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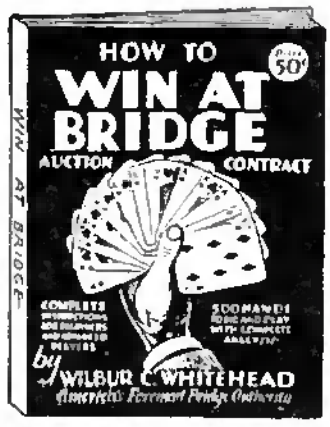

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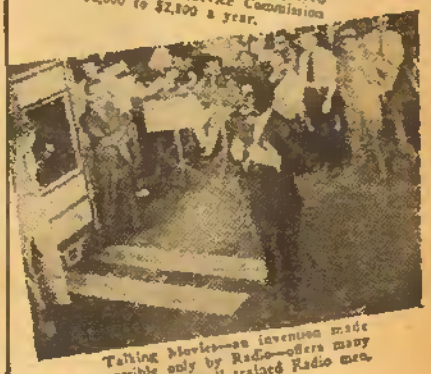

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AMAZING STORIES

Scientific Fiction

Vol. 5 December, 1930 No. 9

In Our Next Issue

THE PRINCE OF SPACE, by Jack Williamson. In the days of uncharted seas and sailing vessels, even piracy, now impossible, occasionally showed a benevolent streak. What such a career might prove to be in the air in future times, when more or less successful traffic between planets is established, we cannot foretell. But there are always two sides to every question—as our well-known writer proves in this beautifully written interplanetary novelette, complete in this issue.

VIA THE TIME ACCELERATOR, by Frank J. Bridge. While followers of Professor Goddard's theories and hopes are studying ways and means for the realization of rocket space travel, those scientists who believe with Einstein that time is a dimension are probably trying to find some manner of travel in time. If history and biography of past days contain so much that is fascinating, how much more absorbing would items of the future be? What our author dreams of for our earