

HOW does a man go about making more money? If I asked myself that question once, I asked it a hundred times!

I know the answer now—you bet. I know the way good money is made, and I'm making it. Gone forever are the days of cheap shoes, cheap clothes, walking home to save carfare, pinching pennies to make my salary last from one pay-day to the next one. I own one of the finest Radio stores you ever saw, and I get almost all the Radio service and repair work in town. The other Radio dealers send their hard jobs to me, so you can see how I stand in my line.

But—it's just a year ago that I was a poorly paid clerk. I was struggling along on a starvation salary until by accident my eyes were opened and I saw just what was the matter with me. Here's the story of just how it happened.

One of the big moments of my life had come. I had just popped the fatal question, and Louise said, "Yes!"

Louise wanted to go in and tell her father about it right away, so we did. He sort of grunted when we told him the news, and asked Louise to leave us alone. And, my heart began to sink as I looked at his face.

"So you and Louise have decided to get married," he said to me when we were alone. "Well, Bill, just listen to me. I've watched you often here at the house with Louise and I think you are a pretty good, upstanding young fellow. I knew your father and mother, and you've always had a good reputation here, too. But just let me ask you just one question—how much do you make?"

"Twenty-eight a week," I told him.

He didn't say a word—just wrote it down on a piece of paper.

"Have you any prospects of a better job or a good raise some time soon?" he asked.

"No, sir; I can't honestly say that I have," I admitted. "I'm looking for something better all the time, though."

"Looking, eh? How do you go about it?"

"Well, that question stopped me.

How did I? I was willing to take a better job if I saw the chance all right, but I certainly had laid no plans to make such a job for myself. When he saw my confusion he grunted. "I thought so," he said. Then he held up some figures he'd been scribbling at.

"I've just been figuring out your family budget, Bill, for a salary of twenty-eight a week. I've figured it several ways, so you can take your pick of the one you like best. Here's Budget No. 1: I figure you can afford a very small unfurnished apartment, make your payments on enough plain, inexpensive furniture to fix such an apartment up, pay your electricity, gas and water bills, buy just about one modest outfit of clothes for both of you once each year, and save three dollars a week for sickness, insurance, and emergencies. But you can't eat. And you'll have to go without amusements until you can get a good, substantial raise in salary."

I began to turn red as fire.

"That budget isn't so good after all," he said, glancing at me; "maybe Budget No. 2 will sound better—"

"That's enough, Mr. Sullivan," I said. "Have a heart. I can see things pretty clearly now; things I was kidding myself about before. Let me go home and think this over." And home I went, my mind in a whirl.

At home I turned the problem over and over in my mind. I'd popped the question at Louise on impulse without thinking it out. Everything Mr. Sullivan had said was gospel truth. I couldn't see anything to do, any way to turn. But I had to have more money.

I began to thumb the pages of a magazine which was lying on the table beside me. Suddenly an advertisement seemed almost to leap out at my eyes, an advertisement telling of big opportunities for trained men to succeed in the great new Radio field. With the advertisement was a coupon offering a big free book full of information. I sent the coupon in, and in a few days received a handsome 64-page book, printed in two colors, telling all about the opportunities in the Radio field and how a man can prepare quickly and easily at home to take advantage of these opportunities. I read the book carefully, and when I finished it I made my decision.

What's happened in the twelve months since that day seems almost like a dream to me now. For ten of those twelve months I've had a Radio business of my own! At first, of course, I started it as a little proposition on the side, under the guidance of the National Radio Institute, the institution that gave me my Radio training. It wasn't long before I was getting so much to do in the Radio line that I quit my

measly little clerical job and devoted my full time to my Radio business.

Since that time I've gone right on up, always under the watchful guidance of my friends at the National Radio Institute. They would have given me just as much help, too, if I had wanted to follow some other line of Radio besides building my own retail business, such as broadcasting, manufacturing, experimenting, sea operating, or any one of the score of lines they prepare you for. And to think that until that day I sent for their eye-opening book, I'd been wailing, "I never had a chance!"

Now I'm making real money. Louise and I have been married six months, and there wasn't any kidding about budgets by Mr. Sullivan when we stepped off, either. I'll bet that today I make more money than the old boy himself.

Here's a real tip. You may not be as bad off as I was. But, think it over—are you satisfied? Are you making enough money, at work that you like? Would you sign a contract to stay where you are now for the next ten years, making the same money? If not, you'd better be doing something about it instead of drifting.

This new Radio game is a live-wire field of golden rewards. The work, in any of the 20 different lines of Radio, is fascinating, absorbing, well paid. The National Radio Institute—oldest and largest Radio home-study school in the world—will train you inexpensively in your own home to know Radio from A to Z and to increase your earnings in the Radio field.

Take another tip—no matter what your plans are, no matter how much or how little you know about Radio—clip the coupon below and look their free book over. It is filled with interesting facts, figures, and photos, and the information it will give you is worth a few minutes of anybody's time. You will place yourself under no obligation—the book is free and is gladly sent to anyone who wants to know about Radio. Just address J. E. Smith, President, National Radio Institute, Dept. OAS, Washington, D. C.

J. E. SMITH, President,
National Radio Institute,
Dept. OAS, Washington, D. C.

Dear Mr. Smith:

Please send me your 64-page free book, printed in two colors, giving all information about the opportunities in Radio and how I can learn quickly and easily at home to take advantage of them. I understand this request places me under no obligation, and that no salesmen will call on me.

Name
Address
Town State

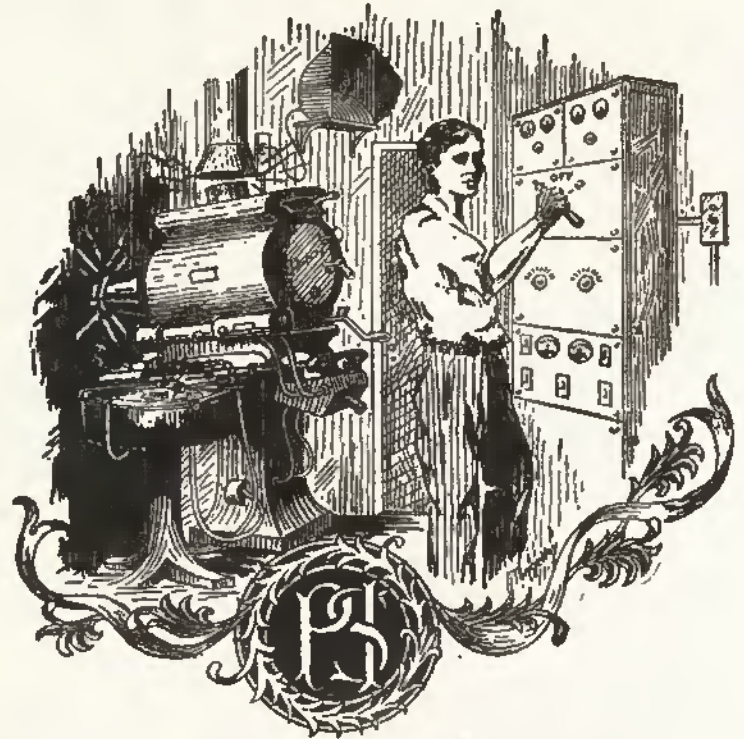
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The tuition for these courses is very reasonable and is payable in easy installments as you study. Also you have the added convenience of studying at home in your spare time. Fill out and mail the coupon below today for special scholarship proposition.

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Please send me, by return mail, full details of your Special Scholarship Proposition on Sound Projection.

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AMAZING STORIES

THE MAGAZINE OF SCIENTIFICTION



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MIRIAM BOURNE, *Managing Editor*

WILBUR C. WHITEHEAD, *Literary Editor*

C. A. BRANDT, *Literary Editor*

Editorial and General Offices: 381 Fourth Avenue, New York, N. Y.

Extravagant Fiction Today Cold Fact Tomorrow

Calories and Diet

By T. O'Conor Sloane, Ph.D.

A GOOD many months ago, one of the great restaurant organizations of this country operating a vast number of restaurants on a chain system, as it is called, printed upon their bill of fare, following the name of each of the principal items, the number of calories contained in each portion as supplied to the hungry consumer. It would be interesting to know how many people, reading this bill of fare and ordering from it, knew what a calorie was, how many had the slightest idea of whether they should eat a great many calories or few, or whether any portion containing a large number of calories should be preferred to one containing fewer. It sometimes seems as if an effort is being made to induce the public to feel that they are living not upon a diet of bread and butter, corned beef and cabbage and the like, but that they are being supported by vitamins or enzymes and, to come back to the subject we start with, by calories.

Those of our readers who have worked in the chemical laboratory, who have made their initial chemical experiments, were taught to make oxygen by mixing potassium chlorate with manganese binoxide in a test tube or retort, heating the mixture rather gently, whereupon oxygen would come off in great quantity. The operation was a perfectly quiet one and always gave good results. But, if they had omitted the manganese binoxide and undertaken to make oxygen by heating the potassium chlorate alone, a much higher heat would have been required, and the operation would probably have been very much less quiet. Now, in this method of making oxygen, the manganese binoxide is absolutely unchanged. In some mysterious way it causes the oxygen to part company with the potassium chlorate quietly and at a low temperature, and when all is over, if the residue is treated with hot water, filtered and washed, the experimenter will get back exactly the manganese binoxide with which he started. The potassium chlorate will be decomposed and will disappear, potassium chlorid being formed.

This is called catalytic action. In our food vitamins and enzymes are contained in rather small or even minute quantities, but by catalytic action or by fermentation they produce results and enable the system to assimilate the various foods which are taken into the mouth.

But in the case of calories there is no question of small quantity. One physician, a high authority on diet, says that he lives upon 1800 per day, other authorities give as high as 3000 per day as a proper number, so in dealing with calories we are no longer indulging in the prospect of minute quantities of matter exercising a great influence. Indeed we are not dealing with matter at all, as a calorie, while it is defined by using matter as a standard, is purely and simply a heat unit, a unit of quantity of heat.

If you are a good housekeeper you know how many tons of coal you have to buy to keep your house warm in winter, you know how many dollars' worth of gas you have to buy to do your cooking. You can express the heating value of a ton of coal

in calories so that it will be a simple matter, if you know how good your coal is, if you know how many calories it gives to the pound, to say, "In order to heat my house I have to use so many thousands of calories in the winter, just as in order to heat my body and to support life, I have to use 3000 or perhaps less, perhaps as little as 1800 calories, each day." But what is a calorie? The so-called small calorie, of which we are speaking, which is spelt with a small "c" as its initial letter, is the quantity of heat required to raise the temperature of one gram of water, one degree centigrade. To heat a tumbler of water one degree centigrade requires about 250 calories and to heat it one degree Fahrenheit would require, roughly speaking, about 150 calories, because the degree Fahrenheit is less than the degree centigrade. So if you want to live on 1800 calories a day, you must take food whose heating power, just as if it was to be burned in a furnace, would be sufficient to raise about eight tumblers of water one degree centigrade. It would be an interesting thing for the housekeeper to find out the calorific value of the fuel which she is burning in the furnace or the gas which she is burning in the range and compare the calories with those which she consumes personally, which she might assume, in her case, to be 2000 to 2500. She would be surprised beyond measure as to the small amount of heat units required to take care of this wonderful human system of ours.

If any combustible producing calories, for that is really what are produced in the system, could produce heat for all the work that is required for our vital processes, human life would be much simpler; we could live on kerosene oil which is a first-class fuel, we could follow the Diesel engine and live on heavy oil, we could live on coal.

But the human system is an amazingly complicated one, and food has to be of a very definite constitution to supply nutriment. The human system will burn only a few things. For the human body is not maintained by the production of heat alone, complicated products have to be formed and delivered to the system, a certain amount of sugar is necessary, and too much sugar indicates disease. Many other products, some of which are absolutely unknown to us, have to enter into the processes of the human body. So when we have determined just what we can eat, our best chemical analysis or determination of what our complicated system needs is to go ahead and eat, and see if we maintain our good health. Then we can always find from books the approximate calories per pound or per gram or ounce in the food and all that the calories will tell us is this simple thing, how many grams or ounces of these foods, which seem to suit us, we should eat. The books tell us the calories in foods—how much are the calories in the sugar we put in our tea or coffee, how much the calories in the cereal which we eat, in eggs, in milk, meat and vegetables amount to. We then have to see if we cannot make up what is called a nicely balanced diet that will suit us, as far as taste is concerned, which diet will aggregate about 2000 to 2500 calories for a day.

A Sequel to "Into the Green Prism"

By A. Hyatt Verrill

Beyond the Green Prism

When we published Mr. Verrill's story, "Into the Green Prism," we were quite prepared to learn that it would meet with the general approval of our readers. But even we were surprised to receive the numerous insistent demands for a sequel, and the explanation for the various questions that arose in the minds of our readers when they had finished the story. We asked Mr. Verrill to write such a story. "Beyond the Green Prism" is the result, which, we are certain you will agree, far exceeds the original. A goodly number of the "fallacies" in the other story are explained, we believe, to the satisfaction of those whose questions and objections we published in the "Discussions" columns of AMAZING STORIES for several issues back. However, many new and thrilling adventures take place and entirely new and unexpected discoveries are made. Read the first half of this story this month.

Illustrated by MOREY

CHAPTER I

An Unexpected Surprise

WHEN I made public my story relating the true facts regarding the mysterious disappearance of my dear friend, Professor Ramon Amador, and the incredible events that led to it, I had no expectation of ever revisiting that portion of South America where Ramon had vanished before my eyes.

In the first place, my work in the Manabi district had been completed before Ramon attempted his suicidal experiment, and in the second place, the many associations, the thoughts that would be aroused by the familiar surroundings—the holes we had dug, the traces of our camp, the site of Ramon's field laboratory—would have been more than I could bear; and finally, I would not have dared lift a shovelful of earth, drive a pick into the ground or even walk across the desert for fear of burying the microscopic people and their princess—yes, even Ramon perhaps—beneath avalanches of dislodged sand and dust.

Yet, throughout all the time that had passed since I

stood beside Ramon and watched him draw the bow across the strings of his violin, and with a shattering crash the green prism and Ramon vanished together, he had been constantly in my thoughts. Ever I found myself speculating, wondering whether he had succeeded in his seemingly mad determination to reduce himself to microscopic proportions, wondering if he actually had joined his Sumak Nusta, his beloved princess, whose love had called to him across the centuries. How I longed to know the truth, to be sure that he had not vanished completely and forever, to be assured that he was dwelling happily with that supremely lovely princess of the strange lost race we had watched through the green prism for so many days. And what would I not willingly have given to have been able once again to see that minute city with its happy industrious people, to see the inhabitants kneel before their temple of the sun, to see the high-priest raise his hands in benediction, and once more see the princess appear before her subjects, perchance now with Ramon walking—erect, proud as the king he was—beside her. But all was idle speculation, all vain supposition. With the shattering of the prism through which we had so often watched the city and its people, all hopes of ever knowing what had occurred had



I heard the first crescendo note and then—Ramon, desert, everything seemed swallowed in a dense fog; a gust of wind seemed to lift me, whirl me about.

been lost. Never again could I gaze through the marvelous, almost magical, sea-green crystal and see what was transpiring in that city whose mountains were our dust, whose people were invisible to unaided human eyes. No fragment of the strange Manabinite remained, as far as I knew, and even had there been a supply, only Ramon would have been able to construct another prism.

Yet somehow I could not feel that my beloved friend had failed in his desires. I could not believe that such love as his could have been thwarted by a just and benign Divinity, and my inner consciousness kept assuring me that Ramon had succeeded, that he still lived, and that he was happier with Nusta than he ever could have been among normal fellow beings. Moreover, I had reason and logic on my side. I knew that the donkey and the dog had survived the test, that although they had vanished as mysteriously and as abruptly as had Ramon, yet they had been uninjured by their reduction in size, and so why should Ramon have been affected otherwise? Such thoughts and mental arguments were comforting and reassuring, but they did not still my desire to know the truth, they did not prevent me from speculating continually upon Ramon's fate, and they did not restore the presence and companionship of the finest, most lovable man I had ever known.

Not until he had disappeared and was forever beyond my reach did I fully realize how much Ramon had grown to mean to me. We had been thrown very close together for months; we had worked side by side, had watched that marvelous miniature city through the same prism, and our hopes, fears, successes and disappointments had been shared equally. Moreover, Ramon had possessed a strange personal magnetism, an indescribable power of intuitively sensing one's feelings, such as I had never known in any other human being.

And though I am—I flatter myself—a matter-of-fact, hard-headed and wholly unromantic and unsentimental scientist, who—theoretically at least—should be mentally immune to all but proven facts, yet Ramon's highly romantic and sentimental nature, his readiness to believe in the most extravagant theories, his temperamental moods, his unconquerable optimism and his, to me, incomprehensible mysticism, all found a ready response in my more practical mind, and I loved him the more because he differed so widely from myself. And often, as I sat late at night, smoking contemplatively in the darkness of my study and mentally reviewing those months at Manabi, I recalled incidents that I now realized were proofs of the high courage, the indomitable will-power, the limitless patience and the almost womanly tenderness of my lost friend.

Almost without my realizing it, Ramon and I had grown to be even more than brothers, and often, as I thought of the past and of the present, a lump would come into my throat and my eyes would fill with tears as I realized that never again would I see Ramon alive.

It was, I admit, great comfort and consolation to write the story of our strange experiences and of his disappearance, but after the tale was done, I realized all the more vividly that he had gone forever and my sorrow became all the more poignant. It was like writing "Finis" to the story, and I found myself becoming morose, aloof and avoiding other men. In order to throw off this almost melancholic mood I devoted myself all the more assiduously to my archeological work, striving in my scientific ardor to forget my lost friend.

AND then, entirely unexpectedly and as though by a direct act of Providence, a most astonishing event occurred which entirely altered my point of view, my thoughts and my plans.

Among the many wealthy private collectors of the world, Sir Richard Hargreaves, Bart, was perhaps the most widely known for the value—both intrinsically and scientifically—of his archeological treasures. For many years he had been acquiring—both by personal collection and by purchase—the most unique and priceless specimens from all parts of the world. Unlike so many wealthy men—for Sir Richard was many times a millionaire—he was neither a scientist nor a collector in the ordinary sense of the word. To him collecting archeological specimens of the greatest value was not a hobby nor a fad. Rather it was a love of art and of the irreplaceable. He realized how rapidly such objects were disappearing, how many priceless specimens had been lost to science and the world, and he was well aware that, in many if not most cases—museums and public institutions are handicapped by lack of funds and must invest their money in those things that will represent the greatest show or results in the eyes and minds of the directors and patrons.

To spend thousands of dollars for a single unique specimen seems to the lay mind a waste of funds, when the same amount would defray the expenses of an expedition and the acquisition of hundreds, perhaps thousands, of specimens. But Sir Richard, with his millions, could purchase such unique objects, thus preserving them for science, and his collections were always available for study and comparison by any archeologist. He was, in fact, one of the greatest benefactors of science, although no scientist himself, and his mansion near Guildford, Surrey, housed several thousand specimens that had no duplicates in any museum in the world. I had first met Sir Richard in Peru, where he had just purchased a marvelous collection of gold vessels from a Chimu temple-mound. Later I had the opportunity in New York of showing him some of my own finds, and I spent a most delightful fortnight at his magnificent estate, examining and describing his specimens of early American cultural art.

He was a delightful gentleman—the typical British aristocrat—abrupt, sparing of words, incapable of showing excitement, enthusiasm or surprise; but kindly, hospitable, courteous to a degree, and thoroughly unpretentious and wholly democratic. I can see him now as I close my eyes—a big-boned, broad-shouldered, slightly-stooping figure; ruddy faced, sandy-haired; his keen, pale-blue eyes hidden under bushy brows, a close-clipped moustache above his firm lips, and always—even in the tropics—dressed in heavy tweeds. Alert, active, with a swinging stride, no one would have guessed that Sir Richard was well past the three score and ten mark, and no one would have guessed—in fact no one other than himself and his doctor knew—that Sir Richard's heart was in bad shape and might fail him at any moment.

Hence it came as a great shock when I learned of his sudden death in London, and I wondered what disposal he had made of his collections. As far as I was aware he had no family nor heirs, for his wife had died years before and there had been no children. Probably, I thought, he had willed his specimens to the British Museum and I could picture the elation of Dr. Joyce at such an unexpected acquisition.

But it appeared that Sir Richard had not agreed with my views in this matter. His will—or that portion of it that held any interest for me or has any bearing on this narrative—provided that his collections should be divided between various institutions in England and the United States.

All specimens from British territories went to the British Museum; most of his Oriental specimens went to the University of Pennsylvania Museum; the Mexican and Mayan specimens were left equally to several of our most noteworthy museums, whose studies of the Nahua and Mayan cultures had been most important, while, to my unbounded amazement, his comparatively small but priceless and unique collection of Peruvian and Ecuadorean objects were bequeathed to me in view—so the testament most flatteringly put it—of my deep interest and noteworthy discoveries in the field of Peruvian archeology and the deceased Baronet's personal esteem and regard.

Naturally I was overwhelmed. Even before I received the collection, I realized what a magnificent and princely gift it was. I had, as I have said, seen the things and had studied them and no one appreciated their character and scientific value more than I did. In fact they were so valuable that I determined that I would at once place them in the museum for safe keeping, loaning them to the institution as long as I lived and leaving them to be preserved intact when I died. Only an ardent scientist can fully appreciate my feelings as I unpacked the cases and gazed at the treasures revealed. Yet, all else were forgotten, all the unwrapped remaining specimens disregarded when, upon removing the tissue paper coverings from one specimen, I found it a rather crudely-carved mass of semi-transparent green crystal.

Instantly I recognized it. It was manabinite—a larger piece than I had ever before seen—and I stared at it with bated breath, as wild thoughts and mad impulses raced through my mind. Here in my hand was the key that might open the closed door of Ramon's fate. Here might be the "open sesame" to enable me once again to look upon that microscopic village, to set at rest forever the question as to whether Ramon had lived and was happy or whether he had vanished once and for all. And yet—and my heart sank and I felt weak, helpless, bitterly disappointed at the realization that the lump of carved green crystal was useless to me. In its present form it would fail utterly as a lens or a prism, and I possessed none of the deep and profound knowledge of optics, none of the almost uncanny mechanical skill of Ramon. It would be utterly impossible for me to transform the crystal into a lens or a prism, and the knowledge that, although I possessed the raw material, I was incapable of using it, was a blow I could scarcely bear.

For hours I sat, brooding, staring at the translucent mass of green, cursing my lack of optical knowledge, wasting my time in vain regrets at not having learned Ramon's formula, and racking my brains in an effort to think of some means of making the rough green mass serve to solve the mystery of my beloved friend's fate.

THEN, suddenly, like an inspiration—almost, I thought, as if Ramon had spoken to me—an idea flashed across my mind. I could remember vividly the shape of the prisms Ramon had made. My long years of training, my acquired power to visualize the most minute details of a sculpture, or an inscription enabled me

to reconstruct, in my mental vision, every detail of the prisms. Of course I realized, even at that time, that no human eye could measure, much less carry in memory, the exact curvatures and angles of a complex prism or lens. But I was positive of the general form, and trembling with fear lest the image should slip from my mind or that, in trying to revisualize it more clearly, I might become confused and uncertain, I at once made careful drawings of the prisms as I remembered them. With these and my description to guide him, any expert optician could, I felt sure, transform my mass of Manabinite into a prism that, with careful grinding and adjusting, would enable me to again view the city where Nusta—and, I prayed God, Ramon also—ruled their minute subjects. Suddenly I leaped up, shouted, actually danced, as another inspiration came to me. I still had the delicate ingenious device by means of which Ramon had focused the prisms. One had come uninjured through the explosion of the prisms and I had preserved it, together with Ramon's violin and all else I had salvaged from Manabi.

No doubt, to an expert in optics, the device would be simple and easily understood, and would aid greatly in manufacturing the contemplated prism.

But to whom could I go with my problem? Rapidly I went over in my mind all the specialists, professors and acknowledged experts in optical physics with whom I was acquainted or with whose names I was familiar. They were lamentably few, but one was all I required. Finally I remembered Doctor Mueller, whose monographs and discoveries in his chosen field were world-famed. In view of what I hoped and expected, the fact that he was in Vienna was of no moment. I would gladly have encircled the globe had it been necessary. Within the week I was at sea, speeding as fast as the humming screws of the *Bremen* could take me across the Atlantic towards Vienna and Dr. Mueller; and locked securely in the Purser's safe was my priceless lump of manabinite, my drawings and the delicate device that Ramon had so skilfully and painstakingly wrought in his laboratory at Manabi.

CHAPTER II

The Doctor Makes Another Prism

DOCTOR RUDOLF MUELLER, next to Ramon the world's greatest authority on optics and physics, greeted me effusively and like an old friend, although I had never before met him. He was a diminutive, dried-up little man of indefinite age, bald as the proverbial billiard ball, with inquisitive eyes behind thick lenses that appeared to be held in place by his bushy overhanging eyebrows, and with such an enormous sandy moustache that I mentally wondered if all the hair which should have been on his head had not been diverted to this hirsute growth that extended fully six inches on either side of the face.

"Hah!" he exclaimed in guttural tones but in excellent English. "So, it is my pleasure to meet with you who have made such works of archeological greatness. *Acht!* Yes, it was with great interest I have read your so-wonderful story of the Herr Professor Amador." He shook his head sadly, his moustache waving like hairy banners with the motion.

"Then, Doctor, you will be doubly interested in my

purpose in visiting you," I told him, and as briefly as possible I explained my purpose.

He nodded understandingly. "Yah, yah," he muttered, "it is a most wonderful matter and most interesting to me. The manabinite—I have so greatly desired to see it, to experiment with it, to test it. And now you come with the crystal that I may make a prism for you that you may seek for your lost friend. No, my friend, I am afraid that you will be disappointed, for sad as it is, I feel that the Herr Professor was utterly destroyed. But we will see, we will see. Permit me the drawings and the instruments to examine."

He chuckled behind his moustache-screen as he examined my sketches. "From these sketches it would be most hard to work," he muttered, "but yet do I see in them the idea that is desired to consummate it. And the little instrument is to my eyes a delight, so-most-excellently made is it. *Yah, yah*, my friend, we will make a prism from the green crystal that will serve your purpose. But—" he threw out his hands in a gesture of finality—"no experiments will I make and no fiddle near my laboratory will I permit. *Ach*, no! I have no wish yet to vanish nor to be transformed into a microscopic man. And—" he laughed merrily—"if that should occur, then the crystal to you would be lost and everything ended. But—" he again sighed—"it is a so-great pity this wonderful carving to destroy."

I nodded. "Yes, it is a priceless thing, but what is a specimen—or even archeology—compared to my desire to learn the truth of Ramon's state? And if, as you fear, he was utterly destroyed, even that knowledge will be better than the uncertainty."

He agreed. "And maybe yet I can preserve the carvings," he announced as he examined the crystal. "Perhaps I may slice from the mass a section with the carving intact."

And so cleverly and skilfully did he work, that no least detail of the sculptured figures was injured or lost.

To relate the details and incidents of the manufacture of the prism would be tedious. It was done secretly, carefully and even though my sketches were of the crudest, yet so incredibly expert was Doctor Mueller that, once having determined the refractive index and other factors of the manabinite, and knowing what was desired and the general form and prismatic principles of Ramon's invention, and having studied the device for focusing, as it were, the little Austrian cut, ground and polished until he had a perfect replica—as far as I could judge—of the prisms made by Ramon. There was only one real difference. Ramon had built up his prisms from innumerable fragments while this was constructed from a single piece. And when at last the thing was done, and in order to test if it were correctly made we tried its powers of magnification, Doctor Mueller was almost beside himself with excitement and wonder. Yet the moment I gazed into the prism I realized that for some reason it fell far short of those Ramon had made.

Its magnifying powers were, to be sure, astounding—that is to anyone who had never before experienced manabinite's powers in this field, but as compared with those we had used at Manabi, it seemed scarcely better than an ordinary lens. No traces of atoms, much less of molecules could be seen, and I felt dubious as to the possibility of seeing the microscopic people with the thing. Whether the fault lay in the quality of the crystal—it may have come from some other source, for all I

knew—whether it was due to some error in Dr. Mueller's formula, or whether a built-up prism was superior to one made from a single piece of crystal, neither of us knew. And although by delicate and most painstaking regrinding and slightly altering the angles and facets of the prism some improvement resulted, still it fell far short of my expectations.

"But it is marvelous, most wonderful!" cried the Doctor. "*Ach*, my friend, if we had a piece of manabinite of so sufficient size, a telescope we could make that the inhabitants upon Mars would reveal. And, my friend, for the love of science, have a care that you do not destroy or lose this so-wonderful crystal.

"Into microscope lenses transformed it would revolutionize the study of biology and germs. *Ach*, yes, if a source of this manabinite a man could find, he would be a millionaire and the world might turn topsy-turvy."

I smiled. "I'm afraid that never will happen," I declared. "As I told you, the crystal is formed only by meteorites striking upon certain mineralized rocks. It is, in a way, a sort of nature-made glass, and I doubt if it has ever occurred in any spot on earth other than at Manabi."

He shrugged his thin shoulders. "Nature herself is constantly repeating," he observed. "Maybe tomorrow—next year—some one will find another deposit. But for now, my friend, all that the world of manabinite holds is in your so-competent hands. Much would I be delighted to make further tests and experiments, but it would be too sad were it to explode or vanish when so doing. So I must content myself with what I already have seen and wish with my whole heart that you may see your dear good friend again, alive and happy."

SO, bearing the precious prism that had required months to complete, and with Doctor Mueller's best wishes and hopes for my success in my ears, I crossed to England and took passage on a Pacific Steam Navigation Company's ship that would carry me direct to South America. At Panama I outfitted and transferred to a coastwise vessel for Guayaquil and six weeks after leaving Vienna I found myself once more amid familiar scenes. Nothing had changed since my last visit. Guayaquil still steamed and simmered in the sun beside the river. The same dank, pungent odor of bared mud flats and decaying vegetation arose from the mangrove swamps; the same boats swung to their moorings in the stream; the same idle, brown-skinned, cigarette-smoking, open-shirted, rope-sandal-shod customs officials dozed on up-tilted broken-down chairs in the vast bare office of the customs, and I could have sworn that the same pelicans flapped ponderously back and forth and plunged into the muddy water, and that the identical ragged, harness-galled donkeys drew the identical loads of coconuts and plantains through the glaring, roughly-cobbled streets.

The little *bongo* or sailing vessel that I chartered to carry me to Manabi was so like that in which Ramon and I had traveled that I felt a sharp pang of sadness at not finding him beside me. And though he denied all knowledge of it, and declared he never had seen me before, the fiercely-moustached, swarthy captain might have been the twin brother to him who had navigated our craft when Ramon and I had journeyed northward towards Manabi and the weirdly strange adventures and experiences we were fated to meet.

And when at last I stepped ashore and glanced about,

I scarcely could believe that it had not all happened yesterday or a few weeks past. There stretched the distant desert; there were the bare red and dun mountains becoming blue and hazy as they receded to the horizon; there were the spiny cacti, the sparse growths of gray-green shrubs, the mounds of gravel where we had dug. Yes, and there was my old camp—scarcely affected by months of burning sun and drenching rains; and beyond was the framework of Ramon's laboratory. Somehow, as I gazed about and recognized each familiar scene and detail, I had a strange, indescribable, almost uncanny feeling that Ramon was close at hand.

The moment I stepped ashore all my doubts of his still living fell from me like a discarded garment. I felt absolutely sure he was alive, and I seemed actually to sense his presence near. In fact this was so strong that, as I went about directing my peons and preparing for my camp, I found myself constantly glancing up and half expecting Ramon to appear at any moment. Of course, I reasoned, this was only natural. There where Ramon and I had been so long together, where we had undergone such strange experiences, where he had so mysteriously vanished, and surrounded on every hand by scenes and objects that brought him vividly to my mind, the reflex action of my mind would unquestionably cause such sensations in my brain. Yet despite my matter-of-fact scientific reasoning, I could not help feeling that my sensations were, to some extent at least, a premonition or a promise that Ramon still existed. I turned and gazed towards the spot where I had last seen him standing before the prism, his poncho draped over his shoulders, his violin in hand, ready to take that plunge into the unknown. Only the bare stretch of sand met my gaze. Yet there, invisible to human eyes and among the minute grains of sand, were the microscopic people, the minute city with its temple, the high priest, Nusta the beautiful princess and—perhaps—my lost friend, Ramon. But were they there? My heart skipped a beat and I drew a sharp hard breath as a thousand possibilities raced through my brain. How could I know if some sand storm had not buried them beneath inches of dust and sand? How could I be sure some torrential rain had not washed village and people away? How could I be certain that some creature—or even some man—had not dug or burrowed where the village had stood and had blindly destroyed all? Only by viewing the spot through my precious prism could I assure myself if the people still existed or if they had vanished, and I was not even certain that my prism would be powerful enough to reveal them if they were there. I was beset by terrible fears, by doubts, by the most pessimistic thoughts. I was mad to rush over, set up my prism and put all doubts at rest, and yet I almost dreaded to do so. And I was compelled to control myself, to calm my excited mind, to be patient, for I had arrived late in the day. The sun was rapidly sinking below the Pacific and there was much to be done before darkness fell, over land and sea.

So, fighting back my longings to set up the prism and end my uncertainties at once, I busied my mind with the more practical routine of establishing my camp, for I had planned to remain for some time. In the first place, I realized that it might require days, even weeks perhaps, for me to locate the precise spot where we had discovered the minute city and its people.

We had found it purely by accident and the entire settlement, I knew, occupied an infinitesimal area of the

earth—a spot smaller than a pin point. To find such a tiny area amid all that waste of sand would, of course, have been impossible by ordinary means, but if my prism served its purpose as well as I hoped and prayed it might, then it would not be such a hopeless task even if I was not absolutely certain of the exact situation of the village of the liliputian Manabis. But it would take time, even if, as I hoped and expected, I might still identify the precise spot where we had set up our prisms in the past. And even if I had good luck in locating the village, I intended to remain near for a considerable period. If I saw Ramon among the people, I would have my doubts set at rest but I felt sure that I would be unable to tear myself away for a long time. And if I saw no signs of Ramon, then I would try to forget my bitter sorrow at his loss by making a full and intensive study of the impossible people for the benefit of science.

But as I had no intention of carrying on archeological work, I had not brought any equipment for excavating nor had I engaged a large force of cholos as before. My outfit consisted mainly of supplies and my only companions were two young fellows I had engaged as camp boys and servants. One was a Jamaican whom I had found at Panama and who was to be my cook, the other a Quichua youth who was a sort of general utility man. It might be supposed that a party of three would not require much of a camp and that an hour or so would suffice to see us settled. And it would have been enough under some conditions, but it takes time to unload a cranky bongo (canoe) surrounded by bottomless mud. It is slow work portaging boxes, bundles, bales and packages on heads or shoulders up a perpendicular river bank and across an area of floury sand, and to set up a camp with mosquito netting screening, to arrange goods, chattels and supplies, to unpack, to get the commissary under way and to pay off and bid endless farewells and "May you go with God" wishes to the boatmen. So, by the time all my outfit had been transferred to my old camp site, and the two boys were unpacking food and bedding and the bongo was slipping down stream and Sam's fire was cracking under his pots and pans and Chico was helping me put up the mosquito bars, the sun had vanished below the horizon, and the gorgeous crimson, gold and purple western sky cast a weird lurid light across the desert and transformed the brown mountains to masses of molten gold.

Rapidly the shadows deepened, the myriad hues faded from the sky, the mountains loomed dark and mysterious against the stars and the desert spread like a black sea on every side. By the light of hurricane lanterns we ate our dinner and—so strange and inconsistent are the workings of one's brains—my last conscious thoughts as I fell asleep were not of whether or not Ramon still lived, but speculations as to whether or not the microscopic Indians had invented some means of artificially lighting their village after nightfall.

CHAPTER III

Ramon Returns via the Prism

NEVER have I felt more excited, more keyed up than on the morning after my arrival, when I unpacked my precious prism and its accessories and prepared to learn the truth regarding Ramon's disappearance. For some reason that I have never been

able to explain—even to myself—I had brought along Ramon's violin. Perhaps it was merely sentiment that had caused me to do so. Possibly I had been actuated by a subconscious, and wholly unrealized feeling that it might please Ramon—or his spirit. But mainly, I think, it was because it was the last thing that he had handled, the only connecting link, so to say, between him and myself, the only tangible object left when he had so suddenly and uncannily vanished with the explosion of the manabinite prism. At any rate, it most certainly was *not* because I had any thoughts or expectations of making use of it. I had no intention of attempting to reduce myself to microscopic proportions, even if, as I devoutly hoped, I was fortunate enough to find that Ramon had succeeded and had not been harmed by his strange transformation. And even had I desired to do so, it would have been utterly impossible, for although I had had the violin restrung—though I cannot explain why I had done so, for I did not know one note from another as far as producing them on an instrument was concerned. At all events, when on this momentous morning I was unpacking my instruments and prism and came upon the violin, something, some strange inexplicable whim or intuition, urged me to take it with me when I went to make the experiment that would settle my doubts and fears once and for all, or would prove to me that I should never know my dear friend's real fate.

It was with trepidation, as well as fast-beating pulses and taut nerves, that I approached the spot where, as nearly as I could judge by memory, Ramon and I had set up the prisms before. Somehow I could not rid myself of a most unreasonable fear of treading upon the invisible Indians—even upon Ramon—and utterly annihilating them. Yet I well knew—as we had proved so conclusively before, that a human being might walk directly over the village without causing the least damage. But the whole affair, the village, the people, the amazing condition surrounding them, even Ramon's disappearance, was one of those incredible things that, even when we know positively that they are so, cannot be believed. But my fears of treading upon the village were dispelled when I reached the spot and glanced about. Fate, Providence or Destiny—as well as Nature and the elements—had favored me. To secure his instruments when we had been preparing for Ramon's great adventure, he had driven stakes into the sand, and they still remained, infallible marks to enable me to set up my instrument on the precise spot. Though I have ever prided myself upon the steadiness of my nerves and my coolness under all conditions, though I have faced most tense and even perilous situations calmly and with no conscious feelings of excitement or nervousness, and although I do not honestly think that I ever had experienced what is commonly termed a thrill at the prospect of some new sensation or discovery, yet, as I erected the tripod that was to support the prism and realization came to me that within a few minutes I would perhaps be watching the microscopic people and their city, might even look once more upon the face of Ramon, I found myself a-tingle from head to foot, my hands shaking as if I had a severe attack of malaria, and I was aware of a most peculiar and entirely novel sensation in my knees, which seemed suddenly and without reason to have lost their power to support me steadily. In fact, my hands and fingers were so confoundedly shaky, that it was with extreme difficulty that I managed to set up the affair and to adjust the green

prism in its supports. But at last all was in readiness, and with beads of perspiration on my forehead, I swung the prism about as nearly as I could judge to the position our former device had occupied, and with a muttered prayer that the prism might not fail me, I looked into its sea-green depths and slowly, carefully adjusted the tiny screws and knurled knobs. For a space I saw nothing but a blurred, greenish haze. Then, so suddenly that I started, the tremendously enlarged sand leaped into view. Even though I had seen the same thing so many times before, even though I might and did expect it, yet for an instant I gasped, almost unable to believe my eyes. As far as all appearances went I was looking through glasses at a vast expanse of tumbled, inexpressibly wild and rugged mountainous country. Immense ridges and hollows were everywhere, their slopes, even their summits, strewn with great jagged, rounded, irregular, even crystalline masses of rock of every hue.

There were huge, shimmering, blood-red crystals like titanic rubies, ice-like octohedrons, that I knew must be diamonds, cyclopean six-sided columns of gleaming transparent material that I identified as quartz, cubes of vivid green, boulders of orange, yellow and amber; great rocks of intense blue, and countless fragments of every shade of brown, gray, ochre with here and there masses of jet black. It was, in fact, a mineralogical wonderland; such an array of rocks, gems, semi-precious stones and metalliferous ores as could exist nowhere on earth save in an accumulation of sand, the detrius of mighty mountains disintegrated, eroded, reduced to their primordial crystals by the elements through endless ages.

I had seen the same astonishing sight many times, as I have said, yet it was as amazing, as fascinating, as though my eyes had never before looked upon it and, for the fraction of a second, my thoughts of the miniature city and—yes, I must confess it—of Ramon were forgotten in my wonder and admiration of this immeasurably magnified yet infinitesimal portion of the dull earth about me. But only for the briefest of moments. The next instant I had moved the prism slowly towards the left, watching as I did so with bated breath, striving to recognize some detail of the enlarged scene before my eyes, expecting at any moment to see the houses or the temple of the city spring into the range of my vision. I drew a sharp breath. Could I be mistaken? No, there was the narrow pass among the boulders—or rather sand grains—down which the miniature, reduced burro had come as Ramon and I had watched him with incredulous, wondering, elated eyes. My breath came in quick short gasps, there was a strange tense feeling about my heart. The village was close at hand—the innermost fraction of a fraction of a millimeter from the spot; half a turn of the fine adjusting screw beneath my trembling fingers should bring it into view. A sharp, involuntary gasp escaped my lips. Clearly, as though it stood full-sized before me, I saw a low stone wall, a stone house! By its open door sat a woman spinning or weaving. Beyond were more houses, a street, men and women. I almost shouted with delight. Once more I was gazing at the microscopic Manabi village. Would I see the princess? Would I see Ramon? The crucial, long-dreamed-of moment had arrived. An instant more and—

I FELT myself hurled violently aside. I reeled backward, stumbled, strove to recover myself and came down violently with a jar that caused a whole constellation

to flash and rotate before my eyes. It had all happened in the fraction of a second, yet, even in that immeasurable period of time, I found myself wondering what had happened, what heavy object had struck me, what it meant. And there is no denying that I was terrified and completely upset—both figuratively and literally—at one and the same time. I was conscious also of a sharp pain and a most disconcerting jar as I fell. In fact the jolt must have been sufficient to have dazed me for a moment—if it did not actually render me unconscious, for I found myself blinking, rubbing my eyes and sitting up.

And what I saw came near causing me to lose my senses altogether. My jaws gaped, I felt paralyzed, as with staring wild eyes I gazed at the apparition bending over me. It could not be. It was impossible. I must be delirious, mad, suffering from delusions. Or had I been killed and was I in the spirit-land? For, as clearly, as plainly as though he were actually beside me, I saw—Ramon!

All these thoughts, these sensations, raced through my brain in the hundredth, perhaps the thousandth of a second. And coincidentally with them rushed other wild, impossible thoughts. Had I been, by some unknown means, reduced? Had something gone wrong with the prism and had I, like the burro, the dog, Ramon, been transformed to less than microscopic size? Or was it all an illusion, a figment of my overwrought brain, a chimera born of my excitement, my constant thoughts of Ramon, some injury to my spine or brain caused by my fall?

And as the vision, the ghost, the apparition reached out a hand and touched me, so tense, dazed, utterly bereft of my normal senses was I, that I screamed. Then, instantly, the spell was broken. "*Madre de Dios!*" the vision exclaimed. "I scared you almost to death. And I must have given you a fearful blow, I——"

The voice was Ramon's! It was no vision, no hallucination! By some miraculous means he, my long-lost, dearest friend, was there beside me! What if I had been reduced to microscopic size? What if I were lost forever to the world? I had found Ramon! He was alive, unharmed, the same handsome, smiling, kindly-voiced Ramon I had known and loved as only one man may love another.

I leaped to my feet, threw myself upon him, embraced him in the effusive Spanish manner. Never in all my life has such indescribable joy, such great happiness been mine. And even in that moment, when I felt his strong muscular arm about me, a wonder beyond words to describe or express came over me. I had *not* been reduced. I was *not* in the village. Not a house was visible. There, lying on the sand within a yard of where I stood, were the tripod, Ramon's violin, the prism, all normal in size. And there, at the edge of the trees, stood my camp. And Ramon was there, full-sized, normal, in every way just as I had last seen him except that—I stared, puzzled, uncomprehending—he was clad in dazzling, iridescent-hued, shimmering garments unlike anything I had ever—No! Sudden recollection came to me, they were—yes, the counterparts of the garments I had seen upon those microscopic inhabitants of the village. My brain whirled, I seemed to be taking leave of my senses. Ramon's voice came to me as from a vast distance.

"*Por Dios!*" he cried, "what a splendid prism! What a magnificent crystal!"

He had caught sight of my prism and, springing towards it, eagerly examined it. "Where did you find this mass of manabinite, *amigo mio?*" he exclaimed. "It is marvelous, *magnifico*. And I thought we had searched everywhere and had secured every fragment. No wonder I crashed into you and bowled you over, *amigo*. But I did not dream you were gazing through this. You see it resulted in my missing my aim, so to speak."

At last I found my voice. "What on earth *are* you talking about?" I demanded. "What has that prism to do with knocking me down? Where have you been, what have you been doing all this time? And where did you get that strange thing you're wearing? Am I dreaming or am I crazy or are you actually here, in flesh and blood, and unchanged? For Heaven's sake, Ramon, explain yourself."

He grinned and then roared with laughter until his face was scarlet. "If you could only see your own face, *amigo!*" he cried, when at last he could control his merriment. "Never, never have I witnessed such a mingling of perplexity, of wonder, of incredulity and of injured pride. But forgive me, my dear friend. Of course it is all most strange and inexplicable. You saw me vanish, you saw me join my princess, my beloved; you saw me become a tiny microbe-like being, and now you see me and hear me talking with you, just as though nothing unusual had occurred. But——"

"Pardon me, Ramon," I interrupted. "I did *not* see you join the princess. The prism through which I was watching was shattered by the same note that caused you to disappear. I never knew whether you were reduced or whether you were utterly destroyed and——"

"*Caramba*, my fiddle!" he exclaimed, ignoring my words and seizing the instrument. "Ah *amigo*, how thoughtful, how kind, how considerate you were to have brought it! So you *were* expecting me after all."

"Confound it!" I ejaculated petulantly. "Can't you answer my questions? Can't you explain? Don't you realize that I have been racked with doubts and fears? That I came here with the one hope—the forlorn hope—of settling once and for all whether or not you lived?"

Ramon smiled, but he was now quite serious. "Forgive me, my dear, dear friend," he begged. "It is only my joy and delight at being with you again that causes me to be so inconsequential. And of course I did *not* know that you were ignorant of the result of my experiment. But to reply to your questions. No, *amigo*, you assuredly are not dreaming, you are very wide awake and, as far as I can judge by your appearance, quite normal mentally. I *am* here, in flesh and blood, and—at the present moment—quite unaltered. As to what the prism has to do with my knocking you over: everything, my friend. And do you not recognize this garment—you who pride yourself so greatly on your trained eyesight, your ability to note the most minute details, to recall the most insignificant peculiarities of a fractured potsherd after months, years? Do you not remember the garments we both saw upon the microscopic Manabis? And as to what I have been doing, where I have been since that memorable day when I stood before the prism. Ah, *amigo mio*, I have been experiencing greater happiness, more wonderful love than I had thought could exist in this world. Never has life held such joy, such perfection as has been given me since I joined my Sumak Nusta. But you will understand when you, too, meet her and speak with her, as you will."

I GASPED. What on earth was he talking about. Was he mad? He was trying to make me believe that he had been reduced, that he had joined the princess. And yet I knew that was impossible, for was he not here before me, large as ever, and not a sign of village of Indians visible? Yet, there was his clothing, of that strange, iridescent, opalescent material that, as he reminded me, we had both observed upon the minute Manabis.

Ramon evidently judged correctly the doubts and the questions that were in my mind.

"Of course no one would believe my story," he said. "But you, my friend, having seen with your own eyes the marvels that the manabinite prisms can perform, should not be skeptical and should be able to comprehend. But I must tell my story. First, *amigo mio*, let us look through your prism at my people. My beloved one will be worried unless she knows all is well. Already I have been too long without reassuring her. Come, gladden your eyes and set your doubts at rest by again gazing upon the village of my people and upon the loveliest, the most adorable of women—my wife, the queen."

Still feeling as if in a dream, still beset with fears that Ramon or I were mad, utterly at a loss to understand what it all portended, I saw Ramon adjust the prism, glance through it, and utter a delighted cry.

"Here! Here, *amigo!*" he cried. "Is she not glorious? Is she not wonderful? And she sees us. She knows you, my dearest, nearest friend, are beside me, that once more we are united. Look, look *amigo!*"

In a daze, my mind a turmoil, I looked into the green depths of the crystal and as I did so a sharp cry of utter amazement escaped my lips. There, clear, sharp, shining in the morning sunlight, was the temple, the village. And there, lovelier than ever, was the princess, Nusta. And by the wrapt, joyous expression upon her face I knew that, as Ramon said, she was aware of his presence beside me. For a brief instant she looked directly at me—through the prism she appeared life-sized and seemed to be but a few yards distant and gazing into my eyes—and a strange sensation, a feeling of weakness, almost fear, swept over me as I saw those indescribably beautiful eyes so near my own, those half-parted lips seeming about to speak. Then, with a quick movement, she stepped to one side, and to my utter amazement I saw her bend and peer into a green prism that seemed a counterpart of the one before my own eyes. Before I could voice my wonder, before I could collect my thoughts at this incredible sight, she again rose, looked towards me and, touching her fingers to her lips with a lovely graceful gesture, she threw me a kiss.

CHAPTER IV

A Revelation

MY God!" I gasped. "She actually saw me, Ramon! And she has a prism—a manabinite prism! What, what *does* it all mean?"

Ramon, beaming with happiness, seized me and embraced me enthusiastically.

"Of course she saw you," he cried delightedly. "She saw you; she saw me. She knows all is well, that we are reunited. But isn't she the loveliest, the most glorious of women? Ah, *mi amigo*, is that not proof of the great friendship I have for thee? Is not the fact that I can

leave her, if only for a brief moment, proof of how I have longed and waited for the happy hour when once again I could see you, hear your voice, delight in your friendship? And is not the fact that she could permit me to leave, could risk losing me forever, proof of how greatly she values your friendship, of how grateful she is for your aid in bringing us together, of the sublime faith she has in me and my assurances? *Santisima madre, amigo*, until you have experienced such happiness as has been mine, until you have known such a love as ours, you will not, cannot understand what such a parting, such a risk means. But I felt sure, confident. Every detail of my plan was studied, and Nusta, wonderful being that she is, insisted that I take even that risk in order that you, dearest of our friends, might join us and share something of our happiness."

With the utmost difficulty I managed to confine my brain to lucid, logical, connected thoughts. If Ramon were crazy, so was I. But the sight of the village and of Nusta had convinced me that neither one of us was mad. There was some explanation, some common sense solution to the whole weirdly incredible affair of Ramon being there beside me and yet talking as if he had been in the microscopic village. And despite the fact that it controverted all common sense, and appeared utterly beyond credence that he should have been reduced and still should be in his normal state and size, yet I realized that it was even more preposterous to assume that he had been living here in the desert alone for all the months that had passed. And I knew, I was positive that he *had* vanished, had utterly disappeared before my eyes.

But he was speaking, and I concentrated all my senses upon his words, for at last he was serious, and was telling me strange, more incredible, more utterly amazing happenings than any living being ever experienced or that any man ever imagined.

"Though, as you now tell me, you knew nothing of what happened when on that morning I took the plunge and vanished," he began, "yet I never, of course, realized the fact. And thank God, I did not, for, *amigo mio*, had I known that you were in ignorance of the results, I should have sorrowed and grieved at thought of the doubts and the uncertainties that might have filled your mind, and my perfect, glorious happiness would have been marred. I cannot in words explain my sensations or just what happened to myself. I remember standing before the prism, of drawing my bow across the strings. Then I seemed lifted, whirled, swept into a greenish, misty vortex. It was not unpleasant—on the contrary it was a rather pleasurable sensation—somewhat like those strange dreams in which one seems to float—a disembodied intellect—in space.

"And then—exactly as though awakening from a dream, unable to know whether the vision had endured for hours or for the fraction of a second, I blinked my eyes to find myself standing before Nusta. With a sharp glad cry she rushed to me, her soft beautiful arms encircled my neck, I held her throbbing glorious body close, and our lips met. I cannot describe to you the wonder, the glory, the heavenly joy of that moment, when, after countless centuries, our two souls were again united in that embrace. And yet my heart was torn with fears that it was only a dream, a vision born of my longings. But Nusta was very real, and presently I forced myself to believe that I *had* been reduced, that I *was* among the microscopic people who had gathered, wondering, half-

frightened at my appearance, that Nusta my beloved was actually in my arms.

"Yet let me assure you, *amigo mio*, that even in that time of my new found love and happiness I did not forget you or my promise to you. Though we had no means of knowing if you were watching us, yet I turned and waved my hand, and Nusta at my request threw you the kiss I had promised you. There is no need to relate all the incidents and details now. I was happy—supremely, gloriously happy, and in the temple before the altar, Sikuyan, the priest, made Nusta my wife. Oh, *amigo mio*, if only I could convey in words some faintest idea of the joy I found with Nusta among her people. Hers is a community of perfect happiness, perfect contentment. There is no poverty, no sickness in that village of the little people. It is almost the land of perpetual youth. The people die only of old age or accident, and—*Madre de Dios*—the discoveries I have made! The puzzles I have solved! Ah, you must congratulate me, *amigo*, for among other things I have learned the secret that has puzzled me for years, the secret of how the ancient races cut and carved the enormous stones to build their cyclopean walls. It is a scientific wonderland, a treasure-trove of archeology, *amigo mio*, for Nusta's people have preserved all the most ancient traditions, all the knowledge, all the customs of their ancestors for thousands of years. Invisible to human eyes, by their minute size isolated from all the world, they have remained untouched, unaltered, unchanged by outside influences. But come! We are wasting time; you must see for yourself; let us hurry to rejoin my beloved Nusta. I——"

"Look here, Ramon!" I cried, interrupting his words. "This has gone far enough. Do you mean to stand there—full-sized as ever—and calmly try to make me believe you actually have been among those people, have actually met and married Nusta? And what's all this damned tommy-rot about my going with you to her? Have you got some crazy idea in your head that I'm going to try the mad experiment of being reduced. No, indeed."

Ramon smiled, but he looked hurt and grieved. "*Por Dios!*" he exclaimed. "You do not believe me, then? But, pardon me, my dear friend. Of course you would not credit my words; they must sound mad to your ears. Who would believe I spoke the truth? And yet, *mi amigo*, all I have related is as true as the Gospel. I was reduced, I *did* marry Nusta, I *have* dwelt among the microscopic people, and I *am* going back—yes, within ten minutes. And——" he grinned maliciously—"you, my friend, are going back with me."

I snorted contemptuously. Still, I thought, if Ramon were mad or if he were merely romancing—and I must confess I was beginning to believe his utterly preposterous tale—it might be well to humor him, to learn just how far he would go.

"Very well," I assented. "Admitting then that all you have told me is true, how is it, Ramon, that having been reduced as you claim, you are now here, life-size, unchanged."

HE laughed merrily. "By the simplest of means, *amigo*," he retorted. "By precisely the same means that reduced me." Then, more seriously, he continued. "In that microscopic village I found manabinite, quantities of it. To be sure the fragments were—judged by human standards, infinitesimal, particles—mere motes,

but in proportion to the size of myself, of the inhabitants, larger than any of the crystals you and I found here. And at once, when I discovered the mineral, a great vista, a wonderful idea came to me. I hoped—I felt sure, that sometime you, my dear friend, would return to this spot, and I grieved to think that you might be here, might actually walk above my head and I would be oblivious of your presence. But with a manabinite prism, and looking through the reverse field, I might be able to so reduce your image as to see you. *Santisima Madre*, but it was slow, tedious work, fashioning a prism without my tools, my instruments. But the people are marvelously skilful in working the hardest of stone, and by chipping, flaking, grinding and polishing we at last completed the prism. It was a poor, inadequate affair, but it revealed wonders, and elated, I made a second, a third, a dozen, until I had two that I felt would reveal your presence if you came here. Of course, *amigo mio*, I did not dream that you would have a prism, that you would be able to see me. But it was most fortunate that you did, for never would I have known you had arrived had it not been for your prism. Do you not see? Do you not guess? It was your image, your reflection in your own prism that at last—after days, weeks, months of watching, I saw. By itself, my miserable prism would never have revealed you, but my prism when focused upon the opposite end of yours, did the trick. It was like gazing at the image in the wrong end of field glasses through the other end of a second glass. Ah, *Dios mio*, how can I describe, how can I put into words the joy, the happiness that thrilled my veins when once again I saw you, my friend, appearing so near to me. And instantly, at once, I put into practice that which I for months had planned should this occasion ever arise, and which I had talked over with my adored Nusta so many times. Having been reduced, I had no fears of attempting the experiment and even Nusta felt confident there was no risk. So, standing behind my prism, I blew the note upon the *quena* I had prepared, and, as before, came the whirling, dream-like, disembodied sensation. Then a shock, a blow, and I bumped into you, *amigo*, full-size, unchanged, enlarged by the reverse action of the two prisms in unison. And here I am!"

I sank, speechless, upon the sand. No words suitable to the occasion came to my lips. Of all the absolutely amazing and incredible things I had heard or witnessed, this was the limit. And yet, as my dazed brain began to function, I could see no valid or logical reason why everything Ramon had told me should not be so. If a man, a dog or a burro could be reduced to microscopic size by means of almost magical properties of manabinite, why should a microscopic organism not be enlarged by reversing the process? As I thought of this, a sudden idea flashed into my mind, and I roared with laughter. "Good Lord, Ramon, you took a terrible risk," I cried. "How did you know that if your experiment worked you would regain your normal size? How did you know that you might not be enlarged to enormous proportions, that the power of the prisms might not transform you to a giant as much larger than ordinary men as they are larger than the little people yonder!"

Ramon smiled. "I knew," he replied, "because I have learned many secrets of manabinite's powers of which I knew nothing when I experimented here with you. Objects, reduced by the mineral, cannot be enlarged to more than their original size, and objects enlarged cannot be

reduced to smaller dimensions than they possessed before being enlarged. No, *amigo*, the risk I took was when I reduced myself. I had no positive knowledge that I might not be reduced to such minute proportions that I would be as much smaller than Nusta, as Nusta is smaller than ourselves at this moment. But I felt confident that she and her people had—or rather that their ancestors had—been reduced to the utmost limits which the manabinite could impart. And I had the evidences of the dog and the burro. They, if you remember, were reduced, and yet—though we had no previous idea of how greatly they would dwindle in size—they were in perfect proportion to the size of Nusta and her people. And I had another guide. As we looked at the village through the prism, the people appeared to be normal in size. Hence, I reasoned that as the action of the crystal when acted upon by the vibratory note was merely to make actual the image reflected in it, there would be no alteration in the size of the image when fixed, as I might say. And if Nusta and her people when refracted in the prism appeared normal in size, then, I reasoned, if the image were reversed, if my image were transferred in actual flesh and blood to the same spot upon which the prism were focused, I, when transferred bodily to that spot, would of necessity be exactly the same size as the people there. And I was quite right, *amigo*. But now, now that I know the powers, the properties, the means of controlling manabinite, and the laws that govern it, there are no risks. And——”

“Hold on,” I broke in. “I saw the princess—your wife, I should say—looking at us through a prism. How did it happen that when you enlarged yourself that other prism was not shattered? That was what occurred here when you were reduced.”

“That my friend, is one of the laws of manabinite. When used as a reducing prism, the stuff flies into dust-gas, I might say. But when used for enlarging an object, no visible alteration takes place in the mineral. But now, come, *amigo*! I must keep my promise to Nusta. I must return and I must bring you with me.”

I leaped to my feet. “You’re a consummate ass if you think I’m going to try any such experiment,” I declared angrily. “Even if I were willing to risk annihilation by the thing, I have no desire to remain a microscopic being. Why, Ramon, you don’t know how I have worried for fear that at any moment someone, something might come that would bury those people—and yourself—or destroy the village and its inhabitants forever. No, no, my very dear friend. If you really want to please me, if you want me to see and meet your lovely wife, if you wish to help those people, for the love of Heaven, enlarge them all to normal size and be done with it. You have it in your power to do so. Why delay?”

RAMON roared with almost hysterical laughter. “Oh what a timid, nervous old woman Don Alfeo is!” he cried between peals of merriment. “But tell me, *amigo*, are you, are the great cities, the communities, the inhabitants of this humdrum feverish world you live in, immune to cataclysms, to accidents, to disasters? Are your cities never destroyed by earthquake, by landslides, by hurricanes? Are not thousands killed every year by motor cars, floods, explosions, cave-ins, shipwrecks, volcanic eruptions, falling rocks and ten thousand other causes? Why and how then would we, we lit-

tle people, be any safer if normal in size? Perhaps—I grant that—if we could be enlarged to—well, say a thousand feet in height or even less, if we could become veritable giants, we might avoid many perils and disasters that decimate ordinary humans. But to be of ordinary size! Ah, *amigo*, we would be subject to far greater dangers than we are as microscopic beings.

“And why, dear friend, are you so fearful of being reduced? Is life in your present state and form so safe and secure that you have no least fear that some disaster may overtake you? And all your life you have been facing dangers far greater than this; braving new situations, making experiments that held far more uncertainty. I have been reduced, I know it is safe, that there is no danger, but even though you ran a great risk—which you do not—even though there was but one chance in a million that you would survive the test yet, I assure you, *amigo*, that it would be worth the risk just to see Nusta, to hear her voice, to know her in the flesh. I——”

“You forget,” I reminded him dryly, “that not only is the princess your wife, but that I am an old or at least a middle-aged man, and that Nusta is a glorious youthful woman. And while I do not deny that there may be much of truth in your words regarding her, and though I would be delighted to meet Mrs. Amador—or should I say the Empress Amador? yet you cannot really expect me to have the same ideas as yourself regarding the risk. But, seriously,” I continued, “I do not agree with you in respect to the safety of such a proceeding as you suggest. Possibly, yes, I will go so far as to say positively—there is little or no risk in you or perhaps myself being reduced by the prism. But how do you know that two persons can be safely reduced at the same time? Even if it were possible, is it not within the bounds of possibility that in the process of reduction, two personalities might be combined into one, or that molecules or atomic portions of one might be transferred to the other, or even that the effect might be to totally eliminate both?”

Ramon rolled upon the ground roaring with laughter. “You old scare-head,” he cried, when at last he could control himself. “There is no reason to assume anything of that sort. And now, see here. If some one should tell you that a totally new and unknown civilization had left wonderful remains on the further side of yonder mountains, and that to reach them it was necessary to climb the ridge, face the perils of glaciers, crevasses, landslides, dizzy precipices and the dangers of snow blindness and starvation; or if someone should inform you that to reach an archeological site you would be forced to pass through hostile Indian country with the attendant dangers of disease, insects, snakes, rapids and what not, would you hesitate? Would you weigh the dangers before starting out? Answer me that, *amigo*. Give me an honest reply to that question.”

I had to grin in spite of myself. Ramon had me there. I shook my head. “I never hesitated and never have considered any dangers that beset the path to scientific discoveries,” I admitted. “But this is——”

“Different, you were about to say,” he interrupted. “But permit me, *amigo*, to contradict you. Among my—Nusta’s—people, in that village that you have seen only through the prism, you will find scientific treasures, archeological discoveries beyond anything of which you ever have dreamed. And they are at your fingers’ tips, if you will come with me, my friend.”

Ramon had won and he knew it. He was well aware that I could not resist the bait he held out for me, and as a matter of fact, from the very first I had, in my heart, felt sure that I would undertake the experiment. My curiosity to see the place and the people for myself was irresistible. Still, I felt I could not yield so easily. "But suppose I wish to return to this normal world, as I shall," I asked, "are you sure I can be enlarged?"

"Absolutely," he assured me. "Was I not enlarged, and I can enlarge you even more readily than myself. No, the only trouble is that unless some one should discover another mass of manabinite, no one in the future can ever be reduced, for as you know, this prism of yours will be shattered when we reduce ourselves. So, my friend, if you leave us and are enlarged, and at any future time should wish to revisit us, you will find it impossible."

"Hmm," I muttered. "Well, let us not worry about the future, Ramon. For all I know there may be no future. Your hints of what I may learn in the line of science have decided me. I am willing to take the plunge with you."

Ramon sprang forward, embraced me, and his eyes sparkled with delight. "I knew you would, *amigo mio!*" he cried. "Ah, my friend, if you only knew the joy that fills me to know we are not to be parted. And Nusta, too, will be filled with happiness. Come, waste no more precious moments. Everything is in readiness. Stand with me behind the prism and in a moment more we will be looking into Nusta's glorious eyes, hearing the music of her voice. And—I forgot to tell you, *amigo*—she speaks Spanish. I have taught her, in expectation of this glorious time, in hopes that some day you would be with us."

CHAPTER V

Accepting His Friend's Invitation

I MUST admit that, as I stood there with Ramon behind the prism and watched him examine his *quena* and prepare to produce the note that would cause such miraculous results, I felt nervous, tense, keyed-up and well—I must admit it—somewhat fearful of what was about to occur. I cannot honestly say that I was afraid, for during a long life of adventure and of exploration in the wilder portions of our hemisphere, I had faced too many perils and death in too many forms to know the true meaning of what most persons call fear. Not that I am braver than the average man. I do not lay any claim to that, but merely because familiarity with danger breeds something of contempt for it, and because fear so often brings on disaster that I had trained myself to eliminate fear from my reactions. In fact I sincerely believe that I would have felt less uneasy had I been certain that the note upon Ramon's *quena* would result in our complete disintegration, for it was the uncertainty of the matter, the sensation that we or rather I was about to enter the unknown, that affected me. It is this dread of the unknown, I believe, which is the basis of most of human beings' fears and terrors. It is dread of the unknown that causes men to fear death, that makes children and some adults fear the dark, that has led to the almost universal belief in and fear of ghosts and spirits, and that is the basis of nearly all our superstitions. I might even go further and say that our religious beliefs are the direct results of man's

fear of the unknown. Religion originally was invented in order to calm those fears by explaining the unknown, by picturing it as a delightful place, and by peopling it with personalities, gods or beneficent spirits. And the more highly civilized and intelligent a man is the more, I have found in my experience, he dreads the unknown. Animals do not fear death; neither do primitive savages, for the brute has no conception of the unknown, possesses no imagination, and the savage feels so assured that his conception of after-life is correct that, as far as he is concerned, there is no unknown. And I am sure that the reason that Orientals and some others court death rather than dread it is because they, too, feel convinced that there is nothing unknown before them. The idea of leaving this familiar world, this life with its pleasures and its pains, to be plunged into some state of which we know absolutely nothing and from which no one has ever returned, is, I confess, rather appalling. In fact few persons are capable of imagining anything or any state other than an earthly existence. And I was on the verge of taking a plunge that was not only into the unknown, but that, if I could trust Ramon's words and assurances, would transform me into a microscopic being; truly a transformation that was so incredible, so utterly beyond reason or the known laws of nature that even my brain could not really conceive of it. To be sure I had one advantage over the man whose life is about to end, and I had one great advantage over Ramon when he had taken the chance in the first place. He had been through the experience and had told me of the sensations, the results. Still, there was the chance, the possibility, that the prism might fail when two persons attempted the experiment, and there was the possibility also, that for some reason or another, the result might be disastrous for us both. How could I be sure this particular prism was precisely like the others? How could I feel certain that the least variation in its composition, its form, its adjustment might not destroy us or reduce us to such infinitesimal proportions that we would be invisible even to Nusta and her people? But I had made up my mind. Ramon's hints at scientific truths to be discovered would have led me to take far greater risks, and while all these thoughts, misgivings and reasons flashed through my perturbed brain I had no intention of backing out. Then, suddenly, just as Ramon placed the *quena* to his lips, I remembered something.

"Hold on!" I cried excitedly. "I'd forgotten about my men. It won't do to vanish without preparing them for my disappearance. What the devil shall I tell them?"

Ramon grinned. "Why tell them anything?" he asked. "After they've eaten up all your supplies they'll find their way back to Guayaquil or Esmeraldas or somewhere, and tell a great story of you being whisked off by devils or getting lost in the desert."

"Yes, and probably be shot or hanged for murdering me," I reminded him. "And even if they escaped such a fate I have no desire to have my mysterious death published far and wide, and then later bob up. There'd be some rather incredible explanations to make."

"You'd really be famous if you vanished, and think what sport it would be to read all the complimentary things the world would say about you. But, honestly and seriously, I see your point. Why not tell the fellows you're going off alone and not to worry if you don't return. You might give them a letter stating they were to be held blameless if you never reappeared."

"Not bad," I commented, "but suppose they should decide to clear out before I were reenlarged, and I should find no one here, no food, no boat? It would put me in a far from pleasant situation."

"All the more reasons for you not ever to return to normal size," he declared. "And I don't believe you ever will, *amigo*. But you might set a definite time for your return, and tell them to wait for you until then, and if you fail to reappear, to leave and report your loss. How long will the supplies last them?"

"With reasonable care, about two months," I replied. "I think your suggestion the only practical one. I'll tell them I am going off with a friend I have met, in order to visit an ancient city, and that I may be absent two months. I shall surely be ready to have you enlarge me by that time."

Ramon grinned maliciously but said nothing, and I hurried off to my camp to give instructions to my men. Being unemotional and unimaginative fellows, and quite content to live a lazy life and feast upon my provisions for the next sixty days, they asked no questions, took my announcement as a matter of course, and showed no indications either of wonder or curiosity at sight of Ramon, who was standing near.

THIS matter having been thus arranged, we returned to the prism and again took up our positions, standing as closely as possible together as Ramon tentatively ran over the scale upon his instrument. Then, with a smile and a nod, he indicated that the moment had come. The next instant the shrill, quavering note rang in my ears. Involuntarily I shut my eyes, clenched my hands, prepared for the strange sensations Ramon had described. But instead of the whirling, dream-like feeling I had expected, I heard an ejaculation from Ramon and opened my eyes. Nothing had happened. We were still there beside the prism, and Ramon was staring, a puzzled, uncomprehending half-frightened expression on his face.

"*Nombre de Dios!*" he cried. "What is wrong?" *Santisima Madre!* Is it possible? Is it—" he left his sentence half finished, leaped aside and seized his violin, and an expression of delight, of vast relief swept across his features. "*Caramba*, of course!" he exclaimed. "I should have known. What a fool I was. And for an instant I feared—*Valgame Dios* how I feared, that something was amiss, that never, never would I be able to return to my beloved one. But it was the *quena*, *amigo mio*. Its note—enough to enlarge me—was too weak to work upon this crystal and to reduce us. But now—now, with the note upon my fiddle, in a moment more we will be standing beside my Nusta."

Oddly enough, as sometimes, in fact so often, happens, all my nervousness and doubts had vanished with the sudden reaction that had followed that tense moment. And as Ramon tucked the violin under his chin and grasped the bow ready to draw it across the strings, I recalled a matter that had puzzled me greatly.

"Just a moment!" I exclaimed. "How was it, Ramon, that when you were reduced your violin remained intact? When I picked it up after you had gone, I found the strings had vanished with you but otherwise it was not affected, and yet the glue that held it together should have vanished also, being animal matter."

Ramon threw back his head and roared with laughter. "Ah, *amigo*, for a keen, observant scientist you some-

times are most unobservant. The glue that holds it together, indeed! Why, my dear friend, did you not know, have you not noticed that there is *no* glue used in this instrument. See—" he held it out for me to examine—"it is not a real violin but a *Charanko*, a native Peruvian fiddle hollowed complete, body and neck entire, from a single block of wood. And the sounding board, the belly, is attached to the sides, not by glue but by *Karamani* wax, a cement composed of vegetable gums, the secret of which is known only to the jungle Indians of the upper Amazon. Now, *amigo mio*, do you understand? And this time, my friend, we will be off. If only I could take my *Charanko* with me! How Nusta would delight in its music!"

Again he cuddled the instrument beneath his chin; his lips smiled, happiness shone in his fine eyes, his fingers caressed the strings, and with a sudden, swift motion he swept the bow downward. I was watching him intently. I saw the sudden motion of his wrist and elbow, I heard the first crescendo note and then—Ramon, desert, everything seemed swallowed in a dense fog; a gust of wind seemed to lift me, whirl me about. I seemed floating—a spiritual, weightless, entirely disembodied intellect upon billowy clouds. Yet my mind, my brain was functioning perfectly. I found myself speculating upon what had occurred, upon what was to be the result. I endeavored to correlate, to fix every detail of my sensations in my mind. I recalled the exact motions of Ramon, the precise sound of the note that had preceded my dream-like state, and I wondered, rather vaguely, if my sensations were the same as those of a person who died, and whether I might not really be dead.

I seemed to remain in this peculiar state, drifting like a bit of thistle-down in a faintly luminous haze, for hours. I began to think that I would continue to drift in this state forever, that the experiment had been a failure, that both Ramon and myself had been killed. And then, abruptly, with precisely the same shock of consciousness that one experiences when suddenly awakened from a dream, my mentality seemed to fit itself into a corporeal body, my feet touched firm earth and the mist vanished.

For a moment I could not believe my eyes, could not credit my senses. I was standing in the Manabi village! Everything seemed normal, natural. The houses near me appeared normal-sized houses, the earth seemed ordinary sand; against a blue sky loomed a range of hills, several Indians of ordinary proportions were within range of my vision, and with a sharp, delighted yelp a mongrel dog fawned against my legs. Could it be possible, was it within the bounds of possibility that I had been reduced, that Ramon's experiment had been such a complete success, that everything appeared perfectly normal and natural, because I, instead of being a full-sized man, was in perfect proportion to my surroundings?

CHAPTER VI

In the Microscopic Eden

THEN, to my confused, whirling brain came the sound of a voice; a voice so musical, so soft, so melodious that the words might have issued from a silver flute. I wheeled at the sound and stood dumb with emotion, speechless with wonder, gazing transfixed at Nusta, who stood almost beside me, clasped in Ra-

mon's arms. Instantly all doubt vanished from my mind. I had been reduced. I actually was in the miniature village. I was a microscopic being gazing with rapt admiration at the transcendently beautiful creature whose glorious head rested upon Ramon's breast, whose wonderful eyes were fixed upon me, whose luscious, adorable lips were half parted in a ravishing smile. Ramon, the villain, was grinning from ear to ear at the expression of bewilderment and amazement upon my face.

"Well, *amigo*, here we are!" he observed, as he caressed Nusta's hair. "And," he continued, "when you have quite recovered from the novelty of your experience I shall be delighted to present you to Her Majesty, Queen Naliche of Urquin, otherwise the Señorita Amador."

Then, to the superb woman in his arms, he spoke in Spanish: "Did I not say, *alma de mi vida*, that he would come back with me? Did I not promise thee, *corazoncito*, that all would be well, and that the staunchest, dearest friend a man ever had would join us here in Urquin?"

No wonder, I thought, that Ramon had been willing to risk death, the unknown, anything, on the chance of joining such a woman, with her love as the reward for his risk. The lucky devil! And it spoke volumes for his friendship for me that he could leave her—if only for a few moments—perhaps to lose her, in order to join me and induce me to return with him to the village which he called Urquin.

I had now in a measure collected my thoughts, and bowing low to Nusta, or as I should perhaps call her, Queen Naliche, I murmured conventional words of salutation and expressed my delight at being in her presence. The next instant I was blushing scarlet and devoutly wishing I were a thousand miles from there, for I had become suddenly aware that I was naked to the waist. I had been wearing a cotton shirt, and of course it had been left behind, lying somewhere upon the sand beside the shattered prism in that outer normal world. Fortunately, I had worn woolen trousers, for otherwise I should have been a veritable Adam in this microscopic Eden. And my embarrassment was increased a thousand-fold by Nusta's, no, Naliche's next words.

"Oh, my Ramon," she exclaimed, "how beautiful is the body of our friend. It is as white as the robes of Melik the priest."

Ramon burst into a guffaw of hilarity at her words. "*Caramba!*" he exclaimed, addressing me, "I'll be getting jealous of you in a moment. The idea of you appearing in such dishabille in the presence of a queen! And my wife is in love with that blond torso of yours already! Not here five minutes and she can't take her eyes from you. Shame on you, my friend! But—" with a change of tone, "I know just how you feel, old man: as if you'd been taking a bath and the walls of the room had suddenly vanished. I'll fix you up in a moment."

He gave some order to an attendant standing near and in a few seconds the girl returned with a garment similar to Ramon's own. Donning the gorgeous opalescent thing I felt far more at ease, but Naliche declared that she thought I looked far better without it. Modesty is, I reflected, a most peculiar thing after all. Many of the men, and a number of the women, who had gathered about wore no garments above the waist, and even Naliche's costume left little to the imagination, yet I had felt inexpressibly embarrassed and ill at ease, absolutely immodest, when I had realized my condition.

And I could well understand Naliche's surprise and—perhaps not admiration so much as curiosity—at the color of my skin. I was the first really white man she or any of the people had ever seen. Even Ramon's skin was a decided olive; Naliche, fairest of all her race, had a glowing, golden color, and I knew from long experience among Indian tribes that nothing arouses greater wonder among brown-skinned people than the first sight of the colorless epidermis of a white man's body.

Ramon's voice interrupted my half-conscious meditations on this phase of human psychology.

"Now that you are clothed and—I hope—in your right mind," he remarked, "permit me to invite you to accept the hospitality of the palace, *mio amigo*. Even the most sublime love and the most wonderful of women—" with an affectionate glance at Naliche—"do not, I find, prevent one from having a healthy appetite. For myself, *amigo*, I am famished—my appetite has not diminished with my size—and you will find that we of Urquin do not lack the good things of life." Then, with a laugh and mock bow, "Don Alfeo," he said, "will you be so kind as to escort Her Majesty to the repast that awaits us?"

Naliche's eyes sparkled mischievously, and she laughed musically. "Can you not be serious, O King of Urquin?" she asked him as, flushing and feeling quite like an awkward schoolboy, I took Naliche's arm. And I must confess that at the touch of her hand, the nearness of her living, pulsing body, the ravishing beauty of her face and eyes so close to my own, a most disconcerting but very delightful thrill ran through my veins. And I no longer marvelled that Ramon was quite willing to forego all the rest of the world and to dwell here in this unknown, invisible spot, where grains of sand were mighty mountains, where a millimeter was a vast distance and where the very lovely, very feminine, supremely alluring woman by my side was his bride and his queen, even though she were smaller, yes a thousand times smaller, than a mote of dust. Abruptly, at the thought I chuckled, and Naliche turned her eyes questioningly upon me.

WHAT a strange thing is habit! How unreasonably, with what fallacy do we humans measure and judge matters! Invisible, microscopic, indeed! Motes, grains of sand, mountains, millimeters! These people were no more microscopic than I was. Everywhere about were grains of sand by countless millions. In the brilliant shaft of light that streamed through a window, sparkling motes danced and gyrated and against the horizons mountains loomed blue and hazy.

It was all a matter of proportion, of comparison, of relativity, as I might say. To these people—to myself if I had any sense—everything here was quite normal, full-sized, entirely natural. But I had been born, had lived, had become accustomed to another sphere of life, and my brain, my thoughts, my impressions remained those of the man—the gigantic incredible being—I had been. I still thought, reasoned and made comparisons as though I were yet in the world to which I had been accustomed from birth. I thought in terms of the world I had left. And yet how did I know, how did anyone know that there might not be other worlds, other phases of life, other human beings to whom the earth and its inhabitants—as I had known them—would appear as infinitesimal as this land of Urquin had appeared to me?

And how could I, or Ramon, or Naliche, or any of these people, be sure that there were not still other beings, other places, still smaller, quite invisible to them, and so on *ad infinitum*?

But I could not explain all this to Naliche, whose questioning eyes were upon me and whose silvery questions were delighting my ears. Though she spoke Spanish marvelously well, and was a remarkably intelligent little creature, yet to attempt to explain matters of which she had no conception was, I felt, beyond my limited powers. But I found that I had greatly erred. Ramon had told her all about the gigantic world he had left in order to join her. And he had made clear to her the amazing properties of the prisms and how he had been reduced. She was quite familiar, therefore, with conditions outside her own domains; she was aware that there was another world, other people of whom Ramon and I were individuals. But, most important of all, she was thoroughly familiar with the history of her own people. She knew the tradition of how her race had once been in that other world, huge people—I must say normal, to express my meaning—and how, by a great calamity, nearly all the race had been destroyed and the remainder had been transformed to their present state. To be sure, until Ramon had told her of the manabinite she had had no idea of what had occurred in the dim past, of how her people had been translated to a new existence, and she had had no slightest idea that she and her people were any smaller than their ancestors. But once Ramon had explained, once he had told her his theories and suppositions, it had all been clear.

Just as he had surmised, some of the ancient Manabis, sometime in the past had, by merest accident, by some vibratory note in all probability, been instantly reduced to microscopic (there I go again, but it cannot be helped) proportions. Naturally, not realizing what had occurred, these few, finding themselves alone in a strange spot, had assumed that all their fellows had been wiped out by some cataclysm. And being unconscious of the amazing alteration in their own size and surroundings, they had made the best of their state, had lived, established themselves, built their houses and temple, had increased and had survived believing themselves still physically unchanged and the sole inhabitants of the land. Also, as Ramon had told me, having been thus cut off and isolated through countless centuries, they had remained uninfluenced by time, by other civilizations and races, preserving all the customs, the arts, the traditions, the faith, and the unspoiled, unsullied simplicity, contentment and happiness of which human beings are capable, when free from vain ambition, politics, alien influences, envy, greed, wars, and all that go to make ordinary mortals unhappy, restless, unsatisfied and sinful.

All this I learned from Naliche—helped out by Ramon—as together we ate in the ancient palace of Urquin. And as the tale unfolded and as I glanced about at my surroundings, I realized the truth of Ramon's words when he had declared that the place was an archeological treasure-house. Yet, somehow, it all seemed most unreal, most dream-like. I was feasting upon delicious yet strange viands—delicate meats, delectable vegetables, luscious fruits, and sipping chicha. Beside me was a breathing, vividly alive, beautiful woman. Within reach of my arm was Ramon, dark, handsome, unchanged. Silent-footed, half-naked girls moved about, attending to our wants. From somewhere the plaintive notes of a

queua drifted to our ears, and yet all my surroundings, the ornately sculptured walls of the great hall, the pastel-colored frescoes, the mosaic floor, the vessels of marvelous pottery, of gold and of carved precious stones, might all have been those of a civilization that had vanished and had been forgotten hundreds, thousands of years before. I had in effect been whisked back through the ages, not only reduced physically but translated bodily to the life, the surroundings of perhaps three thousand years before. Even while listening to the story, the fascinating revelations of my companions, my mind or a portion of it was pondering on the past, on the amazing manner in which Urquin and its people had been preserved unchanged. Tempest, cataclysms, wars, conquests had passed them by. The steel-shod horses of the Spanish invaders, the tramping feet of Pizarros' men had marched unsuspected, unsuspecting overhead. Kingdoms had risen and fallen, rebellions had devastated the land, civilizations had come and gone and yet these people, invisible, indescribably minute, had been, as Ramon had so truthfully expressed it, unharmed, unchanged, unsullied by their very minuteness that, at first thought would have appeared to have left them at the mercy of the first breath of wind, the first downfall of rain, the first chance passer-by. Yes, verily, that which had seemed a calamity, that which had appeared such a misfortune had proved their salvation, the most fortunate of occurrences. And I was soon to learn that it had been even a far greater blessing than I imagined.

CHAPTER VII

An Astounding Discovery

AFTER the meal, Naliche left us, and Ramon suggested that we should stroll about the city—for it deserves to be referred to as more than a village.

Although I had observed much of the life and of the industry of the place when viewing it through the prism with Ramon, yet I found I had practically no real knowledge of the place or its inhabitants. My position might be likened to that of a person who had seen a motion picture of some strange and distant spot and had imagined, from repeatedly watching the picture, that he was familiar with the place and its people. To be sure, Ramon and I had seen the actual happenings, the actual people, the actual buildings. As far as I had been able to obtain any real knowledge of affairs I might as well have watched cinematograph pictures thrown upon a screen. And at every step, at every turn and every new sight, I was more and more fascinated, more and more amazed.

In one day, I realized, I could learn more of the ancient races of Peru, could make more archeological discoveries than in months or even years devoted to poking about crumbling ruins, disinterring mummies, trying to reconstruct life and cultures as they had been ages before. For here I was surrounded by that life and culture, I was among the people who had left those amazing structures, whose feats had mystified the world's scientists for generations. In this splendid temple that we were approaching, I saw the counterpart of the wonderful temple of Pachakamak as it must have been when that sacred city was a Mecca for the races from Mexico to Chile.

Often, in company with my friend Dr. Tello of the

Lima Museum, I had examined, explored and studied that most ancient of Peru's temples, and in an entirely friendly way we had argued and discussed the questions of its original plan, its details and the purposes of its various portions. Never had we been able to agree upon any of these matters, and the accounts of the Spaniards—the letters of Hernando Cortez, who visited the temple in his search for loot—threw little definite light upon the matter. Yet here, in the great temple of Urquin, I had almost a precise replica of that at Pachakamak, and at a glance, a most cursory examination, I realized how far wrong both Don Juliano and I had been in our assumptions, our theories and our ideas.

Through the prism I had obtained no adequate impression of the temple or of its details. It had appeared a somewhat pyramidal structure ornately and impressively decorated, but I had been far more attracted by the people, the priests, and by the worship, than by the structure itself. And a score of other puzzles were solved as Ramon and I mounted the immense steps and stood within the portals of the temple. The great stone thrones or chairs, of which I have already spoken in my former manuscript, the symbolic images, the frescoes and every accessory all had their distinct and obvious reasons for being there. Objects that from time to time had been found in ancient ruins or in tombs, and whose uses or purposes no one had been able to explain, were here with their purposes quite obvious. Also, with something of a shock I found that theories and suppositions, that had so long been accepted by all archeologists as to be regarded as facts, were utterly and instantly destroyed, scrapped, and that much that I had always looked upon as almost incontrovertible truth was palpably false. I had always believed, as had others, that the story of creation as known in Peruvian folklore had been instilled by the Spanish priests and did not antedate the arrival of Europeans.

Yet here, in magnificently-executed frescoes, was the pictured tale. I, like others, have always maintained that no ancient Peruvian (and by that term I mean Ecuadorian as well, for of course there were no such places as Peru and Ecuador in pre-Columbian days) possessed a recorded language. Yet here, arranged in regular chronological order within niches—precisely like those that for years had proved a mystery to all scientists—were rows of the effigy and portrait jars that—even at a glance—divulged their purpose as ideographic records. And the peculiar elliptical, pointed-bottomed urns that Saville and others, including myself, had found in such numbers at Manabi and elsewhere in Ecuador, were here by scores, each filled with ashes of long dead and cremated members of the community, and each with its life-like portrait-jar bearing the face and features of the deceased, beside it.

Here, too, was the great altar, and above it the gleaming golden image of the sun flanked by the silvery moon, the varicolored rainbow, the planets and stars, exactly as the old Dons described the arrangement within the great Kori Kancha, or Temple of the Sun, at Cuzco. But the Spaniards had fallen far astray when they had described the figures. They had, to be sure, stated that the sun bore the likeness of a human face upon its surface, that upon the moon-disk was the face of a woman. But they had failed to relate that the face upon the polished golden sun was that of a benign, kindly-appearing, bearded man.

It was the face of a white man.

RAMON was watching me intently and I saw a triumphant smile upon his face at my expression of surprise.

"Wira Kocha," he observed in a low voice. "The original Bearded One of the ancient legends. I am no archeologist, as you know, *amigo*, but even I recognized him instantly. And if I am not mistaken, it knocks the jaguar-god theory all to bits. See here—doesn't this give you a jolt?"

As he spoke, he stepped towards a shrine-like recess and I gaped in wonder. There, surrounded by offerings of fruit, textiles, weapons, precious stones and other objects, was the life-sized statue of a bearded white man! There could be no question of the fact. The features, the hair, the long flowing beard, the heavy luxuriant moustache, were all unmistakably those of a European. And so perfectly modelled were the features that any anthropologist would instantly have recognized them as distinctly, indisputably Semitic. But if there had been any question, there were the garments. Upon the head was a tight-fitting skull-cap with tabs or ears, a cape or shawl was over the shoulders, and a toga-like robe covered the body.

I felt dazed, thunderstruck. Yet, though it destroyed all my preconceived ideas, I knew that what had always been deemed a fable, was actual fact: Wira Kocha, most revered of the ancient Peruvian divinities, the Bearded One, as he had been called, had actually existed, and he had been a European, a white man, and that ages, centuries before Columbus, a Semite, a Hebrew—or more likely many of the race—had reached the shores of the New World and had visited Peru. The conviction, the certainty that this was so, instantly explained innumerable puzzles. It solved the mystery of why there are no known evolutionary forms of the arts, cultures and religions of the ancient Americans; it accounted for the many inexplicable similarities in mythology, worship, arts, architecture, physiognomy and even dialects between those of America and the Old World, and into my mind flashed the knowledge that it explained the ancient legend of the coming of Manko Kapak, the first Inca. The tale was merely an allegory; Wira Kocha, the Semite, had come from the east, he had been revered as a divinity; he had taught the people their arts, their religion, their civilization; he had organized and enlightened them, and during the thousands of years that had passed he had become inextricably confused with the first Incan ruler of whom the people had any definite knowledge. What more simple? And I now knew why the Incas, the royal family, had been—according to the old Spanish chroniclers—men and women very different from their subjects; tall, fine-featured, light-skinned; often brown-haired. And why Nusta—no, Naliche—was so fair, so lovely, so totally unlike the humbler inhabitants of Urquin. All were descendants—or partial descendants—of those wandering Jews, who, no one could say how long before, had reached America, had settled in the land, and had left their indelible imprint upon the people, the civilizations, the mythology of the ancient American races. I felt that I could not be wrong. The statue or image left no shadow of doubt as to the nationality of the original, and it was so obviously a likeness that I felt it must have been modelled from life. Yet—and the thought was disconcerting—how could that be? The stranger assuredly could not have been seen or known to these microscopic people, and if the statue had been made before they had been

reduced, how could it—an inorganic thing—have been reduced with them? I turned to Ramon and voiced my perplexity.

He smiled. "That troubled me, also," he admitted. "But it is very simple, *amigo*. If you will examine the image very carefully, you will find that it is not what you surmise, but the real thing. Yes, *amigo mio*, it is old Wira Kocha himself—or what remains of him—his mummy."

I could scarcely credit my ears. But a moment's close examination convinced me. What I had mistaken for a beautifully-modelled or carved image was a most marvelously preserved human body. Not one of the dessicated, shrivelled bodies called "mummies" that are so common in Peru and elsewhere in South America, but a cadaver preserved by some mysterious lost process more remarkable than anything ever accomplished by the old Egyptians or by any other race. Still, there had been a great deal of reconstruction done upon it. I could see that portions had been filled out, modelled in, that the features had been touched up, and that the hair, beard and moustache had been moulded into solid masses with some clay-like material. But Ramon was again speaking.

"According to tradition," he said, "the explosion of the manabinite altar—for it was a sacred altar and not a prism that reduced the people—the explosion, I say, took place while a very holy ceremony was being conducted. And the mummy of Wira Kocha, being within the range of the activity, was reduced at the same time as the living beings. Of course, when the people came to their senses, there was no trace of their temple, their houses, or anything else they had known. But there, beside them, was their venerated god, a little the worse for what he had been through—minus ornaments and decorations, with all the added modelling and patching missing, but still in good shape. And this, of course, convinced the people that he had stood by them, guarded them, had protected and saved the few chosen ones from destruction. Hence he became more sacred, more adored than ever, and though we have the sun-god, Inti, of my people, yet in Urquin, Wira Kocha, the Bearded One of my ancestors, of all the ancient races of Peru, is the supreme, the omnipotent."

I could not find words to express the thoughts that filled my mind as I stood there, gazing transfixed at that hard, dark form that once had been a living, breathing human being. Who was he? Whence had he come? How many thousands of years had passed since he had left his home in Palestine, Turkey, Phoenicia, Babylonia—perchance in Atlantis, and journeying over seas had found this new world and had become revered as a deity born of the sun?

WHAT a strange, fascinating, incredible tale those bearded, kindly lips could relate could they but speak. Yet, I mused, it would be no stranger, no more incredible than the tale I could tell of my own experiences here in Urquin.

And even the wonders of the Bearded One, of the temple, of all I had seen, were no greater nor more interesting than the discoveries I made at every turn as Ramon guided me about the city. It was like stepping back perhaps ten thousand years. The arts, the habits, the life of the people were all those of the Manabis before the untoward shattering of their manabinite altar had segregated them from all mankind.

"Here's something that will interest you," announced Ramon, indicating a group of men busily at work in the shelter of a thatched shed.

I drew near and saw that they were metal workers, and I uttered an exclamation of delighted surprise when I saw that they were plating copper and other objects with gold. How often had I racked my brains trying to solve the secret of how the ancient Manabis, Chibchas and Chinus had plated objects of metal—and even of clay—with gold. How many theories and suppositions had I formed to explain the puzzle. But none had been near the mark, for here before my eyes the mysterious art was being carried on, and I laughed when I saw how very simple it was, how I (as well as others) had strained at a gnat and had swallowed a camel, metaphorically speaking. It was all done by amalgam, by combining gold with mercury and then evaporating the mercury by heat leaving the gold adhering to the object to be plated. Yet, after all, there *was* a secret to the process. The objects were boiled, both before and after plating, in some chemical solutions, and even Ramon had failed to learn the secret of these compounds.

"I don't quite understand," I remarked, as we walked on, "how it is that if inorganic substances cannot be reduced by manabinite, there are gold, copper, silver—all the elements, minerals, substances familiar to us—in this place, and that the surroundings, the earth, the rocks, everything, appear no different from those to which we are accustomed. I expected—"

"My dear Don Alfeo," laughed Ramon. "Why should anything be different? If we accept the known facts of science, we must believe that the entire substance of the earth is composed of certain basic elements—gases, minerals, metals—and that everything we know is composed of these in various combinations. Your own body, and mine, contain iron, sulphur, oxygen, hydrogen, carbon—the same elements as those in rocks, trees, the sea, in fact everything else. Yet we call some things organic and others non-organic. If we admit that the universe—as we know it—is composed wholly of definite elements and their combinations, then, *amigo*, we must admit that the same must occur in the most infinitesimally minute portions of the universe, to the *nth* degree as I might say. I have no doubt that, could we but view portions of the earth as much smaller than Urquin as Urquin is smaller than London, Paris or New York, we would find precisely the same conditions, surroundings, earth and objects as we find here, or as you might find anywhere in that larger sphere of life we have left. I——"

"Hold on," I interpolated. "How about molecules, atoms, electrons? How about vibratory waves? Why, Ramon, an atom would, to my way of thinking, be out of all proportion to these people—to us. It should appear as large as—well, it should certainly be visible to us. And how is it possible for us, for the rocks, for metals composed of atoms and molecules, to exist in these minute proportions if the atoms themselves are as large or larger than the objects?"

Ramon roared and clapped me familiarly on the back. "The idea of you, a professed scientist, asking that question!" he exclaimed. "Don Alfeo, I am ashamed of you. Answer me this, *amigo mio*. What is an atom, a molecule, an electron? You can't give me a lucid, matter-of-fact, hard and fast definition. Why? Because neither you, I, nor anyone else knows anything definite in regard to them. It is——"

"Wait a bit, wait a bit," I admonished him. "You

contradict yourself. You showed me atoms when you were experimenting with the manabinite crystals. If those whirligigs were atoms, then I most assuredly *can* describe them."

Ramon snorted. "Yes, atoms of cloth, of objects in proportion to ourselves at that time. And that proves just the point I was about to explain. Those atoms—and for the sake of argument the electrons also—were a certain definite size, a certain definite proportion to the cloth, to ourselves, to our surroundings. And if you could look through a similar crystal, that magnified fibres or other objects here to the same extent as that lens magnified objects there, you unquestionably would see atoms that would be similar to, if not identical with, those you have viewed. In other words, *amigo*, the size of atoms depends upon the size of the object which they compose.

"I might go further and state, without the least fear of contradiction, that, as a matter of fact, we don't know anything about atoms, molecules, electrons, vibratory waves or the rest. It's all theory, supposition, guesswork. It's like religion among primitive races. They argue that there must be some reason for things as they are, so they build up a theory or a faith or a religion to fit conditions, and create a god or gods or spirits to start and control matters.

"We ask ourselves: what lies back of all objects, of the universe? What keeps the wheels going around? There must be something smaller than we can see, than we can conceive, and those things must be composed of still smaller things. So we imagine atoms, electrons; this and that and the other thing. And just because we discover that we have guessed right in one detail, and that there are minute universes or planetary systems that pretty well bear out our theoretical atoms, we shout 'I told you so' and thereupon assume that everything else we have imagined must be equally correct. Take the question of rain. We discussed that subject long before I left you. According to theory, spatters of raindrops small enough to answer for rain here would be invisible as a gas. True enough if all atoms, all molecules in water were based on one definite condition and locality. But we have proof that this is not the case. Ah-ha! Speaking of angels, you know, here's confirmation of my words; it's beginning to rain. Do you note any visible difference between these drops that are falling and the raindrops to which you have been accustomed all your life?"

I admitted I did not. But my brain was in something of a chaos. I could not exactly grasp his reasoning, could not accustom myself to the idea that there was no conceivable limit to the minuteness of things. That being the case, the component parts—atoms, electrons, whatever they might be—would of necessity be in proportion. The thing was too profoundly abstruse. It could be carried to the ultimate degree until there was—well, nothing; and was there, I wondered, such a thing as nothing? Ramon was again speaking.

"The whole trouble is," he observed, "that we are still hedged in, hide-bound, so to speak, with ideas and conceptions acquired through generations of human beings dwelling in a definite world, under definite conditions. With our customary egotism we think that we—I am speaking of human beings as an entity and not of ourselves—are the most important, the only intellectual beings in the universe. We cannot imagine any other spheres above or below us, larger or smaller than ourselves. And yet here we have incontrovertible proof of the fallacy of such nonsensical ideas. These people in Urquin haven't the least conception of the world you and I came from.

"To them it is non-existent. To them the whole universe is here. They live in sublime ignorance of ordinary human beings, of any other world, of any other surroundings, and if there were scientists among them, they'd have very much the same ideas and the identical theories of atomic matter as our scientists who are utterly unaware of this place and these people. Why, *amigo*, even I who have lived here, who am wedded to the most wonderful woman alive, who have become accustomed to the place and the life, even I, I say, find that my brain, my intellect, my reasoning powers are all more or less controlled by the ideas and beliefs acquired in my former physical state. I find myself constantly, unconsciously, making comparisons, thinking of everything here as small, reasoning in terms of inches, millimeters, hours, litres, grams, and all that tommy-rot. Size, time, measurement, weight—Bosh!

"Such things don't exist. They're merely means adopted to enable us to classify and understand matters that otherwise would be impossible. It's all a matter of proportion, of relativity as Einstein puts it. But, *amigo*, even Einstein is as far off as the rest of mankind. He's on the right track, but he's traveling in circles. If I could induce him to be reduced and he could live here in Urquin a while, he'd see things from a new point of view. But—" he laughed at the thought—"I'll wager he would not be satisfied. He'd never rest content until he'd tried reducing himself to still more minute proportions; and the Lord alone knows where that might end. It's beyond the limits of our imagination to contemplate it. But there's another matter, *amigo*.

"Speaking of atoms reminds me that I told you that I had discovered how the prehistoric races cut and fitted the stupendous stones used in erecting the cyclopean walls and buildings about Cuzco and Tiahuanaco. That, in a way, hinges upon the same subject we have been discussing. I know you'll be interested. Come, let us return to the palace and join Naliche. I had my information from her lips—and from the old priest. By the way, he's a fine chap, and brimming over with traditions, legends, history and occult knowledge. You'll like him, and we'll probably find him knocking about somewhere near. And I'll tell you what I've learned and we have old Melik and my beloved one to verify what I say or to put me right if I make a mistake."



Illustrated by
MOREY

Q The television 'phone called my name. I immediately hurried to the booth and saw General Loomis, the Commander-in-Chief . . . standing in his helicopter headquarters

The **Sword** *and* *the* **Atopen**

Hopkins University Midwinter Lecture 2348

By Taylor H. Greenfield

DEAR ERDMAN:

I am enclosing a copy of a paper by one of our recent visiting lecturers, Dr. Johnson. As the lecture was delivered it was automatically typed by Morrison's new invention, which has just been installed.

Only sufficient copies were made to supply the members of the graduate school in Chemistry. Knowing your interest in everything that happened during the past war, I have made you a sort of brief resumé of the high spots.

Hastily, as ever, I am,

Fraternally,
EMIL ZONEFF.

ALTHOUGH Divine intervention in human affairs passed into the realm of the mythical toward the end of the twentieth or at the dawn of the twenty-first century, one is almost inclined to give thanks to the Supernatural for the marvelous efficacy of Dr. Rutledge's discovery and strategem which so recently freed us from the Oriental menace.

A year ago only the Mississippi and the most severe winter in many generations was staying the complete invasion of the United States. In an unbelievably secret manner our enemies had for five decades been developing a scientific offensive against which our laboratories could not in a short interval protect us. The vast and fundamental discoveries made during the past hundred years by the Orientals (and now the heritage of the whole world) can only be compared to the Industrial Revolution of the nineteenth century. Without warning, through the discovery of the cause of gravitation, the Mongols practically lifted their Nangsi metal transports (which were built of a

material combining the lightness of aluminum with the strength and hardness of steel) out of the sea; and in five days skimmed across the surface of the Pacific. The whole West lay at their mercy, though we know with what gallantry their forces were held in check from summer until winter, when the enemy had reached the Mississippi.

Of course, one of the surprises which the Orientals had not counted on was the providential inspiration of Dr. Mernick of the Hopkins, who devised the now famous Mernickian transformer by which light from the sun, received through a series of grates, is stepped from the wavelengths of light into those of electricity. This gave us a sudden limitless source of power on which the enemy had not counted. It virtually lifted our forces off the ground and made them almost the equal of an enemy who had succeeded in neutralizing the gravitational drag.

The final and most disastrous card our subtle enemies played was dealt on the prairies in Nebraska. They themselves were afraid of their weapon and wanted plenty of space to try it in. I was personally present at its début, being at the time in General Sanford's stationary observing helicopter which, through the agency of the power supplied by a Mernickian transformer, hung motionless as a bee fifteen thousand feet in the air. Only the treble hum of the air turbine could be heard faintly through the transparent walls of the observatory, constructed of the annealed cersite which has taken the place of the unsatisfactory glass used by our forefathers. The toughness and tensile

*I*N this story, our new author makes a very ingenious suggestion. The conversion of light into electricity by spectrum gratings he treats as a possibility, and assumes there is no reason why it should not be done sometimes. The idea of using the physiological principle of the action of foreign proteins on the human system to repel an enemy is also an original idea, and with the other furnishes material for an excellent short story, which Mr. Greenfield has worked out in an exceedingly clever manner.

strength of this element, comparable to the best chrome steels, combined with its crystal clarity, made an ideal warfare observation unit. It was practically invisible and likewise quite bullet proof. The great strength of the material in our machine, and the rapidity with which we could rise and fall, indeed made us difficult prey. In addition to this we were hanging behind the great electric field that the Radio Defensive Corps had spread like a screen before our forces, greatly to the embarrassment of the enemy in the use of his anti-gravitational machines.

As we stood at our posts, we saw the great degravitated bombs hurtled against our lines suddenly come into contact with the fan-like electric field, somersault a few times and fall. At the edge of the electric screen the ground was excavated to an enormous depth by the bursting of these intercepted degravitated bombs, most of which had been projected from stationary batteries three or four hundred miles behind the enemy lines. The local batteries bombarding with the old fashioned Sangsi steel shell were still effective. On the whole, however, from our own observation of the local front and from the television reports we were constantly receiving, we judged that the American and Allied Caucasian forces were more than holding their own.

General Sanford, the Chief of the Signal Corps, who stood by my side, grasped my arm, and pointed to the west. Everyone crowded to our side in excitement. Before we could gasp our amazement, the incandescent spot which our Chief had mutely indicated on the distant horizon, zoomed in a blazing arc across our zenith and plunged into the terrain of the English forces which were occupying the little town of Ogallala about six miles to our south. We held our breath. What next?

Only a faint throbbing seemed to pulse in the air above the spot where the missile sank. I was about to pronounce the diagnosis of "a dud," when someone cried, "My God, General, they've turned hell loose this time!" The whole atmosphere for a quarter of a mile radius about the fatal bomb quivered as over a heated griddle. Even as we remarked this, the area began to glow a cherry red. A deafening thunder assaulted our ears when to our horror the earth on which had stood the now flaming town of Ogallala, rose a gigantic incandescent ball and shot like a meteor into the heavens. Our car was a feather tossed in the ensuing hurricane, but even while we bobbed back and forth there was an ear-splitting explosion as the land that was once an American village burst into a blinding blue flare of hydrogen flame twenty-five miles above us.

The swaying of the car gradually subsided in the tortured atmosphere, and a gentle rain began to fall. Ogallala had been chemically "stepped down" into the most primitive element, combined with the oxygen above and was condensing back to earth again as a few globules of H₂O. That day was a sort of crisis; the enemy had discovered and turned upon us the power of atomic degeneration! And I, as assistant chief chemist of the American Army, felt my heart become heavy within me as I soared back to the Central Laboratory.

Providing Flour for the Enemy

EVEN as I watched the advent of the electronic detonator two days previously the inspiration had come to me. What had happened to the doomed Nebraskan town had been so obvious. Through some unexplained agency discovered by the Orientals, the

electronic restraint of the normally stable elements had been removed. In a brief time Ogallala had degenerated through all the steps of the periodic table until it became hydrogen, at which point, owing to the terrific air current and incandescent heat, it had recombined with the oxygen of the air as simple molecules of water.

I thought I had a clue as to how it had been accomplished. The Central Chemical Laboratory was the focus of feverish excitement. The air was tense with the expectancy of tremendous things. Every scientist there felt that we were on the verge of discovering the principle of the Mongol's new weapon. "Give us time!" "Time" was the plea we sent daily to the Defense Headquarters. "Only six weeks more, only a month," we begged, "and then we'll make a boomerang out of the enemy's invention." Anderson, Mahaffey, Dr. Spritz—all the great physicists and chemists of the present age—labored at my side endeavoring to trick Nature into giving us that saving secret.

The television 'phone called my name. I immediately hurried to the booth and saw General Loomis, the Commander-in-Chief of the American and Caucasian Armies, standing in his helicopter headquarters. He seemed haggard and worn. "How much longer, Johnson?" he asked. "The enemy has pretty well eaten out the country and with the advent of winter and lack of food, are bending all their efforts to crush us. Besides, we cannot tell just how long it will be before they begin turning out their new bomb in other than experimental quantities. Two weeks, I should estimate, is about all the longer I can hold them."

"If that is the case, General Loomis," I replied, "we may as well give up. Two months will see us ready. But two weeks—!"

I felt a hand laid on my shoulder. Dr. Rutledge, my science chief, had stepped into the booth behind me and overheard the conversation.

"General Loomis," Dr. Rutledge spoke, looking for all the world like a patriarch of olden times, "until five minutes ago what Johnson has just said would have sealed our fate. But now, I think, I believe, we have one more card to play. I have only this moment completed a series of reactions which have resulted (as I calculated they should) in the production of a new protein, similar in appearance to flour. It should, although of course I have not yet had time to verify this statement, be a practical substitute for flour; and indeed, it is my belief that it will easily be mistaken for that substance. Its particles are laminated similar to starch, of an identical size, and the nutritive factor should be greater than that of bread. It is, in short, a new, a foreign protein never before found in this world of men!"

"Very interesting, I am sure," replied General Loomis, with a trace of bitterness and sarcasm in his voice. "Your noble efforts will result in feeding the yellow devils an excellent artificial fare. They will be grateful, I know!"

"Exactly my object, general," Dr. Rutledge replied. He continued impressively: "You have until now relied upon me largely in the waging of this war to save the white race from the menace of the yellow. Since all is lost at any rate, grant me one last effort in behalf of my country. At all costs, Loomis, hold your present lines for two days, preparing to suddenly retire to the west bank of the Mississippi. I leave it to your strategy to make a sudden retreat (which should extend over a



Our car was a feather tossed in the ensuing hurricane, but even while we bobbed back and forth, there was an ear-splitting explosion as the land . . . burst into a blinding blue flare of hydrogen flame twenty-five miles above us.

period of at least ten days) appear as if enforced by the enemy themselves."

"There should be no difficulty in that direction,"

General Loomis interpolated, smiling wryly on the television screen.

"Once on the west bank," went on Dr. Rutledge seriously, not noticing the interjection, "make a stand for a day or two and then suddenly retreat across the river to the east bank as if again forced to do so. Now, General, two days from this time—before your retreat begins—I shall, I trust, have your armies all along the lines supplied with my new artificial, foreign protein flour. This you will leave in the enemy's hands, which, you have intimated, will be much to their delight. You will do the same at the stand which for a while you held on the west bank. But, mind you, let none of your men

use any of this perfectly harmless food. I will personally see to it that you will receive it in such containers that none will come in contact with your persons."

"Doctor," Loomis said after staring at the old scientist some time in astonishment, "except for years of personal acquaintance, I would say that you were suffering a mental shock. Knowing you as I do, however, I pray to God you're making no mistake this time. I'll do as you wish." His figure faded from the screen.

The next fortnight was one of black despair. I myself doubted on occasions whether or not the old doctor was mentally accountable—even I who had trusted him so long. General Loomis and his staff called up daily to inquire if Dr. Rutledge had any change of plans. As for the army and the populace, they were one in calling on the President to make terms with the enemy. The allies truly were on the point of collapse. All that kept up what morale was left in the chemical division was the unrelenting demands made on us by Dr. Rutledge to continue to ferret out the electronic detonator. Until then, he had scarcely bothered with our work; now he would hear of nothing else. "Today's the Day!" was the slogan he had displayed above every bench.

Finally the fatal day arrived. The retreat across the Mississippi was consummated. This time it was not feigned. The Mongols were hungry, and their appetites were whetted for more flour such as had sustained them for the past twelve days. Moreover, new electronic bombs were beginning to be supplied them.

My name leapt at me across the room: I was being called by that almost human instrument, the television 'phone. Both my superior and I hurried to the cabinet. It was, as we had guessed, Loomis. "It's all up," he said wretchedly. "The fresh supply of atomic degenerating bombs, for which the enemy has been holding back, has now arrived. They matched and neutralized our electric field defense screen just an hour ago, leaving us at their mercy. You've had your chance, doctor, and failed. I advise you both to make your way north and wait until these fiends forget the inconvenience you both have caused them. As for me, I'm leaving this instant to offer unconditional surrender in the name of all the allies."

An Unexpected Turn

IT was about ten o'clock in the morning, just after he had transported all his forces hurriedly to the east bank, and as the Mongols were occupying the old entrenchments on the west, that General Loomis closed his conversation with the Chemical Laboratory. He turned to an aerial officer who stood at attention beside him. "Major Manitt," he said, "trail a white banner of truce on your plane and tell the enemy I will parley with them. Tell them that we will serve rations presently to our men who have worked all night without food or rest, and that if it is agreeable to them, both sides shall simultaneously discontinue activity at one o'clock. At that time I shall cross the river to offer them our terms of surrender."

The officer saluted and hastened to his near-by plane. General Loomis ascended into his helicopter to confer with his staff to draw up in documentary form the surrender, and give the necessary orders relative to lowering of fire that afternoon. He also spoke to the President and to the crowd outside the White House, and

then began nervously waiting the crucial moment. About twelve-thirty, however, a remarkable fact forced itself on his attention. Whereas the allied batteries continued to thunder away, the fire from the Orientals became irregular and sporadic. "Celebrating their victory beforehand," the French commander remarked bitterly to his chief. Loomis nodded. "And getting careless, too," another of the Staff added as he saw one of the enemy's detonator bombs disintegrate three or four hundred acres of a Mongolian base encampment fifty miles to the northwest and shoot it a monstrous blazing rocket twenty or thirty miles into the midday sky.

By twelve forty-five the enemy's barrage had fallen completely all along the line. Our battery nevertheless continued until the set time but elicited no answer. Exactly at one General Loomis with two aides stepped into his air-car. He was a picture of grief and despair. Three minutes later the party landed forty miles across the river before the headquarters and armored dining hall of the Oriental General Staff.

Loomis and his officers stepped out of their car and looked about. No one was in sight. Not even a sentry guarded the mess room door. The General paced back and forth a few minutes in indecision.

"Evidently they mean to make us feel our defeat," he said. "They apparently do not even think it further necessary to observe rudimentary diplomatic courtesy. Come on, boys, beggars can't be choosers, as the antique saying goes." He led the way to the dining hall through a window of which a light was seen shining.

"Perhaps if we find his xanthic highness after a good meal he will be inclined to be a bit more lenient," Loomis whispered with a forced laugh trying to cheer his glum companions.

He opened the unguarded door of the hall. An instant later he reeled back horror-stricken. Instead of a feasting gathering of officers attached to the Mongolian Staff he saw before a feast of men contorted in grotesque shapes by some violent death. Many lay beside the table, some on it, their faces blotched with great, unsightly wheals, their chests bloated until they seemed about to burst. Only one poor wretch had any life left in him—he lay exhausted on the floor with great streams of frothy mucous pouring from his nose and throat.

A possibility dawned in Loomis' mind. He dashed away to search the other mess tents shouting to his aides to follow suit. It was as he guessed: they had landed in a camp of dead and dying; stricken by some mysterious power. Hope suddenly surged back into his soul. He felt dizzy and faint. Could a similar fate have caused the unaccountable silence of the enemy's cannonade? Even as the thought came to him, he knew it must be so. His marvelous old friend, Dr. Rutledge, had risen to the need of the world and crushed the yellow menace.

SUCH, truly, had been the case. In a single hour, through the agency of a harmless food, the subtle scientist had crushed a nation. The principle involved had been discovered nearly two centuries before, when it was well-known that if an animal were injected with a small quantity of a protein foreign to his body, a subsequent dose a hundred million times as weak would cause its immediate and violent death. Even the quantity that might be flying in the atmosphere and become dissolved in the fluids of the nose or eyes would act as the

most virulent of known poisons. Through the ages, however, the human race had more or less come in contact with all the proteins in their world and hence rarely became highly sensitized to any protein occurring in nature. The terrible toxicity of a protein which had never before occurred in nature and to whose power mankind had never been even partially desensitized had up to the time of Dr. Rutledge only entered the minds of a few scientists. His strategy was the working out of a new maxim: Nature is terrible, but man makes it more so.

Addenda

FOREIGN protein sensitization or anaphylaxis was the basis of Dr. Rutledge's coup. The laws governing this reaction had been more or less worked out by a group of scientists in the twentieth century. They had demonstrated that if a guinea-pig or rabbit were injected with the blood serum of another species, a subsequent dose of an infinitely small quantity of this substance would cause convulsions, collapse and rapid death. Inasmuch as there were many proteins in the atmosphere at that time due to the unrestrained pollination of plants of every description, it was not surprising that they found as many as ten per cent of the white race afflicted with a slight pollen sensitivity which showed up seasonally by causing spasms of the smooth muscle of the respiratory system, a disease popularly called "hay-fever."

Since, however, the proteins of the world had always been present, the human race had, by constantly coming into contact with them, become more or less immunized to the majority. Only occasionally a case of violent sen-

sitivity came to light and was recognized as such. Two or three cases there had been which the old scientist discovered while searching the archives of ancient medicine and these gave him the clew he needed.

One was the case of a little girl who had somehow or other become sensitized to the protein of wasp toxin and who suffered almost immediate death from anaphylactic "choc" as the result of being stung by that insect. A second instance concerned a woman who went into violent asthmatic paroxysms if a mouse entered the room where she was, and whose skin broke out into large wheals if touched with mouse hair. Finally, and most outstanding in his mind, was the case of a child who was thought to be sensitive to the fish protein in glue and who died almost immediately when the physician testing her had brought a small quantity of the dry protein into contact with a scratch on her arm.

These had, however, been rare cases, but they pointed out the method. It had already been proved over and over again that animals could be sensitized experimentally by treating them with foreign proteins, provided that after the initial dose they did not come into contact with the same protein until after a lapse of about two weeks. If they happened to do so the first injection or treatment was frequently neutralized and failed to give the desired sensitivity.

With the discovery of a new, highly pure and synthetic protein by Dr. Rutledge the situation with the enemy could be put on a close parallel with the laboratory condition. The enemy could be fed the protein when they were in need of food and had little else, but since it was synthetic, they could not get a second supply until the Doctor put the fatal meal in their way.

THE END

What Do You Know?

READERS of AMAZING STORIES have frequently commented upon the fact that there is more actual knowledge to be gained through reading its pages than from many a textbook. Moreover, most of the stories are written in a popular vein, making it possible for anyone to grasp important facts.

The questions which we give below are all answered on the pages as listed at the end of the questions. Please see if you can answer the questions without looking for the answer, and see how well you check up on your general knowledge of science.

1. How many kinds of elements are there? Give examples of isotopes. (See page 913.)
2. Is there any matter in space? Is space hot or cold? (See page 914.)
3. What amount of the earth's solid surface layers is oxygen? What percent of water and of air? (See page 917.)
4. What is the second most active element? (See page 917.)
5. What was the system of artillery practice in the World War? (See page 929.)
6. What two ductless glands are intimately related to bodily growth? (See page 929.)
7. What is the available method of producing a lethal disease? (See page 932.)
8. What is the area of dispersion for a 150-millimeter gun? Explain the term. (See page 933.)
9. How large a quantity of strychnine is required to kill a man? (See page 933.)
10. What airplane flight was made in 1929 using heavy oil instead of gasoline? (See page 938.)
11. What was the expense for fuel and what would it have been with gasoline? (See page 936.)
12. What effects would follow from the use of the Diesel type engine on airplanes? (See page 938.)
13. Can dimensions be referred to or specified as functions of motions? (See page 960.)
14. Why is a shadow not two-dimensional? (See page 960.)
15. What is a sextillion in the English language or nomenclature? (See page 962.)
16. What is a simple expression of Bode's law? (See page 966.)



Now the sand of the desert began to roll into some strange wave that began just beneath the ship, then sped away — further — till it died in the far distance

When the Atoms Failed

By
John W. Campbell,
Jr.

Author's Foreword

WHEN the events of which I am to tell took place all the world was interested solely in their final outcome, but when that last awful day was ended, and time enough had passed to give our world a chance to find a way to apply and use the awful forces it had had forced upon it, or, indeed, had even found how to control their immense energies, men began to wonder about the true story of the Invasion.

I had always been a writer, first newspaper work, then a book or two. Perhaps because of this the world expected that an account would soon be presented. But had those millions seen that awful battle, seen those mighty wrecks on the hot sands, even then might they understand my dread of telling of that titanic conflict—a conflict in which the weaker was a million times more powerful than any force man had previously seen! It still burns in my memory, that awful scene in its desolate setting—the vast rolling desert below, seared, blasted, fused in great streaks where the intense, stabbing heat rays had cut it, mighty craters blasted in its surface where the terrific explosions of the shells had heaved thousands of tons of sand into great mounds, and those ghastly wrecks that lay crushed and broken on the hot sands below, bathed in the ruddy light of the sun of sunset, now slowly sinking behind the distant purple hills, as the last of the Invaders crashed on the packed sands below.

Two men of all Earth's billions saw that scene—but those two will never forget—as Stephen Waterson and I can testify.

Ten years have passed, ten years of stupendous change, readjustment, and cosmic conquest. Ten years in which a world has been added to man's domain, yet still sharp and clear in my memory is the picture of those shapeless masses, those lumps of glowing metal, that lay on the sands beneath us, the sole vestiges of the mighty ships of Mars.

OUR new author, who is a student at the Massachusetts Institute of Technology, shows marvelous ability at combining science with romance, evolving a piece of fiction of real scientific and literary value. A careful perusal of this story should give the reader not only keen enjoyment, but a considerable amount of instruction, because most of our readers will want to confirm their views of cosmic topics, of atoms, of energy—atomic and material—and the other subjects that blend so well in the text of this tale. A great deal of interesting material may be found on these subjects in recent text books.

Illustrated by
WESSO

Never have I wanted to think long on that scene of titanic destruction, destruction such as man never before knew, but friends have convinced me that it is my duty as one who lived in closest contact with the facts, and one of the two men who saw that last struggle, to tell the story as it unrolled itself before me.

Brief it is. The entire event, for all its consequences, lasted but two days—days that changed the history of a Universe!

But in this march of mighty events, I was but a spectator, and as a spectator I shall tell it. And I shall try to depict for you the character of the greatest man of all the System's history—Stephen Waterson.

Waterson Laboratories
May, 1957

David Gale.

IT was late afternoon in May, 1947, and the temperature had climbed to unbelievable heights during the day. It seemed impossible to work with that merciless sun beating down on the roof. It is odd that a temperature of 95 in May should seem far higher than a similar temperature in July. On the top floors of the great apartments it was stifling. The great disadvantage of roof landings for planes had always been the tendency of the roofs to absorb heat in summer, yet on the top-most floors of those apartments people were living, and in one of those apartments a man was trying to work. Heat was a great trouble, but he found thoughts of hunger in the not too distant future an even greater inspiration to work. The manuscript he was correcting was lengthy, but this was the final revision, which was some comfort. Still the low buzz of the telephone annunciator was a relief. It was so much easier to talk. He took up the telephone.

"Gale speaking."

"Hello Dave, this is Steve. I hear you are having a bit of hot weather in New York today. I have a suggestion for you—I'm coming to pick you up in an hour and a half, and if you will be ready on your roof then, in a camp suit, and with camp clothes for about a

month packed, I can guarantee you some fun, providing, of course, that you're still the man I knew. But I can't guarantee to return you! Meet me on your roof in an hour and a half."

"Well, I'll—now what's up? So he isn't sure I'll get back—and he calls that a 'suggestion'! Anyhow it sounds interesting and I'll have to hurry. I wish he'd get into the habit of warning a fellow when he is going to start one of his expeditions! And I may not come back—I wonder where on Earth he's going now—and where he was then. The only reason he gives me an hour and a half is because it will take him that long to get here. He would drop in on me without any notice otherwise. In that case he must be about three hundred miles from here. But where?"

AN hour and a half later he was on the roof, watching the darting planes, there were a good many, but by far the larger part of the world's business and pleasure was on the ground in those days. Still the crimson and gray special of Waterson's ought to be easily visible. He was late—unusual for Steve. Gale hadn't seen him in more than a year—probably been working on one of his eternal experiments, he decided.

Still he searched the skies in vain. Only the regular planes, and one dirigible—tiny in the distance—it seemed to be coming toward him—and it certainly was coming rapidly—it couldn't be a dirigible—no gas bag could go that fast—then he saw the crimson and the gray band around it—it was Steve.

And now as it darted down and landed gracefully on the roof beside him, he saw that the machine was but thirty-five feet long, and ten or so in diameter. Suddenly a small round hatchway opened in its curved, windowless side of polished metal, and a moment later Stephen Waterson forced his way out. The door was certainly small, and forcing that six-foot-two body in and out through it must have been a feat worthy of a magician. Gale noticed that he would just about fit it, but the giant Waterson must have intended to use it very infrequently to make it that size.

"Hello, Dave—how do you like my new boat? But get in, we're going. There, your bag's in already."

"Good Lord, Steve, what is this? I gather you invented it. Certainly I never saw nor heard of it before," said Gale.

"Well Dave, I suppose you might say I invented it, but the truth is that a machine invented it—or at least discovered the principles on which it is based."

"A machine! A machine invented it? What do you mean? A machine can't think, can it?"

"I'm not so sure they can't, Dave, but get in—I'll tell you later. I promised Wright I would be back in three hours, and I've lost ten minutes already. Also, this machine weighs three thousand tons—so I don't want to leave it on this roof longer than is absolutely necessary."

"But, Steve—let me look at it. Man, it is beautiful. What is that metal?"

"Try the inside, Dave—there!"

Dave Gale was rather good sized—five feet ten, and weighing over one hundred and sixty pounds, but Waterson was in perfect physical condition, two hundred and ten pounds of solid muscle, and Gale had been popped into the hatch like a bag of meal, so quickly was it done.

Now he turned to look at the tiny room in which he found himself. It was evidently the pilot room, and

around the front of the room there ran a clear window, curved to fit the curve of the ship's walls, and about three feet high, the center coming at about the level of the eye of a person sitting in either of the two deeply cushioned chairs directly facing it. The chairs were evidently an integral part of the machine, and from the heavy straps attached to them it was obvious that the passengers were expected to need some support. The arms of each chair were fully two feet broad, and many small instruments and controls were arranged on their polished black surfaces. Waterson had seated himself in the right hand chair and strapped himself in. Gale hastened to secure himself in the left chair.

"Take it easy Dave, and be prepared for a shock when we start."

"I'm ready Steve, let's go!"

Waterson moved his right hand a bit, and a tiny red bulb showed on his left instrument panel; many of his instruments began to give readings and several on Gale's board did so also. Another movement, and there was a muffled hum of an air blower. Then Waterson looked at Gale and turned a small venier dial—Gale had been watching intently—but suddenly the look left his face—and was replaced by a look of astonished pain. The entire car had suddenly jerked a bit, then that peculiarly unpleasant sensation connected most intimately with a rapid elevator or helicopter starting from rest had made itself unpleasantly pronounced. Gale's pained and somewhat sick expression caused Waterson's smile to broaden.

"Whew—Steve—what is this—why don't you warn a fellow of what's coming!"

"I did warn you, Dave," answered Waterson, "and if you will look out, I think you will understand this."

THE car was rising, at first slowly, but ever faster and faster, from the roof, not as a helicopter rises, not as a dirigible rises, but more as a heavy body falls, with high acceleration ever faster and faster. Soon it was rising quite rapidly, straight up. Then another tiny red bulb flashed into life on Waterson's switchboard, and the ship suddenly tilted at an angle of thirty degrees. Then it shot forward, and continually accelerated an already great speed, till New York lay far behind, and then the sky became dark and black, and now the stars were looking in at them, not the winking, blue stars of Earth, but the blazing, steady stars of infinite space, and they were of every color, dull reds, greenish, and blue. And now as they shot on across the face of Earth far below, Gale watched in rapture the magnificent view before him, seeking the old friends of Earth—Mars, Venus, Jupiter, and the other familiar, gleaming points. Then he turned his gaze toward the Sun, and cried out in astonishment, for the giant sphere was a hard, electric blue, like some monster electric arc, and for millions of miles there swept from it a great hazy, glowing cloud, the zodiacal light, almost invisible from Earth, but here blazing out in indescribable beauty.

"We're in space! But, Steve, look at the sun! What makes it look blue? The glass of the window isn't blue, is it?" said Gale excitedly.

"We're in space all right—but it isn't glass you're looking through; it is fused quartz. Glass that thick would crack in a moment under the stress of temperature change it has to undergo. The sun looks blue because, for the first time in your life, you are seeing it without

having more than half its light screened off. The atmosphere won't pass blue light completely and it cuts off the ultra-violet transmission very shortly after we leave the visible region of the spectrum. The reason the sun has always looked yellow is that you could never see that blue portion of its spectrum. Remember, a thing gets bluer and bluer as it gets hotter. First we have red hot, bright red, yellow, white, then the electric arc is so hot that it gives blue light. But the sun is nearly two thousand degrees centigrade hotter than the electric arc. Naturally it is blue. Also, I'll bet you haven't found Mars, have you?"

"No, Steve, I haven't. Where is it?"

"Right over there. See it?"

"But that can't be Mars. It's green, green as the Earth."

"But it is Mars. The reason Mars looks red from Earth is that the light that reaches us from Mars has had to go through both its own atmosphere and through ours, and by the time it reaches us, it is reddened, just as a distant plane beacon is. You know how a light in the distance looks red. That is what makes Mars look red."

"Mars is green. Then it is possible that the life on Mars may be the same as that of Earth!"

"Right, Dave. It probably is. Remember that the chlorophyl that gives the planets their color is also the material that can convert sunlight energy into fixed energy of starches and sugars for the plant, and probably the same material is serving in that capacity all over the universe, for carbon is the only element of the more than a hundred that there are that can possibly permit life's infinitely complicated processes to progress."

"But I thought there were only ninety-two elements."

THERE are ninety-two different types of atoms, but if you have half a dozen men all doing exactly the same thing, can you call them 'a man'? They have found more than six different kinds of lead, two different kinds of chlorine, several different kinds of argon, and many of the other elements are really averages of several kinds of atoms, all of which do exactly the same thing, but have different weights. They are called isotopes. We say the atomic weight of chlorine is 35.457, but really there is no atom that has that weight. They have weights of 35 and 37, and are jumbled together so that the average is 35.457. Really there are over a hundred different kinds of atoms. In my work on this ship I found it made quite a difference which kind of chlorine atom I had."

"Well, how does this machine work, and what do you mean by saying that a machine invented it?"

"Dave, you know that for a number of years the greatest advances in physics have been made along the lines of mathematical work in atomic structure. Einstein was the greatest of the mathematicians, and so the greatest of the atomicists. Now as you well know, I never was too good at mathematics but I did love atomic structure, and I had some ideas, but I needed someone to work out the mathematics of the theory for me.

"You remember that back in 1929 in the Massachusetts Institute of Technology they had a machine they called the integrator, an electrical machine that could do calculus too complex for Einstein himself to work out, and problems it would take Einstein months to solve, the machine could solve in a few minutes. It could

actually do mathematics beyond the scope of the human brain. The calculus is a wonderful tool with which man can dig out knowledge, but he has to keep making his shovel bigger and bigger to dig deeper and deeper into the field of science. Toward the end of this decade, things got so the tail was wagging the dog to a considerable extent, the shovel was bigger than the man—we couldn't handle the tool. When that happened in the world once before they made a still bigger shovel, and hitched it to an electric motor. All the integrator did was to hitch the calculus to an electric motor—and then things began to happen.

"I developed that machine further in my laboratory, and carried it far beyond the original plans. I can do with it a type of mathematics that was never before possible, and that mathematics, on that machine, has done something no man ever did. It has found the secret of the atom, and released for us atomic energy. But that wasn't all, the machine kept working at those great long equations, reducing the number of variables, changing, differentiating, integrating, and then I saw where it was leading! I was scared when I saw what those equations meant. I was afraid that the machine had made an error, I was deathly afraid to test that last equation, the equation which the machine was absolutely unable to change. *It had been working with the equations of matter, and now it had reached the ultimate, definitive equation of all matter!* This final equation gave explicit instructions to the understanding; it told just how to *completely destroy matter!* It told how to release such terrific energy, I was afraid to try it. The equations of atomic energy I had tested and found good, I had succeeded in releasing the energy of atoms.

"But the energy of matter has been known for many years; simple arithmetic can calculate the energy in one gram of matter. One gram is the equivalent of about ten drops of water and that much matter contains 900,000,000,000,000,000 ergs of energy, all this in ten drops of water! Mass is just as truly a measure of energy as ergs, as foot-pounds or as kilo-watt hours. You might buy your electricity by the pound. If you had five hundred million dollars or so, you could buy a pound. You have heard of atomic energy, of how terrifically powerful it is. It is just about one million times as great as the energy of coal. But that titanic energy is as little compared to the energy of matter itself, as the strength of an ant is compared to my strength. Material energy is ten thousand million times as great as the energy of coal. Perhaps now you can see why I was afraid to try out those equations. One gram of matter could explode as violently as seven thousand tons of dynamite!

"But the machine was right. I succeeded in releasing that awful energy. I happened to release it as a heat ray, and the apparatus had been pointed in the direction of an open window luckily. Beyond that was just sand. The window was volatilized instantly, and the sand was melted to a great mass of fused quartz. It is there, and will be there for centuries, a two-mile streak of melted sand fifty feet broad! It makes a wonderful road of six foot thick glass! The machine showed me a thousand ways to apply it. I am driving this ship by means of an interesting bit of apparatus that the calculating machine designed. You remember Einstein's general relativity theory said that mass, gravity, bent space; but as it didn't fall in, as it would if attracted and not resisting,

it must be that it is elastic. The field theory that he brought out back in 1929 showed that gravity and electrostatic fields were at least similar. I found, with the aid of my machine, that they were very closely related. I charge the walls of my ship strongly negative, then I have a piece of apparatus here that will distort that electrostatic field so it cuts off gravity—and the ship has no weight. The propulsion is simple also. I told you that space was elastic. I have a projector, or series of projectors all around the ship which will throw a beam of a ray which tends to bend space toward it. The space resists; and since the mountain won't come to Mahomet, Mahomet goes to the mountain—and the ship sails along nicely.

"The only theoretical limit to my speed is, of course, the velocity of light. At that speed any body would have infinite mass, and as you can't produce an infinite force, you certainly can't go any faster, and you can't go that fast in fact. If I accelerated one of the little five gram bullets I use in that machine gun to the speed of an alpha particle such as radium shoots off, not a very high speed in space, it would require as much energy to get it up to that speed, 10,000 miles a second, as five thousand fast freights, each a thousand tons apiece, would require to get up a speed of a mile a minute. You see that there is no possibility of getting up any speed like that even with material energy—it is too expensive even with that cheap energy—for it costs just as much to slow down again!

"The interesting thing about this energy is that scientists have known about it for a good many years, and while hundreds of people told about atomic energy, no one outside of the scientists ever spoke of the far greater energy of matter. The scientists said that the sun used that energy to maintain its heat—forty million degrees on the interior of the sun. They said man could never duplicate that temperature nor that pressure that prevails at the interior of the sun. They therefore said that man would never be able to release that energy. But the sun had to raise thousands of tons of water, and blow that vapor many miles, and do a lot of other complicated things before there was any lightning. Man would never be able to reproduce those conditions, and he would never be able to make lightning. Besides, if he did, what good would his electricity do him; it would be so wild, and so useless.

"But man discovered other ways of releasing his energies and converting it into electricity in a way that did not exist in nature. Manifestly it is possible to do the same with the energy of matter, and I have done it.

"The object of this trip, Dave, is exploration. I am going to the other planets, and I want you to come along. I believe I am prepared for any trouble we may meet there. That machine gun shoots bullets loaded with a bit of matter that will explode on impact. There is only a dust grain of it there, but it is as violent as ten tons of dynamite. If I exploded the entire shell, remember I would get the equivalent of thirty-five thousand tons of dynamite—which is manifestly unsafe. There are also a series of projectors around the car that project heat rays. These rays are capable of volatilizing anything that will absorb them. The projectors of all the rays have a separate generator unit directly connected. The unit is built right into the projector, but controlled from here. They are small, but tremendously more powerful than any power plant the Earth has ever seen

before—each one can far outdo the great million and a half horse power station in San Francisco. They can develop in the neighborhood of fifty million horsepower each!"

"Lord, Steve, I'm no scientist, and when you speak glibly of power sources millions, billions of times more powerful than coal, I'm not only lost, I'm scared. And you have a couple dozen of those fifty-million-horsepower-generators around this ship. What would happen if they got short-circuited or something?"

"If they did, which I don't believe they will, they would either explode the entire ship, and incidentally make the Earth at least stagger in its orbit, or fuse it instantaneously and so destroy themselves. I might add that we would not survive the calamity."

"No, I rather guessed that. But, Steve, here in the utter cold and utter vacuum of space I should think that it would be hard to heat the ship. How do you do it?"

"The first thing to do in any explanation is to point out that space is neither empty nor cold. In the second place, a vacuum couldn't be either hot or cold. Temperature is a condition of matter, and if there is no matter, there can be no temperature. But space is quite full—about one atom per cubic inch. There is so much matter between us and the fixed stars that we can actually detect the spectrum of space superposed on the spectrum of the star. The light that the stars send us across the intervening spaces comes to us laden with a message of the contents of space—and tells of millions of tons of calcium and sodium. Even the tiny volume of our solar system contains in its free space about 125,000,000,000 grams of matter. That doesn't mean much to an astronomer—but when you remember that every gram of that can furnish as much energy as 10,000,000,000 grams of coal, we see that it isn't so little! And as space does have matter, it can have a temperature, and does. It has a temperature of about 15,000 degrees. Most of the atoms of that space have escaped from the surface of stars and have a temperature about the same as that of the surface of the stars. So you see that space—utterly cold—is hotter than anything on Earth! The only difficulty is that it takes a whale of a lot of space to contain enough atoms to weigh a gram, and so the average concentration of heat is so low that we can say that space is cold. Similarly a block of ice may contain far more heat than a piece of red-hot iron. Nevertheless, I would prefer to sit on the ice."

"Quite so, I see your point, and I believe I'd prefer the ice myself. But that's interesting! Space isn't empty, it's not cold, in fact it is unusually hot!"

"Now we've started this let's finish it, Dave. It is hot, but not unusually hot—if anything it is unusually cold! The usual, or average temperature of all the matter in the universe is about one million degrees, so space at 15,000 is really far below the average, and so we can say that it is unusually cold. The temperature of the interior of the stars is uniformly forty million degrees, which brings the average up. But it is the unthinkable great quantities of matter in interstellar space that brings the average down. Remember that the nearest star is four and a half light years from us, and between the stars there is such a vast space in which the matter is thinly distributed that the few pinpoint concentrations of matter have to be extremely hot if they are to bring the average up any appreciable amount. But here and there in this vast space there are a few tiny bits of matter

that have cooled down to terrifically frigid temperatures—temperatures within a few degrees of absolute zero, only two or three hundred degrees above; spots of matter so cold that hydrogen and oxygen can unite; so cold that this compound can even condense to a liquid; so cold that life can exist. We call those pinpoints planets.

"In the interstellar range of temperatures we have everywhere from absolute zero to forty million above. Life can exist between the temperatures absolute, of about two hundred and three hundred and twenty—a range of one hundred degrees in a range of forty million. That means that the temperature of this planet must be maintained with an allowable inaccuracy of one part in four hundred thousand! Do you see what the chances of a planet's having a 'habitable' temperature are?"

"But we are near my laboratory now, Dave, and I want to introduce you to Wright, my laboratory assistant, a brilliant student, and an uncannily clever artisan. He made Bartholemew, as I call the mathematics machine, and most of the parts of this ship. He had heat rays to work with, and had iridium metal as his material, and plenty of any element. He had a fine time working out the best alloy, and the best treatment. The shell of the car is made of an alloy of tungsten, iridium and cobalt. It is exceedingly tough, very strong, and very hard. It will scratch glass, is stronger than steel, and is as ductile and malleable as copper—if you have sufficient force. Iridium used to sell for about 250 dollars an ounce, but these powers allow me to transmute it, which renders it cheap for me. After this, sodium metal will be cheaper than sodium compounds!"

"I wish that that trip had not been so short, Steve. There were a lot of things I wanted to ask you. Where are we now? I don't seem to recognize this country."

"We are over Arizona—see there is the laboratory now—off there."

"What, Arizona! How fast were we going?"

"We were going slowly, considering we were in space, but considering our proximity to the Earth we are going rapidly. The actual speed is difficult to determine—remember we had cut loose all ties of gravity, and I had to follow the Earth in its orbit, and the whole solar system along through space. From here to New York City is about three thousand miles, and as we made the trip in just under one hundred minutes, we traveled at a speed of thirty miles a minute, or half a mile a second."

"Well, the airplane speed record was about four hundred and twenty, wasn't it—I mean an hour—you have to specify now! You set a new record, I guess!"

THEY were slanting down through the atmosphere toward the distant low building that had seen the construction of that first of Earth's space cruisers. The long gentle glide slowly flattened out and the car at last glided slowly, gently through the open hangar doors. Wright was there to greet them, but Waterson called out that he would stay in the ship a few minutes to show Gale around.

"Steve, you sure picked a desolate place to work in. Why did you go way out here?"

"For two reasons. First I wanted a place that was quiet; and second I wanted a place where I could safely work with atomic energy—where explosions, premeditated or accidental, would not blow up an entire city. Did you notice that crater off to one side as we came in? That is where I tried out my first bullet. I hadn't gotten

a small enough charge in it. I had nearly a milligram—a hundredth of a drop of water. But come, I guess you saw the pilot room. I'll show you how to run the ship tomorrow."

He led the way to the rear end of the pilot room, where a small door opened in the smooth, windowless metal partition. It too gleamed with that strangely iridescent beauty of metallic iridium.

"This bunk room should appeal to an apartment house addict. I had about eleven feet I could use to make it, and it is just a bit crowded."

Considering Waterson's six-foot-two, a room eleven feet long, ten feet high, and about as wide, would certainly be crowded if there was anything or anyone else in the room. As the bunk room was also dining room, gallery, and chart room, it was decidedly crowded. One thing that particularly interested Gale was a small screen on which were a series of small lights, projected from the rear.

"What is that, Steve?" he inquired.

"That is my chart. It is the only kind of a chart you could well expect on board a space ship. The lights are really moving and maintain the relative positions of the planets. I think we will go to Mars first, because it is now as close as it will be for some time. I want to go to Venus soon, but that is on the other side of the sun. I will find that there are detours even in space when I go there!"

"That's quite a chart! I suppose you have more accurate ones too?"

"No, I have no need of more accurate ones. I start for my objective, and it is so big I can't miss it!"

"That's true too! But I haven't seen any apparatus for taking care of your air. I suspect that door over there hides something."

"It does. It leads to the store room and the apparatus room. There are all the tools I carry, the air purifier and water renewer. Remember that the break-up of the atomic energy gives me unlimited amounts of electricity, so I have all the electric power I can use. I find that there is a way to electrolyse carbon dioxide to carbon and oxygen. In this manner I recover the oxygen for the air—at least part of the necessary oxygen—and at the same time remove the menace of the CO₂. There is considerable oxygen fixed as H₂O, however, so I installed an electrolyser to take care of that. The moisture of the air is in this way kept down to a comfortable maximum. The same apparatus is useful for reducing the water. All the water I have I must carry in tanks, which require space. I am able to make them considerably smaller by taking the water, passing it through this electrolyser, reducing it to hydrogen and oxygen, burning them to water again, and thus getting pure H₂O. The one difficulty is in getting rid of the heat. Remember that all the heat I lose I must lose by radiation. But the sun is radiating to me. I receive heat at exactly the same rate the Earth does and I have no protective atmosphere, so the tendency is to reach a super-tropical temperature. The easiest solution of this problem is to go with the ship at such an angle to the sun that the shadow of the exposed surface shades the greater portion of the ship, then by adjusting the angle of the ship, I can adjust the ratio of radiating to receiving area to any value I wish, and get almost any temperature I need."

"That is an idea. I never heard of electrolysing car-

bon dioxide, though. Tell me—how do you do it?"

"That is a process I developed. It requires considerable explaining. However, I am doubtful whether it wouldn't have been easier to convert the stuff directly to oxygen by transmutation."

"Steve, I notice you have plenty of light, but why not have windows?"

I HAVE no windows except in the main pilot room. The trouble with windows is that they reduce the strength of the shell. Also, as this is a sleeping room, and there will be no night in space, why not have it this way? I need considerable strength in the walls of the ship, because the accelerations that I use in starting and turning and stopping are really rather a strain on any material. The outer wall is a six-inch iridio-tungsten alloy shell, with two openings in it, the window, and the door. The rest is absolutely seamless, one solid casting. The window is so designed, in connection with the placement of the ray projectors that it doesn't weaken the shell. There is no frame work, but the two partitions across the ship are each six inches thick, and act as braces. The inner wall is a thin one-inch layer of metal, supported by the outer shell, and separated from it by small braces about two inches high. This intervening space has been evacuated by the simple process of going out into space and opening a valve, then closing it before returning to Earth."

"That one-inch layer of metal of yours is bothering me. There is something strange about it, and all the trim and mouldings in here. The green I suppose is to relieve eye strain, but it is not the color itself that seems strange. It is the impression I have that the metal itself is of that beautiful leaf green shade, and that it is the metal in the chairs, table, and racks that gives them that color."

"Quite right Dave, it is."

"But Steve, I thought that there were no more elements to be discovered. In the collection at the Museum in New York they had all ninety-two, and I saw no colored metals."

"In the first place, remember I told you there really were more than ninety-two elements, if we treat the isotopes as elements, and I don't believe they had all the ninety-two there, for there are several elements that disintegrate inside of a few days. They couldn't keep those. But these metals are compounds."

"Compounds! Do you mean alloys?"

"No, chemical compounds, just as truly as salt or sulphuric acid. They are related to tetra ethyl stibine, $Sb(C_2H_5)_4$, which is a compound that acts like a metal physically and chemically. It is too soft to be any good, but there are hundreds of these organic compounds of carbon. There are red ones, green ones, blue ones, and a thousand different ones, soft, brittle, liquid, solid; some are even gaseous."

"Colored metals! What a boon to artists! Think what fun they will have working in that stuff!"

"Yes, but it is also useful for decorative purposes, although the large molecule makes it too soft to be used as a wearing surface."

"Well Steve, you sure have a mighty fine little ship! What do you call it? You said that you called the mathematics machine 'Bartholemew.' What do you call this?"

"As yet it has not been named. I wanted you to suggest some name for it."

"That's a sudden order, Steve. What have you thought of?"

"Well, I thought of calling it flourine, for the chemical element which is so active that it can not be displaced by any other, but will, on the other hand, force any other non-metal out of its compound. Then I thought of Nifia, the name of Columbus' ship which first touched a new world, and Wright reminded me that Eric, the Red's son Lief landed here in about 1000 and suggested Eric as a name."

"Well, that's a good assortment. Why pick on me?"

"We thought you ought to be good at inventing names, since you had written several books."

"That is a fine excuse! I get mine from old magazines! But I might suggest 'The Electron.' It sounds well, and I remember that you said that you charged it negatively to cut out the gravity of the Earth and an electron—or is it a proton that has a negative charge?"

"The Electron"—sounds good—and the idea is good. An electron has a negative charge. Wright also suggested the 'Terrestrial,' as it would be the first ship of Earth to visit other worlds. It is between 'Electron' and 'Terrestrial' now. Which do you like better?"

"I prefer 'Terrestrial.' It has more meaning."

"Well, we'll tell Wright about it. In the mean time, come in to the laboratory and meet Bartholemew."

BARTHOLEMEW was at the moment engaged in tracing a very complicated curve, the integral of a half dozen or so other curves. Wright was carefully watching the thin line left by the pencil. There was a low steady humming coming from the machine, and a bank of small transformers on the other side of the room connected to it. Wright turned off the machine as they entered, and after greeting Waterson, and meeting Gale, proceeded at once with an enthusiastic description of the machine. He was obviously proud of the machine, and of the man who had developed it. The entire machine had been enclosed in a metal case when Gale entered, but now Wright opened this, and Gale was decidedly surprised to see the interior. He really had had no reason to form any opinion of the machine, but he had expected a maze of gears, shafts, levers, chains and every sort of mechanical apparatus. Somehow the mention of a machine for doing mathematics conveyed to him that impression. The actual machine seemed quite simple—merely a small cable leading from the separate "graph interpreters," as Wright called them, to the central integrator, and hence a small motor carried the integrated result into practice and put it on paper.

This machine made possible a type of mathematics hitherto unknown. This new calculus was to the previous integration what integration was to addition. Integration is an infinite summation of very small terms, and this new mathematics was an integration in an infinite number of dimensions. The beginner first learns to integrate in two dimensions. Then come three. Einstein had carried his mathematics to four. The machine seemed to work in an infinite number of dimensions, but the conditions of the problem really chose the four out of infinity that were under discussion. An infinite number of dimensions has no physical meaning. It might be put this way, Wright said: there are an infinite number of solutions to the equation $x=2+y$, and as such it has no meaning. But if for example you say also that $2y=x$, then auto-mathematically you choose two of an infinite

number of values that fit the problem in hand. A man might have done all this machine did, had he lived long enough and been patient enough. This machine could do in an hour a problem that would have taken a man a lifetime. Thus it had been able to develop the true mathematical picture of the atom.

OVER the supper table that night they had a final discussion as to the name of the ship. It was decided that the name should be "Terrestrial," and plans were made to christen it in as scientific a manner as possible. Considering that the shell was made of iridium, and therefore highly inert to chemical action, they decided on a bottle of aqua regia which dissolves gold and platinum, and does not attack iridium. A bottle was prepared, and they were ready for the christening in the morning. Just as they decided to call the day done, the telephone rang. It was Dr. Wilkins of Mt. Wilson calling Waterson. The conversation was rather lengthy, and Wright, who had answered, told Gale that Dr. Wilkins had called before, about two months ago, on a question in astro-physics, and Waterson had been able to give the answer. This time however, Dr. Wilkins, it seemed, was greatly agitated. Just then Waterson returned.

"Gale, it seems we chose our name well. Also I am lucky in having you here. I must go to Mt. Wilson at once, I'll be back about dawn, and I'll tell you two all about it then. I've got to hurry. So long."

A moment later the two men heard the hum of the motor as the hangar doors were opened. Another moment and the entire countryside was flooded with a blaze of bluish white light, that illuminated the desolate dry desert for miles, and for all those weary miles it was an unending, rolling surface of sand. In the glow of sudden light, great strange shadows which started up by the buildings gave weird effects on the sand, but with it all there was a rugged and compelling beauty to the little world which the light had cut from the darkness. There was a sudden whistle of air, and the light faded as the car shot off toward Mt. Wilson.

"What a mass of sand there is around here! It would seem almost like a dried up ocean bed," said Gale.

"I suppose there is a lot of sand in the world—there should be though, it is the direct compound of the two most abundant elements on Earth, silicon and oxygen."

"Wright, I've often wondered why it is that oxygen, which combines with almost anything, should be found free in nature. Why is it?"

"I don't know, I'm sure. At that I suppose one reason is that there is so much of it. Just a very small fraction less than half of the Earth's surface layers is oxygen. It forms over forty-nine per cent of it to a depth of ten miles at least. It is the second most active element on Earth—in the universe for that matter, and of the active elements there is only one with which it can't combine, namely, fluorin. Of course it can't combine with the inert gases, so I say the active elements. I suppose it is left free principally because there was nothing else to do. Apparently there weren't enough partners to go around. At that it did a mighty good job of it! Forty-seven per cent. of the solid crust is oxygen, 85% of the water is oxygen, and 20% of the air is free oxygen. Well, let's not look so favorable a gift horse in the mouth. If it hadn't been left free, where would we be?"

The discussion soon died down and the men retired

for the night, each wondering what it was that had called Waterson away so suddenly, and each determined to be on hand when he returned in the morning.

The coming of the light of dawn had, perforce, put an end to the activities at Mt. Wilson, so it was shortly after sunrise that the two men heard the hangar doors open. And it was very shortly after sunrise that they had dressed and gone down to greet Waterson. The worried look on his face told a great deal, for both men knew him well, and when Waterson looked worried there was something of tremendous import under way.

"Hello. Had a good night Dave? I have something that is going to interest you—and two and a half billion other human beings. They have discovered something at the Mt. Wilson observatory that is going to change our plans quite a bit. We had intended going to other planets to visit the inhabitants, but we won't have to go. They are coming to us; furthermore, twenty ships are coming, and I have an idea they are good sized ships. But Wright, I think you had better start breakfast. We can discuss it at the table. I'm going to wash, and if you will help Wright, Dave, I think we will be at work pretty soon." Waterson left the room, and the two men looked at his retreating figure with astonishment and wonder. An announcement that our planet was to be invaded from space is a bit hard to take in all at once, and particularly when it is given in the matter of fact way that Waterson had presented it, for he had known it now for over ten hours, and had been working on it during all that time.

AT the table the explanation was resumed. "The ships were first sighted in the big telescope when they turned it toward Mars last night. You remember that Mars is at its closest now, and they are taking a good many pictures of it. When they saw these spots of light on the disc of Mars they were at once excited and started immediate spectroscopic and radiometric observations. The fact that they showed against the disc of Mars meant that they were nearer than the planet, and by measuring the amount of energy coming from them they tried to calculate their size. The results at once proved that they could not be light because of reflection, for the energy that they emitted would require a surface of visible dimensions, and these were points. Their temperature was too low to be incandescent, so they were violating all the laws of astro-physics. By this time they had shifted sufficiently to make some estimate of their distance, shifted because of the movement of the Earth in its orbit, Dave, and so they were covering a different spot on the disc of Mars. Allowing that they were going in a straight line, they were some ten and a half million miles away. The spectroscope showed by displacement of one of the spectral lines that they were coming toward us at about 100 miles a second. The line of their flight was such that they would intercept the Earth in its orbit in about thirty hours. That means that we have about twenty to work in.

"It doesn't take any alarmist to guess that this means trouble. They would not be coming in twenty ships if they were coming on a peaceful mission. Also considering that they come in only twenty ships it shows that they have considerable confidence in those twenty. Since they are coming here without first sending a scouting party of one or two ships, I suspect that they already know that the conditions of Earth are suitable to them.

To determine our conditions would require exceedingly powerful telescopes, but they are helped by the thin air of their planet. I believe that they can actually see our machines and weapons, and that they know just about what we have. I think that they are counting on cleaning up the world very easily—as indeed they would but for one factor, for they have atomic energy. Wright, do you remember that we decided to use electronic rockets to drive the car, once we discovered atomic energy? And that having discovered material energy, we naturally decided not to? Well, they have electronic rockets. This makes me feel sure that that means that they have atomic energy, but have no material energy."

"Fine Steve. Your reasoning is most admirable—but will you please translate 'electronic rocket' and a few of those other terms into English? And otherwise make yourself clear to the layman?"

"Well, I suppose I have no right to call a cathode ray tube an electronic rocket, but when a cathode ray tube gets that big it really needs a new name. The idea is the same as that of a rocket. You know the experiments the Germans, the millionaire Opel, and others carried out in 1927 with rocket automobiles? They had a terrible time with their rockets because the heat of one set off the next. The result was a disastrous explosion—and they had a whole ocean of air to cool them! What would a rocket do in free space? Also remember the principle of a rocket is that you shoot particles out of the rear at a very high speed and thus impart the kick to the ship. The electronic rocket does the same thing—but instead of shooting molecules of hot gas, it shoots electrons, a giant cathode ray tube such as Coolidge had in 1927, but his was so small that the kick was immeasurable. Remember that as the velocity of the electrons approaches that of light, the mass increases and so the electrons as shot from a cathode ray rocket may weigh as much as a milligram. The problem of propulsion then is not hard with atomic energy to supply the terrific voltages needed to run the tube. But the cathode rays are going to be their first weapon. Cathode rays are absorbed by any object they hit, and their terrific energy is converted to heat. They are deadly in themselves, and the heat is of course deadly. They will also have heat rays. I can make a heat ray with atomic energy, though mine is derived from material. The only way we can fight them is to know beforehand what we are to meet. This is to be a war for a world, and the war will be a battle of titanic forces. The weaker of the forces will be a million times greater than anything man has ever known before, and either of these two forces would, if fully applied, blast our planet from its place around the sun! Such forces can not be withstood. They must be annulled, deflected, or annihilated by some greater force. Only when we know what to expect can we fight them, and live. Remember, if they once succeeded in getting one weak spot in our armor, we can never have another chance, and the world can never hope to fight them—mere armies and a navy or two, with a couple of air forces thrown in—what would they amount to? The energy of atoms could destroy them like paper in a blowtorch—think what would happen to one of those beautifully absorbing grey battleships if a heat ray touched it! Their eighteen-inch steel armor would not melt—it would boil away! A submarine would be no safer—they could explode the water about it into steam and crush it. The effect of a heat ray in water is just that—the water is

converted to steam so suddenly that there is a terrific explosion. The cathode rays could sweep an army out of existence as hose might wash away an army of mud soldiers. They won't have gases. They will have no use for them. They could wipe a city off the map, leave only a great crater in the scarred Earth, while men were getting ready to lay a gas barrage. A shell would certainly just bounce off of the armor of my ship and I suspect that it would do the same with the Martian ships. Earth has only one weapon that can even bother them! And that one weapon is the one factor they did not figure on! It is the 'Terrestrial.' But now, if we want to make that one factor upset the whole equation, we have to calculate how to make its value a maximum, and to do that we have to know every other factor in the equation. I have suggested two weapons they will have, the cathode rays and the heat ray. They will, of course, have others; they will have atomic bombs, and I am sure that they will find us so dangerous that they will be willing to lose a ship and crash us. This gives us something else to avoid. Can any of you think of something else?"

"Good Lord Steve, haven't you thought of enough?"

"Plenty, Dave, but it isn't considered good form in military proceedings to permit the enemy to surprise you. In fact, it is highly probable that if he does, you will get a new form, one more adapted to aerial transit."

"Yes, that's true, too. But I remember reading once that ultra-violet light was invisible, and very dangerous to the body. I wonder if they will use that?"

"They may, but I greatly doubt it. Air is very nearly opaque to ultra-violet light, above a certain limit, and below that limit it is not very harmful. The infra-red heat rays, though, are going to be a very great menace. I can't think of any way to make them harmless. Of course, the polished iridium shell of the ship will protect us from the sides, as the heat will all be reflected. The difficulty will be that the heat will fuse the window, and thus attack us. The quartz glass is nearly opaque to heat rays, as is all glass. Being opaque, it absorbs it, 'cuts it out' as we say. The result will be that the glass will melt instantly, whereupon we will go very quickly. The idea of putting a polished metal shutter before the window is the one we will have to adopt, but we must modify it somehow. The heat rays will be turned back all right—and so will the light rays. The question is to shut out heat and let in light. Any suggestions?"

"I wonder if there isn't some selective reflector that we could use, Dr. Waterson?"

"That is a good idea, Wright—but I don't know of any that will pass all the light and reflect all the heat!"

"What is a selective reflector, Steve?"

"There are lots of things that have that property Dave, gold leaf is one, it can transmit green light—that is you can see green light through it, but it reflects yellow light—the complement of the green it transmits. There are a great many organic dyes that are one color when you look at them and the complement of that color when you look through them. The trouble is we need one that transmits the visible portion of the spectrum and—boy—that's it, Wright, that's it—spectrum—take a totally reflecting diffraction grating, reflect out all that part of the spectrum that we don't want, take what we do, pass it through a prism to recombine it to white light, then through lenses so we can see as if through a telescope! We will have absolutely cold light!"



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... but three great hulks dived, and in a dive that ended in flaming wreckage on the packed sands, ten miles below

"Again it sounds good, but I'd like to hear it in English, Steve."

"The idea is to take a diffraction grating, a piece of metal with, usually, 14,438 lines to the inch ruled on it, and previously highly polished, so that it reflects most of the light that hits it. Now it is reflected at different angles, so that we have a spectrum. The spectrum spreads out light and heat waves as well—I use the reflection grating as no material will pass the heat rays, and it then is possible to reflect out of the car again those rays we do not want. The light, which we do want, we will pass through a prism which will recombine it to white light. A prism can either split up light into different colors, or recombine them to white. Lenses then will be needed to make the images clear. The effect will be much the same as a telescope. And that takes care of the heat waves. The cathode rays, luckily won't bother us for the car is already charged strongly negative, and negatively charged electrons will be strongly repelled, as they are in the grid of a vacuum tube, so will never hit us. The bombs constitute the worst menace. The only defense we have against them is the very doubtful one of not being there when they are. That is a good policy in any case.

"As a last precaution—a bit grim—I will arrange it so that if the 'Terrestrial' is damaged to the point of utter helplessness we can, by pushing a single button, explode the entire car—as material energy. It will utterly destroy everything within a radius of a hundred miles, and damage everything within a much greater radius. I believe it will not be serious enough to change the Earth's orbit, though."

"Good—cheerful man, aren't you, Steve! Now what have we to meet that delightful array?"

"We have things even more delightful. Our heat ray is considerably more powerful, I imagine. It is generated by a force ten thousand times as great. Our bombs will be worse. Wright, I wish you would make about a hundred shells that will explode with the full thirty-five thousand ton equivalent of dynamite. And then we will have everything they have that is going to be effective, and have it in a more concentrated form. Can any of you suggest anything else?"

"Steve, you said that your car was nearly pure iridium on the outside, and that is very inert. The outside of their ship will be polished too, won't it?"

"Probably—though I don't believe they were expecting to meet a heat ray."

"Well, I wonder if there isn't some chemical you could spray out that would tarnish their ship, without hurting your iridium ship? Then it wouldn't be polished and would absorb your heat rays."

"That's a good idea, Dave. I might use a sulphide—nearly all sulphides are colored, and form very easily and rapidly. Or I might use liquid ozone. That will tarnish almost anything to an oxide, which is also apt to be colored. I could certainly heat the ship that way, but I wonder—I'm afraid that the oxide or sulphide would break down too easily. There is only one metal that they might use on which that would work, namely steel. Iron sulphide is black, stable, and will not decompose readily. The oxide forms readily, is highly colored, and will not decompose before the metal is incandescent, or even melted. The only difficulty is that steel is so readily attacked, that they wouldn't use it. They would probably coat it with an inert metal, silver for instance.

That forms a black sulphide very readily. I'm afraid that won't work Dave. But Wright, I think that it would be a good idea to develop a few of those field theory equations in a different way. Try integrating number two-six-thirty-nine—I think that's it—and between the limits of equation one-four-twenty-three and zero. I have an idea that a little development of that idea will give us a beam that will be very useful. We haven't time to make much apparatus, but I think the result will be near enough to the space curving projector to allow us to change the extra projectors we have in the laboratory to fit. Also, try calculating the arrangement we will need for the heat eliminator, please. I'm going to give Dave his first lesson in space navigation. We'll be back about noon—if at all!" But Gale caught the wink, so the effect was lost.

TEN thousand miles out in free space the practice began. As Waterson pointed out, it would require some mighty poor handling to hit the Earth now. For the first time in Gale's life he could practice with a machine with no fear of hitting anything.

When the ship slanted down in a long graceful glide, to enter the hangar doors that noon, Gale was in control. The controls of the ship were remarkably easy to master and extremely simple. The one thing that was hard to master was the tremendous range of power. It could be changed in a smooth climb from a fraction of a horsepower to billions! The first attempts had been a bit hard on the passengers, the seat straps coming in for their share of use.

When they returned to the laboratory, they found Wright had just prepared a light lunch, and at once began to demolish it. Six hours between breakfast and lunch is conducive to a husky appetite.

Wright had finished the integration on the machine, and had calculated the mathematics of the heat eliminator in a little less than four hours. The results were very satisfactory, and in the remaining time he had converted six of the extra projectors to their new use, and had them ready for installation. After lunch the men began on the construction of the heat eliminators. Two were to be installed, one for the observer as well as one for the pilot. The heavier work of installing the projectors and the iridium shield was reserved for later in the afternoon.

By six that evening, the new projectors were completely installed and the connections made, and the great iridium shield was cooling from blinding incandescence in its mold. It would be installed that night, but now they felt that a rest and a meal were due them. They had been working under a great strain that afternoon, for they knew that they must get that machine ready before the Martians reached Earth, and there was a great deal to do. After the brief dinner they went out to the shining "Terrestrial." As yet, the new projectors had not been tried.

Gracefully the great shining shell backed out into the ruddy glory of the sinking sun, the red light had turned the desert to a sea of rolling fire, with here and there a wave that showed dark—a mound. In the far distance the purple hills of Nevada seemed like distant islands in this burning sea, and above it rode this lone, shining ship, magnificently iridescent in the setting sun. Now it stopped, hovered, then suddenly a pile of metal ingots that lay to one side of the laboratory leaped into the air

and shot toward it—then paused in mid-air, hung poised for an instant, then sank lightly to the ground. Now the sand of the desert began to roll into some strange wave that began just beneath the ship, then sped away—further—till it died in the far distance, by means of an invisible beam. A wall of sand thirty feet high had been built in an instant, and it extended as far as the eye could reach! Now the ship settled, and slowly, light as a feather for all its three thousand tons of metal, it glided into the hangar.

"Man Steve, that works! How long a range has it? And please tell me about it now you are sure it works!"

"I don't know just how long a range it has—it affected the sand as far as we could see, and we were using very little power. It is just a modification of the space curving apparatus. It projects a beam of gravity, and theoretically at least it has an infinite range; and it certainly has a whale of a lot of power. I can use a good deal of the power too, for the strain of the attraction is taken off the mountings and the ship, and put on space itself! The gravity projector is double and projects a beam of the gravity ray forward and an equally powerful beam of the space curve behind. The two rays are controlled by the same apparatus, and so are always equal. The result is that no matter how great a load I put on it, the entire load is expended in trying to bend space!"

That night work was carried on under the floodlighting from the ship's great light projectors. The entire region was illuminated, and work was easy. Waterson had been instructed to take a rest when he seemed bent on, continuing his work. Even his great body could not keep up that hard labor forever, and forty-eight hours of work will make any man nervous. With a crisis such as this facing him, he certainly needed rest. He agreed, provided they would call him in two hours. Two hours later Gale walked about a mile from the laboratory, and called. He then returned and continued his work on the placement of the shield. It had been placed, polished, and tiny holes bored in it for the heat eliminator inside of four hours. It was operated by an electric motor, controlled from within. It could be lowered and leave the window clear, but when in position its polished surface made it perfectly safe against heat rays. The work had just been completed, when Waterson reappeared looking decidedly ruffled.

"Say, I thought you two promised to call me in two hours! It's been just four, and I woke up myself!"

"But Steve, I did call you and you didn't hear me. I didn't say I'd wake you in two hours."

IT was shortly afterwards that news of the coming invasion was made public. And with the news came the wild panics, even mad, licentious outbreaks all over the world. Man saw himself helpless before mighty enemies whom he could not resist. Never had such a complete disruption of business taken place in so short a time. Things were done that night in a terrible spirit of "we die tomorrow, we play today." The terrible jams in the cities caused the deaths of hundreds of thousands. They wanted to flee the cities, get into the woods and hide like some animal. Within an hour no news could reach most of them, and though Waterson had told of his ship, told immediately, given every government official announcements concerning it, still the mad dance went on. But to those that had stayed near the radio sets, this

news brought relief. No television pictures of it could be broadcast for many hours, as there was no portable equipment within several hundreds of miles, and the men were working on the ship.

That night the three men took turns watching by the radio set for news. The Martians were due to land somewhere on Earth that morning. It would probably be a temporary landing in some land that was just at dawn. And it was so. But the "Terrestrial" must not be taken by surprise.

Waterson was to have the morning watch. Unlike the others, he did not sit by the radio set. He answered the few messages he received, but the entire four hours of his watch he spent working with Bartholemew. The equations he was working with seemed new, strange, and they had terrific import to the understanding. It was but a few minutes before the Martians landed when he had gotten the final result. At once he called the two others.

"Wright, if that equation means what I think it does, we have something that will give us a tremendous advantage! I feel sure that the Martians have actually worked out the problem of the atom by pure brain power—no machines aided them, else they too would have discovered the secret of matter. That machine has made it possible for us to work out problems to meet them. But as they may land any minute now, let's begin on this. We need two of these projectors in front, and two at the stern. If you will start on the actual projectors, I'll start the instrument end. Come on Dave."

And so all three heard the announcement that the Martians had landed. Twenty mighty ships had settled down in the arid land of Nevada. The ships were a bare five hundred miles from them! The dry air of the desert was probably best suited for Martian lungs. Army planes had been cruising about all night waiting for the enemy, waiting to learn definitely what they were to face. It was Lt. Charles H. Austin who sighted them. He first saw them while still on the very outskirts of our atmosphere, and reported them at once, turning his television finder on them. Great balls of purple fire they seemed as they sank rapidly through our atmosphere. The great ships floated down and as they came within a mile or so of him, he was able to see that the great flaming globes of light were beneath them, seemingly supporting them. A breeze was blowing from them to him, and the air, even at that distance, was chokingly impregnated with oxides of nitrogen and ozone, from the forty mighty glowing spheres. They were fully an hundred and fifty feet in diameter, but the ships themselves, illuminated by the weird light of the glow of their sister ships, were far greater. Each was three thousand feet long, and two hundred and fifty feet in diameter. Hundreds of thousands of tons those mighty machines must have weighed, and the fiery globes of ionized air that shone under the impact of the cathode rays alone told how they were supported. Now, two by two they sank, and came to rest on the sands below, and as they came near the ground the glowing ray touched the sand, and for that moment it glowed incandescent, then quickly cooled as the ray was shut off. At last the mighty armada of space had settled on the packed sands, and now there sprang from each a great shaft of light that searched the heavens above for planes. By luck the plane of the observer was missed, and the television set clicked steadily on as the questing beams

were reduced to five, and now the ground was flooded with blinding light. A moment later the side of one of the great ships opened, and from it a gangplank thrust itself. Then from it there came a stream of men, but men with great chests, great ears, thin arms and legs; men that must have stood ten feet high. Painfully they scrambled down the plank, toiling under the greater gravity of Earth. But what a thrill must have been theirs! They were the first men of this system to ever have set foot on two planets! And some of those men were to step forth on a third—the first men to visit it too!

Painfully now they were coming from their huge interplanetary cruisers, slowly they plodded across the intervening space to their comrades, pouring from their sister ships.

THEN suddenly the television screen was white—a blinding searchlight had at last picked up the plane. Wildly the pilot dived, and now there came a picture of all those men looking upward, their first glimpse of the works of man perhaps. But the beam that had been eluded was reinforced in a moment—then there came a dull red beam—a flash—and the screen was smoothly dark.

Waterson and his friends feverishly worked at their tasks. There was no doubt about the inimical intentions of the Martians now. They had destroyed a man without reason. And the projectors were rapidly taking shape under the practiced hands of Wright. Dawn broke, and the men stopped for breakfast, but still the work on the projectors was not done. Many parts were so similar to those of the other projectors that they could use the spare projectors for parts, many others were new. It was shortly after breakfast that the news of the Martians' landing came. They had started now on the famous Day of Terror. But still the men in the laboratory worked at their tasks. The "Terrestrial" had been christened according to plan, and was now ready to start at any moment, but the new projectors were an additional weapon—a mighty weapon.

All matter is made of atoms, grouped to form molecules, combinations of atoms, or a molecule may contain but one atom, as is the case of helium. The atoms within the molecule are held to each other by electro-static attraction. The molecules of substances like wood are very large, and hold to each other by a form of gravity between the molecules. These are called amorphous substances. Water is a liquid, a typical liquid, but we have many things that we do not recognize as liquids. Asphalt may be so cold that it will scarcely run, yet we can say it is a liquid. Glass is a liquid. It is a liquid that has cooled till it became so viscous it could not run. Glass is not crystalline, but after very many years it does slowly crystallize. The molecules of a liquid are held together by a gravitational attraction for each other. But in crystals we have a curious condition. The atoms of salt, sodium chloride, do not pair off one sodium and one chlorine atom when they crystallize; perhaps a million sodium atoms go with a million chlorine atoms, and give a crystal of sodium chloride. Thus we have that a crystal is not $n(\text{NaCl})$ but it is Na_mCl_m . Thus a crystal of salt is one giant molecule. This means then that the crystal is held together by electrostatic forces and not gravitational forces. The magnitude of these forces is such that if equivalent weights of sodium and chlorine atoms could be separated and placed at the

poles, the chlorine atoms at the north and, eight thousand miles to the south, the sodium, over all that distance the twenty-three pounds of sodium would attract the thirty-five pounds of chlorine atoms with a force of forty tons!

So it is that in all crystals the atoms are mutually balancing, and balanced by perhaps a dozen others. The electrostatic forces hold the crystals together, and the crystals then hold together by gravity in many cases; otherwise they don't hold together at all. A block of steel is made of billions of tiny crystals, each attracting its neighbor, and thus are held together. But this force is a gravitational force.

Now what would happen if the force of gravity between these crystals were annihilated? Instantly the piece of metal would cease to have any strength; it would fall to a heap of ultra-microscopic crystals, a mere heap of impalpably fine dust! The strongest metal would break down to nothing!

Such was the ray that Waterson had developed. It would throw a beam of a force that would thus annul the force of gravity, and the projector had been made of a single crystal of quartz. Its effects could be predicted, and it would indeed be a deadly weapon! The hardest metals fell to a fine powder before it. Wood, flesh, liquids, any amorphous or liquid substance was thrown off as single molecules. It would cause water to burst into vapor spontaneously, without heat, for when there is no attraction between the molecules, water is naturally a gas. Only crystals defied this disintegration ray, and only crystals could be used in working with it.

But while the men in the lonely laboratory in Arizona were finishing the most terrible of their weapons, the Martians were going down the Pacific coast.

When morning dawned on our world, it found a wild and restless aggregation of men fleeing wildly from every large city, and with dawn came the news that the Martian armada had risen, taking all its ships, and was heading westward. Straight across Nevada they sailed in awful grandeur, the mighty globes of blazing cathode rays bright even in the light of the sun.

Across the eastern part of California, and with an accuracy that told of carefully drawn maps, they went directly to the largest city of the West Coast, San Francisco. There they hung, high in air, their mighty glowing spheres a magnificent sight, motionless, like some mighty menace that hangs, ever ready to fall in terrible doom on the victim beneath. For perhaps an hour they hung thus, motionless, then there dropped from them the first of the atomic bombs. Tiny they were. No man saw them fall; only the effects were visible, and they were visible as a mighty chasm yawned in sudden eruption where solid earth had been before. One landed in the Golden Gate. After that it looked as a child's dam might look—a wall of mud and pebbles. But pictures and news reels of the destruction of that city tell far more than any wordy description can. Once it had been destroyed by earthquake and fire, and had been built up again, but no phenomenon of Nature could be so terrible as was that destruction. Now it was being pulverized by titanic explosions, fused by mighty heat rays, and disintegrated by the awful force of the cathode rays. We can think only of that chaos of slashing, searing heat rays, the burning violet of pencil-like cathode rays, and the frightful explosions of the atomic bombs. It took them just sixteen minutes to destroy that city, as no city has been destroyed in all the history

of the Earth. Only the spot in desert Nevada where the last battle was fought was to be more frightfully torn. But in all that city of the dead there was none of the suffering that had accompanied the other destruction; there were none to suffer; it was complete, instantaneous. Death itself is kind, but the way to death is thorny, and only those who pass quickly, as did these, find it a happy passing.

And then for perhaps a half hour more the great ships hung high above the still glowing ruins, supported on those blazing globes of ionized air. Then suddenly the entire fleet, in perfect formation, turned and glided majestically southward. The thousands of people of Los Angeles went mad when this news reached them. All seemed bent on escaping from the city at the same time, and many escaped by death. It took the Martians twelve minutes to reach Los Angeles, and then the mighty shadows of their hulls were spread over the packed streets, over the thousands of people that struggled to leave.

But the Martians did not destroy that city. For two hours they hung motionless above, then glided slowly on.

ALL that day they hung over the state of California, moving from point to point with such apparently definite intention, it seemed they must be investigating some already known land. No more damage did they do unless they were molested. But wherever a gun spoke, a stabbing beam of heat reached down, caressed the spot, and left only a smoking, glowing pit of molten rock. A bombing plane that had climbed high in anticipation of their coming landed a great bomb directly on the back of one of the great ships. The explosion caused the mighty machine to stagger, but the tough wall was merely dented. An instant later there was a second explosion as the remaining bombs and the gasoline of the plane were set off by a pencil of glowing cathode rays. But when no resistance was offered, the Martian fleet soared smoothly overhead, oblivious of man, till at last they turned and started once more for the landing place in Nevada.

The last work on the projectors had been finished by noon that day, and they were installed in the ship immediately. Then came the test.

Again the "Terrestrial" floated lightly in the air outside the hangar, and again the pile of ingots leaped into the air to hang motionless, suspended by the gravity beam. Then came another beam, a beam of pale violet light that reached down to touch the bars with a caressing bath of violet radiance—a moment they glowed thus, then their hard outlines seemed to soften, to melt away, as still glowing, they expanded, grew larger. Inside of ten seconds the ingots of tungsten, each weighing over two hundred pounds, were gone. They had gone as a vapor of individual crystals; so gone that no eye could see them! The ray was a complete success, and now as the "Terrestrial" returned to its place under Waterson's skilful guidance, the men felt a new confidence in their weapon! The projectors of the disintegration ray had not yet been fitted with the polished iridium shields, and without these they would be vulnerable to heat rays.

It was during the installation of these that the accident happened. Wright had already put the left front projector shield in place, and was beginning on the right, but the small ladder from which he worked rested against the polished iridium surface of the car, and as

this was rounded, he did not have a very secure perch. The shield weighed close to a hundred pounds, for iridium is the heaviest known metal, and it was constructed of inch-thick plates. While trying to swing one of these heavy shields into place, the changed direction of the force on the ladder caused it to slip, and a moment later Wright had fallen to the floor.

The heavy shield had landed beneath him, and his weight falling on top, had broken his right arm. Wright would be unable to operate any of the mechanism of the "Terrestrial," which required all eyes, arms and legs to work successfully. While Waterson installed the remaining shields, Gale hurried Wright to the nearest town in Waterson's monoplane.

It was three-thirty by the time he returned, and Waterson had mounted the shields. His great strength and size made the task far easier for him, and the work had been completed, and the shields finally polished, and welded in place.

The entire afternoon the radio had been bringing constant reports of the progress of the Martians. As they were doing no damage now, and were over a densely populated district, where any battle such as would result should the "Terrestrial" attack them would surely destroy a considerable amount of valuable property, Waterson decided to wait till they had left California. To the west was the ocean, and a conflict there would do no damage. To the east was the desert, and to the south was the sparsely settled regions of low property value. Only to the north would the value of the property be prohibitive to a final encounter.

When, at about five, news came that the Martians were returning to the desert landing spot in Nevada, Waterson at once set out to intercept them, and as his tiny car was prepared and waiting, the Martian armada came in sight, at first mere glistening points far off across the purple desert hills, but approaching hundreds of miles an hour.

Yet it seemed hours while those glowing points neared, grew and became giant ships, though still miles away. When at last the leader of the Martian fleet came within about a half mile of its tiny opponent, without slowing its rapid flight, there sprang from its nose a glowing violet beam that reached out like a glowing finger of death to touch the machine ahead. But that machine was strongly charged with a tremendous negative potential, and the cathode ray was deflected and passed harmless, far to one side.

And now the "Terrestrial" went into action, retreating before the bull-like rush of its mighty opponents. The twenty great ships were drawn up in a perfect line formation, a semicircle, that each might be able to use its weapons with the greatest effect without interfering with its neighbor. Now from the gleaming ship ahead there sprang out a dull red beam, a beam that reached out to touch and caress the advancing ships. Six mighty ships it touched, and those six mighty ships continued their bull rush without control, spreading consternation in the ordered rank, for in each the pilot room had instantly become a mass of flame and glowing metal under the influence of the heat ray. The other fourteen ships had swerved at once, diving wildly lest that beam of red death reach them, but three great hulks dived, and in a dive that ended in flaming wreckage on the packed sands, ten miles below. The other three ships that had felt that deadly ray regained control before touching the

earth, but those three that went down, mighty cathode rays streaming, struck and formed great craters in the sand.

BUT again that ray of death stabbed out, for one Martian had incautiously exposed his control room, and in an instant it too was diving. The mighty ray tubes forcing it on, it plunged headlong, with ever greater velocity to the packed sands below. An instant later there was a titanic concussion, an explosion that made the mighty Martians rock, and stagger drunkenly as the blast of air rushed up, and a great crater, a full half mile across, yawned in the earth's surface. Every atomic bomb in that ship had gone off!

The three ships that had been rayed retreated now, and left thirteen active ships to attack the "Terrestrial." The shield had been placed long before, and now as the Martians concentrated their heat rays on the glistening point before them, it was unaffected. While they were practically blind, they could not risk an exposure to that heat ray.

"Steve, I thought that heat ray was entirely cut out by the heat eliminator. How is it I could see your beam?"

"You can't see heat anyhow—and it does cut out all the infra-red rays. The reason you can see that beam is that I send a bit of red light with it so I can aim it."

Again the Martians had drawn up into a semicircle, with the "Terrestrial" at the centre, and now there suddenly appeared at the bow of each a flash of violet light. At the same instant the ship before them shot straight up with a terrific acceleration—and it was well it did! Almost immediately there was an explosion that made even the gargantuan Martian ships reel, though they were over ten miles from the spot where the explosion occurred.

"Nice—they use a potassium salt in their explosive, Dave. See the purple color of the cannon flame?"

"Yes, but why not use the atomic energy to drive the shells as well as to explode them?"

"They couldn't make a cannon stand that explosion—but move—he's trying to crash us."

The Martians seemed intent on ramming the tiny ship that floated so unperturbed before them. Now three great ships were coming at them. Suddenly there was a sharp rattle of the machine gun, then as that stopped, the "Terrestrial" shot away, backed away from the Martians at a terrific speed. Gale had never seen the explosive bullets work, and now when the three leading Martian ships seemed suddenly, quietly, to leap into a thousand ragged pieces, giant masses of metal that flew off from the ruptured ship at terrific speed, and with force that made them crash through the thick walls of their sister ship, it seemed magic. Those great ships seemed irresistible. Then suddenly they flew into a thousand great pieces. But all was quiet. No mighty concussion sounded. Only the slight flash of light as the ships split open. Titanic ships had been there—a deadly menace that came crashing down at them—then they were not there! And more, another ship had been crushed by a great flying piece of metal. Only the fact that these three had been well in front of the rest had saved the main part of the Martian fleet. The atomic generators of the one ship must have been utterly destroyed, for the great, glowing spheres of ionized air that showed the cathode rays to be working, had died,

and the great ship was settling, still on an even keel, held upright by the gyroscopes that stabilized it, but falling, falling ever faster and faster to the earth, over twelve miles below.

"Steve—did—did I do that? Why didn't I hear the explosion?"

"You sure did, Dave, and made a fine job of it—three hits out of three shots—in fact four hits with three shots. The sound of the explosion can travel through air, but we are in free space."

But nine ships still remained active of the original twenty of the Martian Armada, and these nine seemed bent on an immediate end to this battle. This tiny thing was deadly! Deadly beyond their wildest dreams—if it continued to operate, they wouldn't—it must be destroyed.

Again they attacked, but now the cathode rays were streaming before them, a great shield of flaming blue light. Again the thin red beam of death reached out, caressed the ships—and the pilot room became a mass of flames. But they had learned that the ships were controlled from some other part; they were coming smoothly on! Again came the sputtering pop of the machine gun. But it, too, seemed useless—the mighty explosions occurred far from their goal—the cathode rays were setting off the shells. And now one of the nine left the rank and shot at the "Terrestrial" with a sudden burst of speed. On it came at a terrific speed—one mile—three quarters—a half—

THEN there came a new ray from the bow of the tiny glistening ship. It seemed a tiny cathode ray, as it glowed blue in the ionized air, but, like the ship, it was strangely an iridescent violet—and as it touched the hurtling Martian, the great ship glowed violet, the floor seemed to spread and flow over it, then it stopped. The ship was no longer glowing—and the strange ray ceased. But where the titanic, hurtling ship had been a moment before, was a slight clouding—and a few solid specks—small—the ship was utterly destroyed!

The other Martians withdrew. Here was something they could not understand. Heat they knew—explosions they knew—but this dissolution of a titanic ship—thousands of tons of matter—and in a fraction of a second—it was new; it seemed incredible.

But now again they formed themselves—this time they made a mighty cube, the eight ships, each at one corner—and five miles on a side the mighty cube advanced, till the "Terrestrial" formed a center to it. Now the great ships slowly closed in—but still the glistening ship remained in the center. There was plenty of room to escape—then suddenly, as the cube contracted to a three mile side, it moved. Instantly there came from all the great ships around it, a low but tremendously powerful hum—such a hum as one could hear around a power sub-station in the old days—the hum of transformers—and the tiny ship suddenly stopped—then reversed, shot back to the center of that mighty cube, and hung there! Now swiftly the cube was contracting—and still the tiny car hung there! It was jerking—but it moved only a few hundred feet each time—then suddenly it started—went faster—faster—then there was a distinct jar as it slowed down—almost reversed—but again it continued. At last it shot outside the wall of that cube and shot away with a terrific acceleration.

"Whew—Dave, they almost got us that time! That

was a stunt I had never thought of—though I can see how it is done. They have tremendously powerful alternating current magnets on each of those ships. This car is non-magnetic, but a conductor, so there are induced in it powerful currents. You notice how hot it has grown in here—you can scarcely breathe—they induced terrific currents in our outer as well as in our inner shell. The result was that we were repelled from the powerful magnets. They were placed at the corners of a cube, so the only place that we could stay in equilibrium was in the exact center. When I tried to escape, I had to go nearer one of the poles, and the repelling force became greater. Then the ships on the far side shut off their magnets, so that they no longer repelled me—and I started to fall back—but I was able to pull out. The terrific acceleration I got just after leaving the cue was due to the repulsion of their magnets. You see it was very sizable! Had I had atomic energy only, I would never have gotten out of that field of force. I can, because of my material energy, escape every time. See—they are going to try again—let them—when they get close, we can turn on the disintegration ray and pick off the top ships. Then the bottom ships!"

Again the "Terrestrial" was held in that titanic field of force—that field was so great that all magnetic compasses all over the Earth were deflected, and the currents induced in the telephone lines, telegraph lines, power transformers and all other apparatus were so great that many lines in the vicinity were melted. The cube contracted to a mile dimension before the glowing, iridescent ray of death reached out to dissolve that first ship—then a second—a third—a fourth—and the Martians were in the wildest confusion—the cathode rays prevented the "Terrestrial's" bombs from striking, but it also made their own projectiles useless. They had been sent to conquer this new planet for their race—and they were failing. They could not rush that tiny ship—for the deadly disintegration ray would only destroy the ship before they had had a chance to crash into the "Terrestrial." It seemed hopeless, but they tried once more.

Now from every side the ships of the Martians came at their tiny opponent, mighty hurtling hulks of hundreds of thousands of tons—it seemed they must get that tiny ship—there seemed no opening. The three damaged ships had joined in this last attempt—and as the seven gargantuan ships charged down at the "Terrestrial," there sprang from it again the pale beam of disintegration—and one of the four remaining undamaged ships ceased to exist. The gap was closed—another ship was gone—and a third flashed into nothingness as the tiny opponent swung that deadly beam—then it was free—and turning to meet the four remaining Martians.

But now they turned—and started up—up—up. They were leaving Earth! And now, as the blazing sun sank below the far horizon of distant purple hills, one faltered, the burning violet spheres went dark, and it plunged faster and faster into the darkness below—down from the glowing light of the ruddy sun into the deep shadow far below—down to the shadow of Death—for the damaged generators had failed. And as that last great ship crashed on the far sands, the violet globes of light of the others were dying in the rare air far from Earth. The Martians had come, had seen and had been conquered!

"Steve—they are going—we have won. This planet is ours now—man has proven it. But they may bring reinforcements—are you going to let them go?"

"No, Dave, I have one more thing I want to do. I want to give an object lesson."

The tiny ship set off in the wake of the defeated giants—faster and faster. It was overhauling them—and at last it did—just beyond the orbit of the Moon. The undamaged ship was leading the train of four ships as they went back. Their world must have been watching—must have seen that battle—must have known. And now they were returning.

AS the tiny ship came up to them the Martians turned at bay it seemed—and waited. Then from the tiny ship before them there came a new ray—invisible here in space—but a ray that caught and pulled the great ship it touched—the undamaged ship. In an instant it was falling toward the "Terrestrial"—then its great cathode tubes were turned on—invisible here in space also. Now it stopped, started away—but greater and greater became the force on it. It was a colossal tug of war! The giant seemed an easy victor—but the giant had the forces of atoms—and the smaller had the energy of matter to drive against it. It was a battle of Titanic forces, with space itself the battleground, and the great ship of the Martians was pulling, not against the small ship, but against space itself, for the equalizing space distorting apparatus took all tension from the "Terrestrial" itself. The great cathode ray tubes were working at full power now, yet still, inexorably, the Martian was following the "Terrestrial!" Faster they were going now—accelerating—despite the mighty cathode rays of the Martians!

Of that awful trip through space and the terrible moments we had in the depths of space, you know. At times it seemed we must annihilate our giant prisoner, but always Waterson's skilful dodging avoided the bull rushes of the Martian. He would strain back with all available tubes, then suddenly turn all his force the other way—try to crash into us. It was a terrible trip—but toward the end he had decided to follow—and came smoothly. The strain of expecting some treachery kept us in suspense. Two weeks that long trip to Venus took. Two of the most awful weeks of my life. But two weeks in which I learned to marvel at that ship—learned to wonder at the terrific and constantly changing tugs it received—terrific yanks to avoid the hurtling tons of the Martian. I thought it must surely weaken under that continued strain, but it held. We had to get whatever sleep we could in the chairs. No food could be cooked, the sudden jerks threw us in all directions when we least expected it—but at last we reached the hot, steaming planet. Glad I was to see it, too!

The "Terrestrial" left its giant prisoner there, and as it rose through the hot, moist air it rose in a blaze of glowing color, for every available projector on its tiny surface had been turned on as a light projector—it was a beautiful salute as we left, red, blue, orange, green—every color of the spectrum blazed as a great, glowing finger of colored light in the misty air.

It took us but three days to return—Waterson admitted he went at a rate that was really unsafe—he had to put in another charge in the fuel distributor—water—and it held nearly a pint, too.

(Continued on page 975)

By Miles J. Breuer, M.D.

*Author of: "The Book of Worlds,"
"The Appendix and the Spectacles," etc.*

The Hungry Guinea-Pig

DR. CLARENCE HINKLE walked reminiscently westward along Harrison Street. Things had changed. The city had grown.

"The spirit of Chicago is growth," thought Dr. Hinkle.

Dr. Clarence Hinkle of Dorchester, Nebraska, was a country doctor of the modern, high-caliber type. He was thoroughly scientific in his methods and made use of all the facilities that modern science offers, in taking care of his prosperous farmer patients. He kept up with scientific progress by visiting conventions and taking post-graduate courses regularly. But this was the first time since his graduation that he had been back to Chicago and his Alma Mater. Now, after ten years of successful, satisfactory practice, he was on a pilgrimage back to old Rush. For study, yes; but also for a visit to the old places and to see old friends again.

He was especially anxious to see Parmenter. He and Parmenter had roomed together for four years, two on the South Side at the University of Chicago, and two on the West Side at Rush, in the center of the greatest aggregation of medical colleges and hospitals within the area of a square mile known to the world. Parmenter had been brilliant and eccentric. As a student he had done astonishing things in biochemistry. He had made a wild and brilliant record in the war. Hinkle had kept up a desultory correspondence with him, which had conveyed hints of some research of Parmenter's; something amazing, but without details of information. Parmenter's work had so impressed the University of Chicago that they had built him a laboratory and dispensary to work in.

Dr. Hinkle walked up Harrison Street looking for it. The huge bulk of the Cook County Hospital loomed ahead of him. Thousands of Rush graduates all over America will appreciate how he felt when he saw the old corner at Harrison and Congress Streets, with the ven-

WHAT makes a giant? What makes a dwarf? It is a generally accepted idea among gland specialists that one of the ductless glands is responsible for abnormal growth. If the pituitary gland is a factor, what would happen if some innocent and gentle animal were treated with the extract? Glandular science has become a most important part of medicine and some physicians specialize in its applications. Dr. Breuer must be recognized not only as an excellent writer of scientific fiction, but as an authority on his subject.

erable and historic building gone, and a trim, business-like new one in its place. It seemed that sacred memories and irreplaceable traditions had been desecrated. But, progress must go on. However, the old "P. & S." was also replaced by a great maze of new buildings. And there ahead was a sign: THE PARMENTER INSTITUTE. So, they had even named the clinic after him! Indeed, he must have done something.

He stopped a moment to look the building over. Two trucks piled high with heads of cabbage drew up before the side entrance. The drivers conversed as they unloaded the cabbage.

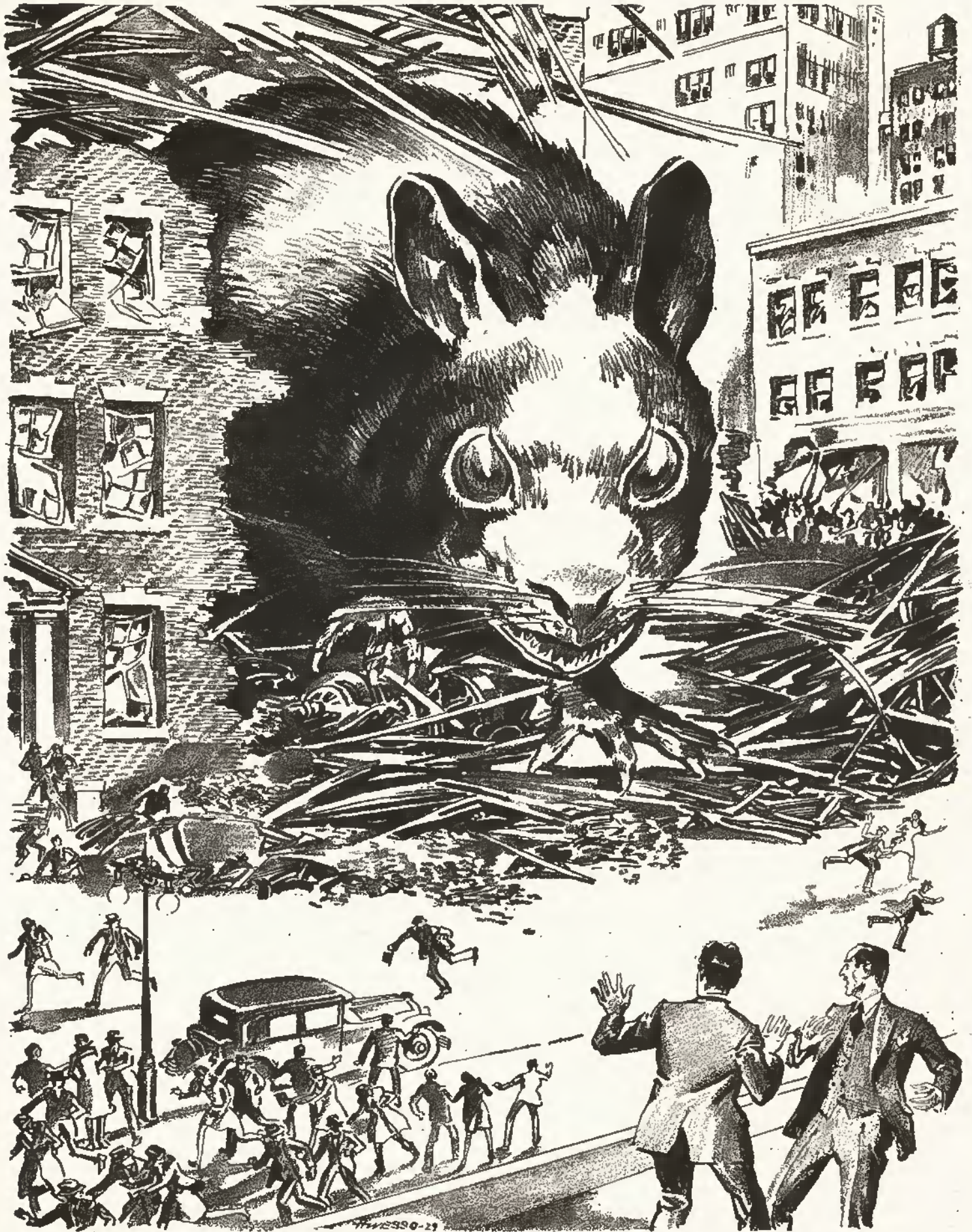
"Yesterday," Dr. Hinkle overheard one of them say, "I delivered a load of freshly cut alfalfa here. You'd think they had a lot of big animals. Funny thing for this part of town. And tomorrow we'll be bringing more stuff; wait and see."

They carried basketloads of cabbage-heads up the short flight of stairs, and the porter of the building always opened the door and took the baskets from them.

"Listen!" whispered one of the truck-drivers to the porter, catching him confidentially by the shoulder; "what's all these loads of green stuff for?"

"For feeding our experimental animals," replied the porter haughtily, as though he knew things they were not competent to understand.

"What sort of animals?" asked the truck-driver, looking doubtfully at the building, whose windows were the same as those of the others with their small rooms.



From the flattened wreckage there gazed out at the rapidly growing crowd across the street, a pair of immense, pinkish-brown eyes . . . set in a head that looked somewhat like that of an enormously magnified rabbit. . . . Illustration by WESSO.

"Guinea-pigs," replied the porter.

"Guinea-pigs?" The truck-drivers looked blankly at each other. "What are guinea-pigs?"

"Hm!" snorted the porter contemptuously. "Don't know what guinea-pigs are!" He saw them every day. "A guinea-pig is an animal like a rabbit; no, smaller—half as big. It looks something like a rabbit and something like a rat."

"Aw!" growled the truck-driver. "He's stringin' us."

"No," replied his companion. "That's true. I saw them when I was in the hospital. The doctors use them for speerments."

An inner door opened and a white-clad attendant stood looking out of it into the hall. For a while, as the door stood open, they heard a number of short, low-pitched, whistle-like notes. Then another hand slammed the door shut, and again the hall was dark and silent. To Dr. Hinkle's mind, the sound had no resemblance whatever to the squealing of guinea-pigs. The truck-drivers continued to carry cabbage and to tarry inquisitively.

Dr. Hinkle walked briskly up the front steps of the Institute, and into the office. He handed his card to the girl at the information desk, stating that he had an appointment with Dr. Parmenter.

"The doctor said you were to come into the office and wait for him," she said, showing him into an adjoining room.

IN Parmenter's office, a large desk was piled high with neatly arranged stacks of books and papers. Sections of bookcases filled with books, papers, and chemicals, covered almost all the wall space, except where it was occupied by a great steel safe. Since there was also a safe in the business office through which he had passed, Dr. Hinkle concluded that this one held, not money, but, rather, records of tremendous importance, or some sort of chemical preparation that might be dangerous in the hands of the wrong people. He sat down and waited, his eyes flitting back and forth among the titles of the medical, chemical, and biological publications.

As he sat in his chair, he could see through the open door down a long hallway. At the end of the hallway was another door; a curious door that seemed to be made of heavy planks placed horizontally, and held together with iron straps. This door was slowly pushed open, an interne emerged into the hallway, and with considerable effort tugged the door shut again and turned a heavy bolt. While it was open, Dr. Hinkle heard several more of those short, reverberating, fluty notes, like the low pipes of an organ. They were accompanied by heavy, dragging sounds, as of something tremendously heavy scraping on the floor with little short scrapes. Another interne came down the hall, and as the two met, the first one said:

"This can't go on much longer. It's got to be stopped."

The second one laughed a harsh, mirthless laugh.

"I guess we'd have stopped it already, if somebody would tell us how."

The two went back through the heavy door. Dr. Hinkle craned his neck to get a glimpse through it. In the vast half-gloom through the door, he caught a fleeting glance at a huge curved back and flanks, covered with long, straight brown hair.

"A cow? Or a bear?" he wondered in astonishment. "It's bigger than a couple of both. What in——"

Dr. Parmenter walked briskly out of a door down the hall, and seeing Hinkle in his room, hastened in. Dr. Parmenter had a worried look about him; a wrinkle in his forehead that he couldn't seem to smooth out, a wrinkle that betrayed some sort of preying anxiety. He looked much older than his country confrère, though the quondam roommates were really almost of an age. They stared wildly at each other, each surprised at the changes in the other. They gripped hands in silence for some minutes.

"Well, so this is what you're up to!" Hinkle exclaimed.

"You look like a million dollars!" Parmenter congratulated.

They sat and chatted small stuff for a while.

"You do look prosperous," Parmenter insisted. "You must be doing well."

"Oh, I've put aside a few thousand. Ten more years like these, and I could retire in modest independence."

Parmenter sighed.

"I can't seem to get ahead much financially." He paused wistfully. "You have a family?"

Hinkle nodded.

"Two boys and a girl."

"Happy dog." Parmenter had a far-away look in his eyes.

Hinkle was also looking a little thoughtful.

"The medical drudge, the traveler over country roads, the custodian of colds and stomach-aches wishes to inquire," he said earnestly, "if there is not happiness in being known all over North America; in having papers published in every scientific journal; in being invited to great conventions as an honored guest; in having a dispensary built for you and called after you—a young fellow like you? You make me feel like a moron."

Parmenter's face warmed up a little with pride.

"And a colonel during the war!" Hinkle continued. "Do you know, I'm famous back home among the common folks just because I can say I used to room with you?"

Parmenter was silent but grateful. Finally he said:

"So you got into the fracas in France too? How did you go?"

"Oh," replied Hinkle, as though he disliked to admit it, "plodding along in a field-hospital unit. But you—" his voice rose in surprise again—"a medical man! How did you happen to go as an artillery officer. I'd think you'd want to give your country the benefit of your scientific training."

PARMENTER sat straight up in his chair. His face livened up with interest.

"Scientific training!" he exclaimed. "Maybe you think you don't need scientific training in the artillery. I dare say I made better use of what scientific ability I may have, in the artillery than I ever could have done as a mere medical officer. Wasn't it so in this war, that only one medical officer out of a thousand had any opportunity to do scientific work? The scientific training I got in the artillery corps has helped me to accomplish what I've done since the war."

Hinkle stared incredulously.

"If you don't think it takes *science*," Parmenter said, "to yank a four-ton gun into place in the middle of a field, and put a shell on a spot the size of a door ten

miles away at the third shot—you've got another guess coming. That takes real figuring, and real accuracy in working. To come up into position one night, and by the next night to have the country for twenty miles ahead plotted into numbered squares, into any one of which you can drop a shell instantly, within ten seconds of a signal from an airplane observer—the whole medical department didn't use as much science as did our little battery of heavy field artillery. That was a glorious kick-up—"

He stopped and turned his head, as several fluty whistles came faintly from within the building.

"But this is just as exciting," he continued when the eerie sound had ceased. He smiled at Hinkle's look of amazed inquiry.

"I guess I'd better show you around," he said. "I've got something here that hasn't been published yet."

"I got a peek at some ungodly thing a while ago," Hinkle remarked; "What is it—a buffalo? No; it's three times as big. A dinosaur? I never heard of any animal that would fit what I saw. Is that what makes the tooting?"

Parmenter stood enjoying his friend's amazement.

"Perhaps I'd better prepare you for the sight first. I can explain briefly in a few moments. A few years ago I got interested in ductless glands and internal secretions, and my interest eventually narrowed down to two of them about which the least is definitely known; the pituitary and the pineal bodies. I've done a lot of work on these two little brain-glands and written a lot about them. Both of them are intimately concerned in body growth. You will recollect that in the pathological condition known as *acromegaly*, in which there is an excess of pituitary secretion supplied to the body, the limbs grow long, and tall giants are produced; and you know how stunted the individual remains in cases where the pituitary body fails to secrete adequately. Perhaps you have also followed McCord's experiments: he fed chicks with pineal glands from cattle, and they grew to three or four times the size of normal birds. Then, a couple of workers in California separated from the pituitary body a substance which they called *tethelin*, and which when injected into mice, doubled their growth.

"I repeated and confirmed their work, and made large quantities of *tethelin*. The fact impressed me that neither the pineal experiments alone nor the pituitary experiments alone produced a well-balanced increase in size of the experimental animals. I obtained the active principle of the pineal body, which I took the liberty of naming *physein*; I got it by four-day extraction with ether in the Soxhlet apparatus and recrystallization from acetone. Man, you should have seen the baskets and baskets of pituitaries and pineals from the stockyards, and all the ether and acetone we splashed. But, after all the dirty work, the half dozen bottles of gray powder that we got gave us a lot of satisfaction.

"Of course we injected the stuff into guinea-pigs. The guinea-pig is always the victim. At first we used six; and six controls which received none of the *tethelin-physein* solution. But we soon discarded the controls, for the injected animals grew like the rising of the mercury in a thermometer. They grew so fast that we had to kill five of them when they were as big as dogs, for fear that we could not feed them. This one we kept in order to ascertain the limit of size to which it would grow. Now we have had it six months, and it is as big as—well, you'll see. It is becoming difficult to feed, and

it's a rough clumsy beast. I'd get rid of it, if I knew how—"

He was interrupted by a terrific hubbub from within the building. The whole structure shook, and there was a vast ripping, tearing. Crash after crash rent the air, followed by hollow rumbles and reverberations.

Dr. Parmenter dashed to the door and looked down the hallway. There were great cracks in the plaster, and chunks of the ceiling were raining down to the floor. The door at the end of the hall hung loose, revealing beyond it, not the semi-gloom of a big room, but the bright daylight of outdoors; just as though a piece of the building had been torn off. A huge rattling, banging din was going on, with clouds of dust filling the air.

He started down the hall, but a shower of bricks and plaster through the wrecked doorway deterred him. Seizing Dr. Hinkle's arm, he dashed out to the street, dragging the latter with him. Hinkle was puzzled; Parmenter was pale and looked scared, but seemed to know what was going on.

OUT in the street, people stood struck motionless in the midst of their busy traffic. Fascinated, like a bird watching a serpent, they stood glued to the ground, their eyes turned toward the Institute. A moment ago the business of Harrison Street had been going monotonously along, just as it had gone for a couple of score of years. Suddenly two or three people had stopped. Some sort of queer things had appeared in a window of the Institute, horrible looking objects, as though a monkey had jumped up on the sill. But no, the pink things were not arms and legs; each had a single huge claw at the end of it. The whole thing looked like an enormous rat's paw. The group of astonished people standing and staring at it increased momentarily.

Then the brick wall bulged outwards, and a section of it as big as a room fell out on the ground in a mass of débris. A vast brown back appeared in the opening, and the thing's clumsy scratching threw layers of brick wall across the street. The enormous animal rolled out and disappeared behind the three-story signboards in the adjoining empty lot.

Dr. Hinkle and Dr. Parmenter ran across the street to watch. There was a huge commotion behind the signboards; then with a crashing of breaking wood the whole structure of signboards went over. There were screams of people on the sidewalk who were caught beneath the falling mass, and the tinkle of glass from smashed automobile windshields. From over the flattened wreckage there gazed out at the rapidly growing crowd across the street a pair of immense, pinkish-brown eyes. They were set in a head that looked somewhat like that of an enormously magnified rabbit, though it was held down close to the ground. Behind it arched a great brown back, higher than the second-story windows, covered with long, straight brown hair, with black and white stripes and spots.

The creature looked around, jerking its head first one way and then another, apparently very much frightened. Then it moved forward a step to the accompaniment of crackling timber. The crowd surged away, and disappeared frantically into buildings and around blocks, as the animal slowly started toward it. Dr. Hinkle felt a sinking sensation within him as he realized that there were injured people on the sidewalk under that mass of

wreckage that crunched and crumpled under the animal's huge weight. Everywhere, windows were filled with heads. In the Institute, the undamaged windows contained white-clad doctors and nurses. In the next block, an elevated train passed with a hollow, rumbling roar, and the giant guinea-pig crouched down and trembled in fear.

Then it ran out into the street with short, quick steps. One could get some idea of its size from the reports of the spectators, who stated that there was barely room in the street for it to turn around in. It had started across the street, and in its efforts to get loose it caught the odor of some scraps left behind at the unloading of the cabbage trucks, for it suddenly began to turn around. Its paw caught in the window of a flat across the street, and in its efforts to get loose it wrecked a side of the building. Beds, refrigerators, and gas-stoves hung out in the open air. The animal seemed very much frightened.

Dr. Hinkle and Dr. Parmenter had been carried by the crowd to the solid shelter of the Cook County receiving-ward. People began to sense that the thing was dangerous, and scattered precipitately away from the scene of excitement. An Italian fruit vendor was pushing his cart westward along Harrison Street. The animal smelled the fruit and immediately became very much excited. It turned this way and that, but always there were buildings in its way. Finally it stepped up on the roof of a two-story flat on the corner. The roof caved in, and the screams of women were heard from within. In its effort to extricate itself, it made a wreck of the building. Then it hastened down a cross street in pursuit of the fruit cart.

The Italian heard its approach and stopped; he stood paralyzed by fear. The guinea-pig never saw him at all; it leaped for the fruit and one accidental blow of its paw knocked him over and crushed him flat. Only a bloody, smeary, shapeless mass on the street remained to tell the tale. Parmenter, already pale and trembling, shrank back as the Italian screamed and raised his hands above his head, carried down by the giant paw. Parmenter's eyes had a cowed, beaten look in them.

THE fruit on the cart made a scant mouthful for the guinea-pig. It chewed very rapidly, with a side-to-side movement of its jaw. When it raised its head, its bare lower lip was visible, pale pink, and below it a group of short, white whiskers. The grinding of its teeth was audible for a block. Another train thundered along on the elevated railway, its windows crowded with curious heads. The guinea-pig became frightened again, and ran swiftly westward along Harrison Street. As it ran, its feet moved swiftly beneath it, while its body was carried along smoothly rocking, as though it were on wheels. It ran very swiftly, more swiftly than the automobiles that tried to get away from it; and the people along the street had no time to get out of the way. First a child on a tricycle was swept away, and then two high-school girls disappeared under it; and when it had passed, it left behind dark smudges, as when an automobile runs over a bird. It ran three blocks west, eating up all the potatoes and vegetables, baskets and all, in front of a grocery store, and then turned north. Hinkle and Parmenter lost sight of it, noting a car filled with armed policemen in pursuit of it.

Parmenter's nerves were indeed shaken. He stared

straight ahead of him and walked along like a blind man. Hinkle had to guide him and take care of him as though he were an invalid. Parmenter felt himself a murderer. All of these deaths were his fault, due directly to his efforts. Despite the fact that he was half paralyzed by remorse, he persisted in trying to follow the animal with a desperate anxiety, as though in hopes that he could yet do something to right the wrong. For a while he led Hinkle around aimlessly.

Then they heard the sound of the firing of guns, and breaking into a run, came around the block into Jefferson Square, a small, green park a couple of blocks area. There the guinea-pig was eating the shrubbery, tearing up great bundles of it with its sharp teeth. It smelled hungrily of the green grass, but was unable to get hold of the short growth with its large teeth. The bandstand and the bridge across the pond were wrecked to fragments. The police were shooting at the animal till it sounded like a battle, but it was without effect. Either its hide was so thick that the bullets did not penetrate, or else the mass of the bullets was so small that they sank into its tissues to no purpose. Once they must have struck it in a sensitive spot, for it suddenly scratched itself with a hind leg, and then went on chewing shrubbery. The police crept up closer and kept on firing; then all of a sudden the guinea-pig turned around and sped up the street like lightning. Before the police recollected themselves, it was out of sight, and the street presented a vista of overturned Fords, smashed trucks, a street-car off the rails and crowded against a building, and tangled masses of bloody clothes. A trolley-wire was emitting a string of sparks as it hung broken on the ground, and a fountain of water was hurtling out of a broken fire-plug. The animal disappeared to the north; the two medical men sought it for a while and finally gave it up.

Dr. Hinkle decided that he must get his friend somewhere indoors. They succeeded in finding a taxi in the panic, and drove to Parmenter's apartment. Hinkle had to support Parmenter and put him to bed. Parmenter would not eat. He continued to groan in incoherent misery. Hinkle went out and got some evening papers. The headlines shrieked.

"Monster Devastates West Side!" "Mysterious Animal Spreads Terror!" and so forth in their inimitable style. The reports said it was a fearful bear, bigger than an elephant or a freight engine, or that it was a prehistoric saurian miraculously come to life. They stated that it hunted people as a cat hunts mice, and that it had eaten great numbers of them, and in its savage rage had smashed buildings and vehicles. Gun fire had no effect on it, and it had in fact devoured a squad of policemen who had been sent out to kill it.

Parmenter sat up when Hinkle read some of these reports.

"The poor idiots!" he exclaimed in sudden and composed wrath. The grossly exaggerated reports seemed to have the effect of pulling him together.

"Newspapers act like a bunch of scared hens," he said contemptuously. "They're starting a real, insane panic, that's all. What do you think, Hinkle; is that guinea-pig going about deliberately killing people? Is it wrecking the town out of pure spite?"

"It is quite evident," Hinkle said, "that the guinea-pig is far more frightened than the people are. The deaths are mere accidents due to its clumsiness——"

"Yes," reflected Parmenter sadly. "A guinea-pig has about as little brains as any animal I could have picked out. If it had been a dog, it could be careful."

"And the thing seems to be hungry," Hinkle continued. "Hunger seems to be the main cause of its destructive proclivities. It is hungry and is hunting around for food. And food is hard to find in this little ant-heap."

Hinkle was correct. The whole subsequent history of the huge animal's wanderings about the city represented merely a hunt for food, and possibly a place to hide. It is doubtful if its hunger was ever satisfied, despite the vast amount of foodstuffs that it found and consumed. Certainly it paid no attention to people. The wrecking of the Lake Street Elevated Station was probably due to its efforts to find shelter. In the evening the guinea-pig tried to burrow under the station and hide. The space underneath the station was too small and the steel beams too strong; and it gave up and turned away, but not until it had so bent and dislocated the steel structure that the station was a wreck and train service was interrupted. The last report of the night located it on West Washington Street. People were afraid to go to bed.

In the morning Hinkle dashed out after newspapers. The editorials corrected some of the previous day's errors about the ferocity of the giant guinea-pig, and called attention to the fact that it had definitely increased in size during its sixteen hours of liberty.

"If it keeps on growing bigger——?" the editor suggested, and left it as a rhetorical question.

The news items stated that during the night the guinea-pig had located the vegetable market on Randolph Street, for many buildings were wrecked and their contents had vanished. The Rush Street bridge was smashed, as were the buildings at the edge of the water. And the city was beginning to go into a panic; for no efforts to stop the animal had as yet been of any avail.

THE evening papers of the second day brought a new shock. Hinkle had spent the day following Parmenter about. The latter dashed this way and that, in taxicabs, surface-cars, buses, and elevated trains, in frantic efforts to catch up with the animal. They did not catch sight of it all day. They arrived in Parmenter's apartment in the evening, dead tired. Parmenter was in the depths of depression. Hinkle opened a bundle of newspapers they had not had time to read.

"LAWYER'S WIDOW SUES SCIENTIST!" announced the headlines; "Mrs. Morris Koren Files Claim for Damages Against Professor Parmenter for Husband's Death. One hundred thousand dollars is demanded by the widow of the prominent attorney who was crushed in his automobile by the huge guinea-pig yesterday. The plaintiff is in possession of a clear and complete chain of proofs to establish her claim——"

Parmenter sat silent and wild-eyed. Hinkle clenched his fists and swore. He thought Parmenter was suffering enough with all these deaths on his conscience. Now, to have added to it a lawsuit with its publicity, and the almost certain loss of the property he had accumulated, and the complete wrecking of his career! Parmenter gazed now this way, now that, and sat for a while with bowed head. He rose and walked back and forth. He sat down again. He said not a word. Hinkle sat and watched his friend's sufferings with a sympathy that was none the less genuine for being speechless. Before him was a broken man, in the depths of disap-

pointment and despair. All his life Parmenter had been working, not for his own interests, but for the good of mankind. To have the people to whom he had freely given of his life and work turn against him in this unkind way was something he could neither grasp nor endure. Hinkle never saw a man change so completely in twenty-four hours.

A later edition carried the announcement of another lawsuit against Parmenter. The Chicago Wholesale Market claimed \$100,000 damages for the destruction of their buildings and merchandise stock. Their evidence was also complete and flawless.

By morning, Parmenter's depression was gone. He was pale, but calm and deliberate. His lips were set in a thin line, and the angles of his jaws stood out with set muscles. He had shaken off his nervousness and a steady light shone in his eyes. His keen brain was at work as of old. Hinkle understood; no words were needed. They had been roommates for four years and knew each other's moods. Hinkle gripped his friend's hand and put his left on Parmenter's shoulder. As eloquently as though he had said it in words, he was expressing his sympathy and his joy because his friend had found his strength again and in spite of his troubles. Troubles indeed, for the loss of life was already beyond estimate; and complete ruin for Parmenter was a certainty.

"Got to find some way of stopping the beast," Parmenter said succinctly.

"If it can be done, I know you'll do it," Hinkle replied. "Only tell me what I can do to help you."

"Stick around," said Parmenter. "That'll help." They understood each other.

Hinkle could not help admiring the sheer will-power of the man. Newsboys went bawling by the window. The morning papers announced a fresh string of lawsuits, claiming a total of damages of nearly a million dollars. Parmenter paid no attention. He nodded his head and went on making notes with his pencil on the back of an envelope. He had made up his mind, and news had no further effect on him. Only once he took Hinkle's breath away with a dispassionate, impersonal reflection:

"The civil damage suits will break down of their own weight. The matter has already gone so far that it is ridiculous. It won't pay any of them to spend any money bringing it into court. But, suppose it develops into criminal proceedings?"

"Well, that's all I have to expect. Science does a lot of good. But sometimes it miscalculates and does harm. Under the laws of Nature, miscalculators pay the penalty of elimination."

Parmenter sat motionless most of the day. He moved once to eat mechanically, and once to receive reports by telephone from the Institute. His mind was busy, as usual.

The evening papers brought reports that the guinea-pig had gotten tangled up in a trolley-wire and received an electric shock which had sent it scuttling to the Lake. The wire dropped to the ground, interrupting the street-car service of that part of the city. The guinea-pig ran straight to the water. There it again smelled green forage and ran northward along Lake Shore Drive. In an hour it had devastated all the trees and shubbery, and eaten up everything green in sight. Because it spent more time at this place, the police detachments caught up with it, and were again vainly pouring bullets at it.

Again something startled it, and it ran off westward. It ran so swiftly that it was out of their sight in a few moments. For the greater part of two days they pursued it about the city in this manner, and the tale thereof is largely a repetition of what has already been said.

Parmenter hit his knee with his fist.

"We've got to stop the brute somehow, or there won't be any Chicago left. Who would have thought that a brainless, clumsy, stupid thing would have the whole city at its mercy?"

HINKLE was turning over the pages of the newspaper, scanning the editorials that were already predicting what Parmenter had foreseen, the breakdown of the damage suits. The editor stated confidently that they would never get into court.

"Better get a lawyer anyway," Hinkle suggested.

"I won't need one." Parmenter's face brightened. Did he have an idea?

There was no time to ask. A strange murmur had arisen outdoors. A rushing, rustling hum, like that of a flowing river, came from the distance. Now and then shouts rose out of the confusion. Hinkle went to the window, full of curiosity at the city's manifold noises.

He stopped for a moment. He also had a quick brain, and in an instant the meaning of it flashed through his mind. He dashed back and caught Parmenter by the arm. With hats and coats in the other hand, he dragged Parmenter toward the back of the house.

"What's up now?" Parmenter demanded out of the depths of his preoccupation.

"A wild, raging mob!" Hinkle shouted. "The people are dancing with ferocity like a bunch of savages on the warpath. I saw clubs and guns. They probably found that there was no redress in lawsuits, and are coming after you to settle it themselves."

Parmenter still dragged back, reluctant to follow Hinkle.

"I don't care to escape," he protested. "What is the use of life in a world where there are people like that?"

Hinkle stopped a moment.

"You seem to have struck some idea for helping this city," he said sternly. "Do you want them to lay you out before you can rectify this blunder of yours?"

They were blunt, cruel words, but they worked. Parmenter straightened up.

"You're right. I've got a scheme that will work. Come on!"

They hurried through the house toward the rear door. There they stopped. There was a mob in the alley; its fierce yells greeted them as they opened the door. They shut it again and went back in.

"Now what?" asked Hinkle. It looked hopeless. The mob was closing in on all sides of the house. Parmenter stood for a moment. There was a pounding on the front stairs of numberless feet. He hurried to the front door, pulling Hinkle with him; and the two stood so that they would be behind it as it opened. The mob raged and yelled outside and blows thundered on the door.

"They don't know us from John Smith," Parmenter whispered. "Put on your hat and coat."

His plan worked perfectly. The door burst in; its fragments swung on the hinges and splinters fell over the carpet and were trampled by a dozen yelling men, who plunged violently half way down the hall at one jump. In a moment the place was crowded. Parmenter and

Hinkle waved their arms and yelled and mixed with them. No one in the mob knew what was going on anywhere except immediately about him.

They were carried on into the rooms by pressure from behind; the surge of them met the mob coming from the rear door. In a few minutes the fugitives had crowded their way out of the door and into the street. For a few moments and from a safe distance they watched the flames and the firemen. There must have been deaths in that mad stampede. Then they crept off to a downtown hotel and registered under assumed names.

Parmenter sat on the bed.

"You'd like to hear my idea?" he suggested, as though nothing had happened. Hinkle nodded his head because he was too much out of breath to speak.

"**S**IMPLE," Parmenter said ironically. "The human mind is a rudimentary mechanism. To think that it took me—*me*, three days to think of it. It is so simple that I'm almost afraid to spring it at once for fear there is some flaw in it. Let me take you through the line of reasoning by which I arrived at it, clumsily, blunderingly, whereas it ought to have been a brilliant flash through mine or somebody else's brain."

He lay back relaxed on the bed, his hand over his eyes, and talked.

"I wish to analyze the situation thoroughly; on the one hand to make sure that I am correct; on the other, to make sure that we are not passing up some good method just because nobody has thought of it.

"To stop this destruction of life and property, we've either got to *catch* the animal or *kill* it. There is no alternative, no third possibility. Is there?"

"No. Plain enough."

"They've tried to catch it. It went through the elephant chains of their trap in Lincoln Park, hardly noticing there was a trap there. Steel columns of the Elevated bend and snap under its weight. It would require weeks of special work to put together something that would really hold it. Our best bet is to kill it. Is that correct so far?"

"O. K."

"Now what are the possible methods of killing?" He held up an envelope on which he had arranged in a column:

Poison
Disease (infection)
Starvation
Trauma (violence)

"Is there anything else?" he asked.

Hinkle thought a while and shook his head.

"These are the only known causes of death, except old age. Now, some we recognize promptly as obviously out of question; for instance starvation. If we wait for that, we'll starve first. Consider disease. The only available method of producing a lethal disease, is by inoculating with some infection which works swiftly. But, if we do that, we are running the risk of its spreading its infection to the people of the city; the spread of infection might do more harm than the guinea-pig is doing. Perhaps that might be considered as a hope if there wasn't something better. Now, poison——"

"It looks as though poison were your real hope." Hinkle agreed.

"Yes. *Looks* like it. The police thought so too.

They've tried poison-coated bullets, and the pig is still here. They've laid poison bait for it——"

"Do you think that the guinea-pig has developed some sort of an immunity against poison?" Hinkle was genuinely puzzled.

"Simpler than that. There is a quantitative relationship. It takes a definite amount of poison to be fatal. Consider strychnine for example. If you remember that it takes 1/1000 of a grain of strychnine per pound of body weight to kill; and suppose the beast only weighed a ton or two, you'd have to have a pound of strychnine. It probably weighs twenty or more tons. Where are you going to get ten or more pounds of strychnine, and how are you going to administer it?"

Hinkle sat and looked blank.

"Never thought of that," was his comment.

"Violence. Trauma. That's all that's left to us," Parmenter concluded.

"And that's out of the question," Hinkle said hopelessly. "How are you going to injure that thing?"

"To think that it's taken me three days to get the idea!" snorted Parmenter contemptuously. "If someone tried to sell you a machine as inefficient as the human brain, you'd throw it back at him.

"Trauma! Didn't I spend two years doing exactly that in France?"

Hinkle leaped to his feet.

"Artillery!" he gasped.

Parmenter nodded.

Hinkle sat down again, the hopeful look gone out of his face.

"No use," he said. "You'll do more harm to the city with the shells than to the guinea-pig."

"Say!" There was a sarcastic note in Parmenter's voice. "Do I have to tell you again that ballistics is a science? But, enough now. We'll get to work and do the arguing later."

Parmenter became a thing of intense activity. He sat at the telephone, called numbers, asked questions, gave orders, with the rapidity of a machine-gun. He seemed perfectly at home in it; obviously he had done it before. From the obscure hotel room he directed a miniature war. Here is some of the one-sided conversation that Hinkle heard:

"Alderman Murtha? This is Parmenter. I've worked out a plan to kill it. Authority to go ahead. Want me to explain it? All right, thanks for your confidence. We'll have it as soon as there is daylight enough to see by."

Another number:

"City engineer's office? Calling by authority of the police department. We want scale landscape maps of all the parks and plat maps of all the country from here to Clark Junction. Deliver them at once to the Fort Dearborn Hotel."

"Is this the Chief of Police? Has Alderman Murtha called you about giving me authority——? All right, thanks. Where is the animal now? South Side? Listen, Order a dozen truckloads of green stuff, cabbage, alfalfa, anything, dumped in the empty space in Jackson Park where the baseball diamonds are. Have it arrive there shortly before dawn, all piled on one big heap. Then lay a trail of the green stuff on in the direction in which the guinea-pig is at the time.

"And don't forget to keep your men away from that pile of greens!"

HE barked the last words out viciously. Then he called long-distance. He placed several calls, asking for Colonel Hahn. Finally the Colonel answered. Parmenter talked:

"You know of our misfortune here in Chicago—that's true, but we have just now thought of it. What's the biggest field gun you can rush over here? Right now, this minute. Yes, 150's will do the business. Two batteries. At Clark Junction. A few shells nothing! We want a five-minute barrage to cover an acre! Somewhere around dawn. You're a gentleman and a soldier. A credit to the service, sir!

"Mayor Johnson has telegraphed to the Secretary of War and the authority will come through promptly. I have maps ready for you; send a plane to the Cicero landing-field, and I'll meet it there. And two airplane observers."

He turned to Hinkle.

"Now do you get the idea?"

Hinkle slapped him on the back.

"A 150 millimeter barrage on the brute! That ought to fix him."

"Grind him up to Hamburger steak," Parmenter said grimly.

"But how will you keep from wrecking the town?"

Parmenter made a gesture of impatience.

"Not a building will be injured. The pig will be decoyed to a clear space in the park——"

"Yes, I got that idea."

"The area of dispersion for a 150-millimeter gun is about a hundred yards. That means the first shot will hit within a hundred yards of the target. They will first send over a few dummy shells, and the hits will be reported by airplane observers so that they can correct their range and angle."

"Looks dangerous anyway," Hinkle said thoughtfully. "I'm going to Milwaukee till it's over."

Of course he was not afraid. He was merely trying to carry off the situation lightly in order to encourage Parmenter. He followed Parmenter anxiously. There was little conversation during the two-hour ride to the landing-field. Three military planes were already waiting there. There was a swift conference over open maps and a few minutes' drill on signals, whereupon one plane rose and sailed away into the night, bearing the maps with it to the position of the gunners. Parmenter looked after them longingly.

"It gets into your bones," he observed. "I could hardly keep myself from climbing in with him. Just think! Four miles away the huge field guns are clanking into position; motors are roaring and the line is swinging round; men are toiling in the dark. By morning there will be a semicircle of Uncle Sam's prettiest rifles pointed this way. But, we'll forget it and hunt for a telephone."

A telephone was not easy to find in Cicero at one o'clock in the morning. They finally located one in the "I." station. Parmenter called the Chief of Police.

"Where's the thing now?" he asked. "Fine. All arrangements made? Coming?"

Parmenter's eyes blazed. Again he was an artillery officer.

"Jackson Park," he said to Hinkle.

There were long waits for cars at night; a change from the elevated to the surface cars; a piece in a taxi, and the elevated again. Dawn was breaking gray over

the lagoon when they arrived at Jackson Park. Parmenter raced with feverish haste to the flat, empty space where a score of baseball diamonds had been laid out for the use of the public. A string of half a dozen huge trucks was thundering away from the spot. Two loaded ones were proceeding slowly; men were throwing out a trail of cabbage and alfalfa bales behind them. In the middle of the open space was a heap of green stuff, big as a huge straw-stack.

Daylight was breaking rapidly. A bright orange blotch appeared out in the Lake; glorious streaks of crimson shot through the blues and grays of the water and sky; soon a glowing ball hung in a purple setting. For an instant the two medical men irresistibly admired the splendid spectacle of the sunrise. But in a moment they were interrupted by the noise of a couple of airplanes coming down in the open field. The pilots stepped out, pushing their goggles up over their helmets. Two motorcycle police came down the driveway.

The two aviators unconsciously saluted Parmenter, and then grinned sheepishly, because he was not in uniform. He looked so much a soldier that their action had been a natural one.

Parmenter gave orders for one plane to taxi across the field out of the way, and remain on the ground in reserve, while the other was to rise and remain in the air to direct the fire. The two motorcycle men were to locate the guinea-pig, and guide the bait truck toward it; and as soon as it had picked up the trail, to hurry back and notify him, here at the park.

WHEN the two motorcycles disappeared, Parmenter and Hinkle waited in nervous impatience. They walked much and talked little. The yellow of the sunbeams grew brighter, and it seemed an age before a motorcycle finally sputtered up to them.

"The pig is coming!" shouted the driver from a distance.

Parmenter threw a smoke bomb; the puff of yellow smoke was a signal to the airplane observer, who, by means of his radio, notified the gunners to get ready.

"Poor pig!" thought Hinkle to himself. "The city and its police, the United States Army, motorcycles, trucks, airplanes, 150-millimeter guns, all mobilized against a poor, lost, hungry guinea-pig!"

The motorcycle men stepped out long enough to tell them that the guinea-pig was near Washington Park; it had sniffed a truckful of fresh alfalfa and had whirled around to seize it. The truck was demolished and the driver had not yet been recovered from the debris. Parmenter turned a shade paler and set his teeth more firmly. The guinea-pig was now following along the train of alfalfa and cabbage that led directly to our heap in the park. Parmenter was silent as the motorcycle whirled around and dashed up the road.

A whining scream came from high in the air; there was a great splash on the beach, which threw up sand and water, left a puff of smoke behind it. The airplane was circling around in a figure "8" between the Lake and the pile of greens. Another scream and a crash in the shrubbery, not twenty yards from the pile of greens. A third heavy thud scattered the edge of the pile of green stuff.

"Good boys!" Parmenter breathed proudly. "They can still shoot."

Hinkle admitted that it was wonderful: the guns at

Clark Junction four miles away, the airplane doing figure "8's," and a shot right at the edge of the pile. A fourth shot came over, and scattered the nice heap of greens all over, spread it flat on the ground. Although the shell had been a dummy and had not exploded, nevertheless the impact of it, squarely in the middle, had scattered the cabbage and alfalfa far and wide.

"Damn!" Parmenter was annoyed. No wonder. With the greens spread over an acre, how could the guinea-pig be located accurately enough to concentrate the fire properly? Someone had missed that point in the plans. They ought to have omitted that last shot.

Parmenter was swearing and shaking his fists. He started toward the scattered pile of greens on a run. Hinkle gazed dumfounded, as he began with demoniac strength to toss bales of alfalfa and heaps of cabbage back on the stack. He started over to help.

Suddenly, when Hinkle got near enough to be within earshot Parmenter whirled around, with a terrible, savage expression on his face.

"Back! Go back!" he roared.

The fierceness in his tone stopped Hinkle. He stood and stared.

"Go!" shouted Parmenter in an agonized snarl. "Go, damn you! Quick!"

Hinkle was too amazed to move.

"I wanted to help you pile it up—" he faltered.

Parmenter drew a pistol from his pocket, a huge forty-five caliber Army automatic, and pointed it at Hinkle.

"Now go!" he shrieked in a shrill voice. "Right now. And run! RUN!"

The command in his voice awed Hinkle. Despite the surging of a turmoil of conflicting emotions within him, he turned and ran.

"Don't stop till you reach the lagoon!" Parmenter ordered after him.

"Damn them and their mobs and lawsuits!" was the last thing Hinkle heard him growl.

He reached the lagoon and looked around. Parmenter was working feverishly, tossing greens on the rapidly growing stack.

Now there came a hubbub from the direction of the 63rd street entrance, the rattle of motorcycles, shouts, the crashing of brushwood, and an oppressive, heavy thudding. In a moment, half a dozen motorcycles drew up beside Dr. Hinkle. A hundred yards away, a huge, towering bulk loomed past. The great guinea-pig thundered by, its arched brown-and-white back as high as an apartment house, crashing through shrubbery, flattening out trees, sweeping aside fences and bridges as though they had been spiderwebs. It skimmed along, eagerly nosing at the ground, following the train of vegetables, piping its impatient huge, fluty whistles, ripping up lawns and driveways in frantic attempts to pick up the tiny fragments of food.

Suddenly it sighted the heap of food. It gave a gigantic leap in that direction, and ran.

"Parmenter!" shrieked Hinkle, and started out toward the busy figure of the scientist. A dozen hands seized him and jerked him back.

"Parmenter!" he moaned again, impotently.

Parmenter looked up at the yells of the motorcycle police. They were making Hinkle's ears ring with their shouts.

"Look out!"

"Come here!"

"What's the matter with you?"

Parmenter waved a light gesture to them, and calmly stepped out of the way of the gigantic rodent. The pig hungrily plunged its snout into the heap of succulent food he had prepared for it. Hinkle covered his face with his hands. The last thing he saw was Parmenter reaching out his hand to stroke the towering side of the busily feeding guinea-pig.

He also recollects momentarily hearing the roar of the airplane describing figure "8's" high in the air over the baseball park. Suddenly there was a long, wailing screech in the air, and a terrific roar. A volcano suddenly seemed to burst where the guinea-pig had been munching. Vegetables, guinea-pig, Parmenter, all disappeared in a flash. In their place was a wall of smoke,

rising swiftly upward, with black fragments whirling and shooting in all directions out of it.

For five minutes, Hell roared and churned and blazed out there. The din was deafening, crushing. Showers of dirt and spatters of blood reached Hinkle and the motor-cycle men. Then it stopped suddenly short, leaving a strange, painful stillness, punctuated by the feeble rattle of the airplane.

Out where the baseball field had been, a huge crater yawned. When the smoke eventually cleared out of it, there was no guinea-pig. Here and there were bloody masses of something lying about the acrid, smoking earth.

For many minutes, Dr. Hinkle stood on the brink of the reeking chasm, his hat in his hand, his head bowed.

THE END

The Sweep of Space

Look where the farthest planet rolls around,
Old Neptune, on our Solar System's rim—
At near three billion miles he makes his bound—
We're almost in the Sun compared to him!
So should we not a longer unit take
On measuring tapes across the void of Space?
Though our astronomers still try to make
The "Light Year" as their interstellar base.

But "year" is a rule of Time and not of Space,
And 'tis a thirteen-figure odd amount—
The Light Year is an inconvenient base
The interstellar distances to count.
I give you now the measure of Solarian—
One million miles of astronomic Space—
The mighty Sun, in dignity Cæsarean,
Has near that width across his golden face.

One thousand of Solarians o'er the void
Make one Saturnian, or one billion miles—
That shoots beyond the farthest asteroid
Between the planets in their starry aisles;
For old Saturn, enwreathed in flying rings,
Rolls onward, near that distance from the Sun—
And far off Neptune, on eternal wings,
At nearly three Saturnians makes his run!

O shining islands of the sea of Space—
What mariner can reach thy starry shores?
For e'en such mighty measures are no base
For thy great distance from our earthly doors.
One thousand times still wider we must measure
To make one trillion miles, or one Stellarian—
To reach thy high, remote, celestial treasure;
One million times the far and long Solarian!

But two and a half quadrillion miles away
Great Rigel in his stellar glory shines—
Across Canopus and the Milky Way
Still wider must we stretch our measuring lines.
One thousand far Stellarians so remote
Make one Kilostellarian through the sky—
'Tis one quadrillion miles where stars may float
Across that fearful void we see on high!

Across a room we pace for twenty feet,
Or down the street for half a mile or so—
But what is such a light and petty feat
To sweeping through the stars' celestial glow?
In eighteen different magnitudes they shine,
In all their bright sublimity nocturnal—
The outward sweep of Space's longest line
Includes quadrillions of those miles eternal!

—By James A. Terry

WHATEVER might be said about the future of aviation, we must not lose sight of the psychological effects of becoming "air-minded" and scientifically inclined. Women's continued independence in the economic field must have an effect on the institution called the "family." And who can judge better than an eminent psychiatrist what that reaction might be?

¶ The fact that Dr. Keller is also a writer of no mean ability only adds to the value of "Air Lines" as a story. . . . Illustrated by WESSO.

AIR LINES

By David H. Keller, M.D.

Author of

"The Revolt of the Pedestrian,"
"The Menace," etc.

IT was not really Beryl Angelo who married William Dills. For a few weeks some very feminine ancestor of hers must have entered and completely controlled her body and mind. Beryl, under ordinary circumstances, would not have thought of marriage and its many hampering complications, and, even if she had thought of it as a legal necessity, would never have selected a man like Dills for a husband. Yet, that is what she did and, when she finally was able to assume control of her conduct, she found that in every way it was too late.

It would have been hard to even imagine a more contrasting and opposite pair than Beryl and William Dills. About the only thing in which they were really harmonious was their keen desire to play the game of life fairly and honestly as they saw it, but, as each saw it differently, this was of little help to them in their feeble efforts to get *en rapport* with one another.

"I am going to be perfectly honest with you, Billy, Old Boy," said Beryl, about six months after they were married. "If it were not for my hobby of inventing new and at the same time useful pieces of machinery, this domestic life would bore me—horribly. I never was cut out for a home. Give me a machine shop, let me take control of a plane, or play with television, and I am happy as a song-bird in springtime, but shut me up in a home, to plan three meals a day and supervise the laundry, and life is not worth living."

"But you knew that the reason I married you was to have a home. I was so tired of my room at the Authors' Club."

"I know that. You were honest enough in saying so. And you said you loved me and you do, and in my own silly way, I like you well enough, but it worries me to have you and the home and the baby come between me and my work."

"But the baby is not here yet."

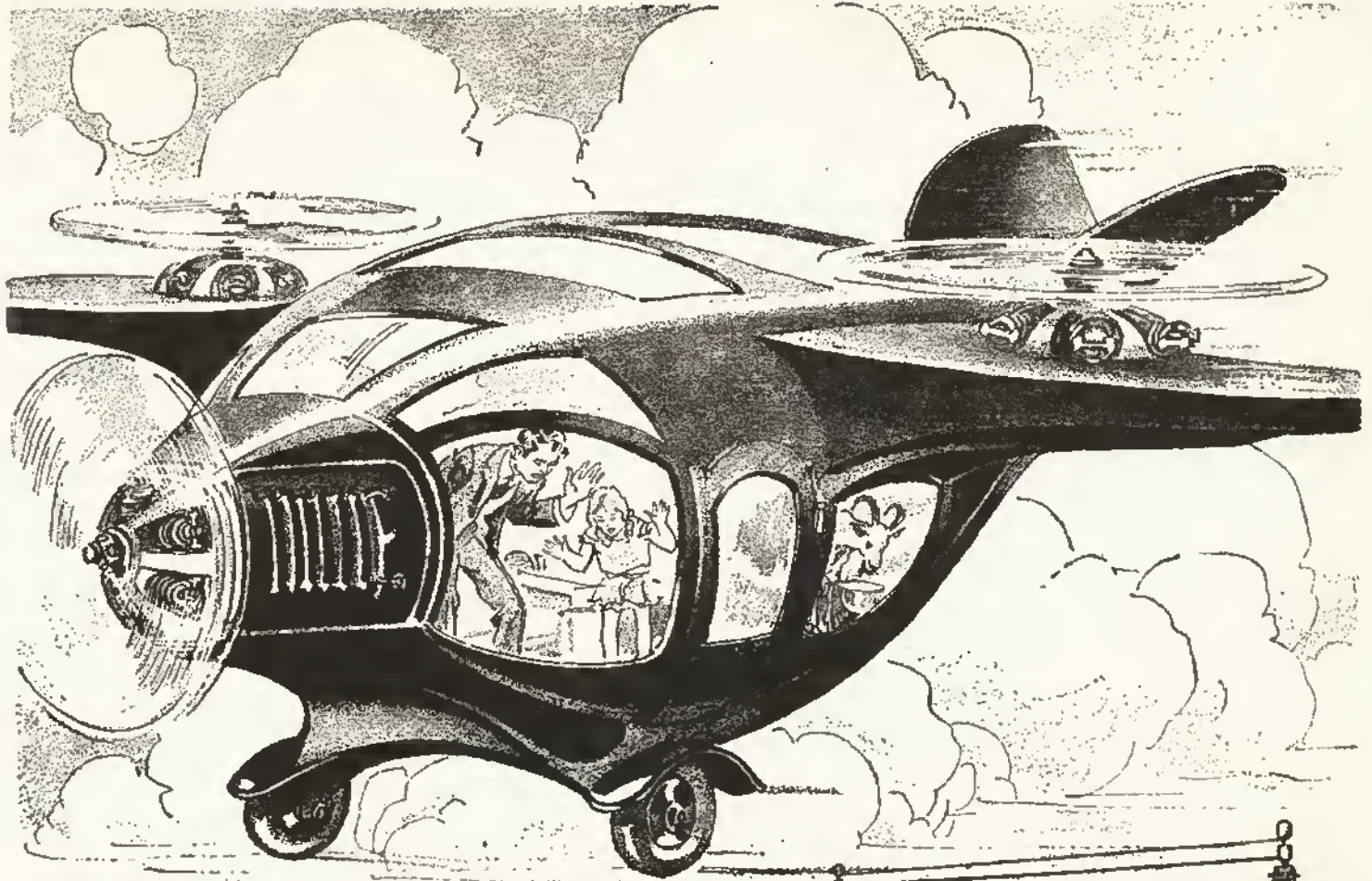
"That's true, but when it does come, it will have to be taken care of for years and years, and so will you. When you start to write, you are so absorbed in your old novels that never sell that you even forget to eat. That last time I worked for thirty-six hours steady in my shop, I found out, when I came home, that you had not eaten a bite, and had fallen asleep over your old typewriter."

"I'll admit that I did that. But I was worried about you. I had hopes of a different kind of a future."

"You talk like a man of the last century. Things are different now. Women refuse to look on a home, marriage, the raising of children, and the preparation of innumerable meals as a part of their life work. I tell you, things are different. Women are doing things. Just sit still a minute and let me tell you what the President of Aviation Consolidated said to me this afternoon. He said, 'Beryl Angelo, when you married that Dill man, one of the greatest electrical inventors of the century came near being ruined. You have one of the most remarkable mentalities that the scientific world has ever known. Your ability has made our company what it is today. You had to go and marry and tie yourself down to a home and a husband and babies, and you cannot do it and do your best work as an inventor. You have about ruined your career.' I tried to explain to him that I had made arrangements for the care of the baby and that I did not think I would be away from my office and laboratory more than two weeks when baby came, but he feels rather bad about it. He said, 'If your husband was so keen to be a father, he could have gone and adopted a baby. His idea of thinking that you had to be a mother, just because you were silly enough to be his wife, is all passé!' That is the way a really great man looks at the mess I am in, Mr. William Dills."

"But I thought that a woman could not do anything more wonderful than to become a mother."

"That is because you are not air-minded. You are not even machine-minded, except when it comes to a typewriter, and I am surprised that you do not want to use a goose quill as people used to do. You are old-fashioned, your ideas are old-fashioned, your stories are hopelessly behind the times. For example, that one you called 'The Perpetual Honeymoon.' In this age, when there are ninety divorces to every hundred marriages, who would want to read a story with a name like that?"



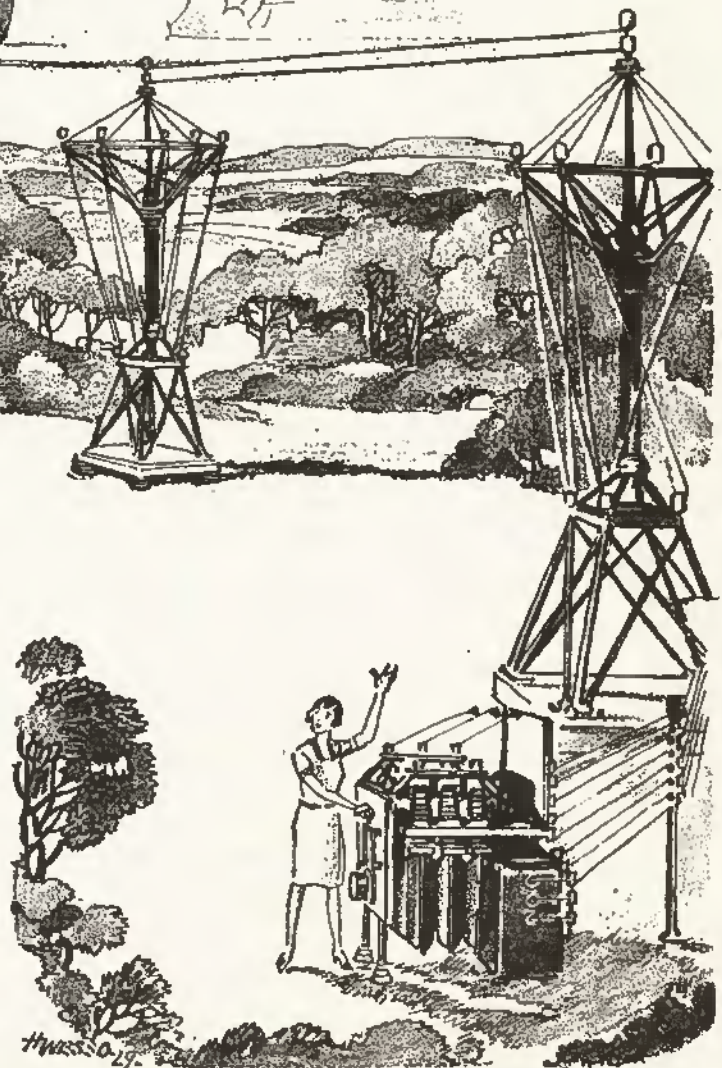
Starting the machinery, she stood there, watching the plane as it went . . . up into the blue sky.

“But it really is a fine tale.”

“Perhaps, but not life as it is today. I think I could still love you a lot if you would snap out of it and do something. Win a trans-continental air race or invent a new variety of robot. I even suggested that new typewriter for you to think about, and if you had shown any interest, I would have invented it for you. Don’t you remember? The one that you simply talked at and it wrote the words from the sound of your voice.”

William Dills kissed her good-bye, as he said,

“Now, you run off to your work, and leave me here in the home with my thoughts and typewriter. If you do not want the baby, I am real sorry we are going to have one. But I think that it will come out all right. You invent all kinds of machines and, no doubt you can invent something to take care of the baby. This is a machine age—what you should have done was to marry a machine husband. A robot inside and a cave man out-



side; something that you could connect to a light socket for action and disconnect when you wanted rest. Your mistake was in marrying a live man."

BERYL ANGELO never heard the last of this statement, as she was already on her way to the office where she had an appointment to meet the heads of several of the most important departments of Aviation Consolidated. These men were financiers, business executives, capable of organizing and perfecting business on a large scale, but they were not, on that account, perfectly air minded. They had imagination, but were not inventors in the real meaning of the word. More and more the company had come to rely on Beryl Angelo for inspiration. She had given them many thoughts which they had been able to commercialize. Her marriage had appeared to them to be almost a temporary insanity. They dreaded the possibility of her gradual detachment from her office and laboratory, due to the increasing demands of married life. In fact, this conference was held with the idea of suggesting to her financial and other means of continuing with her work, irrespective of any future matrimonial complication.

"We are going to be perfectly plain with you, Mrs. Dills," started one of the Vice-Presidents, but he was at once interrupted by the lady in question.

"Please do not call me Mrs. Dills. That idea is so old that it is almost archaic, antiquated, moth-eaten. Just because I entered into a legal contract with a man is no reason why I have to be bothered with his name. I used to be Beryl Angelo, I still am Beryl Angelo, and for all time to come I am going to be Beryl Angelo. So, that is that. Now, go on with your story."

The man smiled.

"Well, what we wanted to say was this, Beryl Angelo. We were all upset over your marriage, and while we want you to be happily married, still we cannot imagine how our company will be able to get along without your help. So, we want to do all we can to help you so you can direct the affairs of your home life without sacrificing in any way your efficiency as the head of our invention department. Anything you need we will give you. It is useless to tell you that we want to make our company the leading company in the world. In fact, we hope that by future consolidation it will be the only company of its kind in the world. We need you."

Another of the Vice-Presidents took up the thread of conversation.

"It is not just the money alone that we are after, though the stockholders are naturally anxious to have as large a return as possible on their investments. What we are after is efficiency and the promotion of the ease of mankind. We believe that the future of mankind is in the air. It is perhaps useless to recall history to you, but you will remember that it was only in 1929 that a Stinson monoplane flew 650 miles from Detroit to Langley Field, Virginia, powered by the Packard Diesel-type engine burning fifty-four gallons of furnace oil on the entire trip. He made over one hundred miles an hour for six hours without electrical ignition at the cost of \$4.68, whereas gasoline for the trip would have cost \$26.85. This one trip opened an entirely new field for air travel, greater economy, ability to carry a heavier load of merchandise or passengers through reduction of fuel weight, a reduction in the fire hazard and the better use of every form of wireless wave by the elimination of

electrical interference. The Diesel engine is not fired by electricity. More and more the plane has been used for the carrying of freight. Cotton print goods made in Massachusetts have gone to San Francisco by plane in five days less time than they could have gone by rail express and three weeks quicker than they could have gone by freight. In 1929 the passenger mile per day for airplane service was 75,000. Last year it was nearly one hundred million. The human race has taken to the air in every way, but so far, we feel that we have only begun to taste of the commercial possibilities. We have to make new discoveries, leading to greater rapidity and a safety that will make it possible for everyone to go up and stay up and come down in comfort. We look to you to make these inventions. The future of aviation lies in your hands. For goodness sakes! don't use those hands in housekeeping."

"You need not worry," replied the young lady. "I am as much interested in my work as you are. I am married now and I am too proud to undo what I have done, and I am going to stay married. But even at that I feel that my efficiency will be just as great and perhaps greater because of the new difficulties I have to overcome. No doubt, the liberation of my libido will enable me to perform even greater work than I have in the past. But I am going to start by asking for a short vacation. There are certain inventions I have in mind for my home and then there will be a short period of incapacity. I think that by the first of next August I shall be ready to start work in earnest as the head of the department of inventions."

After a prolonged conference, the meeting adjourned, and Beryl Angelo thoughtfully went to her private office. Slowly, she looked over her card index. In one place she noted that there were two hundred and thirty-seven unsolved problems in aviation awaiting her active inventive energy to solve. Another part of the card index gave in detail the problems dealing with a home, husband and baby, and each of these problems was marked solved or unsolved. If solved, it meant that she had either actually made or had in course of preparation some piece of delicate machinery which would completely take the place of the wife in the home. She smiled as she looked over some of these, realizing the fact that their very accuracy and completeness operated against their usefulness for everyday use. Some of the problems of the home were still unsolved, for example, bedmaking. In the laboratory she had a perfect bed-maker but it was so complicated and so bulky that she felt it would be out of place in the average home, especially in the guest chamber.

IN the course of her experimental work, she had perfected over a dozen robots for work in various parts of the house. Some of them worked accurately and perfectly, while others left many parts of the household economy unsolved. There were still places where human servants had to be used, and even these were inefficient without supervision. She had tried *talkies* in the kitchen, preparing special films for different parts of the day. For example, she instructed the cook to press a certain button as soon as she entered the kitchen in the morning. At once a life-sized picture of Beryl Angelo appeared on the screen and a voice that could have come from no other woman started to give instructions:

"Go and bring in the morning's milk, cream and bread

from the front door." Here ensued a lapse of some minutes. "Now place four tablespoonfuls of coffee in the percolator, with three cupfuls of water and place on the central burner of the electric stove. Turn on the electricity. Now go to the refrigerator and take out six slices of bacon and six eggs. Before returning to the kitchen be sure to shut the refrigerator door." Another pause. "Now place the bacon in a frying-pan."

The talking movie ought to have worked, but for many reasons it did not. The maids who were intelligent enough to cooperate with it did not heed it and those who were not intelligent would not listen to it. One maid put cotton in her ears because she said she could not work with that spooky thing talking to her all the time. Beryl decided to place a robot in the kitchen and have less complicated meals and a greater peace, as far as servants were concerned, but after she had gone to the greatest trouble in arranging the machinery she found at the first breakfast that the robot had been unable to tell a good egg from a bad one.

After this, she awoke a little earlier, cooked a pot of oatmeal for her husband, put it on the dining-room table with some milk, bread and butter and jam, and bought her own breakfast in a cafeteria near the office. He accepted this plan, as he did so many of her actions, without comment except that the first evening he remarked that he had been lonely without her. She at once arranged a one-reel breakfast *talkie*, in which she flashed fifteen minutes of brilliant conversation on him from the screen. He looked at it and listened to this reel one morning, and then never started it again. At times he would go out to the parlor and look through the windows into the street. He found it difficult to be the husband of such a peculiarly brilliant woman, especially when he found that he was spoken of as Beryl Angelo's husband. Lots of people who spoke to him did not know his real name.

In the course of time the little baby came to live with them. William Dills was very happy, while his wife treated it as a commonplace. She was longing, had been longing for weeks to get back to her work. As soon as possible she returned home from the hospital and in a few days was in her office, leaving the baby in care of a competent nurse and the father. In discussing this with her husband, she told him that she felt that a competent machine was better than an incompetent nurse, but a nursing robot would require the constant supervision of a trained mechanic and that it would be impossible to ever train an author to properly care for one. William Dills did not answer this last remark, but secretly promised himself that as this was the first and possibly the last time he was ever going to be the father of a baby, he was going to learn all that he could in regard to the care of it.

He did this, not from a sense of duty, but because he wanted to. If it had been a boy baby, or an ugly baby or the baby of any other father, he would have felt different about it, but it was such a lovely little girl baby, such a darling beauty of a little woman, that he was head over heels in love with her as soon as he saw her. This love was probably intensified by the love-hunger which developed so rapidly in his married life.

So Beryl Angelo, feeling that she had satisfied all the demands that even the most old-fashioned social code could place on a married woman, returned to her office, leaving William Dills, her husband; Ariel Dills, her

daughter, and Miss Agatha Trim, the nurse, to run the Dill household. It is only fair to state that they did so in a nearly perfect manner. Maids came and went in such rapidity that Dills never tried to learn their names, but William, Ariel and Miss Trim remained an unalterable triumvirate.

WEEKS passed and months. Beryl, happy in her own particular work, exhausting all of her mental power for the benefit of Aviation Consolidated, was satisfied to look over the twenty-four hour report which she had elaborately recorded on a chart of her own invention. She felt that if the baby was well, was growing normally and cutting her teeth on the proper schedule, she, as the mother and head of the family, was doing all that could be expected of her.

Meantime, William Dills was dividing his time between his portable Corona and his equally portable daughter. He was learning to care for a baby, under the watchful eyes of Miss Agatha Trim.

"One can never tell," he remarked to that individual, "what the future may have in store for us. I may not always be able to think up plots for new stories, and if I am not able to, I may be able to make a living at taking care of babies. At least, I am receiving a wonderful experience with Ariel, and even if I never have any use for that experience in the future, it is a pleasure to know that I am doing some little things for her now, thus showing her that I love her and am glad that she is here with us."

When he talked that way, the nurse would take a long cane and go out into the garden and cut the seed pods off the Oriental Poppies. She told herself that this was the only way she could keep from exploding and telling the man's fool wife what she thought of her.

But, irrespective of her relative position to her family, Beryl Angelo was slowly becoming an international figure in the scientific world. She had persuaded the company that she worked for to buy all patents pertaining to the Cierva Autogyro. Thus, free from any suit for infringement of the original idea, she had gone ahead and perfected an airplane that could speed up to three hundred miles an hour, stop still in the air, and rise or descend in a perfect perpendicular. This machine was so nearly foolproof and so well adapted to the small country or city home that mankind, more than ever, went up into the air, as the roof of even a small house sufficed for a perfectly easy landing, and it was no longer necessary to go several hundred yards before attaining the required height to fly.

Twenty-five years before, many millions had been spent in building automobile roads of cement. Now, these roads lay like white ribbons over the country, used only by the occasional pedestrian and the less occasional owner of an old-fashioned automobile. There had come a time when the manufacturing of fine carriages was stopped; in a similar manner, Ford and General Motors had ceased to manufacture automobiles. Everything and everybody was in the air. But one thing more was necessary, and Beryl Angelo spent many sleepless nights on the problem. She wanted a freight plane that would take its load from any place in the world to any other place, without an aviator guiding it. It seemed that each invention pointed silently to that consummation of perfect aviation. Planes no longer burned in the air, they no longer fell, they hardly rocked. The new gyroscope that Beryl had installed as part of the standard

equipment of the passenger planes made it possible to cross the Atlantic without spilling a drop of water from an almost filled glass. The expense of such machines per mile was almost nothing, but the great cost was in the salaries of the pilots, who after all, did not do much except sit there and draw their salaries.

There was still some freight carried by the railroads and on steamships. Although the competition was severe, these antiquated common carriers had managed to survive. Everyone knew that when the pilotless plane arrived railroads would become streaks of rust and the ships would rot slowly in the harbors of the world, a few giant freighters and locomotives being carefully preserved, along with the American buffalo.

The idea was slow in arriving. Perhaps it never would have arrived had it not been for a visit to Broadway. This street was now destitute of automobiles, just as the Main Streets of the Middle West had become destitute of carriages years before. Movable sidewalks carried the millions of pleasure seekers, while commuting suburbanites came drifting into the aerodrome in their private planes. Any other woman would have been thrilled by the neon signs, the thronging thousands and millions, but Beryl Angelo was disconsolate. She was hunting for an idea, and the excitement of Broadway, the husband by her side, the thoughts of her little child at the hotel, safely cared for by the faithful Miss Trim, were all unable to rouse her from her constant self-questioning.

Finally, her husband spoke, "Those people on the movable sidewalks are just like so many pawns, Beryl. See, if they get on at one station, they have to stand still till they reach another station. They are in a sort of line, a circuit, and they cannot get out of it. Like I used to be when I drove a carriage, get in a rut and have to stay there. They are just so many pieces of helpless humanity. Put a soap box on that platform, and it would stay there just as well as a man."

AND then the idea came to his wife. Without a word, she turned and went back to the hotel. He tried to reason with her, explain that he had already bought the tickets, and that this might be the last time that they would ever see grand opera. She simply said that she wanted to get somewhere where it was quiet and where she could think.

All that night she sat at the desk in the hotel bedroom, filling pages with drawings and figures and apparently meaningless scrawls. When morning sent beams of light into the room, her husband found her fast asleep at the desk. But she had solved the problem.

Just as fast as she could, she traveled to the offices of Aviation Consolidated and asked for a conference with the President.

"I have solved the problem of a freight plane that will not need a pilot. Each plane will carry at least ten tons of freight. By a little adjustment, we can make this plane from one of our standard models for \$2,500. It will be perfectly automatic, and with it your company will control the commerce of the world. What do you say about it?"

"O. K. Wonderful! Lovely!! When can you give us the specifications and blue prints?"

"Sometime. Is it worth five million to you?"

"It's worth ten times that much. Where are you going to assemble it?"

"On the yard, back of my home, out in Clearbrook. I

am afraid to do the work here. Too dangerous. The railroads and steamship lines have been afraid of this for years. I will put a plane in back of the house and fix it up so that it looks like a wreck. When everything is ready, I will try it out. I wish you would send for our electrical expert. I want to go over details with him."

In a short time the man and woman who were the leaders in modern aviation were closeted in a sound-proof room.

"Here is my thought, Johnson," said the woman. "We have a plane that can go many thousand miles without refueling. We have an absolute knowledge of the miles per hour and the miles per gallon of fuel. In one of our trial tests we measured off an exact hundred miles between two landings. We added to that the fuel necessary for a three hundred feet ascent and a similar descent. We started the plane off with an exact amount of fuel, down to the ounce. We timed it. It arrived at the landing two seconds later than we had estimated, with ten drops of fuel left. All the pilot did was to sit there; if I remember correctly, we wanted to lock the controls, but the president would not let it be done.

"As you know, the gyroscope has not only made aviation safe, but it has made direction definite. Give me the exact distance between two cities and their exact relation to each other, as far as the points of the compass are concerned, and I will guarantee to send a plane there to within a few miles of the landing-field without having any other guide except the compass and the gyroscope. But I want to go further than that. Do you suppose it would be possible to establish electric lanes around the world, broad waves of controlling electrical force, which would hold pilotless planes and control the gyroscope so that the planes would swing around a corner. In other words, do you think that we could make escalators in the sky, transfer Broadway into the air, so that if a pilotless plane, loaded with freight, rose to the level of the New York-London-aerial-escalator, it would be automatically guided by that force till it arrived in London? We could regulate the fuel so it would drop of its own accord. That is what is in my mind. We could have the gyroscope control and the robot pilot sensitized to our own wave-lengths so that no competing company could take advantage of our invention. How does it sound to you?"

"From anyone else, Beryl, it would sound nonsense. We do know that there are magnetic currents circulating around the world. We do not know very much about them. Perhaps you do? The whole earth seems to be a large magnet. I do know this. Electricity is cheap, and it is an easy thing to send a wireless wave around the circumference of the world. It does not take long. We have thought we could send such waves to the moon and obtain the echo, or whatever you want to call it. Suppose we look at it this way. You set up a broadcasting station on one side of your country home. Have a receiving station on the other side. Then send out a code word—just a sound will do, and you will be able, after a little practice, to receive that code signal, that sound, after it has gone around the world. It takes but a little while, just a very little while, as we measure time. Now, we can figure it out this way; that this sound has gone around the world on some kind of an electric escalator; no use in putting it into scientific language; we are not reading a paper for a scientific society. Suppose we increase the strength of the station we are broadcasting it

from and make the sending of the signals continuous; then we have an escalator around the world, as they have on Broadway."

"Then," interrupted Beryl Angelo, "suppose we have the gyroscopic robot in the pilot's place tuned to that signal—that code sound. He has a wireless receiver. So long as he is in the groove, everything is O. K., but if the plane swings to the right or the left, then the signal makes him change the steering gear, and back the plane goes to its perfect course. How is that?"

"That is right, provided our premises are right. How are you going to start?"

"I am going to send a plane around the world."

"Isn't that a little grandiose? Why not try a shorter circuit?"

"If it works at all, it will work that way. All or nothing has been my motto for years. I wish that you would have some of the men figure out the exact circumference of the earth at the latitude of my house. I want to figure out the amount of fuel necessary to drive a plane around the world from that point. I want to be absolutely accurate, because when the fuel is all gone, I want it to drop right in my landing field. Now, I will go and see about those wireless stations. I suppose the President of the company can get a permit for me."

IN a few weeks a large broadcasting station was erected on one side of the land, owned by William Dills. He protested a little, as the workmen ruined his cucumber bed, but the station had to go up. It was not really one of the old-style broadcasting stations; it was a wireless projecting station, and when it was finally in working order, Beryl Angelo had the code sound sent due east, and the automatic control continued to send the same code signal due east every second. On the other side of the garden, the receiving station was erected, and with ceaseless regularity, the code word arrived. There was every reason to believe that it had traveled by wireless around the world. The electrical expert of Aviation Consolidated visited Beryl and expressed himself as satisfied that a line had been created around the world.

"I knew you could do that," he said. "There is no trick at all in doing that. You could send a message around that circuit just the same as you are sending a sound. What is the grand idea of constantly repeating the same sound?"

"I was working on the receiver in the robot. I wanted to tune it perfectly to the sound that it was going to be guided by. It has to constantly react to that sound."

"You going to use a standard machine of our make?"

"Yes, and no. It looks like the average machine, but I have a lot of new trappings in it. Of course, I am going to send it empty, except for the fuel and, perhaps, a goat. What do you think of the idea of sending a goat around the world as a passenger?"

"That is on a par with your other ideas. Honestly, I think that some of this plan is pretty sketchy. At the same time, if it does work, it ought to go over big. So you are going to use a regular four-passenger plane?"

"Yes, the one with the two cabins. They communicate, you remember, but the large one I am going to leave empty. The goat, with some hay and a pail of water, goes in the smaller one. The gyroscope stabilizes the plane so that the water will not spill. That was shown some years ago, but even now I think that it is a wonderful invention."

Together they walked to the plane. A hundred feet to one side of the landing field the experimental plane stood.

"Looks like an antiquated wreck," laughed the expert.

"I made it look shabby on purpose," Beryl laughed as she replied, "I didn't want any spy to suspect what I was going to use it for."

That night she had the plane filled with fuel. Her calculations had been accurate. She had allowed for a certain evaporation; in every way she had provided for this airplane to go around the world on the electric air line that she had built with her radio—go around the world, and stop in the garden of her land.

The next day she came back at three in the afternoon. The plane was ready except for the goat. She took this nanny down and, by main strength, lifted it over the side of the plane and put it in the cabin, seeing that it had free access to the water and hay. Then she looked at her watch. It was three-thirty. Starting the machinery, she stood there, watching the plane as it went three hundred, seven hundred, a thousand feet up into the blue of the sky and then, turning due east, streaked rapidly out of sight.

"Now, all I have to do is to wait for it to come back on the other side of the landing field, and in the meantime, keep the electric escalator working by constantly flashing the code word."

She walked silently into the house. It was the first time for many months that she had ever been there at that time in the afternoon. For some reason that she could not comprehend, she wanted to see her little daughter, Ariel, and her husband. She tried to remember when she had last seen him. But he was not in his study, nor was she in her nursery. At last, she found Miss Agatha Trim in the bathroom washing her hair. The nurse was astonished to see her mistress.

"Excuse me, Mrs. Dills," she said, "I always take an hour or so off at this time, so I was not expecting you. Anything I can do for you?"

"Yes. Where is Mr. Mills and the baby?"

"Bless me, don't you know? Every afternoon they go out and play house in that old wrecked airplane back of the house. They have some old bedding there, and that is where they both take their afternoon nap. Sometimes they take their lunch there. You know the one I mean, the one with the two cabins? Well, they took the larger cabin and fixed it up for a play house, and they are out in it now. They draw the blinds and go to sleep, and it is the dearest sight to see her cuddle close to him. She has grown to be quite a young lady, and very smart, too; she knows a lot."

Beryl Angelo collapsed in a chair.

"You don't mean in that one special old plane?" she said.

"Yes; the one you had hauled here some months ago."

For the first time in her life the inventor of Aviation Consolidated fainted. Then she explained herself.

"That plane that my husband and daughter are in, Miss Trim—"

"Yes, Mrs. Dills."

"Well, I just sent it around the world."

"You did what?"

"I sent it around the world. I put a goat, with some hay and water in the back cabin, started it off at three hundred miles an hour, and it won't come back till it goes around the world."

"Well, they will soon come back. I would not worry about it. You just trust your husband! He won't let anything happen to your little girl. He loves her too much."

"It does not make any difference how much he loves her. They won't have anything to eat."

"He always takes a lunch, Madam, and then they can drink goat milk if it is that kind of a goat."

But the wife and mother, for so she suddenly found that she was, in spite of all her attempts to act otherwise, was worried. She ate no supper, and after supper she had more cause for worry. The telephone rang.

"Is this Mrs. Dills? Yes? Well, this is Deterkin of the company. I am the one who did the calculations for you in regard to the circumference of the earth to enable you to figure the number of gallons of fuel you would need. I found my old calculations and I made a mistake of six thousand miles. I must have been drunk or something. If you loaded a plane to go around the world on my figures, it will drop into the Pacific Ocean the other side of San Francisco. Sorry."

And that was the end of the world for Beryl Angelo. The husband that she had neglected, the baby that she had only given birth to and then placed in the hands of a nurse, the two beings whom she should have loved more than any others in the whole world, were going to die by her hand, and she could not help it. There they were in a cabin; behind them in another cabin was the goat. The plane was in command of a robot, directed by a code word. They had to go on and on and on till the fuel gave out, and then they would drop to death in the Pacific Ocean.

She could not sleep. She could not even close her eyes. At last she could not think. Finally, morning came. Still dressed, she walked out into the garden. She wandered over to the landing field. There she found

a little rag doll. Pressing it to her and calling, "Ariel, Ariel," she at last broke into a torrent of tears.

She heard the soft beating of an airplane landing. "Some one from the office," she told herself. Then she heard a "Ba-baa," and looking up, saw a goat being pitched over the side of the plane and then a little girl and finally a man, who staggered a little as he took the girl's hand and walked towards her.

"Hullo, Beryl," said the man, "Ariel and the goat and I had quite a ride."

"What happened?" the woman said as she took the little girl in her arms.

"We always played house in that old plane. Yesterday we went to sleep, and when we woke up we were just beating it somewhere over the ocean. It has been a long time since I ran a plane, but I went and watched that old robot and I said to myself, William Dills, be a man. If a piece of machinery can run this airplane, so can you. So, I watched how he did it, and by and by I disconnected him and took control myself and say, we sure had a rough time of it! Finally, I turned it around and made it slow down, and when it got daylight, we ate some of the lunch, and I finally found my way back here. That was certainly some trip. Ariel liked it; guess she is going to take after you, Beryl."

Hand in hand the three went into the house. Beryl Angelo went to the phone and called up the office of Aviation Consolidated and asked for the general manager.

"Hullo," she said. "This is Mrs. William Dills. Yes. Don't you understand! Mrs. *William Dills!* I want you to send some men out and take down this broadcasting station.

"Yes, I am through with it. And tell the President that I am going to take a three-months' vacation. I want to get acquainted with my family."

THE END

COMING SOON!

Sequel to

The Skylark of Space

By

Edward B. Smith, Ph.D.

Illustrated by MOREY

By
Jack Winks

The FIRST ORNITHOPTER

THE dream of the early aviators was to cross the British channel. This Bleriot did and won world-wide fame by it. Grace lost his life in the same attempt. Helicopters rising and descending vertically are still one of the dreams of inventors: This is an unusually interesting phantasy based on the ornithopter, the flying machine of Daedalus and Icarus in old-time mythology, and later in Leonardo da Vinci's sketches—with improvements. The story is so realistically written you will expect to be able to use the machine soon.

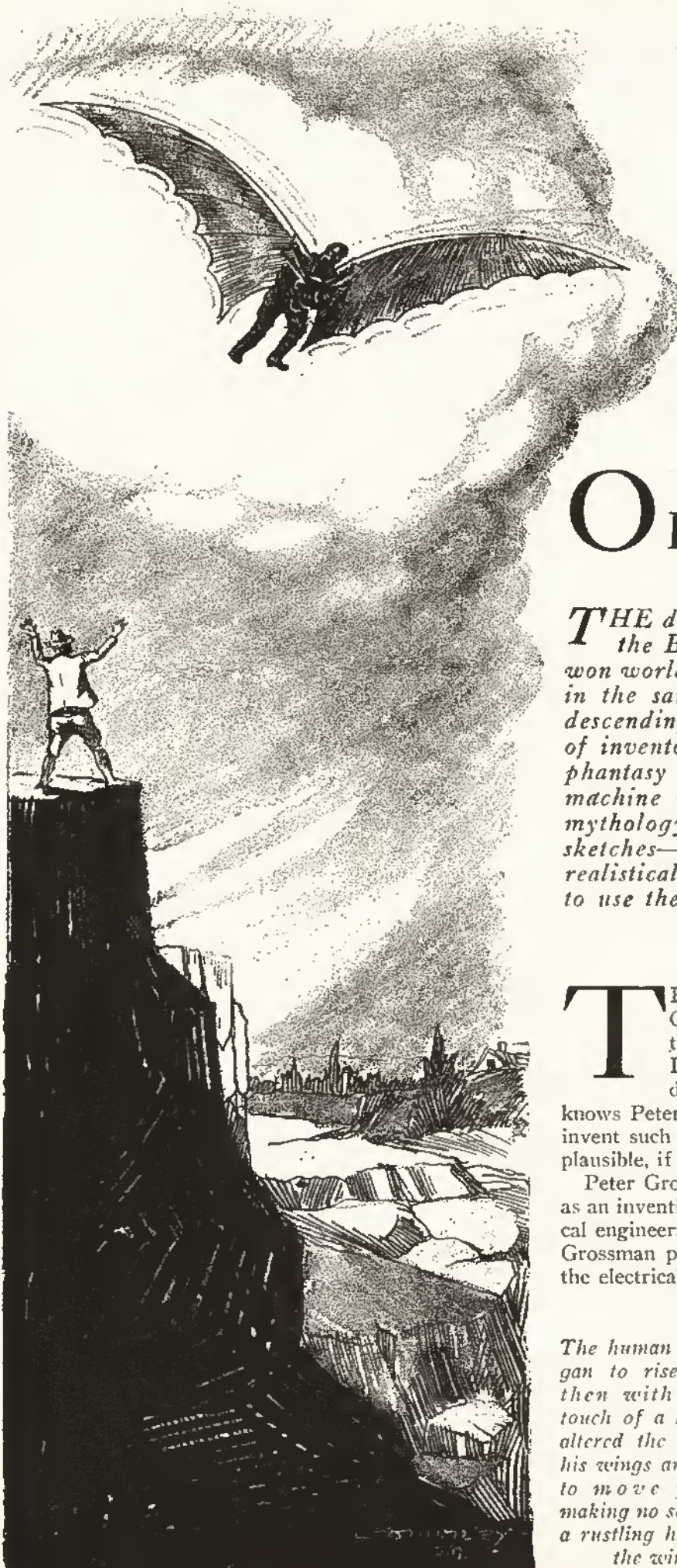
A Strange Sight

THIS tale was told to me by my friend, Peter Grossman, and I confess that I believe it to be the plain and unvarnished truth. First of all, I know Peter and have a tremendous confidence in his integrity; secondly, anyone who knows Peter, knows he has neither enough imagination to invent such a story nor enough guile to make it sound so plausible, if he did invent it.

Peter Grossman is a hard-headed business man as well as an inventive engineer. He stands well up in the electrical engineering profession and is the inventor of the new Grossman power battery, which is at present astounding the electrical industry. In his day, Peter was one of the

The human bird began to rise faster; then with a cool touch of a hand, he altered the pitch of his wings and began to move forward, making no sound but a rustling hiss from the wings

best guards on his college eleven; nowadays he is bidding fair for the heavyweight championship of his home county, only two men, Arthur Boef and Adolph Dickmops surpassing his 240 pounds. But Peter is still a young man and is in strenuous training to reach the top of his class. I have hopes that three or four extra-square meals per day, plus sundries, will tell their tale.



On the day our story begins, Peter was driving out to Willets' Ford, in central Indiana, to inspect a possible power site. The district was comparatively deserted, as the land was poor for farming, and it was calculated that a dam thrown across the river at a strategic point would yield a goodly output of power for an hydroelectric plant. So Peter was on his way to look it over for a client. It was a beautiful summer day, and Peter's ancient Ford was bumping cheerfully along over the ruts of an old country road when he saw what he saw.

As he topped a small hill, he says, there flapped through the air directly in front of him and hardly a hundred yards away an ungainly object, which a startled second revealed to be a man! In his amazement Peter almost drove into the ditch. Hastily jamming on the brakes, the car squeaked to a sudden halt, and Peter stared at this strange sight in transfixed astonishment.

On wide-spreading wings which flapped in ungainly, but determined fashion, a man was wobbling through the air! Truly, he was flying like a bird! But like a sick or wounded bird. His progress forward was not very speedy, and as Peter watched, he sagged lower and lower, until he fell the last ten feet, and landed with a crash in the middle of the road only about twenty feet in front of the stalled Ford. His wings, one of them now broken, gave one or two more feeble flaps, then stopped, and the man lay inert, apparently unhurt but exhausted.

Thus far too much astounded to move, Peter now awoke to the exigency of the situation, and heaving his bulk from behind the steering wheel, he dropped heavily to the ground. As he rolled toward the flier, the man looked up wearily.

"I'm not hurt," he muttered dispiritedly. Then he tried to get to his feet, but one of the wings of his curious flying machine tripped him, and he slumped back. Peter grasped him by the arm and assisted him to his feet.

"Not hurt, are you?" he demanded.

"No, guess not."

"Well, I'll help you home in my fliv." So Peter guided the man's rather shaky footsteps to where the faithful old Ford was patiently waiting and helped him in. While, doing so he had occasion to observe this unusual birdman.

He was a little man, "no bigger than a minute!" as Peter afterwards remarked. He probably weighed nearly ninety pounds. His hair was almost a minus quantity, but his eyes were large and of a brilliant blue. They were the eager, hopeful eyes of a dreamer, but when one looked at his long, slim but capable hands, one realized that these were the hands of a doer.

At present he seemed dejected, viewing his flying apparatus with a disheartened expression. The machine consisted of two parts, the wings and a motor. The motor was connected to the wings by a complicated system of levers, and a storage battery hanging at the inventor's waist supplied the power. The owner of this apparatus unstrapped it from his back and laid it carefully and almost reverently in the rear seat before he climbed into the Ford. Peter cranked up and hoisted himself in, proving as he sat down that the seat would hold no more than the two of them.

The stranger was looking at Peter in some envy.

"If I had part of your poundage, friend," he said, "there'd be two good men here now instead of one fat man and an undersized runt."

"You're surely outspoken enough," returned Peter calmly. "Well, I'm somewhat the same way myself, and

so we ought to get along together." He let the clutch into high. "My name is Peter Grossman; profession, electrical engineer; home, Shermanville." And Peter stuck out a chubby hand, into which the slender fingers of his companion seemed to be engulfed as they shook hands.

"Mine is John Petite; profession—as near as I can be said to have one—aeronautical engineer, and my home is right here," indicating a lane leading off to the right of the road, "if you care to drive in."

Peter Investigates

LOOMING among a grove of trees was a small farmhouse of a nondescript color. It stood a short distance back from the highway and was well screened by trees on at least three sides. In an open field to the right of the lane stood a wooden tower with a small platform at the top. They drove up the dusty lane, and Petite saw his companion's eyes roving toward the tower and explained, "That's the place where I started my flight. I tried it only once before and fell before I got to the road, so you see I'm improving."

Peter's only answer was "Oh?"

He saw as they pulled into the little farmyard that the signs of occupancy were scanty, but that the little barn seemed to have been fixed over as a workshop. There were no chickens or farm animals in sight, and in consequence the place had a deserted look. On the left of the house grew an old and extensive patch of berry bushes.

"This is my place," said Petite. "I bought it dirt cheap a couple of years ago, because the farmer said that the land was too poor to raise a decent crop on. But it provides me with solitude in which to carry on my experiments. Here in the barn I've managed to fix up a sort of combined machine shop and chemical laboratory. The stuff I make my wings out of I make here. I'm a sort of jack-of-all-trades, you see."

Peter took in everything. He certainly was interested. He said, "What do you call your apparatus, and how does it operate? I see your power is electrical. Perhaps I can help you in its application."

Petite gave Peter a searching glance; then, seemingly satisfied with his appearance, the inventor decided to confide in him. Laying out his wings, which were mounted on a stout canvas jacket, he proceeded to use them to illustrate his lecture.

"All true flying creatures fly by flapping or vibrating their wings. By 'true flying creatures' I mean the birds, the bats, and all flying insects. Men have tried from time immemorial to imitate this manner of flight. There was Icarus and his daddy, Daedalus, but, like Darius Green, I felt that 'wings made o' wax wouldn't stand sun's heat an' hard whacks,' so I had to make mine of something else. Then there was old Leonardo da Vinci. He wrote several books on flight, but he didn't know a thing about it. He thought, like everyone else, that the wings of a bird struck downward and *backward* in flight, whereas they really strike downward and *forwards* during the down stroke and upwards and *forwards* during the up stroke! These facts were first demonstrated by a man by the name of J. Bell Pettigrew, a professor. He analyzed the movements of a bird's wings during flight and even constructed artificial wings which satisfactorily reproduced them. That was in 1867, and he also showed that the wings of an insect or of a bat act in exactly the same

way as a bird's. This may surprise you, but it's true, for I have verified it myself. The wings of any flying creature, i. e., a bat, bird or insect, are screws, structurally, and act as screws when vibrating, because of the fact that they twist in opposite directions during the up and down strokes.

"Professor Pettigrew demonstrated these facts, but it was left to me to make use of them in artificial flight!

"Now the material of the wings proper is a derivative of cellulose, which I call 'cellupress.' I use old newspapers as my raw material. I put it on, in imitation of a bird's feathers, in flakes. The main frame, modeled after the bones of a bird's wing, is duralumin. The power is supplied by this electric motor mounted between the wings and working through a system of levers. I carry this storage battery at my waist. And there's the whole trouble. I can't store enough power. I'm perfectly satisfied with my wing material, but I can't get electricity enough to last me more than a few hundred feet.

"I can work out a chemical problem pretty well, or I can design a wing even better, but I can't get more electricity out of a battery than can be put into it."

After this long lecture, Peter repeated a question, "What do you call your invention?"

"Why," said Petite, "an ornithopter." He rolled the word over his tongue as though he liked the sound of it. "An ornithopter, from the Greek word *ornithos*—bird, and *pteron*—wing, you know. That is, a machine which flies like a bird."

"Can you gain altitude with your orni—ornith—opter?" Peter, who is rather adverse to the use of big words unnecessarily, stumbled over this new one.

"Not much. I am almost compelled to fly in a horizontal plane from my starting point. That's why I use that tower."

Peter had a mental picture of little Petite climbing shakily up that wooden tower, there to launch himself out on the air, not knowing whether he would fall to the ground and be crippled, perhaps for life, or would fly. It must take a lot of courage and belief in self! Peter's heart went out to this self-styled "runt." He would try to help him.

Peter eyed the apparatus speculatively.

"If you had plenty of power, you could fly all right, eh?" he inquired.

"Yes."

"Such a flying machine might not be worth much at first, but it would be worth considerable in the end, would it not?"

"A fortune!" enthusiastically.

"Well," said Peter thoughtfully, "I have a notion to help you out. Tell you what! I'll come back tomorrow and bring a battery of my own that I think will improve your machine's performance. I have some business down by Willets' Ford now, but I'll be back tomorrow, early. Here's my card." And Peter shook hands with Petite while the latter earnestly exhorted him "not to forget!"

An Intruder

WHILE Petite stood watching Peter's car rattle down through the midsummer dust and heat of the old lane, another, but unseen listener, was beginning to absorb the gist of the talk which had just passed between the two engineers.

"Gus" Jensen, son of the road, lounging in the shade

of a dense clump of blackberry bushes near-by, had been awakened by the arrival of the two. Cursing a bit, he had turned over on his stomach to view the intruders on his privacy. He reflected that there was a possibility that something profitable to him might develop out of that talk. Perhaps there would be something of value about the premises—poor as they seemed—which he could safely steal. If the theft promised a financial return, Jensen was willing to try it, always provided of course that it did not entail too great an expenditure of energy. Anything remotely resembling work was strictly against Gus' principles.

When Petite drew out his flying apparatus from the car and started to explain it Gus' eyes bulged and he almost betrayed his presence with a lurid exclamation, which he smothered just in time. The others were too much interested in their conversation to notice his outbreak and Jensen watched the rest of the proceedings in safety.

Gus was all ears as the monetary possibilities of Petite's invention were mentioned. Here was the chance he was looking for! Suppose he should steal those marvelous wings and hold out for a ransom for their return! There would be little work to such a plan, save the writing of the note to demand money—which act would indeed be labor for Gus. That was the only item which caused him to hesitate. But avarice can overcome even the laziest disposition, and the hobo decided that he would steal the ornithopter.

Opportunity came sooner than Gus expected, for Petite, all unmindful that someone other than Peter had overheard his discourse on the art of flying like the birds, went cheerfully about the business of mending the broken wing. The inventor gave no thought to the possibility of anyone even finding out about his invention, much less trying to steal it. He took it for granted that there were people who would steal it if they had only a chance, but he was sure that none of these people had wind of his invention. Peter, he trusted instinctively, and his trust was not misplaced.

As Petite worked in his little workshop, Jensen was watching and trying in vain to perfect a workable plan for stealing the ornithopter. No plan suggested itself to his slow brain, so he gave up trying to think and determined to leave the accomplishment of his design to fate. Jensen was a firm believer in chance. Nor was his belief to be shaken on this occasion.

The day wore on; Petite worked on. Sometimes he whistled in a high, piercing key, which was not at all to the taste of the ears of the watcher in the bushes. Those shrill notes grated on Jensen's nerves and angered him. But he retained enough sense to remain concealed and wait.

Petite entirely forgot the lunch hour, but when the tramp's hunger informed him that it was noon, he softly pulled out of his pocket a package wrapped in a dirty newspaper and ate the meat and stale bread it contained. "Have better scoffin' than this 'n a few days," he reflected. "If that there little runt 'ud only leave 'is wings alone f'r a minute! He sticks by 'em like they wuz made out o' solid gold!"

At last, however, the hobo's patience was rewarded. Petite laid down his machine and, still softly whistling to himself, hurried into the house for some necessary item, leaving his shop door trustfully open! Golden opportunity! And Jensen seized it!

He hastily rushed into the little old barn, grabbed the ornithopter and was out again before a stammerer could have said "Jack Robinson." He trembled all over with excitement, for Gus was a coward at heart and hated to steal anything, not only because of the effort involved but because of the peculiar thumping it caused his heart while the affair was progressing. Indeed, this latter quite alarmed him, and he was in the habit of informing other "bos" that he had a weak heart.

As Jensen hurried into the bushes with his prize, anyone watching might have noticed a very pronounced limp in his walk. True, one leg was crippled; how, no one but Gus knew, and he would never tell. So it happened that Petite, hastening back to his precious invention, discovered his loss immediately. As he entered the door, he looked around, then muttered to himself:

"I left them right here, I'm sure! What——!" This exclamation was broken off by the sight of a big gob of dried mud lying in the place where he had left the ornithopter. "Someone has stolen it!" he fairly screamed, tearing his hair in anguish. Then the frantic inventor began to search the workshop. Yes! His brain child was gone! The efforts of ten years wiped out in a minute! . . .

With a rattling and a squeak, Peter Grossman pulled up in the farmyard. He found little Petite running around—as Peter expressed it—"like a chicken with its head off."

"Thought I'd drop in again on the way home," shouted Peter cheerfully. "So here I am! Why, what's the matter here? What makes you look so pale? What has happened while I was gone?"

Petite approached the Ford with a woe-begone expression. "It's been stolen!" was all he could stammer.

"Stolen. By whom?"

"I don't know——"

Pursuit

PETER had to do a bit of questioning to get to the bottom of the trouble. Immediately his trained brain took charge of the situation.

"Let's see that lump of mud," he said. "Mud is scarce now; everything is dusty." When he saw it, Peter added, "Pour a little water on it now: you know, wet earth has a different color when dried." And when that was done, he questioned Petite. "Knowing the neighborhood as you do, where do you think that mud could have come from?"

Petite was quick to catch on, and after a minute scrutiny of the wet clod, he announced:

"There's only one place in the immediate vicinity where I recall having seen mud just this color. It's a little, swampy patch of ground down by Cedar Creek—quite close too, by the way! Say, let's go down there right away! I'll bet it was just some hobo. They sometimes camp down on Cedar Creek in the summer! You see, the railroad goes by on the other side of the creek. Come on, let's go!"

"Take it easy. If it was a tramp stole your ornithopter, we'll have to sneak up on him."

So the two started on the trail of the thief. It led them toward the marshy place, and when they lost the trail, which they soon did, for neither of them was a woodsman, they continued toward the place which Petite had described.

As they neared the marsh, Petite cautioned quiet.

With all their care, they moved but awkwardly through the bushes. But smoke showed them to a fire, and at the fire they saw Jensen. The wings lay in a careless heap beside him and dangerously near the fire. Poor Petite almost expired when he saw them.

Jensen was engaged in the laborious task of writing a note. In his hand a stub of pencil, on his knee a dirty scrap of paper, he was perspiring freely and cursing under his breath as he licked the pencil and scrawled on the paper. So absorbed was he with the task, that he did not notice the approach of the two engineers until they were quite close to him. Then he leaped to his feet with a startled expression. He had not expected a pursuit at all. He had not reckoned on Peter returning that day. But Jensen knew instantly that his only safety lay in flight. How he wished some of his old companions of the road were here now to help out. Some of them were tough babies and, with their backing, he would not be forced to flee ignominiously as he was doing now.

"Damn that bum leg, anyhow! Feller could git away from that there fat guy even then, but the little cheese was fast!" Such was the substance of Jensen's thoughts as he stumbled hurriedly along at as fast a run as he could muster.

Indeed, the "little cheese" was fast—and furious! If his physique had permitted, he would gladly have given Jensen a good beating. He caught up with the tramp immediately and dived at him like an angry terrier. Jensen, frightened though he was, turned and made a show of resistance. He was too big a man for Petite to harm, but his frightened eye saw Peter approaching and he threw up his hands with a whimper of "I gives up, bo! Don't hit!"

Peter seized the intimidated tramp by the scruff of the neck, and as he towered over him threateningly with his six feet two, he growled:

"What do you mean by stealing this man's flying machine?"

"I ain't stealin' that there thing!" whined the tramp. "'Nother feller stole it an' brought it here, an' I wuz goin' t' take 't back soon's I cud! I ain't no thief, mister! I didn't steal 't!"

"Shut up!" growled big Peter. "Petite, run back and get that scrap of paper he was sweating so profusely over. We'll see from that, I think, if he stole the ornithopter."

After a little search, Petite returned with the paper, and read:

"i got yur flappin machine and i want mony fer it bring 50\$ to"

Here the scrawl ended, as Jensen had been interrupted.

"So! You thought you'd get money for it!" ejaculated Peter. "We ought to turn you over to the authorities, but I don't think they'd even want a yellow cur like you. . . . Now, let's see, Petite, what can we do with this thief?"

"Give him a swift kick and turn him loose!" returned Petite with disgust. "We can't have him arrested without letting out my secret."

"I'll give him a ride in my Ford and dump him out about fifty miles from here. Here, you! If I ever catch you hanging around here again, I'll wring your neck see?"

Jensen whined an abject assent.

Petite picked up the ornithopter, not without many black looks at the tramp, and the three started back to

Petite's house. The little man was so glad to get his invention back that he whistled a little again and was in good spirits when they reached the farmyard.

"All's well that ends well! I shan't hold any grudge against you, hobo, *but* I don't want to catch you around here again! I'll be on the lookout this time, and I'll shoot your hide full of rock salt!" And Jensen knew that the inventor meant what he said. Gus was really thankful to come out of it so well. His plans had not succeeded, but, on the other hand, he was not being punished for them, and he knew he was getting off easily.

So Peter drove off with the tramp and Petite reminded him of his promise to return on the following day.

"I'll be back early," Peter told him.

Petite watched the old car pull out and depart in a cloud of dust. Then he returned to the farmhouse and partook of a lonely meal. His wings he carried with him, having resolved never again to let them out of his presence. After a close inspection, he was convinced that the tramp had done them no harm and took them back to his workshop to finish his repairs. Late that night he finished the job, carried the ornithopter into his bedroom and went to bed.

About ten o'clock in the morning Peter again drove up. Petite greeted him and he got out of the automobile, carrying a small rectangular box with him.

"How have you been progressing?"

"I've got everything in readiness to attach your new battery," rejoined the other. "All we have to do is hang it on the belt and connect it with the motor."

Further Plans

PETER set the new battery down on the workbench of the old barn and began to examine Petite's ornithopter closer than he had done before. The battery was a little box of brown-molded bakelite, about 12 inches by 16 inches by 6 inches high. On top were two highly polished terminals of a rounded appearance and two small binding posts with a tiny silvery link between them. The link was now open, but could obviously be closed, connecting the binding posts together.

The whole thing was a mystery to Petite, and he did not hesitate to say so. Peter explained as completely as he could.

"This battery is still a secret, although I've got a company organized to manufacture it. Perhaps you've heard, or maybe you haven't, that ionized helium gas in a tube has eighty times the conductivity of pure copper. Well, my battery consists of a series of tubes containing helium and two electrodes. When the space between the electrodes becomes a conductor, that is when the helium gas, which is my electrolyte, is ionized, and an external circuit closed, a potential difference appears across the electrodes, causing a current to flow. Now these cells connected in series form my battery. The strange part is that the cells will not start ionization of the helium without help, although once ionization is started, no matter how slightly, the battery will maintain it. Thus I have a flashlight cell and a tiny vibrator incorporated with the battery to start ionization. When this link is closed, the battery is ready for use and will discharge 98 per cent of the electricity previously stored in it. Its operating voltage is 50 volts, and it is capable of maintaining its maximum discharge of 20 amperes for ten hours! That is, it will store and return ten kilowatt hours! This, as you

know, is unprecedented in any battery. Its internal resistance is on the order of 10^{-6} ohms, or in decimals .000001 ohms. It will positively revolutionize transportation and the use of power in this world! Just think, electric automobiles and trains will be faster and far cheaper than gasoline or steam vehicles! It is the one thing which the modern world has been waiting for."

"Marvelous!" gasped Petite, gazing in awe at the tiny producer of such power. "You can manufacture it in as large units as you wish I presume?"

"Yes. I can make a battery which will pull a full size, loaded freight train in less space and much less weight than a locomotive tender." And so enthusiastic was Peter about his invention that he could have continued talking for hours, but at last he realized what he was there for and became suddenly curious about Petite's ornithopter. "Now explain your flying machine to me," he said. "My interest was too much distracted by business yesterday."

And Petite, with a last awed glance at the "Grossman power battery," gladly began to hold forth on his favorite topic.

"You know, I was telling you yesterday that all flying creatures use the same principles in flight. Now by 'flying creatures' I mean birds, bats and insects. Flying fish or flying squirrels are not included in this category, as their flight is simply gliding flight, and when their initial momentum is expended, they must descend. But birds, insects and bats maintain themselves in the air for long periods. It is their true element, and they are as perfectly adapted to it as fish are to the water or deer to the forest. They support themselves by striking the air with specially adapted extremities called wings, producing sufficient reaction to maintain and propel themselves. All these wings act in the same way, thus proving that nature has found only one way to create successful flight. Man imitates that way—though imperfectly—with his airplanes. His propellers strike the air and produce a reaction which drags the supporting surfaces forward. They in turn produce reactions which lift the airplane and support it in the air. To fly, then, an airplane must move forward—and at considerable speed. But a bird can so shift and balance the reactions of his wings that he can hover for indefinite periods above the same spot. Witness the humming bird.

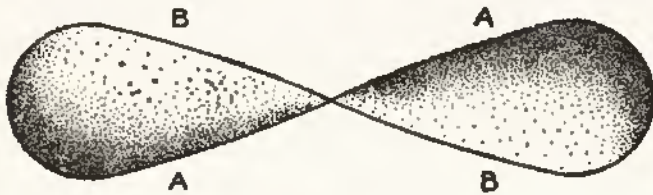
"Now as to the actual actions of the wings." Petite took out a piece of paper and a pencil and drew the following sketch.



SKETCH No. 1

"This is the shape a single wing takes in flight. 'A' is the leading edge and 'B' the trailing edge of the wing. The motion is the downward stroke—downward and forward, remember! You, an engineer, can readily analyze the forces produced by such a motion. The reaction will be such as to force the wing upward and forward. Now we have been considering the bird as motionless, that is, only the wings moving. If we let the bird move,

of course the wing motions are spread out in a wavy sort of fashion, but the wing itself follows the same movements. On the up stroke—upward and *forward*, remember, the wing changes to this general shape, flexible somewhere near the middle."



SKETCH No. 2

"As before 'A' is the leading edge, and 'B' the trailing edge. You see the motion is really a screw motion.

"My problem was to artificially duplicate this flexure of the wing and to make it automatic. That is, the wing must automatically change shape as the stroke changes. Well, with a strong, light, flexible material like cellulose, the problem resolved itself into making a series of internal connections in the wing itself. This was solved by a lot of experimenting, and my wings flew with a dead weight of 100 pounds before I trusted myself to them."

"If the action is really a screw action," remarked Peter, "why don't you replace wings by a pair of screw propellers?"

"Screw propellers!" exclaimed Petite, impatiently, "that's what everyone thinks! Can't you see that this has a thousand advantages over screw propellers? If a helicopter's screws are stopped by lack of power, it falls. It has no flexibility. It must have motors that run at a very high speed! It requires more power because it is not so efficient. My wings overcome all these disadvantages. If my power gives out, I can spread my wings and glide safely to earth. My wings vibrate at a slow rate of speed, and they are very flexible. They are equivalent to screws with an adjustable pitch. Now do you doubt the merits of an ornithopter as against a helicopter?"

"Fine!" ejaculated Peter, "I'm glad to know all these things. Now let's try my battery. I'm eager to see how it works on your ornithopter."

A Perilous Test

SO they examined the motor, but to their disappointment it was only a 12-volt motor and the new battery could not be used with it.

"We'll lock up your place. Bring your ornithopter, and come with me," said Peter. "I don't think your motor is adapted to this work anyway and I want to study the question in my laboratory. I believe a new type of motor could be worked out to advantage."

Petite readily agreed, for he now had all confidence in Peter. The two men then drove to Peter's home in Shermanville, and in Peter's small, but well equipped laboratory, they set to work on the problem of a motor.

Peter tested Petite's motor and found that its efficiency when working through the necessary levers was fairly low. He then designed the new type of motor which he had said he had in mind. It took him a week to complete the calculations and drawings. In the meantime, his own consulting business was allowed as little of his time as possible.

The new motor he called a "flapping motor." It had two oscillating armatures, one for each wing, and worked on about the principle of an electric doorbell. A set of powerful electro-magnets pulled down an armature, and were automatically de-energized; a set of magnets on the opposite side then were energized, and thus the armature was pulled back and forth with great power. Two armatures thus actuated provided power for the two wings. The motor was rated to produce a two and a half horse power, but was capable of great overloads. Its r.p.m.—to use this symbol—actually the number of complete "vibrations" per minute could be varied. Its bearings were very large and well lubricated, being designed to carry great stresses.

This motor made in the shops of an electrical concern of a near-by city, was to provide the power for the perfected ornithopter. While they were waiting the delivery of the sample motor, Petite fretted somewhat, and was kept in Shermanville only by the opportunity to subject his wings to still more exhaustive tests and to improve upon them.

At last, after delays which seemed ages to the impatient inventor, the motor arrived and was installed in the ornithopter. On tests without the wings it proved very efficient, and seemed to be all that could be desired.

Then one morning the two set out once more for Petite's deserted farm to give the ornithopter a thorough test. By this time, Peter was nearly as eager for the test as was Petite. The machine rode safely in the back seat of Peter's Ford, wings folded and covered with a tarpaulin.

When they reached the farm, it was as deserted as ever, but the dust in the lane had been settled by a rain a few nights before.

They lost no time getting about the business they had come out for. Petite unpacked the wings, attached them to the stout canvas and leather jacket, on which the new motor had been mounted, and examined closely all the control wiring. He was pale, and trembling with eagerness. Soon his life's dream would come true, he was sure of it. He would be able to mount and soar through the clouds in exact imitation of a bird. No sitting in a close little cabin, or cockpit, while a stinking motor dragged him through the air, assailing his ears with noise. No! Just a comfortable jacket and two huge wings fanning the air above. A touch on the control buttons or on the rheostat. A dart . . . a dip . . . a soar . . . a swirl . . . Thrills and excitement never before available to man. What tame airplane ride could compare with the bliss of being a bird for the time?

Petite's anticipations were whetted by the delays. He gave a last glance over the contrivance. Peter silently hooked the new, tested battery in place. They shook hands and stood looking at each other a moment. Peter felt the urge to give up this foolhardy attempt, but he said nothing. Petite turned, walked lightly to the starting tower and began climbing. The wings were folded, and stood out from his back. He looked like some preposterous dream of past ages—Like Icarus starting his fabled flight from Crete on his wings of gulls' feathers and wax.

Peter felt tears in his eyes. It seemed so silly to suppose that two men could succeed in something hitherto so impossible as to be laughed at as absurd. But Peter's faith in his battery and motor did not waver, and he steeled himself for the take-off. Petite was spreading

his wings; waving them by hand; luxuriating in their feel. He was setting them! Bending forward, poised on the brink of death or fame! He touched the starting button; the great wings began slowly to vibrate. Then as they went faster, they began plainly to twist—screw fashion; then faster until Petite's toes, striving instinctively to maintain a foothold, were lifted clear and his body hung from those moving wings.

The human bird began to rise, faster, then with a cool touch of a hand, he altered the pitch of his wings and began to move forward, making no sound but a rustling hiss from the wings. His speed increased; he circled, rose and descended. Then turning carefully he shouted exuberantly to Peter, "Wonderful! She works like a watch! Watch me now!"

With these words he began another series of maneuvers. Turning to right, to left, up, down and hovering motionless, he practiced the use of the controls. As Petite became more proficient, he attempted more elaborate maneuvers. Still flying only 50 to 60 feet above the ground, he made figure eights, circles and ellipses. Then he tested his speed in a straightaway flight. He

returned and landed lightly on his feet only a few yards from where Peter had been watching fascinated.

"Congratulations, old top!" shouted the birdman, "all my success is due to you!" and he wrung the engineer's hand. "We'll organize a company! Ornithopters will soon be as common as motorcycles! Want to trade places with me and try a flight?"

"Not I!" ejaculated Peter, aghast. "I'd look pretty lying in a heap below that tower, wouldn't I? I'd only have to reduce about 140 pounds first anyway. Nothing doing!"

Petite laughed.

"Your brains are proportionate to your build, my friend. That should content you."

Petite made several more flights and now Peter tells me they've almost got a perfected ornithopter ready for the market.

So your dreams, gentle reader, of flying around like a bird, may be nearer realization than you think!

And so this dream ends, a fantasy embodying a hope for the future, perhaps justified by past achievements.

THE END

COMING

in the Winter Edition

AMAZING STORIES
QUARTERLY

Among several other stories of unusual merit,

WHITE LILY

By

John Taine

*Author of "The Purple Sapphire,"
"The Gold Tooth," and several other
successful scientific fiction novels.*

The Corpse that

By E. D. Skinner

Author of: "Electro-Episodes in A. D. 2025."

LIEUTENANT-Colonel Algernon Sidney St. Johnstone, N. Y. N. G., was violently agitated. This fact was plainly evident to John, the erstwhile valet of Algernon's "pre-war" bachelor days and now promoted to general factotum in charge of his combination private den and public business office. Algernon had just arrived in his office, and he had shot down the pneumatic tube from the roof above with a velocity that escaped being a catastrophe by a miracle!

In fact John had been decidedly fearful that some serious calamity actually had happened up there on the roof in the first place, for Algernon had landed in his "runabout" monoplane with a violence that had shaken the whole building! And Algernon, though reputed a "fool for speed" in the air by popular acclaim, was rated by the experts as the most exactly perfect in his landings of any aviator, amateur or professional, extant—and his skill in this respect had been even more pronouncedly in evidence, since he had obtained this new "runabout" monoplane with all its modern trick appliances. This was the same machine with which he had made that startling record in the "landing" contest at the recent Grand Aerial Olympic at Roosevelt Field. This year of A. D. 2026 had been exceedingly prolific in revolutionary achievements in aeronautics, and this feat of his was considered the outstanding feature of the whole year. The experts said that this record would stand for all time! The official electrical "speed-indicator" had registered his speed at 462.728 miles per hour at exactly one-half mile from the ultimate "Landing Platform," but he had promptly snapped his forward propeller back into its enclosed pocket in the machine, where its roaring fury ceased to affect his speed, and he had shot the rear propeller, which was already going at full speed "in reverse" in its enclosed pocket in the rear of the machine, out behind, and he had made an exactly perfect right-angled turn around the "course" marker in the center of the field—saving himself from a spill in that sharp turn by having that rear propeller going at full speed "in reverse" be-

THERE seems to be no limit to the variations in the pictures that authors can draw of the future. Mr. Skinner, obviously, has a good sense of the ridiculous and he shows us a not impossible future, in which is included, besides some very remarkable perfections of modern inventions, now only in their embryonic stage, some developments of modern trends of fashion both in living and in dress, which combine to make an unusually interesting scientific story, all the more fascinating because it is quietly interspersed with subtile humor.

hind so that it held him—and he had shot the "helicopter," already going at "landing" speed in its enclosed pocket in the top of the machine, aloft exactly as he came to a full stop right over the final "Landing Platform," and he had made his landing in exactly 9.286 seconds elapsed time for the final half-mile, including the landing on the platform, as registered by the official electrical "Timer"! And he had missed a perfect alignment with the diagram they had drawn of his machine upon the platform, and which duplicated the machine's proportions, by less than six inches; and the automatic weighing device attached to the platform had registered less than one pound in excess of the combined weight of himself and the machine, showing that the impact

of his landing had had less than a single pound of violence in it!

Therefore, when Algernon upon this occasion landed upon the roof of his own office building with such violence that he shook the entire structure, anybody with a particle of sense should have known that there was a screw loose somewhere.

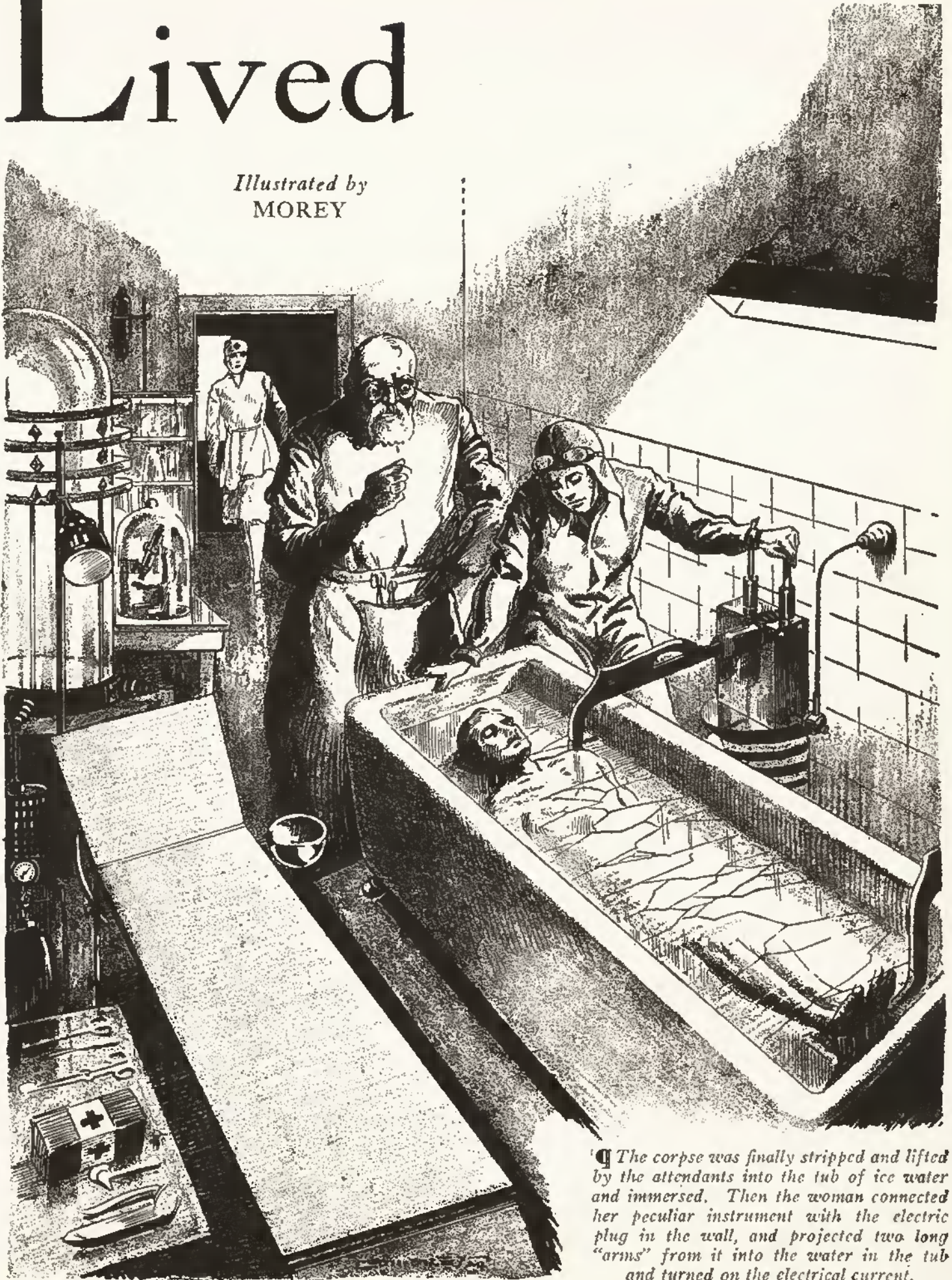
Now that Algernon was down in his office, however, the evidence that something was seriously wrong with him was so vivid, that a partial realization of the fact penetrated even the density of John's obtuse brain! With a bang he kicked himself out of his aviator's togs, and slung them broadcast over the room, and slammed himself down into the swivel chair by his desk with his face contorted in a fury.

What John thought about the matter however, that is supposing that he actually thought anything concerning any matter, utterly failed to register upon his features. The blank impassivity of his facial expression would have proven the final despair of the original creator of the original Egyptian sphinx!

Finally, however, Algernon seemed to recover some measure of control over himself, for he quietly and methodically proceeded to slip his wrists into a pair of bracelets attached to an "Electric Regenerator" upon his desk. Then he snapped them shut and set the machine

Lived

Illustrated by
MOREY



The corpse was finally stripped and lifted by the attendants into the tub of ice water and immersed. Then the woman connected her peculiar instrument with the electric plug in the wall, and projected two long "arms" from it into the water in the tub and turned on the electrical current.

at "One Second." Finally he pressed a button and relapsed into unconsciousness for that brief period of time. After that, evidently a bit refreshed by this modern equivalent for "one night's sleep," he pulled a gold case from his pocket, extracted a single tablet stamped "Equivalent to One Full Meal in Food Value," and hastily swallowed the thing in lieu of a "breakfast."

Following this, he turned his attention to the combination-lock of a drawer marked "Private" in the desk. Setting the knob of the lock at "0," he turned it forward to "20," back to "15," forward again to "2," back to "1," again forward to "3," back a full revolution to the same "3" and lastly forward to the final "15." Then he applied a firm, steady pressure to the knob, and a circular segment of the floor upon which the desk stood—the outlines of which blended so perfectly with the inlaid floral-scroll design of the rest of the floor, that, under normal conditions, it was practically certain to escape detection—this circular segment revolved half-around, disclosing a considerable compartment filled with sealed tins of tobacco, as well as a varied assortment of pipes. Selecting a well blackened "briar" from amongst these pipes, he filled it with tobacco from a half-empty tin, adjusted a patent "Smoke Consumer" to it, pushed a button in the desk which started an automatic "Atomizer" to going, by which the room was immediately sprayed with a perfumed disinfectant which was guaranteed to effectually deodorize the fumes of tobacco. Then he disconnected all the electrical connections of the room, so that no snooping minion of the law could "look in" with a "Television" apparatus, and "get the goods" on him for violating the latest legal monstrosity, in the shape of an anti-tobacco prohibition amendment to the Federal constitution. And then, finally and at last, having attended to all the precautionary details necessary before indulging his "criminal instincts," he "lit up" and started puffing violently at his pipe with a savage avidity.

FOR a moment the soothing effects of the tobacco transformed his distorted features into a look of serene content, but his complacent placidity was short-lived! Pretty soon he was staring glumly into space, and mumbling fretfully to himself.

"Tobacco is about all the pleasure there is left in life," he grumbled audibly, "and even that is forbidden by law. Pretty soon it will be a criminal offense to breathe the plain, out-of-doors, unadulterated circumambient atmosphere! Some crank will be preaching that it's got microbes in it—if he can bamboozle enough suckers into 'donating to the cause' while he does the preaching. This is getting to be a terrible world! And meanwhile, according to the latest statistics, more than three-fourths of the men employed in this country are working for the government as 'Law-Enforcement' officers, and they are grafting for what they can get out of it by snooping on the people, trying to catch them at some petty infraction of some legal vagary of some mentally irresponsible crank of a legislator. Pretty soon there won't be any other kind of a job left for a man that has to work for a living. And, even now, the 'cost of government' has already climbed into the trillions!"

The man, John, traversing the floor at the time in the act of gathering up the aviator's togs which Algernon had scattered broadcast over the room when he first entered it, heard his master's voice speaking, and auto-

matically, from the force of a life-long habit, he promptly answered: "Yes, sir. As you say, sir."

Algernon jerked the pipe out of his mouth, and glared savagely at the recumbent figure.

"Yes, sir! As you say, sir!" he mimicked the dutiful John viciously. "That's all you know—just 'Yes, sir! As you say, sir!' Some of these days you'll be saying 'Yes, sir! As you say sir!' to God Almighty, while He is consigning your everlasting soul to eternal torment!"

"Yes, sir. As you say, sir," the irrepressible John echoed automatically.

Algernon opened his mouth as if to say something—but, evidently, the words for what he wanted to say were not in his vocabulary! Anyway, he didn't say anything.

It was quite evident to the discomfited John, however, that his master was certainly in a "heck of a stew" this morning! In fact, he couldn't remember that he had ever seen him so badly upset.

For a few moments there was a dense silence in the room, while Algernon stared gloomily into space. Then, suddenly, as if he had finally solved a difficult problem that had been tormenting him, he straightened up with a jerk.

"Listen to me, John!" he snapped sharply. "Stop that everlasting messing around on the floor for a minute, and get up on your feet like a man, and pay attention to what I'm telling you."

The inclined figure, with the inevitable "Yes, sir. As you say, sir," promptly obeyed with the military precision of a trained soldier.

"I'm going on a scientific expedition to the top of Mt. Everest in the interest of the American Institute," Algernon continued in measured tones, as soon as the stooping figure was definitely stood up "at attention." "A new species of *Ovis Poli* has just been reported in a restricted district close to the peak of Mt. Everest, and the Institute wants specimens. Get a move on you, and get my big touring biplane stocked with supplies for one month, and see to it at once. I start in two hours. I've told you the nature of this expedition, so that you can figure out what I will need—but, for God's sake, give me some real food to eat. I haven't eaten a bite of real food since I married, and my teeth are about ready to drop out! And don't forget plenty of tobacco and a good assortment of pipes in that secret false bottom! And get Hicks & Hicks at their home plant in Glasgow on the radiophone, and have them ship me by airplane one hundred cases of their best 'Scotch.' Have them time the shipment so that it will catch me in mid-ocean. We can tranship the stuff there. They can figure out how to catch me, if you give them my exact air-line route to Mt. Everest and my exact time of leaving here. I will leave here exactly on-the-minute at eleven o'clock this A. M. New York City 'daylight-saving' time, and I will go precisely at an average of two-hundred-miles-per hour speed. They'll probably want as much for a special shipment like this, as the bootleggers here would hold me up for—but, anyway, I'll be getting the real goods, that hasn't been 'cut' or 'doctored,' and not the deadly poison that they are murdering the people with here."

"Yes, sir. As you say, sir," John answered promptly. "But, begging your pardon, sir, I might suggest that real food of any kind is very difficult to obtain upon market at such a short notice, now that people have taken

so generally to subsisting upon the chemical tabloid substitutes. If you could postpone your trip for a single week, I could get anything you want raised and matured by the old 'Electric-Forcing' process."

"Can't wait!" Algernon snapped decisively. "The start must be this A. M. exactly as I stated. Do the best you can. I don't expect the impossible—but, for God's sake, get me something, anything, I don't care what it is, but get me something in the nature of real, tangible, honest-to-goodness food to eat!"

"Yes, sir. As you say, sir," John answered with alacrity, but with a puzzled frown on his brow. "But, begging your pardon, sir, shall I stock the plane for one or two persons?"

"For one!" Algernon snarled viciously. "I'm getting away from the whole damned human family. The whole outfit gives me a pain. I'm going out all alone by myself—and I'm going to eat, and I'm going to drink, and I'm going to smoke, and I'm going to sleep just as if I was actually a human being once more."

NOT long after this, having finished his smoke, Algernon pushed a button which snapped his secret tobacco compartment shut again, stopped the automatic "Atomizer," re-connected the diverse electrical connections of the room, pushed the plug of his "Radiophone" into his private "E. V. R." socket, slipped the framework of its combination "head-phone and microphone" contrivance over his face, and spoke softly into the mouthpiece.

"Charlie Grant there?" he asked.

"Yep! This is he speaking," the voice of his official broker came back to him, with the terse economy of words which was one of that individual's principal characteristics. "But how come?" he added with a note of curiosity in his voice. "I thought you were hiding-out somewhere from that irate St. Croix Van Der Vere von Rennselheimer who sued you for five millions in damages for your criminal alienation of his wife's affections—with a genuine photograph of an extremely compromising nature, to back the thing up. The boys have been telling some great stories about that photograph around here. It must be rich!"

"That was just a bad egg that was so rotten that it exploded before it hatched," Algernon answered carelessly. "Mrs. Ida May Van Der Vere von Rennselheimer, as she was known here, is admittedly quite an eye-full to look at. With this fact to go on, they hatched up a nice little scheme to blackmail me—but their scheme didn't work. I was warned in time, and I was fixed for them. She gave herself away the first time we met. She staged a near-fainting act at her first sight of me, as if she was so dazed by one look at me that she was absolutely powerless to resist me! Of course I am free to admit that my personal appearance is not to be sneezed at, but real honest women don't act like that! I had to chase my head off, before I finally caught my Esmeralda. I never imagined that she ever had any serious objections to being caught, but she wasn't advertising her willingness with a 'Front-Page Scarehead' until the proper time came. We men with money learn from experience to be leary about such things. So I took a hunch from the way that woman acted, and promptly set my private sleuths on their trail to dig up their past. We didn't get it all, but we got enough! His real name—or perhaps more properly, one of his previous

names—is just plain 'John Smith.' They have departed for pastures new—with my blessing—and it's one sure thing that they don't use the name of 'Van Der Vere von Rennselheimer' again for awhile! But that photograph really is a corker. It's probably all that you heard—and then some! I've got it preserved in a secret drawer in my safe for a curio. I'll show it to you sometime. They made it by composite photography."

Charlie Grant chuckled softly into his end of the Radiophone. "They'll have to get up early in the morning to catch you napping, won't they, Old Man?" he commented with a note of admiration in his voice.

"They'll have to do worse than that to catch me napping, the way things have been going lately," Algernon snapped back tartly. "I haven't slept a wink of real natural sleep since I was married. It's been one steady GO! GO! GO! all the time, both night and day. I've used my 'Electric Regenerator' exclusively. What's the news on 'change?"

"Oh, sort of so-so," Charlie Grant answered deliberately with careful precision. "Some losses and some gains, but, as far as you are concerned, about 50-50."

Then, after a short pause, he proceeded with the same deliberate precision to make his report to his master.

"Your stock in National Cereals, Consolidated, has slumped a trifle," he said. "The contract with the farmers was, that they should deliver their entire wheat crop to their nearest elevator upon a certain specified date, and at the then prevailing market price. Unfortunately for them, the Bears got busy on 'change just at that particular time, and they complained that the resulting market price was less than the actual cost of raising the wheat, and they refused to deliver. We have got out a blanket injunction against them from the Federal court. This forbids any act or failure to act which directly or indirectly interferes with inter-state commerce, or which in any way results in a restraint of trade. That covers the ground pretty thoroughly. And, besides, we have plastered their farms with libel suits for the damages resulting from their failure to comply with their contracts. So we have got that situation pretty well in hand."

"The farmers will have to learn that a contract is a sacred thing, and not merely a scrap of paper," Algernon commented tersely.

THE next is more serious," Charlie Grant continued carefully. "The recently discovered process of reducing a mountain to a molten mass by the intense action of super-powerful electric energy, and then separating the desired metals out of that molten mass by chemical reactions, has disrupted the whole mining industry and created a lot of serious complications. Mining by hand-labor is now practically extinct, and the workers in that class are on the war path. They absolutely refuse to do even the small amount of work that is left for them to do, at anything that approaches a reasonable figure. They demand a violently radical re-adjustment in hours of labor and rate of pay, which would automatically take care of those who have lost their jobs. They demand that the excess profits resulting from this new process be divided with them, utterly ignoring the fact that they neither invented the process nor bought the rights to it—and can, therefore, have no just claim to the excess benefits resulting from it. We tried our usual trick of covering every imaginable human

activity or inactivity with a court injunction, but they are defiant—and the Prohibitionists have filled the jails with their victims, so that we have no jails left to put them into. With your 'Alaskan Gold, Consolidated,' this situation is not just now so material. The previous over-production of gold was already threatening the stability of the 'gold standard' upon which our fiscal system is based, and so, if this production had not been stopped in some way for a while, we would have had to 'cover' the stuff up to avoid a collapse. But with your 'National Steel, Consolidated,' the situation is different. This is a basic industry, and any protracted stoppage of it inevitably spells disaster. We can probably starve the working people into submission in the end, though just now it looks as if this would prove expensive. But, to add to our troubles, the molten lava from the mountains, where we have used the new process, has in some cases flowed down into the valleys and caused widespread destruction to lands and buildings. Now a lot of the people who have suffered in this way, have combined and hired a shyster lawyer, and he has shot a flood of damage suits at us. And so, quite naturally, your stock in 'National Steel, Consolidated,' has hit the rocks pretty hard."

"The damage suits won't amount to anything. They can't hold us for an 'Act of God,'" Algernon remarked carelessly. "But the working people must be kept in their places, no matter what it costs. Their Bolshevik agitators would upset everything if they got the chance. They will have to learn to adjust themselves to the new conditions resulting from modern progress. The world can't stand still just to please them!"

"Well, it's going to be an expensive business this time all right," Charlie Grant replied gloomily. "And besides, on top of all this, the politicians are laying their plans to take advantage of the situation. It will take a mint to fix the next presidential election!"

Then, after hesitating a moment, he continued in a happier frame of mind.

"But, anyway, I picked up fifteen millions for you in a little flurry on 'change last Sunday, so that a little more than evens the score for the time being," he said. "The Sabbatarian agitators have been getting the people all stirred up lately, with a lurid crusade, demanding that the Stock Exchange be compelled to obey the Sunday-closing laws the same as the movies and baseball and the other business and amusement enterprises have to, and a resolution was passed at the Thursday meeting of the Board of Directors to the effect that all Sunday sessions of the Stock Exchange should be discontinued—at least until after the approaching presidential election. But I noticed that a quorum did not vote on that resolution—which was rushed through in a hurry, so that such little technicalities would not be noticed—and I suspected a trick and made it a point to be there promptly on time. As I suspected he would, the chairman of the Board ruled the resolution illegal for want of a quorum, and we transacted business as usual. But young Phil Sheridan failed to tumble to the trick, and so he took advantage of what he thought was a good chance for an outing, and he hopped down to Florida in his plane for a week-end fishing trip. And then, with nobody there to protect his interests, the Bears staged a raid on his holdings and cleaned him out. Seeing that the stuff was there to be had for the picking of it up, I slipped my claws into fifteen millions of it. But young Phil was hit pretty hard. It seems that some bootlegger's thug,

evidently having a day off with nothing else in particular to do, caught him out somewhere all alone by himself and held him up and took all his money and valuables, leaving him only a little odd change. Anyway, he didn't have enough left to buy gasoline to get back with—you know he still clings to that antiquated plane that was his father's, and uses gasoline for power—he never did have the machinery installed to utilize the modern Atomic Energy—and so he radioed to his bank for funds, and they promptly informed him that he didn't have any funds. That must have been a real facer for him! Of course the story eventually got around, and some of the boys got sympathetic and raised a purse to send his wife and baby down to him. I chipped in a dollar in your name, and charged it to 'Profit and Loss' on the books. But I have no idea what they will do down there. I guess they'll have to stage a 'Back-to-Nature' stunt, and go to fishing for a living."

Then, after another slight pause, Charlie Grant concluded his report.

"Well, I guess that's everything of importance that I have to report," he said. "And now I suppose you're about through with your honeymoon, and ready to get back on the job again. And I'll sure be glad to get you back again, too! This business is too strenuous for one man alone. And, besides, I'm always worried for fear I won't do everything exactly as you would."

"You've done just fine, Charlie," Algernon answered genially. "You should worry! You're getting your double percentage, ain't you? But you needn't expect me back on the job for another month at least. I'm off on an airplane expedition to the top of Mt. Everest in the interests of the American Institute. A new species of *Ovis Poli* has been reported in that district, and they want specimens."

CHARLIE GRANT whistled softly into his end of the Radiophone.

"H-m-m!" he murmured hesitatingly after a bit. "Won't that be a rather strenuous picnic-excursion for the missus? You know she's nothing but a chicken, and she hasn't got her pin-feathers sprouted yet!"

"Mrs. Esmeralda Clemantine Jones-Bronson St. Johnstone will remain at home," Algernon snapped acidly.

"Phew-w-w—: And so that is it!" Charlie Grant commented with a long-drawn breath. "So you two have quarreled already! You know I told you in the first place that you two were both too hot-headed to get along together."

"I'm taking a lot of real, honest-to-goodness food along, and plenty of pipes and a generous supply of tobacco, and Hicks & Hicks of Glasgow will have a plane meet me in mid-ocean with a special shipment of genuine 'Scotch' that hasn't been 'cut' or 'doctored' and which isn't any kind of a deadly poison, and I'm going to eat and I'm going to sleep and I'm going to smoke and I'm going to drink like a real human for one month anyway!" Algernon retorted hotly.

"You'll never make it with all that whiskey," Charlie Grant remarked with judicial emphasis.

"You don't know that big touring biplane of mine!" Algernon snapped back promptly. "She'll carry a thousand cases of whiskey easy."

"I'm not thinking about the plane; it's you that I am thinking of," Charlie Grant answered blandly. "But I know you two didn't quarrel about a little thing like

that! Even you have got enough sense to arrange such minor details to suit yourself, and she is no holier-than-thou fanatic to object to anything reasonable. Now you tell your papa just what the real trouble is! You know 'I'm good at patching up misunderstandings between people.'"

Then, at last, Algernon finally spluttered his heart out in a wild medley of words.

"Well, to begin with, she went and bought herself a thing they call an 'Atomizer Beautifier' over a week ago," he spluttered furiously, with his words tumbling over each other in a wild confusion in their haste to be out. "This thing is supposed to be a 'labor-saving' device! She had been complaining that it took all her time to dress herself in the two or three minor items she wears—with some forty changes of costume every day to conform to some forty various phases of her daily existence, and some forty hand redecorations of her face to make its prevailing color-scheme conform to the forty different color-schemes of her forty different frocks—and the agent talked the notion into her head that this contrivance was just the ticket to save a lot of bother! It—or, more properly, they, for there are seventeen of them—is nothing but a small-sized spraying machine, on the same principle as the big ones, air-brushes they call them, used in the wood-cabinet factories to spray the enamel and varnish on the cabinets, and it is operated by hand with electrical power. The thing could be sold in the ten-cent store at a good profit, but the agent sold it to her for a thousand. The excess in the price pays for the bright idea, and for the talk the agent has to put up to sell the thing. The seventeen little spraying machines are filled with seventeen different colors in paints, and you spray the paint on your face like you'd spray varnish on a piece of furniture. There are seventeen different facial masks—made to order to fit the particular face—and these seventeen different masks have seventeen different designs perforated in them to let the paint through to the face in the manner desired. There are about a million different possible combinations in which you can use these masks to achieve the results that strike your particular fancy—and some more millions of impossible combinations by which you can gum up the whole works—and the first two times she tried it, she got her combination mixed and had to do the job over. The paint fades in a few days—so that you will have to repeat the operation often so that the manufacturers can sell you lots of paint to keep you supplied—but it takes a chemical to get the stuff off, and she let the chemical stay on too long, and it took the skin off with the paint. Then she had to go to a beauty specialist and get some more skin grafted on. Finally, however, she achieved what she called a success—though it looked a thousand times worse than any hand-painted freak I ever saw, and God knows, some of them would permanently stop any clock that has ever been invented yet—and then she celebrated by throwing a big house-party. Then she turned up at this party in a costume which she said Wertheimer had especially created for her—but which was in reality an exact duplicate of what I've seen amongst the savage cannibals in the Pacific Ocean Islands—and I went on the war path! And the one-piece watered-silk lingerie-combination she wore in addition to the skirt-flounce didn't cover her any better than the grease the savages smear on their bodies covers them—she'd had her skin treated and the high-spots touched up in colors before

she put the thing on because they showed through—and I said it was the ugliest thing I'd ever seen, and she said the skirt was the one remaining badge of woman's historic enslavement by man and a necessity so long as the brute male insisted upon such things, and I said she should go and live with the savages where she belonged if she wanted to wear a thing like that, and she said I was jealous and didn't want her to look pretty for fear she'd attract another man, and I said I wouldn't be disgraced by having a wife of mine looking like that in public, and she said that I knew right well where I could go right quick if I didn't like her style, and I said that I'd go to the divorce court and not to the place she had in mind, and she started bawling and said she'd go home to her ma, and I hopped into my monoplane and got out of there!"

EXACTLY one month after this, a huge touring biplane hovered for a moment one morning over a glacial precipice on the northwestern slope of Mt. Everest, less than a thousand vertical feet from its highest peak.

Presently the mists of the early-morning fog cleared temporarily, and a powerful electric searchlight revealed a dark object wedged in the depths of a deep fissure in the glacier. Like a flash, a heavy grappling hook attached to a steel cable was dropped from the biplane, and a good hold was secured on the dark object, and it was hastily hauled up into the biplane.

Then the biplane sped away with terrific speed down into the lower regions to the south-east.

Within the hour, the biplane landed with reckless violence directly before the front door of "Father John's" famous sanatorium in Darjeeling. A moment later, the business manager of the establishment was hurrying in person down to that front door, in response to the report of an agitated attendant concerning an obstreperous customer who "wouldn't take 'no' for an answer!"

Not until he heard the voice of this troublesome intruder, did he suspect that the figure before him, completely clad in full aviator's togs, was a woman!

"We are very sorry," he said apologetically, "but what my man has told you is perfectly true. The present season has been unusually severe, and the influx of amateur mountain climbers attempting the climbing of Mt. Everest has been unusually large, and the resulting casualties have been entirely out of proportion to our expectations. We positively cannot accommodate a single one more."

"Possibly you are not aware that you are addressing Mrs. Esmeralda Clemantine Jones-Bronson St. Johnstone, the wife of Lieutenant-Colonel Algernon Sidney St. Johnstone, N. Y. N. G., of New York City, U. S. A." the woman snapped imperiously with a queenly dignity. "For me, no hospital is ever full! You will summon 'Father John' himself at once, and you will have attendants transfer my husband to an operating table, and you will have the operating table wheeled to a bathtub filled with ice water, immediately!"

It may have been that the woman's imperious assurance overawed the manager, or it may have been the magic of the name, or again it may have been a combination of both, but, anyway, things happened with a surprising alacrity after that.

In a surprisingly short space of time, "Father John"

himself stood before an operating table in front of a bathtub filled with ice water. He was a heavy-built man of more than six feet in height, and he had a "hooked nose" and a pair of beady, black eyes, deep-sunk beneath bushy, heavily-overhanging eyebrows. But he was in reality a native of the district. Of any knowledge whatever of the modern medical science of the day, he was as innocent as a child—but he had the lore of the ages concerning the treatments for the results of severe climatical exposures, at his finger tips. Wherefore the world-wide fame of his sanatorium, which depended largely for its existence upon the casualties resulting from the prevailing fad for amateur attempts to climb on foot to the highest peak of the redoubtable Mt. Everest. "Father John" was not his name, nor anything that approached it in any way—but the nickname had been fastened upon him long years before by a would-be humorist, and it had been acclaimed as "descriptive," and it had been popularly adopted by the civilized world, none of whose people could pronounce his actual name. In the establishment of this sanatorium, his business manager had adroitly "commercialized" this nickname.

Upon this occasion, what Father John saw at his first glance, was an inanimate object upon the operating table being rapidly stripped by two attendants, and, upon the floor in front of the bathtub, a woman in aviator's togs busily assembling the parts of a peculiar instrument which she had brought with her in a case.

With quick, professional precision, he stepped to the operating table and examined the inanimate object upon it. He felt for its pulse, and held a mirror in front of its nostrils. Finally he applied an electrical device attached to a plug in the wall. Then he turned to the woman with a brusque, uncouth manner, but with that kindly light in his eyes which told of the sympathetic heart which had endeared him to his thousands of patients.

"You have taken this to the wrong place," he said roughly. "You should have taken it to the morgue. We don't treat corpses here."

"You will treat that one!" the woman snapped back at him with that imperious manner of her's, but without lifting her head or pausing in her work. "I am no doctor, but I know some things that you don't. I'll start this job with what you don't know, and then you can finish it with what I don't know."

Perhaps Father John was over-awed by this woman's imperious assurance, or by the magic of her name! Anyway, he folded his arms resignedly and watched her proceedings with an intense curiosity, and only interfered when it seemed necessary to back up her strange commands by the exercise of his own authority.

With rapid, trained movements, the corpse was finally stripped and lifted by the attendants into the tub of ice water and immersed. Then the woman connected her peculiar instrument with the electric plug in the wall, and projected two long "arms" from it into the water in the tub—one of them being at the head of the corpse and the other at the foot—and turned the electrical current on.

Gradually the ice in the water melted, and, very very gradually the corpse relaxed from its rigidly contorted position, and assumed a more natural appearance. At the end of a half-hour, a perceptible glow, actually illusive of real life, was discernible in it!

Then the woman ordered its immediate removal to the operating table. With swift, accurate movements, she turned off the electrical current from her instrument, removed the previous "arms," and adjusted new attachments. Then she snapped a band around the forehead with a metal plate pressed upon the crown of the head, another around the chest with another metal plate over the heart, and two more claspings two more metal plates to the soles of the feet. Then she turned the electric current on again—and stood rigid over the supposed corpse watching its reaction to this final treatment with an intense alertness, while she held a vial containing a colorless liquid ready in her hand.

Presently convulsive tremors agitated the body from head to foot. Gradually these increased until, finally, it was flopping about upon the operating table in a perfect pandemonium of activity! In a panic of fear, the attendants hastily fled from the room—but Father John promptly recalled them in response to a frantic appeal from the woman. By this time his own eyes were bulging as if about to pop out of his head, but he stuck to his job like a veteran! Patients of his had told him stories of things like this before—but the stories had gone "over his head." He had thought that they were good-naturedly guying him. Now, however, he was actually seeing the real thing!

And then, at last, the muscular convulsions in the body finally reached its lips, and its jaws opened spasmodically—and the alert woman emptied the contents of her vial hastily into the wide-open mouth.

Then she faced Father John for a moment with a weird, strained expression on her face—as if she had gazed into Eternity and had caught a glimpse of the Everlasting.

"There is your 'corpse' now," she croaked hoarsely. "I've done my part. See that you do yours!"

And then she collapsed completely upon the floor in a dead faint—adding one more to the medical problems which from then on taxed Father John to the limit of his abilities.

TWO weeks after this, Lieutenant-Colonel Algernon Sidney St. Johnstone having sufficiently recovered to discuss serious matters, he and his Esmeralda held a lengthy consultation.

"And remember, no matter what happens, you must never, never, under any circumstances, go flying away into the dangerous places of the earth all alone by yourself like that again!" she said in conclusion. "You must have some regard for me. You must think what it would mean to me if I lost you! It was just pure luck that enabled me to save you this time! I went to your old office trying to find out something about what had become of you, and that beastly man of yours treated me like a dog. All I could get out of him, was an everlasting 'Yes, ma'am! As you say, ma'am!' Haven't you ever trained that anthropoid ape to say anything else? If you ever bring that thing into my house, I'll go right back home to mother right then! But I did get hold of your big 'Electro-Visual' apparatus anyway, and I searched every crazy place in the world that I could think of for you, but I couldn't find a sign of you anywhere. Then I hopped over to Charlie Grant's office, and he told me where to look for you, but his 'Electro-Visual' wasn't strong enough to reach that distance. So I hopped back to your office, and I brow-

beat that beastly man of yours good and plenty this time, and I caught a glimpse of you through your big 'Electro-Visional' just as you fell into that crevasse in that glacier and broke your leg. And I hopped back home—knocking two other runabouts sky-west-and-crooked on the way, and for which you will have to pay—and I got my big touring biplane out, leaving my runabout out there for the elements to destroy at their leisure—which will be some more expense for you—and I turned that big plane loose, and I collected a complete assortment of citation-tags for violations of the International Aerial Speed Regulations in all the intervening languages and dialects, and I just reached the peak of Mt. Everest in time to catch a glimpse of you before that blizzard came up. Fifteen minutes after that, everything up there was covered with a foot of new snow, and then I never would have found you!"

And then, after a short pause and in a strangely coy, pleading voice, she added:—"I've made a few changes in our home which I think you'll like. I've had a hot-house, with an 'Electro-Forcing' apparatus attached, installed in our back yard. This thing sprays the ground inside automatically with a concentrated essence of a powerful chemical fertilizer, whenever the aridity of the soil reaches a certain point, and it maintains an equable temperature by automatically turning on the heating apparatus whenever it gets too cold and by starting the fans to going when it gets too hot, and it keeps the interior permeated night and day with a fierce electric light that no human can stand, and all you've got to do is to stick the seed of anything you want into the ground, and just press a button, and then pick the stuff, all ripe and ready for the table, at the end of a single week!

And I've resurrected an old recipe book that mother used when she first started housekeeping, and that tells exactly just how to prepare anything you can think of for cooking; and I've had an electric range installed with a 'Fireless Oven' attachment; and all you've got to do is just to stick the stuff into the oven, and press a button, and the thing starts to cooking right away; and it keeps right on cooking until everything is done; and then it quits automatically, and you just leave the stuff in there until you want it; and then you go to the oven and get a nice hot meal right fresh and just as you want it whenever you choose. And I've had a man transform our old attic into a duplicate of your old bachelor den, and you can go up there and smoke whenever you want to. And I dug up a pair of twin beds, with real coil-spring mattresses, from amongst the antiques in a museum, and I've had them installed in a spare room upstairs so that we can get our regular sleep in the natural way."

And then, finally, she cuddled her face down into the hollow of Algernon's neck, and stuck her nose up into his left ear, and whispered something that brought a gleam of happiness into the haggard features of the weary man.

"And I've disposed of that 'Atomizer Beautifier' layout, and that 'Wertheimer' costume that you disliked so violently," she said hesitatingly. "A poor woman came around begging one day and I felt sorry for her, and I gave her the whole business. She said that she had been a nurse in a dog-hospital, and that they had invented a machine which did ten times what she could do, and so she lost her job—and that she had a husband and six young children to support, and that they were all starving to death!"

THE END





¶ Almost immediately the sides of the ball became transparent and I observed the professor . . . inside . . . He was pointing at a light in the middle of the top of the ball. Then I saw his hand touch a button—

Fourth Dimensional SPACE PENETRATOR

By Julian Kendig, Jr.

WE have published a number of interplanetary stories, which have impressively presented great distances and magnitudes of space. Here we have a rather delightful phantasy of intra-atomic travel. The author does not hesitate to express his personal views about subjects of physical science and calls upon the data of science for the development of his absorbing tale. The reader may not agree with some of his views, but that makes the story only the more interesting, for novelty even in surmise attracts the thoughtful readers. Even those less devoted to science will enjoy this romance of the electronic world.

I HAVE at last succeeded in persuading Professor Longhorn to permit me to write to the public about our many remarkable experiences.

"All right," he consented, "I really see no harm in your proposal; no one shall believe you, as long as you do not present too convincing a proof. I do not wish it to be proved until the proper time has arrived. In four hundred years, no less, my twenty volumes, which I have so laboriously written, will be found in a state of perfect preservation, disclosing to the world a perfect description of all that I have learned and discovered. Would that the time were ripe to give it to them now."

I have known Professor Longhorn for years, both as my teacher and intimate friend. Why he singled me out of the millions to be his partner, I am unable to explain. I was still in college when he appointed me as his secretary. I readily accepted the position, for I knew him to be an unusual man, and a remarkable scientist. This unknown genius was at least from four to five centuries in advance of his time, scientifically.

He had penetrated the secrets of the infinitely small atom, and of the equally immense expansion of the Universe. To him also the mysteries of time were no longer a secret; nor were the dimensions which lie beyond our own simple three. In a sense, he knew everything which man could desire to know, and not a word of it did he breathe to the *populus*. This was partly due to his sensitive modesty, but there was even a more worthy reason—his charity and love for the human race.

Anxious to learn, I asked him about it.

"Why is the time for disclosing your secrets not ripe?" I asked. "Think of what it would mean: interplanetary transportation would be as instantaneous a process as stepping across the room. There would be no such factor as time or space. Things could be ac-

Illustrated by
WESSO

complished miles away in a few seconds that would otherwise take many years to complete. You could observe all this at your will; watch your plans revolutionize

civilization, and develop it to perfection. With such a gift, you would be recognized the world over as the father of science."

"I naturally take it, Perkins," he answered quietly, "that you do not understand human nature. If you did, you never would have made such a thoughtless statement. This velvet scheme of yours would be possible only provided that the world was inhabited by a race of perfect angels. The modern day crook, Perkins, has learned to put our modern sciences and inventions to even more practical use, from their view point, than has the general public, simply because they are organized. So it is with everything. That is the very trouble with our modern cities. They simply lack organization. The city government is too inefficient to accomplish the big things, and as long as such conditions exist, crime will remain unaltered. I have set four hundred years as the time necessary for entirely overcoming this great issue. I do not believe in giving such a foothold to the criminal, for the public is not yet able to defend themselves. As long as we are the only possessors of this valuable secret, we may ourselves become useful in rounding a few of them up for our own entertainment.

"However, there is still a much more important reason, Perkins, which has to do with the influence on religion. You have witnessed indirectly many revolts against the existence of God, which have taken their origin from false scientific reasoning. If science does not progress too quickly for the minds of the people, religion will always be a jump ahead, and there will be no immediate danger. However, disclosure of my discoveries would undoubtedly bring about drastic changes which might result in the utter annihilation of religion. How

many times a civilization has thrived and disappeared into obscurity on this very planet, I am fully unprepared to say, but be there cause, as there is for everything, it may some day be traced back to the disregard for true religion. I personally know of four such civilizations, the last of which inhabited the continent of Atlantis about eleven thousand years ago."

The truth of this speech was too evident to be disputed. One thing was certain; one cannot take away a religion without giving a better in return. Even the religion of the ancient Romans was better than nothing.

It was with his permission that I finally began to write these chronicles of the many experiences that we have had together concerning our many very interesting scientific experiments. These chronicles are not to be told in the order in which the experiences actually occurred, but rather in the order in which I recollect them. You may then pass judgment as to whether the Professor is or is not a very remarkable man.

The following is an account of an experiment in which I personally assisted, and in which we succeeded in penetrating the impenetrable fourth dimension, in a manner hitherto undreamed of; and although the penetrating process is not so easily explained, the fourth dimension is really very simple; more simple than you might imagine.

IT was a balmy evening on the twenty-first day of June, when I was aroused from a comfortable position in a rocker on the front porch, to answer the irresistible call of the telephone bell. It was Professor Longhorn.

"Tonight," was his simple statement.

"You have it completed, Doctor?" I asked excitedly. I called him "Doctor" because he did have a Doctor's degree and that was the name which seemed to please him most, although he wished to be publicly known as Professor Longhorn.

"Yes," he said, "and would you mind doing a little errand for me on the way over?"

"Certainly not," I agreed.

"Very well then, stop in at a chemist's and get me a sample of every known element, except the expensive elements such as radium, which I happen to have anyway; and lug them over with you."

Of course I could not fathom his purpose.

After a few more seconds of incidental conversation, I started for the residence of Doctor Longhorn. I knew that the simple word "tonight" meant that he had completed his fourth dimensional penetrator, with which he was ready to experiment, but to save my life I could not explain his order for elements, most of which I knew he had up at his laboratory already.

When I arrived at his house, he seemed not the least bit excited about the unusualness of the event, for things like this were everyday occurrences with him.

We departed immediately for his laboratory, which was situated on top of a hill at the rear of his house and served also for an astronomical observatory. On the way up he tried to explain the fourth dimension to me.

"Define a dimension, Perkins," he commanded suggestively.

"Any measurable extent or magnitude, as length, breadth, or thickness," I suggested.

"So says the dictionary. Both are partially mistaken."

"I'll bite."

"That is if science ever expects to find any more. By the process of deductive thinking, according to the definition, any thing that does not answer to that definition is not a dimension."

"Exactly."

"All very well, but the word dimension was in use long before the dictionary."

"Well, what is your definition?" I ventured.

"Observe this. A dimension is the part or direction of a motion or combination of motions."

"I'm a little confused."

"It is not so perplexing. What I mean is this: a dimension is not, as is usually supposed, a relative direction, in general but the relative path of a motion. Observe that you, as a whole, can only move in three dimensions, although you can move in an infinite number of directions."

"Yes."

"Therefore, the secret of dimensions lies not in the fact that you are composed of three dimensions, but that we are all free to *move* in so many dimensions. Nothing that we know is really made up of less than three dimensions, but any three dimensional object can *move* in any one of three dimensions—in a straight line, for instance."

"A piece of paper or a shadow are two dimensional, are they not?" I asked.

"A piece of paper has thickness, and a shadow is not a thing. But move in a straight line, and your motion, you will observe, only makes use of one dimension at a time."

"Suppose I were walking across the room," I ventured, "and suddenly took a notion to go up the chimney. Would I not be using two?"

"One at a time," assured the Doctor.

I smiled. "I am beginning to see light. When I wish to go up the chimney, I am going in a second dimension in relation to the first."

"Precisely, and if you go in any direction not in the same plane with the first two, you will be moving in a third dimension in relation to the other two. But you move in only one dimension at a time."

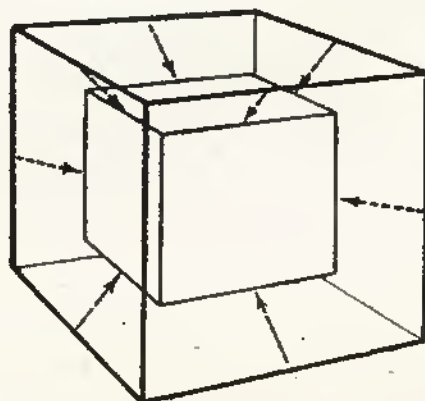
"Now suppose I want to go in a fourth dimension in respect to the other three: Then what?"

"Not so easily done, but altogether possible. You would merely have to become larger or smaller."

"Merely!"

"It is more easily explained by a perfect cube."

By this time we had reached his laboratory, in which were all his scientific instruments. However, the thing which interested me most, at that time, was a portable blackboard upon which was drawn the following figure:



"You will observe," he said, taking a pointer, "that the sides of the larger cube represent our three dimensions, in an orderly fashion, for its sides are all at right angles each to the other two. Now substitute the word motion for sides: then make the cube smaller. Observe that a new motion is created which is at right angles to the other three; for if you draw a line perpendicular to any side of one cube, it will also be perpendicular to the corresponding side of the other cube. Then as the inward motion is along these perpendicular connecting lines, the motion is undoubtedly perpendicular, or at right angles to the other three motions. That motion therefore is fourth dimensional in respect to the other three."

I gasped at the simplicity of it all.

"Then time is not the fourth dimension, as was supposed!"

"I doubt if time is any dimension, it is just possible that it is the fifth, and again possibly not."

"But, Doctor, it is impossible to move in that direction, so what good will come of it?"

"Aren't you taking a lot for granted?"

"You mean?"

"The secret shall be found in four hundred years. However that does not prevent us from making use of its possibilities. Did you bring the elements, Perkins?"

"They are on the test table."

"Excellent! I had you bring them all because I didn't want to take the time to specify particulars; a few additions to my store will not matter."

A large silvery ball, about eight feet in diameter, rested upon a *ring* table at one end of the laboratory, so that the bottom of the ball was plainly visible below the ring. On top of the ball was a large four bladed propeller, its shaft vertical as of helicopter design, as if the ball were meant for flying purposes. Directly below the table was a circular tray, divided into sections into which the Professor placed a sample of my elements. What could those elements possibly have to do with the fourth dimension?

WHAT followed directly causes my head to swim. I am writing with six large photographs before me, for the purpose of reminding me that it was not all just a fanciful hallucination, but a reality, a vivid truth. And it all happened within the four walls of Doctor Longhorn's laboratory. I am sorry I cannot publish these pictures, but the Professor claims that they would only prove the truth of my story, which proof he wants chiefly to avoid, on account of the damage it would undoubtedly do. I can well understand that no one will believe my story without the photographs; I can hardly believe it myself, despite this unmistakable evidence.

The first is a photograph of a city from an airship. What a peculiar city! But I am getting ahead of my story. The second, also taken from the air, was of a smoking volcano near which there is a canal. The third is a photograph of a great elevated highway bespeckled with traffic. The fourth is an inside view of a great temple, and the fifth and sixth are other views of the city. This concludes the set, although I have many similar views put away.

As I look them over, I half wonder, despite myself, how it all happened. I saw the Professor lock the door as we entered and I saw him place the key on the marble topped table.

But to get back to my chronicle.

There was a door on the side of the ball which had previously escaped my notice, into which the Professor disappeared. Almost immediately the sides of the ball became transparent and I observed the Professor moving about inside on a level floor which rested at about the table level and under which the ball retained its silver cast. He was pointing at a light in the middle of the top of the ball. Then I saw his hand touch a button and the ball again became its same old silvery self. Then the propeller began to rotate, faster and faster, until the ball began to rise off the table. Something queer was happening, or was I mistaken? It looked smaller. Nonsense. No, it *was* smaller. Yet how could it be. I shut my eyes for about twenty seconds so that I might be able to perceive any change if there were any, but when I opened them—

"Doctor!" I shouted. "Doctor Longhorn! I say, Doctor Longhorn!" It was gone, ball and Doctor. I glanced hurriedly at the key on the table and at the locked door, but both were intact.

"Good heavens," I thought, could anything have gone wrong with the experiment? Perhaps the Doctor's queer machine made use of some deadly ray which had destroyed them both. If only I had kept my eyes open, I might have been able to save him.

I was worried and irritated beyond all expression. A fly began buzzing around my head and bothered me considerably. I seized a fly swatter, and watched it hover over the ring table hoping it would land. But it didn't, so I swung at it impatiently. I don't know what it was that made me miss that fly; it may have been divine providence or my nervousness at losing the Professor. At any rate I did, and then it was, with cold perspiration in great beads on my forehead and my heart somewhere in my throat, that I perceived and realized that it was not a fly but a minute silvery ball with a small helicopter propeller suspending it. It was by the greatest of miracles that I had not assassinated Professor Longhorn. As I swayed on my feet, half dazed, I perceived that the ball was slowly returning to its original size. Finally, reaching its maximum and again coming to rest on the ring table, the door opened, and the Professor emerged. I must have presented a sickly appearance, for the Professor became suddenly alarmed and catching me as I fell, led me to a couch and fetched me a glass of water.

"Perkins, what on earth has happened?" he cried. "Speak to me. I did not think to alarm you. I should have warned you. Come, I beg your pardon my man; take this water."

"You do not understand, Doctor," I gulped. "If you only understood—"

"Perkins!"

I watched his face pale to silver as I described his narrow escape, in short gulps.

"Oh Doctor! It is I who owe an apology; I should have known; what shall I say?"

I saw him swallow hard. "Forget it," he said, smiling. "I should have informed you."

That ended it. We both shook hands, both of us slightly pale.

"Will you enter my fourth dimensional penetrator?" he invited. "We shall see what we shall see." We entered and the door banged behind us.

"This time," he said, "in order to avoid any mistake,

I shall inform you as concisely as possible, just what we are about to do."

"I am very curious," I assured him.

"In the first place, we shall need light." So he opened the door, got out of the car, and turned on the lights, which were situated around the border of the ring table, and which cast a bright silvery light upon the elements below. This he had forgotten to do before on account of the excitement over his narrow escape. The door closed again and I could see the laboratory clock as plainly as if I were looking through glass.

"The walls of my penetrator," he explained, "are made of a substance of my own invention. It is only possible to see through it when there is more light on the outside than there is on the inside." He turned the light on in the car. "There," he exclaimed, "you cannot see out now, because the light on the inside is more intense than that on the outside. Awhile ago it was just the other way. That is why you were able to see me from the outside as you could now if you were on the outside."

And out went the light.

"I am curious to know what the elements are for," I ventured.

"When we have a fourth dimensional penetrator," he answered, "all we need is something to penetrate. Below us are samples of nearly all of the known elements, illuminated by the lights from my ring table. If we desire to ascertain the composition of one of the gases, we need merely to push through the valved stems of the valved glass vials. If it be a liquid of which we are curious, we need merely submerge ourselves in the open dishes containing them, much the same as with solids."

"Explore them?" I said. "What on earth do you mean? You talk as if we were starting for Mars when we are not even leaving the room."

"Not Mars of course Perkins, but who knows what might happen before we are through?"

"How convenient this fourth dimension," I thought.

I WAS very anxious to get started, for frequent experiences had taught me that the Professor's experiments were always extremely interesting, and often very exciting; and this one particularly had promises of being of a very unusual type.

I looked curiously about the sphere. In the center was a little round pedestal which I at first thought was some kind of a mariner's compass, but whose dials looked somewhat like those of a gas meter. Arranged in circular design were twenty-two little pointers, each with a separate dial of ten figures circumposing near their outer rims. Each one was labeled, starting at the top; units, tens, hundreds, thousands, ten-thousands, etc., up to what is known in the English language as a sextillion, or a thousand times a billion times a billion.

"What is this?" I asked.

"That," said the Professor, "is to keep tab on our existing size in diameters, which is the only way we have of measuring our progress through infinitesimal space."

"You are taking no chances, I see, Doctor, on overstepping your meter. Why, that would be about four times smaller than an atom."

"Ever so many times smaller than that, my dear Perkins. Perhaps you do not understand my meter. I shall therefore explain it to you. Our unit of measure, you will understand, is our natural size, which we shall call one. The meter works reciprocally; that is: when we

are actually one-half our natural size in respect to diameter, the unit hand shall point to 2."

He demonstrated accordingly by starting the propeller and reducing our size until we were about one-half our original size. The sensation was similar to starting downward in an elevator, as the room seemed to take on ballroom proportions. The meter correspondingly indicated "2."

"That indicates that our natural size is exactly two times our present magnitude," he explained.

My thoughts began to wander and I took time out to examine more closely the interior of the machine. An iron railing about two feet from the outer wall was to prevent us from falling through its almost invisible inclosure. The floor was simply covered with red carpet which fitted tightly to the wall and along with the two comfortable easy chairs, which occupied positions back to back on each side, gave the penetrator quite a home-like appearance. He opened a small trap-door which was placed inconspicuously on the carpeted floor. There we found food and water to last a month. There were also two large cameras, moving picture and otherwise, besides which were four loaded revolvers and a few boxes of cartridges.

"Good Heavens!" I exclaimed, "you would think we were flying to Africa instead of planning to be gone perhaps for a half an hour. Why all the riddles? Why the loaded revolvers? Hah! I have it," I said mockingly, "Burglars!"

"We should both perish if we stayed over half a minute," returned the Doctor.

"Be killed by burglars?" I asked.

"Joke if you like, Perkins, but I assure you that I am serious."

It was that that brought me back to my senses. Could I have dreamed how close we did come to losing our life, there would never have been any such mock seriousness on my part at all. I suddenly realized that this was no common experiment, and that almost anything unusual was liable to happen under such conditions where we were approaching an entirely new field of existence. From then on I became serious.

"What is the danger, Doctor?" I asked.

"Death of old age."

"I thought you were being serious, Doctor."

"I assure you that I am both serious and sane."

I sighed. I was glad to hear the last part of that.

"Leave it to me, Perkins. I see no harm in not telling you just yet, so I shall leave the enjoyment of mystery entirely to you; that is, unless you want me to tell you."

"I'll wait," I agreed.

I confess that I was wild with excitement. I could not imagine what the Professor was up to. My eyes fell incidentally on the laboratory clock which loomed up dimly in the distance, owing to our half size, and which read exactly twenty-six minutes after eight. If the Doctor was right we would either return at 8.26:30 P. M., a half minute later, or die of old age.

"It is now a question," ruminated the Doctor, "of the element which we shall explore."

"Since it is a matter of question," said I, "let chance decide for us."

I always carried a small pocket memorandum book, which by chance had a complete list of the elements, along with a table of their respective atomic weights. The Doctor shut his eyes and I handed him a pin, while I

held the book open to the proper page. After aimlessly groping around, he finally jabbed, and it was just by a quick rotation of the book that I succeeded in preventing him from pushing it through my thumb. It stuck fast in the "d" in Hydrogen, atomic weight, 1.008; the simplest of all the elements.

"Rotten!" I exclaimed.

"Terrible!" agreed the Professor.

"What shall we do?" I said, annoyed.

"We have left it to chance and we must accept her choice."

"Very well."

"Are you ready?"

"Yes."

"We shall be off then."

A GAIN I was conscious of that peculiar sensation common to the starting elevator, and again the walls of the laboratory seemed to recede from all sides. After we were fairly started, there was positively no sensation at all. While the tens hand was still on its ninth circuit, the walls of the room became hazy, finally fading into the blue distance, all appearing much like the blue sky. The lights on the ring table, however, still shone brightly from above, and the tray was still faintly visible far below. I watched the Professor's finger press the stopping button, as the magnitude meter read exactly one hundred. Then a peculiar thing happened: we were jarred roughly by the sudden stop, not forward, side-ward, or up, but inwardly, after which we seemed to resume our original stature.

"The laws of inertia, apparently, are not altogether strangers in the fourth dimension," explained the Doctor.

I have before said that there was no sensation, but if any living person cannot get a thrill out of such a manner of travel, he is a dead man.

"We shall stop more carefully hereafter," he announced. "However, we had better approach the hydrogen vial before it gets too far away." This we did without further delay.

Keeping the valve of the vial within our vision we began to decrease in size again until we could see space between the valve and its wall. The meter read "1000"; but it read "10,000" before we actually attempted to enter the hydrogen. The valve then became a long black tube, and as we approached the hydrogen end, we first saw its blue—a little hole in the distance—grow larger, and as we emerged it once more took on the appearance of the sky, except that it was of a very much lighter shade.

"You will recall, Perkins," suggested the Doctor, "that our little magnitude meter measures by diameters as does the microscope; however, actually figuring in respect to size, as the meter now reads '10,000' diameters, you are actually contained in your natural self, as many times as ten thousand cubed—or one trillion times."

"How many?"

"One trillion (1,000,000,000,000). Let me have your hat." It so happened that I had it on.

"If I should fill it with water,"—He made a motion as if to suit the action to his word, whereupon I protested, of course. He laughed, "It would take a trillion hatfuls of water to fill your hat once, the way it was when we started."

"Hm-mm, we ought to be seeing a few atoms by this time, oughtn't we?" I asked.

"Apparently not."

"So I see. Is there anything to stop us from seeing them?"

"Only their minute size; we are now approaching that point."

The meter registered nearly eleven and one-half thousand diameters, or a trillion and one-half hatfuls before we actually saw an atom, or rather its nucleus, which was about the size of a pea. The electron was as yet invisible.

We were actually seeing an atom! What was still more wonderful—this was being made possible, not with the assistance of the far-seeing microscope, but because we ourselves had been reduced so tremendously as to be far out of the range of the microscope.

When the nucleus was about three-eighths of an inch in diameter, a thin black line began to form about nine inches away. This proved to be the orbit of the speeding electron. It was then that we noticed millions of little black specks all about us, moving rapidly as if they were soot hurled about by the wind. A slight sensation as of a stopping elevator announced that the Doctor had stopped. Out came the cameras for the purpose of taking both kinds of pictures, for which I could see no use; for prints could have been made from the cinema, which could be enlarged. But the Doctor insisted that he knew how to get the best pictures, and since they were cameras of his own invention, I did not dispute him. He explained to me later that they were perspective cameras, which took pictures in relief.

It suddenly dawned upon me how great was our little experiment. Was there no limit to smallness? What was to prevent us from continuing to grow smaller forever? What kind of a wall could possibly stand in the way of the infinitely small? My mind became confused, thinking of it.

"Confound it," I said, "is there no limit towards which we are approaching?"

"No," said the Professor, there is no such thing as dimensional limit. Although it is hard to recognize this truth, it is even harder to imagine a limit, for no matter how distant a limit is set, there must always be something beyond. As three dimensional lines can be limitless at both ends, so can all fourth dimensional lines, like those over which we are traveling."

"It's a rather confusing proposition," I agreed.

"Oh no, not necessarily. It is just another way of stating that there is as much space within my laboratory as there is outside."

"Impossible!"

"Can you compare the two infinities by saying that one is greater than the other?"

"True. Still, I do not see how it is possible."

"The fault is neither yours nor mine. We were born under certain conditions by which we have lived. Our eyes have grown naturally accustomed to visualizing objects as they seem, and not necessarily as they are. It is an old story. A worm may walk across a wrinkled piece of paper and see only the polished surface. The three dimensions with which we are familiar are not defective as we know them, but either the fourth dimension is warped or our own three are—relatively.

"By way of illustration, we shall represent all the first three dimensional lines by three straight and ordinary pencil lines, but when we come to illustrating fourth dimensional lines we are confronted with a much greater

difficulty. There is a physical phenomenon, whether you think so or not, which is so ordinary that we do not even begin to wonder at it. You have noticed many times while walking up a long avenue, how the other end of the street seems to come to a vanishing point. This is only an illusion, for you know it to be a fact that each side of the street is geometrically parallel. This may illustrate the difference between the fourth and third dimensions. The fourth dimensional line, therefore, is a line which appears to vanish at one end and spread out at the other but which actually is infinite in length at both ends, for if you follow the line out with my fourth dimensional penetrator, you will find that it is actually the same width all the way down."

"I'll take your word for it," I said jokingly, "at any rate Einstein wins; it is relativity."

And so we progressed towards the vanishing end of the line, with the nucleus becoming larger, the electronic belt broadening, and the Doctor's moving picture camera ticking away merrily. I began to notice a peculiar closeness about the penetrator and was wondering how the Doctor had provided for ventilation, when he suddenly stopped taking pictures and turned a valve which let fresh air into the room. The magnitude meter revolved harmoniously to the tune of nearly twelve thousand diameters.

"You could put a billion of those on the head of a pin," said the Doctor by way of suggestion, pointing to the near-by atom.

We held our course very close to one in particular, and finally, when the orbit of the electron was about eight feet across, we maneuvered in such a way as to be directly over the speeding electron.

SLOWLY the nucleus grew larger, through the stages of size, which were equal to a cherry, an orange, a basket ball, a pumpkin, etc. By that time we could actually see the electron, although it was flying past us at the rate of nearly fifteen times per second.

"How distant would you judge the atom nucleus to be from us now?" he asked.

"About thirty feet."

"It's at least a half mile."

"A half mile! Why, to be visible at that distance, it must be immense."

"Not so very large."

"At least five hundred feet in diameter, surely," I cried.

"It is actually too small to be seen with a microscope."

"Don't! I'm nearly crazy as it is; my mind can not hold it all. Please don't mention it again."

"I was only joking, Perkins," he apologized. "We are dealing with relative size only, for the present, for it would not be practical to use our standard measures upon a thing so small that it cannot be measured by even a small fraction of that standard."

He drew a foot rule from his pocket and held it up to the light. "Does this not prove relativity, Perkins," he continued, "when, with the unfailing assistance of my penetrator, it is made physically possible to measure interatomic space with a foot rule."

"Or fourth dimensional space," I added.

"The atom, my dear Perkins, is undoubtedly matter of the third dimension and not of the fourth, and is thereby measurable relatively by feet and inches, but the fourth dimension, as I said before, is different. Our magni-

tude meter has served us sufficiently in measuring it for us. I have with me a fourth dimensional linear scale, which is of no earthly use as far as I know, outside of being useful in explaining questions which I foresaw we would undoubtedly come to, sooner or later. You will observe that it's really a scale of inches. Fourth dimensional space, unlike any other space with which I am at the present familiar, varies as does light, inversely as the square of its distance from a fixed plane, such as our own. This rule records this variation accordingly. At one end we have a unit which, compared to the third dimensional scale, does not fall far short of a true inch, and reading from left to right, we have a half of that, a quarter, an eighth, a sixteenth, etc., until the progression becomes of infinitesimal value." He set the two rules side by side. "That is the difference between the dimensions."

It was odd to admit that I actually knew what he was talking about.

"This remarkable experiment not only proves relativity," he continued, "but it proves a far greater thing; it proves there is a God. Could such a Universe with all its immenseness, order and complications, come into existence in any other way? Why do men try to depreciate mentally, the magnificence and wonder of the Universe in order to bring it into the scope of man's reasoning? It is far better for man to try to bring his reasoning within the scope of the magnificence and wonder of the Universe. Why is it that eminent scientists insist incessantly upon placing a limit to that which they cannot understand? It is because they have in a few years reached the rung in the ladder which signifies knowledge of all, and as, with all their knowledge, they cannot conceive of anything without a limit, there is naturally nothing to suppose, but that there must be a limit, and let it go at that."

All talking ceased while we watched the electron slowly grow larger, and seemingly decrease its speed, until it passed below us at the comparatively slow rate of one revolution per second.

Suddenly I recalled something which caused cold beads of perspiration to form upon my forehead. It was extremely unpleasant to think about, and so I concluded my thinking with a loud and startling shout.

"Stop! Quick!" I shouted. "The time!"

"What's the matter, have we collided with an atom?"

"No, the time! It's nine o'clock!"

"Surely you are mistaken," he replied.

"I know, Doctor, but you said——"

"I recall stating that if we were gone more than half a minute, that we should die of old age."

"Exactly."

"Let me see your watch. Excellent! We have been gone no longer than fifteen seconds. We have plenty of time yet."

"My watch says nine o'clock," I argued.

"Your watch is of a very good make and I assure you that it does not err. However, your watch was not made to indicate more than one time—the present. My clock, which is now some trillion miles over yonder (that is, just across the room), is also of a very good make, and reads at the present precisely not later than 15 seconds after we started."

"Einstein again triumphs, I see."

"Unless Einstein lives to be four hundred, he shall never learn about his victory."

The electron increased to the size of a golf ball, and now we caught a glimpse of it only once every ten seconds. Then our penetrator showed some other remarkable qualities. With a loud wher-r-r, the Professor accelerated the machine to follow the electron around in its invisible orbit. It took us seven six million revolutions to finally overtake it, and hover directly over it. Strange to say, even at that terrific speed, we were not acted upon by centrifugal force, due to some contrary force.

Then a remarkable thing happened. Suddenly everything became dark.

"Doctor!" I cried. "The table lights—they have gone out."

"Do not become alarmed, my dear Perkins," he said.

"What is wrong?"

"We have merely exceeded the speed of light," announced the Doctor, calmly.

Wonder of wonders! More than 186,000 miles per second around a point so small that billions would fit on the head of a pin.

"But," said I, "the light is from the table, is it not?"

"The light was."

OUR little conveyance was now brilliantly lighted with a soft bluish white light, which, however brilliant, was not blinding unless one was inclined to look curiously towards its source. That minute nucleus of a hydrogen atom was now a bright and glowing sun, of enormous proportions; while directly below us, the lover's delight, shone alluringly as a new and more beautiful Diana. A great blue half moon of majestic beauty was our once infinitesimal electron. And what was even more curious was that it stood not alone, for sharing its light was a sister satellite about one-fifth the size of the other, doubling the beauty of that more than awe-inspiring spectacle.

I shall not bore you with descriptions. Try to imagine yourself smaller than an atom, traveling faster than light, receiving all your illumination from a great bluish sun (an atom nucleus), and gazing down upon an enormous electron accompanied by a satellite which reflects with its sister the unusual blue tints graciously bestowed upon it by its mother sun. It is impossible to describe, so I leave the rest to you.

For one glorious ten minutes the Doctor retarded the penetration of the little ship, while we sat and gazed in wonderment. Nor were Sol and Diana our only neighbors. Now that the penetrator had decreased its speed to (approximately) one revolution per minute in proportion to our size, and since we were traveling with it just as slowly, we found ourselves surrounded on all sides by a great curtain of stars, thousands of distant atoms, shining as only stars can shine on the highest mountain peaks. A great milky way not unlike our own, but seemingly much brighter, stretched around the entire sky in a great belt.

"Showing that the atoms of hydrogen are also bound in nebular formation," remarked Doctor Longhorn.

Of course we took pictures and I regret to say I forgot to read the magnitude meter at this point. Our next movement was to approach the electron, and as we descended, we noticed that at the very closest part of it to us, it was covered by a small white circle which we judged might be a polar ice cap. It was so small in proportion to the rest of the planet (as we may now call it)

that we also judged that it must be summer in the North.

"It appears as though we were going to find life," he said.

"Could it be possible, Doctor?" I asked, much excited.

"Relativity is the answer."

"But such small people must necessarily have a very minute brain."

"It is large enough for them," he replied.

"But what I was referring to, Professor, is this: A few days ago I read a book which stated in so many words that the smallest brain that can exist with reasoning power weighs two pounds."*

"The statement was undoubtedly correct as far as it went, Perkins, because any smaller brain would be out of proportion to the environments of the earth; however, here we have an entirely new system of standards. Even the light is different from our own. Here even an atom nucleus has enough internal pressure to burst into blue hot flame. This sun must be ever so many times warmer than our own red hot system; that is, relatively. Therefore there may even be a race of intelligent and civilized people living on this electron, as there may even be on countless numbers of others."

"Indeed, considering the number of other electrons there are on the earth, it only hints at the titanic size of the Universe."

"One always learns new things, Perkins. If we did not, our little experiment would be worthless, even though we have exceeded the imagination of man which cannot otherwise comprehend this unusual venture; of man whose insignificant microscope with which the surface, only, is open to exploration; even then, when we are actually able, through the assistance of my penetrator, to explore the interior of matter, I should never have started without a purpose. To learn, hear, and touch; to see with the eyes, even to realize, to fathom the abyss which separates the beginning from the present, and the present from the end, and still greater the beginning from the end; into the bottomless infinity.

"We shall not find 'The Creator' here, for we are not on his plane, which is beyond. But it proves that there are many other places, some very close to us, of which science has never dreamed. Most narrow minded men conceive of no possible place, outside of our own paltry Universe. The stupid pretenders! We have gathered from our experience that the Universe is divided into seven great orders: three of which man has lived throughout the ages; the orders which proportionize length, breadth and thickness. Then there are a set of three others of which man, so far, has had but a dim conception. Man has measured time for years without knowing exactly what it was that they were measuring. Time is relative, as we have now proved, with two other orders; that of internal and external space through which we are now traveling; and that of the proportional progression of the ethereal and material rings. The seventh order is the great Universal order which governs the other six together. Here may we find 'The Creator of all things'."

"I flatter myself that I followed you distinctly until you mentioned the Ethereal rings, Doctor," I admitted.

"Some day in your spare time, Perkins," he suggested, "look up a diagram of the solar system. You will notice that the orbits of the various planets, if the diagram is

*See "Animals of the Past," by Frederic A. Lucas, Page 93, N. Y. 1913 Handbook.

to scale, increase in distance respectively by some form of progression." [If you are bored at this explanation, continue reading again at the foot of this paragraph. I assure you the explanation interested me greatly.] "This progression has been called Bodes Law, after its discoverer. The unit of measure is the earth's distance from the sun, which was set at ten. By actual measuring, it is found that the distance of Mercury from the sun is 4; that of Venus 7, or 4 plus 3; that of the Earth 10, or 4 plus 6; that of Mars 16, or 4 plus 12, the Asteroids or minor planets, 4 plus 24; Jupiter, 4 plus 48; Saturn, 4 plus 96, etc. In each case you will notice that the number which is added to 4 is always twice the preceding addendum, and since the distance of Mercury, the nearest planet, is 4, we may call this the base and say that starting with Venus with 3 as the multiplicand, we find that the following planets are always twice the distance of the previous orbit, from the orbit of Mercury. Bode, however, did not see, or at least did mention, this last fact about Mercury being the base, and so I have made this little addition, which I believe to be true. The same law holds true with the satellites of Saturn, but Jupiter, with its four larger moons which were all that were known about in Bodes time, has 7 for a base instead of 4. The truth of the matter is that there is evidently an unoccupied ring within the nearest, for I am positive that the natural base should always be 4. That led me to suppose that all the rings existed before the planets, and if so, these rings must exist around every known body. I thought of the atom with its system of rings. Everything that existed must then be composed of these little rings. From this I became convinced that even the ether must be also composed of these rings, and if by chance their motion was in a contrary direction to the direction in which everything else seemed to be moving, this would explain how ether is frictionless and allows the earth to move about the sun without resistance. The same effect may be obtained by putting two rollers together. If they are moving both at the same speed in opposite directions, there will be no friction between them. It was all this that led to my building my machine, which uses this system of rings as a medium in which to travel."

If there is anything you don't understand about the Professor's explanation, it is probably what he meant when he mentioned the progression of rings.

The atom nucleus had long since ceased to become smaller, for as we progressed, our relative distance from it increased, which made it appear about the same size.

"What is it that makes the atom nucleus self-luminous?" I questioned finally.

"This light which we are now conscious of," he explained, "is traveling at the relative speed of about 186,000 miles per second, much as does our own, but if not relatively speaking, it is traveling at a much greater speed. As we approached the atom, it first appeared as a little black speck, showing that our own light was bright enough to make it seem black. Now that we have gone beyond our own light we find that it is very bright compared to the blackness of interatom space. Relativity simply."

Silence followed, as we both curiously watched the electron grow. I became conscious of a slight change in our position. "Is anything wrong?" I asked.

"I fear we should freeze if we should attempt to land on the pole."

"Land?"

"Surely. To come so far without landing would be an inexcusable failing."

Never did I forget that sentence.

THE electron continued to grow until it was no longer perceptible as a ball. Clouds announced the presence of an atmosphere. Then the Professor announced that we had reached a comparatively natural size at what he supposed would be equal to the size of electronic inhabitants if there were any.

We burst into the electronic atmosphere as the darkness was again transformed into a bluish white daylight, by the diffusing of the sunlight by the atmosphere. About five miles below us were myriads of fluffy white clouds, which I believe were about six miles high.

After we had finally broken through these, we discovered below us as far as the eye could see, a vast stretch of forest-covered mountain country, whose brownish shade suggested autumn. These trees, unlike our own in autumn, were more of a reddish brown than natural.

I remarked the fact.

"That may be explained," he answered. "It is not autumn as you supposed, but midsummer."

"Then reddish brown is their natural color?"

"Just as green is ours,"—meaning, of course, the natural color of our trees—

"Then unlike our trees," I deducted, "they do not depend upon chlorophyll for their color?"

"It is only natural to suppose," he continued, "that since we have a red sun and trees whose color is opposite to red, that a blue sun would give light to trees whose color was opposite to that of blue, which would be approximately brown."

"Why?"

"Because the most soothing color to the eye under a red light is green; and under a blue light, brown. That is the reason red has always seemed so brilliant to us."

As if to prove it, the Professor's blue necktie reflected, in place of its ordinary dull shade, a brilliant and alluring shade.

We drifted southward and downward toward their arctic circle, but no signs of civilization appeared.

At about the forty-eighth parallel we came upon the first signs of animal life in the form of a little domelike hut out of whose tubular chimney smoke was rising.

"Man!" I exclaimed.

"Primitive," he agreed.

I was for landing immediately to be more informed, but the Doctor wisely decided to continue farther. From then on we passed an occasional hut. In another hundred miles or so, we came upon a small village of little domelike houses like the one which we had just seen, arranged in streets and avenues. There was a larger hut in the center, from which all streets radiated, which were connected to each other by cross avenues, somewhat similar to a spider web, but in almost perfect circles.

"Not so primitive," I surmised.

"No, there is in that town, Perkins, that which hints unquestionably at civilization."

"What is that?" I asked.

"A motor car."

"A motor car!"

"It is on the east side upon a street running east and west."

Indeed it was, for nothing else could have gone as fast. From our altitude of about twenty-five hundred of our feet, we also saw many little specks, which were undoubtedly people.

"We shall not bother to stop at a small town," said the Doctor, "for there will probably be cities in a world where there are motor cars. At any rate there must be other towns."

A little mud road led southward from the town, through the mountains. We followed it carefully down a long but beautiful valley in hopes of finding a city. We saw three towns, nestled deep in the side of the mountains, and laid out on a similar plan to the first, through which the road passed, and from which other little roads radiated. The forest then became farm country, cleared of trees and planted with grains. A larger town appeared, through which the mud road changed to stone. (Remember all this was going on in the Professor's laboratory.)

As this new improvement continued on out of the town, traffic upon it increased, which in turn increased our hopes.

"And to think," I said, "that scientists have been trying to destroy the atom for years."

"The atom will never be destroyed," assured the Doctor.

"Nature has provided for that by providing the electron with more force than any outside force is able to destroy. No one can so much as even retard the motions of the earth which has no more force behind it than is behind the electron. You have many times heard the story of the things that could be accomplished if the force behind the electron could be harnessed; better to try to harness the earth. If ever man *should* obtain enough power to destroy an atom, you must remember that the destruction would be very slow, for at least a trillion electronic years fly past every second. This also goes to show how ridiculous these scientists are, when they say that the earth will probably not sustain life more than a billion or more years, a mere second in the time of the Universe."

"These scientists have an authority for this," I reminded him, "they are only using the moon, which has long been cold and dead, for an example of what might happen to the earth."

"The moon," he replied disgustedly, "the moon; do you know what the moon is for? It is up there to laugh at these, 'would be scientists,' who can only see one side of everything. We can only see one side of the moon, and probably we never shall see the other. Then these remarkable men who are cocky enough to call themselves scientists are willing to state as fact that the moon is nearly cold enough to liquefy air and is absolutely uninhabitable, when they have never seen the other side."

"They judge that the other side is much like this side naturally."

"Perkins, you make my blood boil. Just to convince you that there are people on the other side, I'm going to take you to the moon as soon as we return and show you. I know how it is possible; and what is more I know exactly how it came that the moon shows only one side, and how those volcanoes came to be there." (He did, and I can assure you that the Professor's words were not mere idle boasts.) Strange how we talk about the hidden side of our satellite.

VERY soon we made a new and more startling discovery. The little stone road which we had followed for the last ten miles suddenly ended and intersected a giant highway, about two hundred and fifty feet wide at least, bespeckled with all kinds of motor vehicles. The stone road entered the main highway by means of a ramp which approached at the center of the highway. It was clear that the fastest traffic moved closest to the outside, to allow for slowing down before entering the ramp.

But this was indeed a very remarkable highway; straight as an arrow, and level as the sea, through hill and over valley by means of tunnels and bridges, and bordered from end to end as far as the eye could reach with a cement border fence, inclosing the road and sidewalk and supporting in turn a long stream of night lights.

"No doubt," said the Professor, "such a highway must lead to a city; we shall follow it."

"By all means," I agreed.

Our choice of direction was made when we discerned a thin blue line on the left horizon which indicated some large body of water; and accordingly we made for the seashore.

We soon learned that we were not the only airships in the sky. Great wings supported giant planes and even dirigibles, which cut the clouds at tremendous speeds; while many smaller aircraft buzzed around us as flies, in the form of little winged motor cycles and such.

At the end of the road, which we were approaching, a curious little ring of smoke was visible just above the blue horizon. Along the road, in dome contour, were many houses of many sizes, some of which were much larger than the first which we saw. Some were even two and three floors high, wherein they took on a more cylindrical shape.

Presently the city loomed up, a great expanse of marble splendor, with a most unusual display of architecture. Great cylindrical skyscrapers, constructed in ever decreasing sections, towered skyward; one even a thousand feet or more. There were many, however, which were the same diameter all the way up. We were quick to see its advantages, for it allowed for rounded intersections at the crowded street corners. This great city, like the smaller towns, was built on the spider web plan, with all the main streets radiating from the center, and connected by great circular avenues which circumscribed the entire city. The circular avenues were all elevated above the others, and entered by ramps; and each was from seventy-five to one hundred feet wide.

Five great canals entered the city at equal distances apart, which were nearly five hundred feet wide, and one which was a thousand led to the near-by ocean. Great stackless liners, passenger and otherwise, moved swiftly in and out. The smoke ring, we learned, came from a volcano, which was about five thousand feet high, and which was situated between the city and the sea.

We hovered about the city for a few minutes, in order to become more acquainted. A huge Grecian temple, as it appeared, held a prominent position in the city. It was of titanic dimensions, being about half a mile long, fifteen hundred feet wide and about four hundred and fifty feet high, with huge pillars supporting its heavy masonry roof. It was of a beautiful snow-white marble, which reflected the light of the blue white sun alluringly.

Coming towards us, we noticed one of the many flying cyclists. He was not a great ugly beast, a hideous spider

man, or a curious all-metal being; he was simply a human being. Curiously we watched him, but as he could not see us, he continued on his way. He wore simple breeches tucked in stiff white boots, and half hidden by an overhanging waist, which was also of a creamy hue. Nothing covered his curly hair.

Following a passenger dirigible we finally located the main air landing field, which was a huge round elevated platform supported by great round pillars. On this we attempted to land, and as we came gently to earth a great flock of curious people collected about us. A great silvery ball with a helicopter propeller was strange to them.

We hesitated to dismount at first for fear of the crowds; but our worries were soon diverted, as ten armed sentinels pushed through the crowd and surrounded the machine.

"We're either wholly welcome or under arrest," predicted the Professor. "We shall optimistically hope it is the former."

A SLIGHT hissing noise announced that the Professor had put into action the vacuum cup, which I learned, constituted the bottom of the penetrator and held it fast to the platform. We had landed near the edge of the platform so as not to interfere with other air traffic. After taking one last look at the penetrator we stepped out to meet the sentiment of the mob.

The leading officer stepped forward and began asking questions in a very musical and pleasant-sounding language, which was entirely foreign to us.

The electronic satellite at that moment appeared above the horizon, and as we were forced to indicate that we were not of their earth, the Doctor calmly pointed toward the minor Diana and then to ourselves.

A murmur arose from the crowd, the sentinels looked at each other. After a little exchange in conversation, we were directed to follow them. Four were left to guard our penetrator, and it was well that we locked it, for immediately the crowd rushed forward and climbed up on the ball.

We followed the leader down by a flight of steps which led under the platform and from there across the street to an unusually broad building of about ten stories in height. Curiously, we discovered that each floor was only a large single room, accessible by the cylindrical elevator shaft which passed up through the center of the building.

We were escorted directly to the top floor, a rather cool and refreshing room about which there were thirty-six windows, arranged in groups of three. Between each group was a railing of marble or some such substance, in semi-circular design, behind which sat as if in deep thought, living statues, twelve in all, occupying comfortably cushioned seats. The floor was carpeted with a deep blue velvety cloth, which, contrasted directly against the white marble wall, had a very beautiful effect.

Nor did the thinkers wink an eye until they were addressed by the chief officer. After a brief conversation, the particular statue addressed, blew a little silver whistle, and all the other statues responded immediately by walking towards us. We were then ushered into the semi-circle and made to take two seats of honor against the wall, while all the other thinkers filed in and were seated in a row along the inside of the semi-circular wall.

The first one spoke. I hardly realized that he was

speaking to us not by word of mouth, but through the mind, each thought being impressed upon my mind as he spoke.

"It has been reported, O welcome strangers," he began, "that you are from the satellite, Mertile. If this be the truth, let us hear from you some form of introduction. Give us your purpose for the visit, what led up to it, and how you managed to accomplish such a remarkable feat. We are the twelve secretaries of science, headquartered in the capitol city of Tenonia, in the great country of Asperia. This planet is called by us, 'Phema'."

"We must apologize for a slight error in the location of our origin," replied the Doctor, and strange to relate I could feel his thoughts just as I did those of the secretary, and still more strangely we can converse thus together to this day.

"As we were not from your world and as we were not able to communicate, we used your satellite to indicate that we were from another world."

"You are then from a distant sun?"

"No."

The secretaries stole a glance at each other.

"Then as I perceive that you are not spirits, and as you are not from our world, where in creation are you from?"

The Doctor firmly believed in that when you are in Rome, do as the Romans do, and so he adjusted his conversation accordingly.

"Our story is strange, O inhabitants of Phema. We have come through a great expanse of space, from a world billions upon billions of times larger than your entire universe, as you know it. It is so large that your great planet is but an infinitesimal electron, trillions of which form one of our elements." The Doctor told then his story exactly as we know it, while the twelve secretaries sat stupefied.

When he had concluded, the Secretaries again regained consciousness enough to continue speaking.

"Your story is indeed strange," he said. "It is hard for even us who are Asperia's foremost scientists to believe your story. However we hold this position, because we are broadminded enough to believe anything that is logical." He then turned to the other eleven secretaries and asked if they had any further questions.

The Secretary of Mathematics spoke.

"This fourth dimension is an entirely new contribution to our scientific field, for we have never found it necessary to progress so far geometrically; however, your strange excuse for using such a dimension will be the birth of extended research in that line. May I ask if you believe that there are any more such dimensions?"

"I believe that there exist seven different dimensions, one for every corresponding order of existence in the Universe. Beyond that is merely a repetition of the first seven. The seventh which corresponds to Universal order, is a dimension which constitutes progress through the dimensions."

The Secretary of Science was equally inquisitive.

"How many planets revolve about your sun," he asked.

"Eight."

"You spoke of our planet being an electron in one of your elements, a while ago. What is the atomic weight of that element?"

"1.008."

"You have supplied me with a valuable piece of information," he approved, "You shall be rewarded presently."

"You are scientists, I suppose," resumed the Secretary

of Astronomy. "Perhaps we shall be able to assist each other from a scientific standpoint."

We agreed.

"You are now welcome to ask questions and free to move about in our city. We shall supply you with guides, or we ourselves shall gladly take that responsibility; just as you wish."

"We should be glad to have your kind assistance," we agreed.

"It is now approaching sunset. Perhaps you would like to join us in watching it from the roof. We assure you that it is a most inspiring spectacle."

We were delighted to accept his invitation.

The elevator continued through the top of the roof where a wonderful view of the city met our eyes, and the sun with all its blue white splendor was just above the sea lined horizon.

The light of the great blue sun, now dulled by the evening mists, was just as blue as our sun is red on similar occasions, while sun, sky and clouds, mocked by the becalmed sea, presented an alluring sight indeed. This soft light, again, on the great white structures, which was reflected and re-reflected, was still more pleasing to the eye. It was the distant trees that again reminded us of their peculiar color.

The Secretary of Botany was quite interested in our description of our green trees, as a result of our red sun.

"Imagine the beauty of a red sunset," he said to his companions. Whereupon we assured him that *his* sunset was far more beautiful than our own.

After the sun had set, the clouds intercepted the light in many colors, among which, purple, green and blue were predominant; all of these secondary colors, of which blue is a part. At home we never come across blue in the sunset, but only those colors which are tinted with red; thus there was no blue in this sunset.

The dusk having arrived, the city became fiery with lights.

"Are you familiar with electricity?" The Secretary of Physics asked.

"To a certain extent; our cities are lighted with electricity, though perhaps not so brilliantly."

"What is your source of power?"

"Water and steam."

"Indeed, I believe we are a step in advance. All our power is supplied by the magnetic forces of the planet, which seem to be inexhaustible."

"Our world is not ready for that as yet; however, the time will come."

DINNER was served on the tenth floor, on little trays which we held in our laps. These people never used a table as an aid to eating. The tray was divided into eight sections, which contained in all an eight course meal; it was about two inches deep, one inch being monopolized by the depth of the compartments, and the other was a twofold hollow liquid container, one compartment of which was supplied with water, and the other with some kind of fruit juice. The food was taken to the mouth by long handled side ladles; nothing more; the meat being already cut. Glass straws were fitted through little holes in each end of the tray, through which we were supplied with the iced drink.

The Secretaries were then anxious to show us everything. We were first directed to the laboratory of the Secretary of Physics on the ninth floor, where the labora-

tory of the Secretary of Botany was also located. The first thing he exhibited was a shelf containing a bottled example of every known element, labeled in Asperian hieroglyphics. The labels, we were told, contained the name of the element plus the atomic weight. These numbers were based upon a system of ten much like our own system.

The first, we recognized as hydrogen. But the Doctor hastily seized another with a shout of delight. The startled Secretary, anxiously begged him to be careful not to break it.

"What is it?" I exclaimed, "Why all the excitement?"

"Excitement! Excitement! Indeed! Read the number on that, Perkins!"

I glanced at the figures which were written thus on the paper label: "V-Iox" which translated meant "2.059."

Hurriedly I glanced down the list in my little notebook to find out what gas (for the bottle looked empty) had such an atomic weight. But there was none to be seen.

"My table doesn't seem to be complete, Doc," I apologized. "What on earth is the element?"

"That's the question. What is it?"

"It is coffina," explained the Secretary. (English pronunciation)

This, of course, was unfamiliar to either of us.

"There is no such element on our earth," explained the Doctor.

The Secretary seemed surprised. "That is a remarkable piece of information," he agreed. "Would you mind picking out all the elements which you do not have?"

It was not long before we discovered that it would be much easier to pick out the elements which we did have.

Hydrogen, oxygen, argon, nitrogen, carbon, cobalt, calcium, copper, iodine, mercury, neon, silver, tin, zinc, iron and radium, were the only elements out of our whole system of 92 elements which were in existence on the hydrogen electron. All the rest were strange. All eyes watched the Doctor laboriously sort them out on the table, and when he came to the little metal bottle in which the radium was kept, he showed unusual surprise. There was at least a pound in it.

"That bottle would have been worth the wealth of a nation back home," announced the puzzled Doctor.

"You may have that bottle as a gift," said the Secretary, "It is not worth much to us, for I have plenty more."

The Professor overshadowed his gratitude.

"I shall give you anything I possess in return," he said. "I shall give you the plans for my fourth dimensional penetrator."

"We should like nothing better," they agreed. "Also in return for a supply of your elements, we would be glad to give you a sample of each of ours."

"I regret to state that that would be impossible."

"Indeed, would it be too much trouble to return to your laboratory and secure for us the necessary samples?"

"If trouble were the only difficulty," the Doctor explained, I would gladly do it, but you do not understand. It would be physically impossible for me to return in less than many trillions of years."

"I do not understand your words."

"You take, I understand, a period of 634 of your days to complete a solar cycle, or one year."

"Right."

"But by the time I could again retain my normal mag-

nitude, and secure for you that which you desire; your planet will have completed no less than countless trillions of revolutions about its sun nucleus."

"I believe I understand you now. Our time is so very much different than yours."

"And even if time were the same to both of us, I should never be able to re-locate your sun out of the billions of others."

Thoughtful silence followed.

"However," the Doctor continued, "if anyone out of curiosity, would like to return with us, he may, remembering, of course, that it would be absolutely impossible to return."

All shuddered at the very mention of it.

"And be tortured with the remembrance of the fact that all our friends had disappeared in a single second, after we had left our world; and that every second after that, ages were passing by, like the wind, and taking with them all that is dear to us? No. It would be unbearable. Try to imagine yourself, leaving your own world to become a being of the next larger planet, knowing all the time that you could never return, unless by chance, an infinite number of years later to find your world a new and altogether different home, where you had once before lived with all your friends."

It was useless to suggest further, although I believe the Doctor would just as soon become a giant cyclops as become a midget, even on that scale.

I could write volumes, describing the strange plants and animals that were there, and the many strange phenomena of nature; but I shall leave that for the Professor in his works, for that is more along his line. These things were all shown to us within the same building, where all the scientific research apparatus in the country seemed to be collected together. The observatory was on the roof.

I SHALL describe a little of our visit to this, however, for here we learned much of interest. The telescope was not just what we expected, for it was composed of but a single lens, mounted and pivoted in such a way as to be conveniently focused in every direction. I knew then that the lens was not made of glass, for it would have been impossible to use a single lens of glass in astronomy.

"That is merely a simple element," explained the astronomer, "whose atomic weight is approximately '105'. It is called Ranasium."

"That lies between palladium at '106.7,' and rhodium at '102.9' on our scale," replied the Doctor after a few seconds recollecting, "Silver is '107.88', evidently all the elements which you have lie between our own. By the way, do you have an element with an atomic weight of eight?"

"Poleritic gas ('8.4,') and it is highly explosive."

"Bad news, Perkins. We are citizens of the third electron from the nucleus of an atom of a highly explosive gas, to which some giant may even now be placing a match."

"What matter," I said. "The explosion would be so slow to us that we would not even notice it."

"That is just it. As I was saying before, there is no force existing which can destroy the atom, so why worry."

The sky, you may as well be informed, was at that time fiery with stars, massed in many strange constellations.

He naturally supposed that we would first like to examine the surface features of the near-by satellite, but we informed him that already we had passed relatively close to it, and that we were far more interested in the more distant objects. He then decided that the nebulae would be an excellent choice, which indeed they were.

There is something about viewing distant atom-nebulae through a telescope, that causes a feeling of wonder. To think that I was composed of Sextillions of those great luminous clouds, some of which were many light years separated.

"The closest star," said the Astronomer, "is about fifteen trillion miles from here." That was about ten trillion miles closer than our nearest star.

The sky was suddenly transformed by a brilliant aurora borealis, which made all further observations impossible. However, the aurora was magnificent, and showed that even an atom nucleus is not immune from solar disturbances. This led the Astronomer to show us some photographs of their sun, which, not unlike ours, was bespeckled with sunspots.

A faint rumbling sound, as if made by distant thunder, was just audible.

"Thunder?" asked the Doctor.

"Old Titanus, the volcano, has been doing that for months. However there is no danger of eruption, for it has done it many times in the last thousand years without emitting anything but smoke. The last eruption, it has been told, occurred thirteen hundred years ago, at which time this part of the land, on which the capitol now lies, was formed. Since then, it has been extinct, outside of the smoke."

As we had no place to go that night, we accepted the kind invitation of the Astronomer to stay at his house until we intended to leave. We were immediately driven there in a little egg-shaped, magnetic power-driven vehicle, through the brilliantly lighted streets of the city of Tenonia. During our conversation we learned that the planet turned over a day once about every twenty-seven and one-half hours, whose sum annually totaled up to about two of our years. This, according to Dr. Longhorn's ring system placed it out about the distance of Mars, from its nucleus.

The suburban district of the city was mainly composed of the now familiar round houses. The Astronomer's house was unusually large, and was divided into fourteen triangular rooms, with the apex toward the center, where a little sky-lit hall was just large enough to provide for the fourteen doors from all the rooms.

The first room, that is the one directly behind the front door, was a form of reception room, gaily decorated for the benefit of visitors, with all kinds of metal ornaments and pictures. The walls were all marble. In addition to the door leading to the center hall, there was a door on both sides of each room at the end nearest the outside, leading to the adjacent rooms. The proud Astronomer lead us through them all: library, dining room, kitchen, pantry, bedrooms, and bathroom in which there was a magnificent fountain. The library was made up of great rolls of paper kept in boxes, altogether somewhat like the modern music-roll, with the title printed on the end. Their contents were read by inserting the roll on an axle and pushing a lever which released a spring when you wished the roll to continue.

In the morning we enjoyed breakfast in much the same manner as we enjoyed the dinner the night before,

after which the Doctor began to collect those things which he had taken with him. He collected first a goodly supply of science books or rolls, and a large sample each of all the elements, especially that of ramosium, the wonderful magnifying element, and radium.

"We must take advantage of our good fortune," he said, "the chances are a million to one that we shall never find another planet advanced so far along in civilization."

It was not long before we found that the penetrator was not half large enough to hold it all. Wondering what we could do about it, we were wandering down an avenue with the Astronomer, when we came across a dwarf. In a flash the Doctor saw his chance. With the Astronomer as interpreter, he asked the dwarf how he would like to become of normal stature. The dwarf became indignant, and asked us to stop making fun of him.

"I really mean I can restore you to normal size," insisted the Doctor.

The dwarf, finally convinced that we were not joking, consented to try anything once, if we were sure it wouldn't hurt.

After again unloading the ship of everything but the radium, the Doctor swore the dwarf to secrecy and showed him how to make the ball larger and how to stop it again when he became of sufficient height.

Nervously he hopped in and shut the door. He could easily see us, but of course we could not see him. Then we anxiously watched it expand, fearing that he might become over ambitious. He took no chances on still being too small for he again emerged, a seven foot giant.

The penetrator was now large enough to hold everything, and we hastily piled it all in and still had plenty of room for twice as much. The dwarf assisted us gratefully, and presented a comic appearance indeed, with his big fat baby face, for as he increased skyward he also increased laterally.

About midday we had a violent thunder shower, which was possible, because the necessary elements were not among those lacking, for as you will remember, nitrogen, oxygen, and argon, of which pure air is composed and hydrogen, the first element in water (oxygen being the other) (H_2O) were among those which both worlds possessed.

THAT afternoon the Astronomer ushered us to the woods after the earth had been freshened by the rain. The electronic fowl, as the air was cooler, were singing at their loudest in numerous complicated airs.

To be walking through a forest of brown leaved trees in a paradise of many unusual birds, and with a hundred strange plants growing about you, is something to live for, especially in a forest free of insects as this was.

"Have you no insects?" asked the Doctor.

"We did have, not many years ago, but we have invented an instrument which kills insects by sound. We have an element called, cita, which can be made to vibrate as many as seven hundred thousand times per second. When set to vibrating, all the insects within a radius of two miles die, except those which are covered with earth. This leaves enough for the birds."

There were trees resembling evergreens, maple, oak, and birch, and many others which did not resemble any variety I know. One tree had curious octagonal leaves, three of which I have preserved to this day. We collected seeds for as many trees as possible. There was a wood mouse with a tail about thirty inches long.

At a farm house of the regular dome type, we saw many milk-giving animals, much like the goat in appearance, which were also used to pull the plough.

That night we saw the sunset from the great temple which we first saw from the sky. The sunset was not nearly as beautiful as the interior of the temple, which was constructed entirely of white marble. The first thing that caught our eye as we entered, as it naturally did for anybody, was a great fountain in the center, which hurled its sparkling waters two hundred feet in the air, which then fell tumultuously, as a mighty cataract, into a giant bowl, from which it overflowed into a pool below. Inside, as well as outside, great marble pillars, forty feet in diameter, reached gracefully toward the great ceiling, four hundred feet above us. The very base on which they rested was twenty feet thick in three steps. Between the several pillars were titanic statues of ingenious sculpturing, representing life, knowledge, music, etc.; but you will understand they were not Gods, for they worshiped the one unknown God, just as we do. He was beautifully represented by many lights at one end of the building, which were directed in many colors upon a mirror from hidden sources. This temple was the prime temple of the whole nation and was thus erected purposely in the capital at a great expense.

The country, we learned, was a huge island about the size of the United States and was inhabited by over a hundred million people. The capital was the largest city, housing over seven million alone. The great highway led to another large city, known as Palmita.

The next morning we were up bright and early to take photographs of the city as an everlasting souvenir of that wonderful experiment. Pictures from the air, about thirty of them of the city alone, were taken with great care to get the light exactly right. Pictures of the airships, temple, volcano, canals, ships, forests, roads, houses, buildings, people, vehicles, birds, animals, sea, and all forms of nature were photographed. It took us nearly a week to secure them all.

The seventh day we were there the Astronomer took us out on the sea to an island which was about ten miles in diameter, and where he told us a collection of animals had been gathered from all parts of the world—a form of outside zoo.

"The animals are so vicious," he said, "that they have built a network of bridges across the island from which the animals may be safely observed. They are all allowed to run free, except those which are liable to prey on the weaker, who are isolated from the rest."

They were taking no chances I thought, for the bridge proved to be about forty feet high.

"Good Lord! Is that alive," exclaimed the Doctor, as we viewed the first animal. It was a——? At least it was amphibious.

"A Brontosaurus! Or I'm not Dr. Longhorn."

"A which?" I said, surprised that anyone could guess a name for that.

"It's prehistoric; one of the largest of the amphibious dinosaurs."

"The beginning and the end, together," I said, "just another knock at evolution."

The brute was indeed large. He was sixty feet long and about fourteen feet high. That same day we saw a Diplodocus, and the Morosaurus, both something like the first; a Triceratops, he of the three-horned face; The Horned Ceratosaurus, who walks erect, and a

Stegosaurus, the armored dinosaur; all hideous creatures of the past. There were many others, some even more hideous, but most of these never existed on our earth. The Doctor was so overcome that he even arranged to secure a young Brontosaurus to take home with him.

I shall never forget the trip to Palmita the next day, at the speed of a hundred and fifty miles an hour in a little egg-shaped vehicle, which the Doctor later jokingly called the omelet. We went for the sole purpose of securing photographs, and by a lucky stroke of coincidence we took only the stationary camera. The only difference between the two cities was that Palmita, being the older of the two, lacked the elevated cross streets.

We started back that afternoon, and even though the distance was sixty miles, I knew we would be back in twenty minutes. The sun was halfway down in the west and the sky was absolutely cloudless. It was a perfect day. Then about ten minutes after we had left Palmita, (when we were about half way) we noticed a great black cloud towards Tenonia which we mistook for a thunder cloud. Then an astonishing thing happened. A hole avalanche of automobiles, headed for Palmita, passed us with a great roar that would make ten thousand cannons sound like a door slam, at the rate of about three hundred miles per hour. Thousands of them.

"The volcano!" shouted Lama, (the Astronomer). "The volcano has awakened!"

Had the Astronomer lost his head? He was driving like mad towards the thing that was causing millions to flee in terror.

"Stop!" shouted the Doctor. "Stop for your life! If those cars should jump the lane, we should all be instantly killed."

But Lama only urged the car to greater speeds.

"If we should stop now," cried Lama, "you would be forever isolated from your home."

We realized the truth with sinking heart, but could we let this man sacrifice his own life just for us? Neither the Doctor nor I dared speak for the other, and it all happened so quickly that we hardly knew what to do. We both looked despairingly at each other, and our hands met understandingly, as I detected his faint but determined nod. Simultaneously we grabbed his shoulder begging him to forget us, and protect himself, but with hair flying in the breeze and teeth set, he did not answer; he merely continued at the terrific rate of three hundred miles per hour; and this was the man who had so recently dreaded the thought of leaving this world.

The very thing the Professor dreaded, happened. An automobile in the opposite alley suddenly skidded and turned over, and nearly thirty automobiles close behind it piled up on top of it, all going nearly three hundred miles per hour, with a roar that numbed the senses. More fortunate cars were crowded into our side of the road and nearly forced us into the cement wall. Skilfully we jumped the sidewalk, and missing the wall by hardly two inches, we continued upon the walk for over a mile, which fortunately at that time was otherwise not in use.

SIX minutes after we discovered the smoke we were at the outskirts of Tenonia. Here we found thousands of bewildered pedestrians crowding the streets and making them impassable, for there was already an inch of ashes upon the streets. The dust was terrible, and we soon found that not only dust was falling but red-hot ashes and cinders, some an inch in diameter.

Unable to proceed farther in this direction, we entered a ramp and mounted to one of the circular boulevards. Here we found it much easier to progress with the hope in mind that we should eventually find a less crowded main street. We proceeded slowly this way for over a mile, ever towards the flying platform and the fury of the volcano, and then we suddenly came upon a new difficulty. As we were crossing above one of the main streets, a giant boulder suddenly plunged out of the sky and fell right through the bridge, so close to us that we were forced off the bridge and into the crowded street below, and the egg became a real omelet of twisted steel. No one knows how we crawled out of that wreck alive, and the truth of it is, we all escaped with only a few scratches and bruises.

Ten blocks more through a whirlpool of red-hot cinders before we ever could be called safe; ten blocks of burning hands, face and eyes, and blistered feet. The sun was now blotted out by that great black cloud that seemed to mean destruction to all, and which issued from the fiery mouth of an enraged volcano, dimly visible through the shower of fire and ashes. It seemed to be vomiting all Hades down upon the beings of a peaceful city. How those red-hot, sharp-edged cinders cut and burned our bruises! The air was heavy with dust that made us gasp for breath, while our eyes burned until they were almost swollen shut. Nor were these tortures our only difficulty. We, out of the millions, were the only beings who were inbound, and so we had to fight a mob of pushing, shoving, panic-stricken people, blinded into insanity and intent only on saving themselves from what they supposed was the end of the world. Feet seemed miles, and minutes seemed hours; and thus urged on by the will to succeed, fearful lest we should fail after all Lama had risked, we finally covered the first dreadful block, and reached the protection of the first culvert. Here we found many who had come so far to die. We only dared hesitate for a second with so much before us. As I could only just see Lama ahead, I was about to suggest that we hold on to each other, but with sudden fear and apprehension, I discovered that the Professor was not with us.

"Doctor Longhorn!" I shouted. My words came hot and distorted. Then Lama sensing that something was wrong, assisted in the useless shouting. I shuddered to think of the Doctor out there in that hell alone. Another boulder, such as only the worst of volcanic eruptions could produce, crashed not thirty feet ahead of us crushing all around beneath it, causing the earth to tremble for acres around. I marveled at the physical disturbances that could produce such violence.

Frantically we retraced our steps in search of the Doctor, but without success, calling as we went with half choked lungs. In that almost inky blackness pierced only by the penetrating red light of the red-hot cinders, nothing was visible beyond a yard. The roar of the distant volcano and the rain of ashes drowned out what little sound we were able to produce. I could neither hear nor see Lama, but as I felt his friendly hand in mine, I gripped it like a vice, for he was the only friend left to me. I felt him tow me gently on again towards the penetrator and safety, and through the fire I read his mind messages as if nothing was between us.

"We must go on," he said. "It is our only chance. If the Doctor is able, he will do the same."

Those words, "If the Doctor is able," bit into me. It

never occurred to me at the time that even if we did reach the penetrator, all was lost without the Doctor, for he had the keys, and I did not know how to control the machine.

"Oh for light and water," I thought.

As if in answer, a bolt of lightning cut the dust-filled atmosphere quite close to us; and with it came a clap of thunder. Though loud, it was hardly audible above the din and roar of its superior disturbance. Such a storm without lightning was physically impossible. There was no water, with it, though even if there had been, it would have boiled before it hit the ground.

When that disappeared, we were conscious of the presence of a new light. A building was on fire about two blocks ahead. A great cinder struck me in the back and knocked me down. From then on consciousness became a serious effort. Time seemed to pass more slowly, for we were just now passing under the second culvert, overcrowded with people from one end to the other of its hundred foot depth. More thunder and lightning, more lighted buildings, more shrieks and cries; yes and more ashes, tons upon tons of it; and we had eight more blocks to go.

If anyone could wish for water more than those who lived in that evil hour, that person is dead beyond assistance. Through those streaks of fiery cinders, which scratched as well as burned, which penetrated the lungs and singed the hair; through the driest of heat and the coarsest of dust; all these and many other tortures were endured even to death by the inhabitants of that great electronic city. Here and there, we stumbled across abandoned automobiles, at the place where they had been stalled by the depth of the cinders, and whose occupants had taken to flight on foot, much as we had done.

Back in '79 A. D. a milder volcanic eruption buried Pompeii, which is skilfully described by Bulwer-Lytton, in his novel "The Last Days of Pompeii." If Bulwer-Lytton's description was accurate, I, as I sit here, have actually lived under a disturbance which was without the least exaggeration three times as violent, incapable as I am of describing it. Yet how incidental this all was in the time revelation of our great Universe. That which seemed as endless hours and which were endless hours, were after all only fractions of a split second. While we were thus enduring such indescribable hardships, our friends at home, if they were reading their newspaper, had not even enough time to read a syllable. If he had been writing, his pen would not even seemed to have moved, while we were exposed to the wrath of the great volcano. Live through that trillionth of a second we must, though it take hours.

I SHALL never forget the faithfulness of Lama, the electronic Astronomer. This man when he could easily and justly have saved himself, sacrificed his life on his own world so that we might live on ours. Into the furnace he plunged; that furnace that he knew was hell-fire itself; enduring almost impossible tortures at the risk of his life, and all for what end?

Hope turned to despair as we continued without a trace of the Professor. Vainly we searched, but even if there were no fire and brimstone, there would still be the mobs, and hope of finding him would be rare. What chance had we, then, as things actually existed?

Half consciously we reached the protection of the third culvert, where we found hundreds who had given up all

hope and had collected here to die, shouting piteously in their delirium for water.

"Musa! Musa!" (Water! Water!).

We must not hesitate. A second might mean death. The light from the burning city now made it much easier to see, but we were in constant fear of being crushed beneath its crumbling walls as greater haste was impossible. Earth tremors increased the danger, coming frequently and violently. There were at least nine inches of ashes to resist our efforts and walking became almost impossible.

More hours seemed to pass, and then the fourth culvert, with still six to go and the city buried in ten inches of ashes already. This culvert was at the intersection of two of the main streets and was incidentally equipped with a — was it a fountain? We rushed madly towards it, dipping our entire heads blindly into it, over eager for its cool and refreshing contents. For a brief second I felt its icy coldness against my cheek. It hurt! It was burning! What I at first had supposed was the coolness of the water, was only a red-hot coal against my face. The disappointment was almost unbearable. It was the fiery burn of molten ash, which had quickly dried out the fountain. Behind us, an old man cackled with laughter, hysterically.

"Gisa baspeno warna parsi de consta parchi," he mocked us in his native tongue. The poor fellow had undoubtedly become insane.

The block, which lay before us, was directly below the burning mass of Tenonia's highest building, a great thousand-foot skyscraper, the heat of which was unbearable. It was only the will of success before starting that carried us safely past it, walking, as it were, in a stupor of blindness. I cannot describe anything which occurred in that block.

The fifth culvert was not unlike the others, crowded with lifeless forms. The ash was now a foot deep and seemingly as hot as melted lead to our unprotected feet, the shoes of which had long since been robbed of their soles.

We had nearly completed the struggle with time down the next block when the greatest earthquake arrived. We were all thrown flat on our faces as a great yawning chasm opened up before us, not a yard away, which swallowed up a truck-load of people who were struggling down the avenue. Then with a second crash the jaws of the earth closed over them, as if nothing had happened. We turned our faces away from that dreadful sight as we arose to our feet in time to witness a catastrophe a thousand times worse. A thousand burning feet of fire, swayed, toppled and fell, with a roar that knocked us senseless with inconceivable force. Fortunately, by the guiding hand of Him who creates, it fell diagonally away from us, but the shock which followed must surely have been felt in Palmita. It left a burning mountain of molten rock and twisted steel, an impassable barrier to all those who were so unfortunate as to be on this side of it. Or was it by the hand of the devil that so many were trapped who otherwise would have been instantly and mercifully killed? This great tragedy killed all our hopes of ever seeing the Professor again.

Blindly we tripped over the dying fatalists of the sixth culvert. At the opposite edge I tripped over a form which sent me sprawling headlong out into the ashes. I turned to see who the other unfortunate victim had been, and retraced my steps until I stood directly above him. A

flash of lightning came to my assistance lighting up his unconscious but smiling face. Through mingled joy and despair I realized that it was the Professor. I clutched at Lama's sleeve. Without another word, we seized him between us, and shielding his face from the fires, we plunged on, calling his name joyfully. Had he been conscious, he would have told us to leave him behind and save ourselves, but for this reason I am thankful that he was not, for he shall always know that we did what we did because we wanted to do it.

Although Lama is to this day unwilling to admit it, I frankly believe that there were times in that next three blocks in which he must have dragged both me and the Doctor with him, for there were many moments of which I have no recollection, even though there were many others which I shall never forget, even in my happiest hour. They shall haunt me through life as they haunted me then.

I know not how we finally arrived alive at the half-buried flying field, which had every good reason to be deserted. How we welcomed its friendly protection, its unlimited water supply (though it seemed about to boil) and its other comfortable resources. Our baby Brontosaurus was nearly half dead with fright, as might naturally be supposed, but he was soon quieted when we entered. What a relief it was to step out of that bed of hot ashes nearly knee deep into a dust-proof protector!

Many precious and anxious moments rolled by before we actually brought the Doctor back to consciousness, nor was he slow to react. A half a minute after his recovery we were off into space. Five miles miles further we found the ashes as thick as ever, and we were fifteen miles high before we could actually look down upon it

all. Here we found the sun again, a great fiery ball in a myriad of tiny stars. Curiously we looked down upon the great city of confusion. Lama was weeping silently. Thirty miles from Palmita marked the dividing line between light and darkness.

There remained then, nothing to do but set in order those things which the earthquake had so rudely misplaced. It was then that we made a remarkable discovery. The moving picture camera had so fallen, that the button which started the automatic mechanism had been released and a whole roll of film had run through undeterred, and as the lens was on the outside of the ball, a pictorial record of the whole eruption must have been taken.

That very night on which we started our remarkable adventure, we again saw the laboratory clock. It read, I am positive, no later than (8.26:30) P. M. or a half minute after we started.

* * * *

When finally our picture was thrown upon a screen back in the laboratory, we saw the catastrophe again reproduced as it had happened. We saw the giant skyscraper topple and fall; we saw a thousand titanic burning torches blurred by the great rain of ashes. It was then that we realized what we had gone through that night, in that trillionth of a second, when our minds were numbed by reality.

As a conclusion I might add that Lama is happy, faithfully watching our red sunsets every evening, and studying our stars and green vegetation in concealed wonderment. However, there are sad moments when he remembers that his people all perished countless millions of years ago.

THE END

Calories in the Boarding House

Air: The Minstrel Boy to the War Has Gone.

The boarding house star to his dinner has gone.

In the dining room you'll find him.
His napkin white he has girded on
And the waiter stands behind him.

"Waiter, this soup is made of hay—
And you're very shy on chicken!"
Says the waiter, "This is calorie day,
So please refrain from picking.

"There's a thousand calories on your plate
Enough for half a day,
You're getting very peculiar of late—
Get busy, for I can't stay."

The boarder fell for the calorie talk
And his dinner he managed to swallow.
But he might as well have been eating chalk,
And the calories left him hollow.

Lonecoast

When the Atoms Failed

By John W. Campbell, Jr.

(Continued from page 925)

When at last we reached Arizona again, Wright was there to greet us—and so were delegates of every nation. It was supposed to be a welcoming committee, but every one of the delegates had something to say about why the secret of material energy should really be given to his country.

Waterson refused to give out the secret of that energy though. He demanded that the nations scrap every instrument of war, and then meet in the first Terrestrial Congress and write laws that might apply material energy to the ends of man, not to the ending of man!

It seems strange, the persistence with which the governments of the world held fast to those old battleships and guns! They were hopelessly useless now, yet they would not agree to that term of the agreement! It required Waterson's famous ultimatum to bring action.

"To the Governments of the Earth:

"For centuries and millenniums man has had wars. One reason has been that he has had the tools of war. The tools of war are going to be abolished now. Every armored cruiser, battleship, destroyer, submarine, aircraft carrier and all other types of war craft will be taken to the nearest port, and every gun, cannon or other weapon of more than one mile range loaded on those ships. They will then be taken to the nearest ocean, and sunk in water of a depth of at least one mile.

"In the first place the weapons would be useless. The ship, I now have, has shown that. There will be no economic loss as the type of power they use is now obsolete. The iron and other materials they contain can be produced directly by new methods that are simpler than salvaging that metal. They are, however, curiosities that the future will be interested in. The navy department of Japan will select the finest ship of each type from each of the navies of any other country, and I will then transport that ship to a selected spot well

toward the center of the Sahara desert where they will be set up as museums of naval history.

"This is to be done within seven days, or the 'Terrestrial' will do it more completely. It must be done for the good of our race, and at last there is a power that can get it done—the 'Terrestrial!'"

Needless to say, it was done. We all know the result. No armies meant no national spirit—no race jealousies can exist unless there is some one to stir them up, and now it is to the benefit of no one to do so!

The laws that made possible the application of Waterson's new energies are well known—and this manuscript is not the place for quotation of international and interplanetary law. It was a great problem, and we must acknowledge the aid of the Martians in solving it. Their experience in the application of atomic energy was immensely valuable. The light beam communication that Waterson made possible has done as much for us as have the energies he released.

And the peace that exists between these two races must always exist, for they are the only neighbors Earth can ever have. And they did not damage us much. We still feel a bit of dread of them I suppose, but statistics have shown that the trouble man himself caused in his wild panics did far more damage than did the Martian heat rays.

May God help these twin races, so close both in bodily form and place of birth, to climb on in friendly rivalry toward better things through the æons, as long as our sun can yet support life on the globes that wheel around it, migrating from planet to planet as the race grows, and the planets cool, settling on them as the Martians have settled on Venus.

And thanks to Stephen Waterson's foresight and vision in establishing the Supreme Council of Solar System Scientists, we dare hope this may come true.

THE END



In this department we shall discuss, every month, topics of interest to readers. The editors invite correspondence on all subjects directly or indirectly related to the stories appearing in this magazine. In case a special personal answer is required, a nominal fee of 25c to cover time and postage is required.

A LETTER OF EXCELLENT CRITICISM

Editor, AMAZING STORIES:

Although I have read almost all of your stories, this is my first letter to your Discussions Column. Though the change in management has not affected your magazine, I (and probably others) am sorry to see that the famous Paul's illustrations will no longer grace the contents of the magazine. * * *

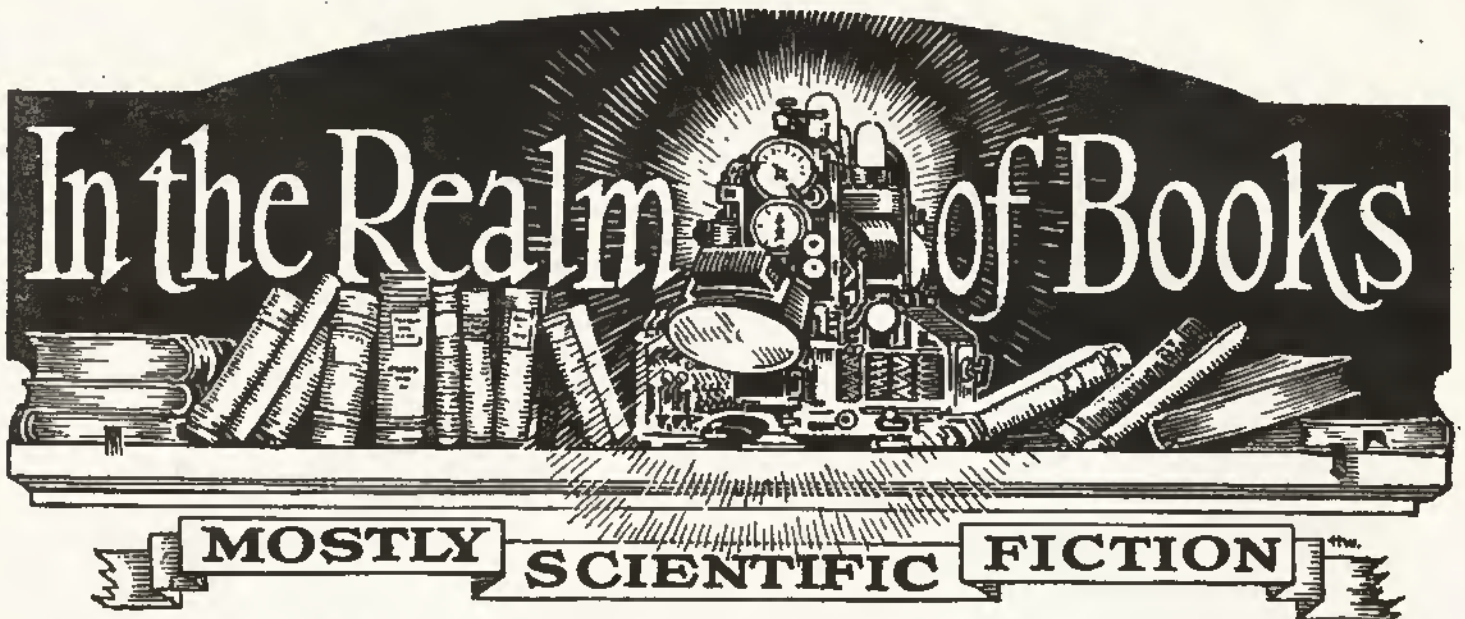
However, I think Wesso's illustrations are excellent and compare favorably with Paul's drawings. Briggs' drawings are also good, but Bob Dean's illustration could be much better. I have just finished the October issue. I did not like the cover. Wesso made a fine job of the drawing, but there are probably other scenes in this issue that would have made a better cover picture. For instance, in Verrill's "Death from the Skies" many vivid pictures are presented, such as the projecting of the Martian meteorites from the

earth by Henderson's wonderful machine. Incidentally, this story was the best of the issue, in my opinion. But then, all of Verrill's stories are excellent. I think that due to the incandescence of the material of the meteorite, electrons were being evolved, which set up vibratory waves, which disturbed the thought waves and other energy waves in the brain. This story was as good as "Into the Green Prism." I liked all of Captain Meek's stories, namely "Futility," "The Murgatroyd Experiment" and "The Red Peril." In the latter story the explanation of the high frequency waves is excellent. "Out of the Void" was not so good. The best interplanetary story doubtless was "The Skylark of Space." I am glad a sequel to this remarkable story is planned. "The Dog's Sixth Sense" is certainly good as far as it went, but it would have been better if the adventures of the mind-reading detective were prolonged. Alexander's stories are good. "The White Army" is

an excellent biological story. There are many interesting facts contained in it. It certainly increases one's mental digestiveness to read a story like this rather than to try to absorb the facts from a textbook.

In "Gold Dust and Star Dust" can be shown experimentally the formation of a three dimensional figure, but how can it be assumed that by continuing the process in a similar manner, the three dimensional object can be "tilted" into the fourth dimension. Here is my idea of the fourth dimension: In order to locate, say a rectangular solid in space, one must know: 1st, the length of the solid; 2nd, the width, 3rd the height, and 4th, the time at which it was existing in that space. I enjoyed the September issue. In the August issue, I liked "The Wand of Creation" by Coblenz. I certainly hope no one duplicates Dr. Kramm's experiment. "The Dimension Segrega-

(Continued on page 979)



"Old Civilization of the New World," by A. Hyatt Verrill. Published by Bobbs-Merrill, New York—\$5.00.

THE readers of AMAZING STORIES are very familiar with the author of this book. Many of his stories have touched on ancient American races such as the Incas, the Mayas and the Indians of Southern America. The present book is a fascinating account of the discoveries which have been made in the last century in Mexico, Central America and South America—all of which we have included in the term "Southern America."

We may start by noting the fact that the book is thoroughly well illustrated with very beautiful reproductions from photographs of the ancient remains, that numerous diagrams are given to elucidate the mathematics, writings and other branches of the learning of these people, that it has an excellent contents, list of illustrations, full index, and a most extensive bibliography. The illustrations of the old temples and structures show what a wonderfully artistic spirit these ancient Indians had; who or what they are is still to a

great extent a mystery, but they did extraordinary work. The hardest stones were cut for buildings, so that when laid up a knife could not be inserted between stone and stone. The automobilist in Peru today, in places, drives over an asphalt road constructed centuries ago by the Inca race. We here read of the astonishing highway thousands of miles in length, with bridges and tunnels. The bridges were of the suspension type, and have disappeared. Some of the tunnels are still in use. We read of their wonderful temples, the pyramidal structure called the *Kus*. The bas-relief of the Gods of Sacrifices tells much of their religious system.

The author does not hesitate to say that there is much of mystery about these ancient people. They did incomparable weaving, superior to that of the Navajo Indians of America, and some of the fabrics had 300 threads to the lineal inch, which is a wonderful index of fineness. And all this beautiful work, for it was beautiful, was incomparably dyed, was done on the crudest kind of looms, being pure hand work, as far as such could be, while the loom of the present day, even the

foot loom which is used by those who are ambitious in handcraft, is a complicated mechanism, compared to what they had, and our work is inferior to theirs. It is futile within the limits of our space to do more than, in a general way, recommend to our readers this book as a valuable follow-up on the remarkable stories which have been written for AMAZING STORIES MAGAZINE by Mr. Verrill on this subject. It will show again how closely he follows actual scientific facts, and findings in his scientific fiction.

A wonderful example of their fresco work faces page 40 of the book. It comes from British Honduras, and puts the modernist to the blush. It is really beautiful, while much of the modernistic work, at least to the writer, sadly lacks this feature. Another illustration gives interesting views of the stepped-in arch, which was used by them in place of the voussoir construction of modern time.

—T. O'C. S.

"The Earth Tube"

For a review of this scientific novel by Gawain Edwards, see the December issue of AMAZING STORIES.

READERS' VOTE OF PREFERENCE

Stories I like:

- 1.....
- 2.....
- 3.....
- 4.....

Why:

.....

Stories I do not like:

- 1.....
- 2.....
- 3.....
- 4.....

Why:

.....

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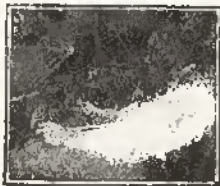
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A Few Interesting Comments from E. E. Free, Ph.D.

Romances of Jules Verne Hailed as Aiding Science

That Jules Verne, great writer of scientific fiction, who was born just a hundred years ago, contributed largely to the growth of two modern sciences, aeronautics and oceanography, was maintained at a recent meeting of the French Geographical Society, in Paris, by no lesser authorities than Professor Charles Richet, dean of Parisian scientific men, and Dr Jean Charcot, distinguished Polar explorer.

When Jules Verne wrote his stories, Professor Richet said, the only means of aerial transport was the balloon, a craft at the mercy of the elements and of innumerable accidents. Verne saw that this would never do and imagined his famous flying machine, the Albatross, embodying many elements of design now become aerial commonplace. Verne's stories of the sea bottom first awakened public interest, Dr. Charcot said in the facts of oceanography. Among French boys who grew up on Verne's novels this interest has been maintained, the explorer said, so that not only were some of these youngsters inspired by Captain Nemo themselves to become oceanic explorers, but the others have had enough interest and information to provide financial and official support for exploration of the ocean depths. M. Mauraud, French Minister of Education, added that in his opinion Verne's scientific romances had been among the most powerful educational influences ever experienced in France.

* * * *

Is Earth's Tail Slowly Sucking Away Our Air?

That the earth has a tail, like that of a comet but shorter, and is continually losing the gases of its atmosphere to keep this tail in existence is the startling conclusion of Dr. Carl Stormer of Oslo, Norway, who has been studying the variety of aurora or "Northern Lights" sometimes seen a thousand or fifteen hundred miles above the ground. Already known as the world expert on auroras, Dr. Stormer recently discovered radio echoes believed to be due to waves which leave the earth and are reflected back to us from clouds of electrons or something else between the earth and the sun. The only probable explanation of the thousand-mile-high auroras which he has observed is the conclusion, Dr. Stormer now believes, that sunlight shining on the earth drives off into space billions of gas atoms from the upper layers of the air. These form the earth's "tail," perhaps visible to anyone in outer space as we see the tails of comets, but invisible to us because of the lower, denser layers of air. The high auroras are believed due to electric rays from the sun striking against this cometary tail and making it shine. If this is true the earth must be losing its atmosphere, slowly but appreciably. How this loss of our air is made up, or whether it is made up at all, no one has yet guessed.

* * * *

Uncovers Musical Sins of Vacuum Sweeper

A vacuum sweeper behaves like a trio of very bad musicians; it plays at least seven musical notes at once, only two of which have any proper musical relation

to each other. That is one reason why vacuum sweepers make such penetrating noises; a fact recognized by commercial experts as one great obstacle to wider use of these household conveniences. This musical misbehavior of sweepers, was disclosed at the recent meeting of the American Institute of Electrical Engineers in New York City by Mr. T. Spooner and Mr. J. P. Foltz of the Research Laboratory of the Westinghouse Electric and Manufacturing Company, who have devised a new apparatus which measures the different noises emitted by all kinds of machines. The loudest single noise of the kind of vacuum sweeper studied by Mr. Spooner and Mr. Foltz turned out to be a musical note sung by the rotation of the motor. This was accompanied by its first harmonic; as middle C of a piano, for example, might be accompanied by the C one octave higher. These two, if they were sung alone by the sweeper, might not be displeasing. They would resemble, in fact, two tones about like the D above middle C on the piano and the D an octave lower. But the perverse sweeper sings at least five other tones at the same time; one due to the small fan that keeps the motor cool; a second coming from the swing of the fan through the air, just as an airplane propeller makes a droning tone when the machine is in flight; and three more tones sung by the vibration of the metal fan in three separate ways, like the vibration of a cymbal. The combination sounds a good deal like a baby playing seven organ notes at random.

* * * *

On Venus Yellow Races Would Be White

The "white race" of the planet Venus, if any such creatures exist there, would probably be about the color of a ripe orange. The leaves of trees would be pink or crimson. Blue light, like the color of the star field of the American flag, would be unknown and utterly invisible. Probably it would ruin the eyes of the Venusians, precisely as powerful ultraviolet rays damage the eyes of the inhabitants of earth. These deductions, together with others surprising enough never even to have occurred to writers of tales of interplanetary travel, follow reasonably from new photographs of Venus made with ultraviolet rays by Dr. Frank E. Ross of Yerkes Observatory, but reported by Mount Wilson Observatory, the large telescopes of which were used in the work. Venus is surrounded, these photographs reveal, not merely by one layer of atmosphere, but by two. The upper layer, which is transparent and probably of very low density, like the upper atmosphere of the earth, is filled with billowy clouds resembling the very high cirrus clouds of the earth's air. Below this there seems to be a dense, impenetrable atmosphere of deep yellow color. The real surface of the planet remains invisible. If Dr. Ross is right about the yellow color of the lower atmosphere it follows that any sunlight which reaches the solid surface of Venus will be of deep yellow tint, containing no blue light at all and probably very little green.

Any creatures who live on the planet must have evolved, therefore, in light of this color and will have become adjusted to it, not to the relatively pure sunlight of the earth or of Mars.

(Continued from page 975)

tor" contains good science, but I doubt the possibility of segregating the third dimension. There has been quite a number of stories using the principle on which "The Eternal Professors" is based, but Keller's literary ability makes it the best of them. I wish more stories by H. G. Wells, E. R. Burroughs and Ray Cummings would appear. I hear that scientific stories are being filmed in Germany. I think that there are many such stories that would make fine films except for the difficulties in obtaining pictures or rather optical illusions for the photographing. Why wasn't "The Twenty-First Century Limited" printed on schedule?

C. Wanser,

2586 44th St., Long Island City, N. Y.

(This interesting letter is of a type which may be termed "helpful" to the editor. It is not only appreciation we are looking for but we wish to be helped, and it is such letters as you write that will help us to go in the right direction. Verrill and Dr. Keller are proving to be great favorites with our readers. Dr. Keller has written an immense amount in his lifetime, and has an appreciation of human nature outside of literature. You speak of printing on schedule. Sometimes crowding out or other causes compel us to postpone a story.—EDITOR.)

MORE ABOUT THE SCIENCE CLUB. AN INTERESTING ACCOUNT OF ITS PROGRESS

Editor, AMAZING STORIES:

Your kindness in publishing our letter in the AMAZING STORIES QUARTERLY is deeply appreciated by Mr. Gerson and myself. The purpose of this missive is to give the idea, organization, suggested improvement, etc., of the Science Correspondence Club as it stands today.

Our aim is to promote the advancement of science through intelligent discussion and the creation of new ideas among its members. Our qualifications for membership are: Sincerity, above all—ability to discuss leading science topics of the day, seriously and intelligently. Of course, now and then, little humorous and personal discussion are indulged in by the members to relieve the mind, after an intensive discussion on Mathematics—Structure of the Atom—and other topics. A President and Secretary have been elected, candidates for the positions of Treasurer and Librarian are nominated and are being placed before the members.

Starting 1930, the members will all be requested to pay \$3.00 annual dues. To make this point clear—in the period of this year all members writing to the President receive a complete list of correspondents, an application and a ballot containing several questions. Their questions, when all tabulated and the results known, will determine the ultimate organization of the club. For an example, I will quote three of the leading questions:

1. Are you in favor of a member Librarian with a Librarian and all circulation to be free, except for the cost of mailing and postage, which will be paid for by the member requesting a piece of literature, etc.?

2. Are you in favor of a \$3.00 a year dues to be instituted starting 1930?

3. Are you in favor of a small paper to be published by the Club and to be paid for out of the dues?

These are just three of the most important questions that are on the ballot form. I will now proceed to explain and enlarge these three questions.

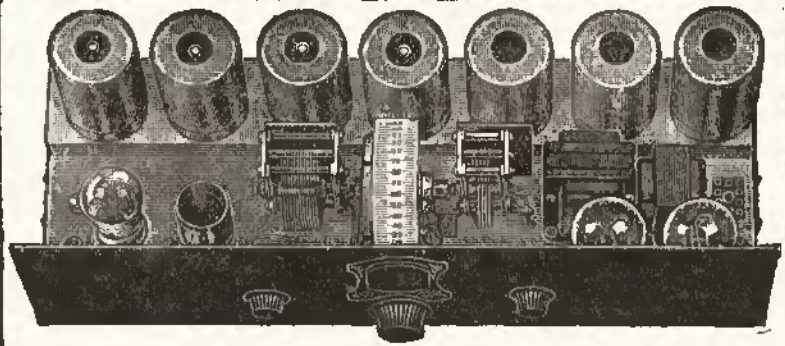
The Librarian is to be chosen by the members and his duties are to be to collect all clippings, books, magazines, articles, photographs, experiments and any other scientific literature he can gather. These are to be, it is hoped, submitted by the members who will keep close watch on their daily newspapers and local literature for anything of interest. All this material will be gathered, separated, tabulated and will be sent out to the various members upon request. The member will only be required to pay the postage and a small fee, which he will receive back when he returns the literature he has borrowed.

The dues which the member pays are to cover the cost of printing and circulating the club bulletin and also he gets a certain amount of the club correspondence stationery that he may use in his correspondence with other members. The remainder of this fund is to be placed in the treasury and will go to cover any expenses that may arise.

The paper does not need any explanation, as that will be given when the member writes to our President.

Our membership is increasing by leaps and bounds and now numbers over fifty. Among our members are included Dr. Miles J. Breuer (our

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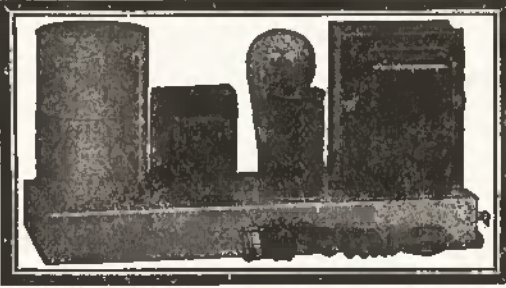
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advisor), Jack Williamson and David M. Speaker, all well-known authors. Again I issue a sincere request to everyone—members of the feminine sex are sincerely welcomed too—to write and help us out in our aim of getting two hundred members by 1930. We now have four young ladies in our club roster. We hope you give this letter a kind reception, Mr. Editor, and all scientification readers who are socially inclined. We again inscribe ourselves for the betterment of Science.

Walter Dennis,
Sydney Gerson,
c/o. 4653 Addison, Chicago, Ill.

(At last the Science Correspondence Club has materialized and we are delighted to get such a clearly expressed letter, showing how much has been done already for its organization. We wish it the very best of fortune. We publish this letter with utmost pleasure and give the club our very good wishes and will help it in the future all that we possibly can.—EDITOR.)

A COLOR PROBLEM. SWALLOWING FOOD AND LIQUIDS AGAINST GRAVITATION. LITERATURE IN STORIES. HELIUM BALLOONS. NOTES ON STORIES

Editor, AMAZING STORIES:

I have been reading AMAZING STORIES for more than a year and I can say that the magazine has come to fill an important place with me. AMAZING STORIES was the first magazine which printed a consistent supply of science.

I notice that many readers want you to change the name and the style of the covers of the magazine. This is my opinion on the subject—use your own judgment. No matter how you change the cover I am sure that you will not lose any old readers, so put the magazine out in the dress which you think will attract the most new ones.

The discussions department of the magazine is to my mind as interesting as the stories. Many of the letters show intelligent thinking; most of them show thought of some kind; all of them are interesting. I noticed especially a letter in the June issue by W. Warren Williams. He mentions the appearance of a deep blue color where a model airplane propeller was turning. I have noticed this phenomenon several times, always where the object that turned had several spokes or blades, such as a flywheel, an automobile wheel, etc. I can think of no way to account for this. The wheels could not turn fast enough to cause etheric disturbances of sufficient frequency to be visible; besides, only part of the circle turned blue, and the sun had something to do with it. I join with Mr. Warren in desiring the opinion of you and your readers on the subject.

I want to disagree with Teddy Projector, who in the August issue claims that gravity is necessary to eating. On several occasions I have swallowed liquids and even solids while standing on my head. To do this it is necessary to work against gravity. The act of swallowing, indeed the whole passage of food through the alimentary canal, depends not upon gravity but upon peristaltic muscular action.

In the September issue there is a letter by Gordon Lane which suggests lifting a ship by means of highly compressed helium. I am afraid that Mr. Lane does not understand the first principles of the balloon. The more the gas is compressed the greater is its density; the greater the density the less buoyant the effect. Otherwise Mr. Lane's unusual communication showed a good imagination. I would suggest that he write the story he implied, if he will brush up a bit on physics first.

A word as to the type of stories to put in the magazine:

I like them all, interplanetary, biological, astronomical, and what-not. By all means print stories with a good scientific background, but do not neglect the literary part of the story. I am in sympathy with Dr. Breuer, in the July, 1928, issue, in his plea for more literature in scientification.

How about some stories by Cummings? He ranks with Wells as one of the best. Also, let's have another by Smith and Garby, authors of "The Skylark of Space."

I have noticed the great changes you have recently made in AMAZING STORIES. They seem all right to me, but the magazine is almost completely changed. However, I will continue to read the magazine as long as you keep on printing scientification.

One more "brickbat." Miss Stone, in the second instalment of "Out of the Void," made the mistake of assuming that the velocity of a falling body depends on the weight. Galileo proved otherwise centuries ago. Otherwise the story was fine, but let's have accuracy.

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Some other recent stories that I liked were "Barton's Island," "Futility," "Danger," "The Grim Inheritance," "The Airlords of Han," "Phagocytes," "Into the Green Prism," "Buried Treasure," and "The White Army." The last was quite similar to "Phagocytes" but better.

Smith in "The Flying Fool" went to a lot of unnecessary trouble. Why didn't he reach down, take hold of his boot-straps, give a pull, and rise into the air? It is just as plausible. Nevertheless, the story was good. After all, the device didn't work.

The story about "Sam Graves' Gravity Nullifier" was out of place. There was no scientific background that I could see. It was more of a dissertation on business instinct than scientific.

I will now tell you the best way to run the magazine: just as you prefer.

Clyde F. Beck,
Lakeport, California.

(We certainly appreciate what you say about our magazine, that "it will never be given up by friends, no matter what the cover or name may be in the dim future." We are glad to know that you find the letters in the discussions columns interesting. Even those letters bearing criticism indicate that interest is felt in our labor by the correspondents. Your problem in color is not easy to answer. It is undoubtedly of a very simple origin, not involving disturbance of frequency or anything of that order. This may seem to be a feeble answer, but in all these cases the exact conditions have to be known to enable one to form even a good surmise. What you tell us about swallowing, head downward, carries out what, in our answer to Mr. Projector's letter, we stated that the editor had seen. That was a great many years ago, but we certainly saw what we described and it is exactly what you tell us you have done yourself. The helium question, of course, was wrongly treated by our correspondent. There is nothing magical about helium. When compressed, it will not have its lifting power increased, but on the contrary its lifting power decreases regularly as it is more and more subjected to pressure. We absolutely agree with you about literature in stories. If a man could describe in good literature what he sees out of a window, it would make good reading, so true is it that style in writing is everything. Remember that the gentleman whom you wanted to lift himself by his boot-straps was put down in the name of the story as being a fool.—EDITOR.)

A COMPLIMENTARY LETTER WHICH IS MOST ACCEPTABLE

Editor, AMAZING STORIES:

I am at the present moment buried in "The Chamber of Life." I cannot wait until I have completed it to inform you that it is one of the most interesting, fascinating and instructive stories that I have "tasted" for a long time. I am constantly reading AMAZING STORIES. I revel in them—devour them.

I have just finished "Death from the Skies" and it, too, was extremely good. It was well written, very convincing. However, I believe "The Chamber of Life" excels it.

Oh—I do hope that you will continue to give us as good stories as you have so far. I will admit that I was a little disappointed when I saw Hugo Gernsback's name disappear from the pages. I was correspondingly surprised to see him blossom out in "Science Wonder Stories" too, and promptly obtained a copy, and I am thankful to learn that we have not lost a good magazine by his departure from AMAZING STORIES, but we lovers of scientification now have two magazines monthly to feast on. Fine! The more the better.

Who cares about the paper?

Who cares about the cover?

They have both become very familiar to me and I could tell AMAZING STORIES a mile off, upside down. It's what is inside that counts—no doubt about it.

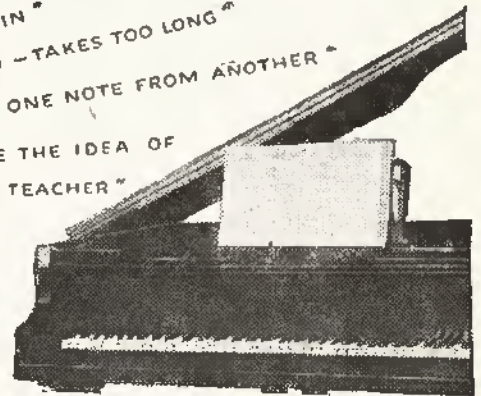
Evelyn L. Norman,
5614 N. Campbell Ave., Chicago.

(You need not be afraid that the quality of our stories will deteriorate. We have a most able staff, as we may venture to call them, of short story writers and have already accumulated a number of excellent pieces of literature, which as they appear in our columns, we are sure will please you. The editors are greatly cheered by such letters as yours and they would certainly be very much hurt if they would receive unfavorable criticism one-half as bitter as your criticism is in the other direction—that of good appreciation.—EDITOR.)

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VARIOUS CRITICISMS OF STORIES IN OUR AUGUST ISSUE

Editor, AMAZING STORIES:

I trust that you will not lose patience at the frequency of my letters, for to me the August issue of your magazine contained so many excellent targets for brickbats and praises that I could not resist the temptation to inform you of them.

"Out of the Void," by Leslie F. Stone, I consider the worst serial you ever published. I wonder if its author knows that a planet the size of "Abrui" would cause certain changes in the orbits of Uranus and Neptune which would lead to its ultimate discovery. If the theory that the planets were thrown off by the sun were true, then "Abrui" would contain only the lighter elements, and radium is very heavy. For this reason, and obvious others, the satellite sun is an impossibility, especially the part about its coming to life. Because of their range the death rays would have to consist of vibrations with disintegrating powers, and a substance at absolute zero would be their only hindrance. On the whole, it may be an excellent love story, but it has no place in AMAZING STORIES.

It would have been better if Captain S. P. Meck had left infinity out of his "The Red Peril." A number which when multiplied by zero will equal some integer, is not possible on the scale of ten, if we consider negative numbers to be less than zero and apply algebraic laws to them, since

$$1 \div 2 = \frac{1}{2}$$

$$1 \div 1 = 1$$

Larger than zero.

$$1 \div 0 =$$

$$1 \div -1 = -1$$

$$1 \div -2 = -\frac{1}{2}$$

Smaller than zero.

Otherwise it was an interesting tale. In "Gold Dust and Star Dust," by Cyril G. Wates, the second dimension is again resorted to. What would bodies of such dimensions be composed of?

The others, especially "The White Army" by Dr. Daniel Dressler, seemed to be appealing and scientifically correct stories.

If Jos. E. Vincent in the August discussion columns does not believe in the "solar system theory," i.e., that an atom has its electrons and protons arranged and composed on the same basis as our solar system, what then does he take as the composition of electrons and protons?

James E. Suiter,
 751 Bergen Ave., Jersey City, N. J.

(A number of our correspondents have expressed admiration for Leslie F. Stone's story "Out of the Void." We only hope that you consider our other material so good that even if this were the worst it still might rank as a good one. In your little equations you do not give the result of dividing 1 by 0. This, of course, is infinity, certainly much greater than zero. As regards the second dimension or two dimensional objects, imagine a body subject to the Lorenz-FitzGerald contraction going through space with the velocity of light. It would have lost its length but would retain its width and breadth, so there you would certainly have an object of two dimensions. As regards the "solar system theory" of the atom, this may all be changed in the near future. Chemistry is in a very rapid process of growth and of wonderful development. Recently we read of the division of the hydrogen molecule, and later still of the hydrogen atoms into two parts, two different elements. All branches of science are in a state of a flux generally, let us hope, in the way of advance. We certainly are theorizing very vigorously in all branches. It is even said that the division of hydrogen into two elements was preceded by calculations resembling in intricacy those of Professor Einstein.—EDITOR.)

WEIGHT IN AN INTERPLANETARY VESSEL

Editor, AMAZING STORIES:

In reading the "Discussions" column in your October number I noticed that Mr. Whitfield Potter asked whether a person in a space-flier would be without weight or whether he would retain his normal weight. To me, an engineering student, this would obviously be a problem in inertia. In other words, his weight would depend entirely upon the acceleration of the vehicle if he were screened from gravitational influence. If he were not, he would retain his normal weight plus the weight due to acceleration. At great distances from any heavenly bodies the effect of gravitation on him would be very small. In a rocket type of vehicle his weight would be only that produced by acceleration. In a vehicle of the anti-gravitational type the acceleration would necessarily be small, if not zero, so he would weigh practically nothing.

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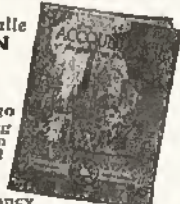
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In a projectile, as in Verne's "From the Earth to the Moon," he would be a freely falling body, after leaving the Earth's atmosphere, as would the projectile, and as such would have no apparent weight.

I have been a reader of AMAZING STORIES for several months and personally would not ask that you make any changes in your magazine, even though most of your stories must be taken "with a grain of salt" at the present time, at least.

George Eastman,
Hibbing, Minn.

(In your letter you apply the term weight to pressure due to acceleration, but it is perfectly fair in a general way to apply the word "weight" to the sensation of acceleration, although it may not be due to gravitation. In a colloquial way it is quite permissible. But it is not quite right to speak of weight due to acceleration, for it is really pressure, not weight. In any of these vehicles, rockets or otherwise, the man's weight would diminish as he left the earth, but as long as he was within the range of terrestrial gravity, he would possess weight which would rapidly diminish as he got out beyond the sphere of its intenser action. But towards the end of the letter you speak of the man having no apparent weight and here you are right, because the weight would be there although it might not be felt by any of the travelers. You certainly must take our stories "with a grain of salt." If our authors did not use their imagination, our stories would be dry indeed.—EDITOR.)

A SUPPLY OF BACK NUMBERS OF AMAZING STORIES

Editor, AMAZING STORIES:

Several times in your discussion columns I have seen where readers have desired back numbers of your magazine. I have all the copies of AMAZING STORIES since the first issue, Vol. 1, number 1, of April, 1926, to the current issue, with the exception of March, 1927, and July, 1929.

They are in good condition and I would like to dispose of the entire lot at a reasonable price.

If you will publish this letter in your discussion column it will be greatly appreciated.

J. Fred Seitz,
2502 Dulany St., Baltimore, Md.

(We are sure that this letter will interest many of our readers, who wish to get back numbers of AMAZING STORIES.—EDITOR.)

THE BEST ON THE STANDS

Editor, AMAZING STORIES:

Have just laid aside the October issue of A. S. and have only one comment to make. It is just like all the others—"the best on the stands." I have read A. S. since the first issue, including the ANNUALS (now no more) and the QUARTERLIES, and expect to keep right on reading them as long as they are published.

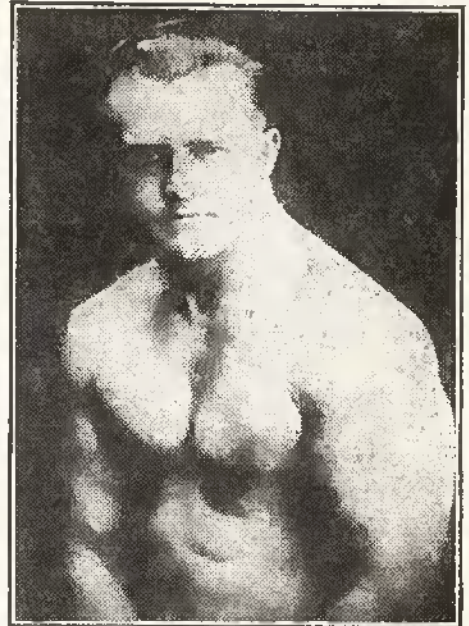
I wish to agree heartily with Mr. G. Setel, Alhambra, Calif., that slurring of other magazines usually indicates a narrowness of character and shows that, quite possibly, the same person may write other magazines and slur this one.

In his comments on stories I take particular note of the fact that Mr. M. Miller, 1439 Southern Boulevard, terms several of the stories "wild, impossible, utterly fantastic," and other similar words. Will Mr. Miller kindly explain just how he can be sure of his facts? "Remember Jules Verne"—is all I have to say. Another thing—don't be so sure that everyone likes or dislikes the same stories as yourself. As to whether "The Skylark of Space," while traveling at the rate of a billion miles a second, should have crashed into other planets, comets or stars, remains to be seen. I class "The Skylark of Space" as one of the best stories ever published in A. S.

Once again, good wishes for A. S. and give us the sequel to "The Skylark of Space" soon.

Milburne O. Sharpe, R. E., E. E.
202 Gloucester Ave. East, Middlesboro, Ky.

(We repeatedly have emphasized the danger of saying that stories of the future are impossible. Very wonderful things are yet to be done on this earth, although it sometimes seems as if man had done as much as possible already in the comparatively short space of the last hundred years. We certainly think the world is wide enough to absorb more than one magazine in its own field and we will always avoid, if that is the proper expression, anything critical of our competitors whatever our private opinion may be. Everybody does not think alike.—EDITOR.)



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If You Were Dying To-night

and I offered you something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. Tomorrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will start to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance!

A RE-BUILT MAN

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, lanky chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy, the kind that fire you with ambition and the courage to tackle anything set before you.

ALL I ASK IS 90 DAYS

Who says it takes years to get in shape? Show me the man who makes any such claims and I'll make him eat his words. I'll put one full inch on your arm in just 30 days. Yes, and two full inches on your chest in the same length of time. Meanwhile, I'm putting life and pep into your old backbone. And from then on, just watch 'em grow. At the end of thirty days you won't know yourself. Your whole body will take on an entirely different appearance. But you're only started. Now comes the real work. I've only built my foundation. I want just 60 days more (90 in all) and you'll make those friends of yours who think they're strong look like something the cat dragged in.

A REAL MAN

When I'm through with you, you're a real man. The kind that can prove it. You will be able to do things that you had thought impossible. And the beauty of it is you keep on going. Your deep full chest breathes in rich, pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge, square shoulders and your massive muscular arms have that craving for the exercise of a regular he man. You have the flash to your eyes and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle fellows. If you doubt me, make me prove it. Go ahead. I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them, I will do for you. Come then, for time flies and every day counts. Let this very day be the beginning of new life to you.

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Shoal Waters

Wherein Young Channing Meets the Toughest Trio North of Rio—



Old Pawlins

A Desperate Gang of Bootleggers Dare Everything to Run Uncle Sam's New Coast Guard Blockade

THE beam of the searchlight moved in a wide circle as Ensign Channing followed its course with his binoculars. The Coast Guard cutter was running parallel to the shore and several miles out. They had run south from Cape Fear River to Snake River Inlet and were heading back to the station.

Old Pawlins was standing beside the ensign.

"The sea is running high tonight. Good night for the rum runners to try to make a landing," he said.



"His gun, thank God, was still dry"

Bart Channing nodded. He could feel the boat riding the huge swells as he watched the white caps, iridescent in the stream of light.

"It was on a night like this that Lieutenant Hogan made his capture," said Fleming.

Always Lieutenant Hogan, Channing thought. He heard of nothing but that capture since he joined the Coast Guard Station. Hogan himself seemed to feel superior because he was an Annapolis graduate, and more than once he had spoken in slighting terms of the Coast Guard Academy from which Bart Channing had recently been graduated.

"Look! To the starboard!" shouted Carey from his position beside the electrician on top the small cabin.

"She's a rum runner, and one of them fast ones." Pawlins exclaimed, looking at Ensign Channing.

Channing cursed himself as he picked the speeding rum boat up through his

glasses. While he had been thinking of Hogan these enlisted men had located the boat with their naked eyes. He removed his glasses and figured rapidly.

"They're heading for Dead Man's Inlet," Fleming cried, waiting nervously for commands.

Dead Man's Inlet was one of the numerous indentures which dotted the Carolina coast. The water at its entrance was rough and its mouth was jammed with islands. Several narrow, winding creeks flowed out of it through the heavy brush of the swamp. Once lost in that inlet, the rum boat would be safe.

"Stand by to fire," Channing ordered.

So begins but one of the great rip-roaring stories of he-man adventure to be found in the **NEW BRIEF STORIES** for January. Get a copy today from your nearest news-stand and follow Channing and his shipmates through the most bewildering experiences ever to happen to a Coast Guard crew.

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Channing

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which an African missionary stumbles upon King Solomon's fabulous wealth and the fight of his life; and "Flying Gold," involving a thrilling fight in the air for a fortune.

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"He shoved her hard apart, and in a split second the boat was half filled with water"



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AN INTERESTING LETTER WITH VALUABLE SUGGESTIONS FROM AN ENGLISH READER

Editor, AMAZING STORIES:

I have been the delighted reader of your publication AMAZING STORIES for some considerable time and can wish for nothing better in the way of interesting literature. There can be no doubt that your magazine is exceedingly popular over here, as my agents have been frequently sold out and have sent for further copies.

One of the most interesting parts in your magazine is the "Discussions" portion and I trust that you will not cut this down, as some of your readers wish. The varying criticisms which people put forward, for and against your stories, prove that they are interested in its welfare and their excellent scientific arguments in some cases have amazed me, to say the least.

I, of course, have some brickbats to throw as well, and these few I have outlined below.

(1) Stories which bear a distinct relation to one another in regard to their setting should not be published. By this I mean stories like "The Master Ants," "The Seventh Generation," etc., are too much like Wells' "Time Machine" to be fair to Mr. Wells, who was the originator, and whose story was by far the best.

(2) Can you not make the short stories in the MONTHLY editions a little longer? The short story has the disadvantage that good scientific facts have to be crowded together so much that the actual plot around which the whole thing is evolved is lost.

(3) I am afraid that I must join the ranks of those who pray for more illustrations occupying a half page. It would be as well to increase the number of your artists so as to give more variation, but I think Mr. Wesso has done some very excellent work.

Now for a word or two on the stories given so far. For sheer originality, I think the conventional biscuit must be handed to Mr. Hamilton, whose stories "The Comet Doom" and "Locked Worlds" were the finest I have ever read. A close second comes "The Second Deluge" by Mr. Serviss, who has apparently ceased writing; perhaps you can persuade him to write another. I was glad to see my old friend E. R. Burroughs again and I trust that we shall hear more of him again. Mention must also be made of "The Moon of Doom," "The Yeast Men," "The Metal Man," and many others whose originality puts them to the fore.

A story which I believe that your readers would like is "A Voyage to Arcturus" by Herbert Lindsay. It deals with Interstellar travel in a thought machine and the evolutionary changes which the travelers find on a planet of Arcturus are astounding. This was one of the best books I had read before AMAZING STORIES came to my notice.

I have observed in your "Discussions" columns that some of your readers proposed that you should publish some of your best narratives in book form. This, I think, is very commendable and a library of books of this sort would be well worth having. The stories should be first published in the two magazines and the general consensus of opinion should be followed in choosing those which are to be published.

These should be published monthly and as other libraries such as "Bennis Sixpenny Library" and "The Readers Library" over here have an enormous sale, there is no reason why "Amazing Stories Library" should not thrive equally well, perhaps at a higher cost per volume and a better binding.

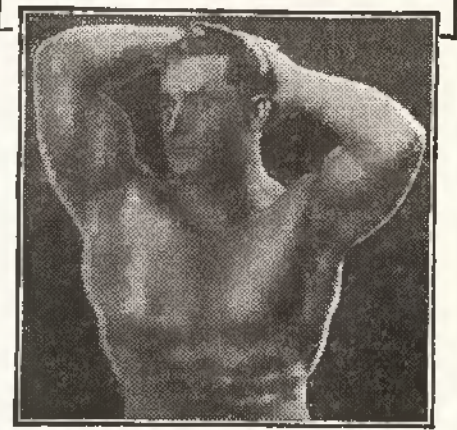
I am afraid my enthusiasm has run away with me in writing this long letter, which is an unprecedented occurrence with me, but your stories certainly warrant the extra praise I give them.

I wish you every success with your publications which have started so well and I trust that you will eclipse yourselves in an effort to make AMAZING STORIES even better for the future.

J. G. Strong,
5 Barston Road, West Norwood, London, Eng.

(We are always very glad to get foreign criticisms, especially such as yours, which speak for themselves. You have joined other critics in expressing your disapproval of so many short stories, but unfortunately there are many who are not satisfied with a small number in each issue. We tried the other system, but we have found that our readers objected to it. We have a great many artists now working for us, and our trouble is to decide which is the best, because each one has his own field, his own definite merits, and we think it is quite interesting to have interpretations of our stories by various artists. The writer certainly

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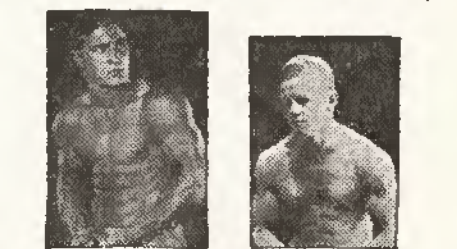


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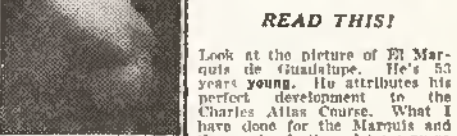
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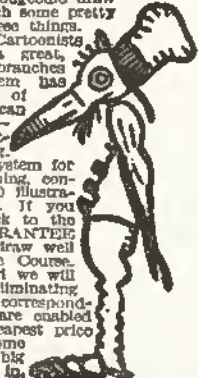
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hopes that eventually we shall publish some books based on the best stories we have published, but this is still in the future. With regard to making our magazine better for the future that certainly is our constant effort, and we think that perhaps you will come to the conclusion that we have succeeded in improving it in the past.—EDITOR.)

LIKES AND DISLIKES IN GOOD MEASURE

Editor, AMAZING STORIES:

The cover picture of the September issue was very good. I hope you will have Mr. Wesso draw most, if not all, of the pictures. He's the best of all. I do not like so many artists drawing for one magazine. I would like to see more full-page pictures as of old. I would rather see the titles over the first page of the stories instead of partly over the pictures. I liked the old style of letters in the titles best. AMAZING STORIES as you have it now reminds me of a certain detective story magazine. I do not like it. The stories are all right. "The Red Peril," by Capt. S. P. Meek, U. S. A., was very good. "Gold Dust and Star Dust," by Cyril G. Wates, was second to it. Your line-up for the next issue has a good list of authors, and I'm expecting a good October issue. When will the sequel to the "Skylark of Space" appear in AMAZING STORIES? I would like to see "Tarrano the Conqueror" and "The Man on the Meteor" by Ray Cummings appear in AMAZING STORIES. Do not change the name, as it is good enough. I am glad that you are increasing the reading material in AMAZING STORIES and I hope you will continue to do so. In the first issue you had 91 pages of reading, not counting the full-page pictures. Now you have about 75. Will you ever have as much again?

Jack Darrow,
4225 N. Spaulding Ave., Chicago, Ill.

(Mr. Wesso is now doing very good work. He has assimilated our ideas and is a great accession to the paper. We rather like the idea of having a number of artists. The sequel to "The Skylark of Space" will be given probably early next year. As for the coming issue, we hope you will not be disappointed. Not only were the names good—we believe the stories justified the heralding. We are still working on further improvements.—EDITOR.)

A QUERY ABOUT INTERPLANETARY STORIES

Editor, AMAZING STORIES:

I have been reading AMAZING STORIES for about a year and naturally want to visit your "Discussions Department." A few weeks ago I received my copy of "The Vanguard of Venus," by Landell Bartlett. What did the Spanish girl mean (if she was Spanish) when she wrote on the note "India is safe"? Did she mean that India alone amongst all the other nations of the world is safe from the slavery of the Venerians? That hardly seems possible. Anyway, that gives me some relief.

Next thing I want to know is why all fiction writers declare that the inhabitants of Venus, Mars, Jupiter, Saturn and other planets have a higher civilization and are more advanced in science than we are, for example "Mernos," by L. C. Kellenberger.

By the way, I recently bought the August issue. "Barton's Island" by Harl Vincent was an exceptionally good story. It was the only story in which I was much interested. "Out of the Void" by Leslie F. Stone was also a good interplanetary story, but I like stories of distant future better. I am sorry that your artist Paul does not draw the pictures for your magazine. Will you give the name of your new artist?

Why don't you reprint some of the best stories of E. R. Burroughs, S. A. Coblenz, D. H. Keller, E. Hamilton, H. Gernsback, H. Vincent, H. G. Wells, A. Merritt, F. Flagg, A. H. Verrill, Marius, E. E. Bell, C. White, L. Senarens, G. P. Serviss and P. F. Nowlan?

Mangho Anandings,
Box 2096, Manila, P. I.

(You will find in some of our stories about Interplanetary life (life on the other planets of our system) that very disagreeable attributes are given to the inhabitants of these distant orbs. You will find the names of our different artists printed in our magazine. We feel that we have some of really unique qualities in their work of carrying out the ideas of science of all kinds in their illustrations, something which it is not easy to find men to execute. As far as reprints are concerned, we have so many good original stories that we feel that we have little room for reprinting old ones which are more or less accessible elsewhere.—EDITOR.)

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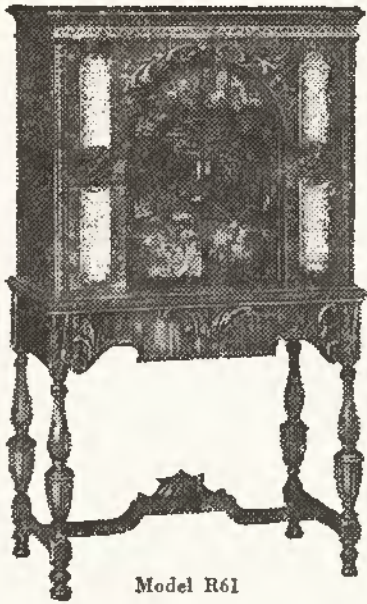
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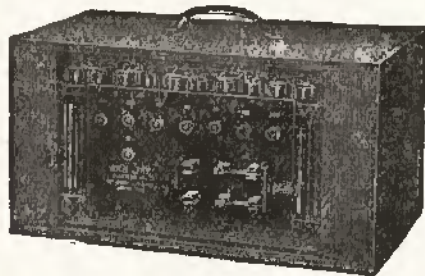
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AN ADMIRER OF A. HYATT VERRILL'S STORIES. NAMES OF SOME FAVORITE STORIES

Editor, AMAZING STORIES:

Having just come upon the criticism by Mr. Ladig in your August issue, which concerns your excellent contributor, A. Hyatt Verrill, we feel that we must come to the defense of our favorite author.

Mr. Ladig states that "The World of Giant Ants" holds no appeal for him because it is not based on facts. Since this story is but a treatise on the habits of ants, presented in the most absorbing manner possible, we conclude that Mr. Verrill's method of merely enlarging their physical appearance, makes the story, in the critic's estimation, unfit for your publication. By "facts" we conclude that Mr. Ladig means literal records of true events. Therefore, we advise him to scan the contents of a physics textbook, for that is the type of fiction he craves.

"The World of Giant Ants" is the finest achievement in AMAZING STORIES' long list of successes. Mr. Verrill's handling of a subject which holds no interest in its original form for the average reader, has undeniably created a masterpiece. We were completely absorbed from the opening sentence to the last word. After completing this narrative, we felt that, unlike other scientific fiction, we had gained a lasting knowledge of the subject, which was Mr. Verrill's chief aim; besides, we got a thorough enjoyment from the story itself, and are eagerly awaiting Mr. Verrill's next endeavor.

Another story we wish to praise to the skies is "The Sunken World" by Stanton Coblentz. The fine idealism of the author was reflected throughout, and apart from the scientific element in the story, we feel that a great many people would do well to compare the perfection attained by this mythical world with our supposedly civilized state.

"The Space Bender," "The Murgatroyd Experiment," "The Red Peril," "The Yeast Men," "The War of the Worlds," "The Time Machine," "Into the Green Prism" and "King of Monkey Men" were other outstanding stories.

Some of your stories end too abruptly and spoil the effect. In other instances, the plot of the story is submerged beneath an abundance of technical details after a good beginning. However, we suppose that a writer of scientific fiction cannot be gifted with these other qualities in addition to his technical knowledge. Therefore, when such authors as A. Hyatt Verrill, H. G. Wells, Stanton Coblentz and Dr. David H. Keller are found to possess all of the desirable qualities, we are anxious to see them represented in every issue.

We wish AMAZING STORIES and its contributors continued success.

B. Herbert Greenhouse,
George I. Levitus.

(Our readers will find that Mr. Verrill's story about the large ants is really a deep study in entomology and an attempt to dissect the character of different kinds of ants, for the time has now come when we really have to assign to these wonderful insects a character of their own. If our authors were to be pinned down to plain, dull facts, their work would be as dull as the subjects. We must allow imagination its full sway and we must remember that imagination has done a great deal for natural science. Mr. Verrill, we admit, is inclined to give a very free reign to his imagination, but the charm of his stories consists in their combinations of literary qualities with his knowledge of science, especially of archeology, entomology, and ethnology, and we shall have a great deal from his pen. Dr. Keller and Mr. Coblentz we regard as authors on our staff. Mr. Wells we have not used recently because we have so many good stories on hand, which are entirely original, that we dislike using reprints, to any great extent for the present.—EDITOR.)

THE AMENDE HONORABLE

Editor, AMAZING STORIES:

Wish to retract a criticism of one of your artists sent to the QUARTERLY some time back. Artist Briggs obviously is familiar with scientific apparatus. I made the error of basing my criticism solely on one picture. All due apology to Mr. Briggs.

Burrie Cunningham,
Springer, New Mexico.

(We are sure that Mr. Briggs will appreciate this letter. We think that he has done very well indeed with the representations of scientific apparatus which forms an important part of our pictures.—EDITOR.)

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**INTERPLANETARY STORIES. THE NAME
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Editor, AMAZING STORIES:
I have been a reader of your "wonderful magazine" for one year, and think it is about time I woke up and gave you a piece of my mind. What your magazine lacks is another interplanetary story to each issue. In reading your "Discussions" I have seen where some readers want you to change your, or rather "our magazine's" name. I think it is all right as it is. The name of our magazine is AMAZING STORIES, but I don't see anything amazing in some of the stories you print in it. Keep it up to its name and print something amazing.

Now about some stories; the best story I ever read was "The Skylark of Space." One particular story I did not like was "The English at the North Pole." It does not belong in our magazine at all. Some of your stories do not end right, such as "Sam Graves' Gravity Nullifier." You should go on with the story and tell us what it was used for and if it was a success or not.

Some time ago you promised to publish a sequel to "The Skylark of Space." I don't see it coming. After all these brickbats I think you deserve at least one bouquet.

Of all the magazines I ever read (and I have read a great many), AMAZING STORIES stands out as distinctly as the Woolworth Building would stand out on the Sahara Desert.

Anthony DeFusca,
625 Bainbridge St., Philadelphia, Pa.

(Undoubtedly it is not easy to have all our stories amazing, but as long as you call it "our magazine" we will feel that it has a good friend in you. As editors we cannot help feeling a personal relation with its readers, and from that standpoint we are most desirous to please them, and we feel that we can flatter ourselves by feeling that we are pleasing many readers like yourself. The sequel to "The Skylark of Space," has been promised us by the end of this year. The bouquet you fling is most acceptable, and is appreciated by us.—EDITOR.)

**A MERE GIRL WRITES US A LETTER,
AND A GOOD ONE**

Editor, AMAZING STORIES:
This is another letter from a mere girl, I am seventeen years old, and have been reading AMAZING STORIES for about a year. I'll say they're great. What we want is more interplanetary stories and less detective stories. I think that most of the other girls will agree with me in that respect. By interplanetary stories I mean the ones like "The Skylark of Space," "The Second Swarm," "The Moon Men," and the story that you published in your latest Quarterly, "Venus Liberated."

Speaking of "Venus Liberated," I do not see that it is possible to exchange thoughts as the Venusians did with the terrestrials. It is my opinion that only pictures would come from such an intercourse instead of words. Another thing that I have to criticize in the story is that the author made a few errors in the astronomy of it. If the satellite in the picture, Kellos, was situated at the distance of 1,000,000 miles as stated, it would not have lasted one revolution. Instead, it would have fallen into the sun. I do not know at what distance the sun's attraction becomes greater than that of Venus, but I do know that it is around 400,000 miles.

Apparently, Harl Vincent is ignorant of the fact that the finding of a planet or satellite by mathematics has been accomplished only once; in the case of Neptune. Still, the old professor Timken, after a few hours' work, had not only found that satellite, but had actually seen it. In several other places in the story there are other mistakes like these. Please try and correct them.

It might interest you to know that I have bought a three-inch telescope since I first became interested in astronomy through AMAZING STORIES.

Barbara Baldwin,
566 College Ave., S. E., Grand Rapids, Mich.

(You are pretty safe in concluding that neither words nor pictures will ever go "on the ether" between the earth and Venus. Harl Vincent is a scientist of reputation and was quite justified in having the astronomer in his story make an astonishing calculation. He is not tied down to Leverrier. Besides, as the author says, "Prof. Timkin was a clever fellow." It will interest you to know that you are not the only one of our readers who has started in practical astronomy. Personally, we think that Kellos was safe enough for a romance or tale of fiction.—EDITOR.)

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Editor, AMAZING STORIES:

I started reading your magazine about four years ago and up to now I have had every issue. I would like to say a few things about the magazine. In some of your issues your stories are too short, as soon as you get interested in a story, it ends. For instance in your July issue, I may cite "The Space Hermit." There were really no adventures in it. Could you not have had them go somewhere instead of just wandering around? The author could have had them go to some Planet and have some adventures there before ending the story. Myself, I like rather long stories. I don't know about your other readers. How about more interplanetary stories? They are the best variety of story I have ever read.

The "Skylark of Space" was the best interplanetary story I have ever read. How about some more like that from Smith & Garby? They have the right stuff. I also like some of those stories you publish about trips and adventures in the future; let's have more of those, too.

Here's a thing that has been asked for quite a lot, and that is, to put two issues a month out instead of one. It feels like a year in between each issue as you have it now, instead of a month. You should also have a better grade of paper in your magazine, and leave the cover of it the same.

I like it the way it is.

W. Higgs,
501 33rd St. W., Saskatoon,
Sask., Canada

(When our magazine was started some of the numbers contained very few stories. It was at once recognized that this was a defect, and now we give more. What we try to do is to give one rather long story and then fill up with others which are shorter. You will find that some of the O. Henry stories which were widely celebrated were extremely short. We think you will always have plenty of interplanetary stories. The trouble with them is that they inevitably develop impossibilities; that has to be submitted to, because they have excellent science also. We are very glad to get your approval of our cover. We are giving great attention to the designs and we are sure you will continue to like them. Two issues a month we fear would be too many for some readers.—EDITOR.)

OUR YOUNGER CRITICS. THEIR OPINIONS ARE DESIRED BY THE EDITORS

Editor, AMAZING STORIES:

This is my first attempt to make myself and my opinion heard in Discussions. I probably would not have written this had it not been for the fact that I chanced to see what seems a very unjust letter denouncing criticism from immature youths. I myself am seventeen and feel quite sure that no small percentage of your readers are of about the same age, because who, after all, are the inventors and explorers of tomorrow if not the youth of today, and so, who has a better right to take advantage of such a wonderful department as your "Discussions" column.

With such a magazine as AMAZING STORIES a department such as this is indispensable, for where else is one to let off steam from the hours of thinking and dreaming which your magazine provokes?

Undoubtedly you think by this time that I have a colossal nerve to write a letter in such a tone, but I assure you it is not meant as a sarcastic or dictatorial one, but just as a slight protest from a youth, for after all, youth must be served.

Walter Faust,
181 Wyckoff Avenue,
Brooklyn, N. Y.

(We wish that we knew what letter you refer to. We presume it is Mr. Vernon's contribution. Certainly we desire criticisms from immature youths, because they are our readers to a very large extent, and it is they, as well as the adults, whom we wish to please. Write to "Discussions" as often as you wish, and we will be delighted to give your letters full attention. But we do denounce unjust criticisms from young or old, because we are doing our best to give you a thoroughly good magazine and our list of authors is such that there is no reason why you should not be getting the best.—EDITOR.)

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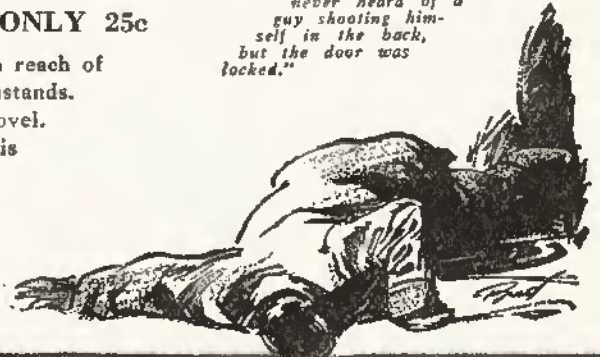
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A LETTER OF VARIED COMMENT

Editor, AMAZING STORIES:

At last I am taking the liberty of contributing to the "Discussions" Department of my favorite magazine, the pioneer of scientification. It was the first edition of the AMAZING STORIES QUARTERLY which attracted my attention originally, and "The Moon of Doom" made me a constant reader. I haven't missed a story since, and even obtained copies as far back as August, 1927, but have not come across a story to surpass it, although many equal it. I would be out of order if I did not remark on the name of the magazine I have come to look forward to each month. In my opinion, which is probably worthless, the name AMAZING STORIES is in no way descriptive of the contents of the magazine, which are of an entertaining scientific nature. I'm sticking by AMAZING STORIES to the finish, which termination I hope will never come about. I have always considered Mrs. Clare Winger Harris deserving of the highest praise for her originality, but I find the "Diabolical Drug" to be nothing but a combination of Wells' "The New Accelerator," and Starzl's "Out of the Sub-Universe." However, I enjoyed Mrs. Harris' treatment of the theme much more than that in Wells' story. "Below the Infra Red" was an outstanding piece of scientific literature in fiction form, as were also "The Sixth Glacier," "The Sunken World," and "Ten Million Miles Sunward." As I read your magazine more for entertaining instruction than for scientific research, I will not deign to prove or disprove any theories contained in these stories. What's the matter with all the readers of the "Vanguard of Venus"? I have only read one comment on this unusually fine story so far, and I think this an injustice to the author. Let's have more stories from the pen of Mr. Bartlett. Please disregard the pleas of the semi-monthly fanatics, as the QUARTERLY fills the gap in excellently.

George Bowring, 339 Newland St., Los Angeles, Calif.

(The editorial staff, with the exception of one member, has not been changed. The "Discussions" column is being taken care of by the same editor who has always had it in charge. Mrs. Harris, who is a favorite of ours, will be very much pleased when she sees how highly you estimate her work; we believe that we were her discoverer.—EDITOR.)

A CORRESPONDENT WHO HAS ENJOYED EVERY STORY WE HAVE PUBLISHED

Editor, AMAZING STORIES:

I have purchased copies of the monthly, QUARTERLY and ANNUAL ever since their birth. I can honestly say that I have enjoyed every story in the above mentioned magazines, especially the monthly.

The authors I like best are Jules Verne, Dr. M. J. Breuer and H. G. Wells. In your July issue of the monthly in the story of "The Space Hermit" your artist, Paul, has drawn a picture showing the propeller of the plane to be absolutely motionless, while in the story it is supposed to be running at 1200 revolutions per minute.

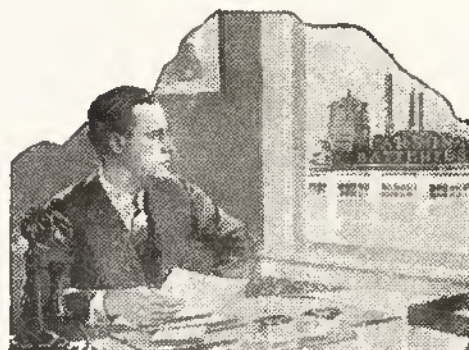
Robert Margolis, 214 Rutledge St., Brooklyn, N. Y.

(Of the authors you mention as your favorites, Jules Verne and H. G. Wells have been objected to by very many. We consider that you are in the right and that they are among the best, but the magazine of course is designed to please everybody and that makes a letter like yours most acceptable. We are sorry about the propeller of the plane acting so badly. We'll have to suppose that the hermit was taking a glide. The magazines you ask about have no connection with us.—EDITOR.)

A BRICKBAT FROM AN APPRECIATIVE READER

Editor, AMAZING STORIES:

I have been an ardent reader of AMAZING STORIES ever since I read my first copy, which was over a year ago. I enjoy your interplanetary stories and stories of the distant future very much and would welcome more of them to your pages. A few of the stories you publish mar rather than aid your magazine if you are to publish stories entirely of the Scientific class. Among these is Bob Olsen's story, "The Superperfect Bride." This story has no scientific strain whatsoever in it, and has no business in a magazine the type and quality of AMAZING STORIES. "The Evolutionary Monstrosity" is a disgusting piece of literature, if you would consider it literature at all. Besides



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other things, its science is lame in more than one particular. Evolution is determined by natural selection, struggle for existence and the survival of the fittest. It can not be accomplished by one individual in a short space of time; it must take the lives of hundreds of generations and vast areas of time to bring about as complete a change of internal and external appearances as described in this story.

On the whole, though, I think you have a truly remarkable magazine and I hope you will continue to publish as good magazines in the future as you have in the past.

John H. Bishop,
204 Fourth Street,
Falmouth, Ky.

(It is curious that a correspondent who voices such approval of our magazine should hurl such vigorous brickbats. We think in one way you are going too far in considering evolution a mathematically proved and definite thing. There is room for any amount of discussion on this subject. The whole story of evolution has not been written yet.—Editor.)

SOME GOOD ETHICS FROM A FRIENDLY READER

Editor, AMAZING STORIES:

I find a distinct (and agreeable) improvement in the last two or three issues of A. S., notably in cover designs, illustrations, editorials, stories, and proof-reading. And improvement denotes progress.

I find that in certain respects humanity has advanced but little during the past two thousand years. That it has (in general) lost sight of certain fundamental truths known even to the "ancient" philosophers.

This is an age of unrest, little true understanding, and irrationality, characterized by inordinate ambitions and desires; false motives; love of display; commendable qualities approximated and manifested (in many cases) only through a motivation of expediency; cultivation of intelligence subordinated to mere acquisition of knowledge, often irrelevant to purpose, or accomplishment; average mass intelligence low; general practical altruistic co-operation toward a desirable end, poor; etc., etc.

Not knowledge, but wisdom and power, are the ultimate goal to be attained.

Apparently, all life is progressively cyclical. That is to say, while it often appears that we are getting nowhere, such is not the case, but is only due to the length of our "journey," so to speak, and to its "ups and downs."

Virtue brings its own reward, if genuine and constant. To my mind, good will unto others is the greatest virtue of all. For practical purposes it can be made a doctrine, and a policy.

The greatest and biggest (mentally) president this country has yet had was a life-time advocate of that policy, and every citizen of the U. S. A. reaps the benefit of his wisdom through the unification of a recalcitrant South and a proud, stern-willed North. "In unity there is strength." And strength, combined with courage, intelligence and good-will, is conducive to a healthy state of self-respect.

Well, to get back to A. S. they are enjoyable, if not all that is to be ultimately desired. While not dripping with the quintessence of irrefragible wisdom, they are, on the whole, entertaining, and stimulating to a jaded imagination, and so fulfill, partially, at least, their purpose.

Best wishes for your continued success.

C. H. Osbourne,
San Francisco,
California

(We are pessimistic enough to agree with you in what you say about the slight improvement in humanity in the past twenty centuries. Just imagine a world in which people were only as good as common sense would tell them that they ought to be. Then we would have no law, the golden rule would be carried out, and without effort the world would be enormously improved. In testing the intelligence of enlisted men during the war it is understood that the mass-intelligence came out very low, and we certainly think that the present application of a multitude of laws to regulate humanity and the paternalism of the governments of the world shows that man certainly needs more intelligence, more character and less obstinacy and this applies to the government personnel. Our comments will not improve your letter—it expresses our ideas very closely.—Editor.)

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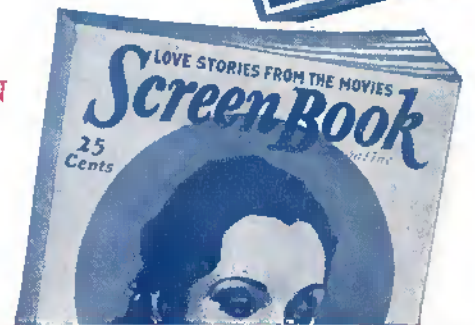
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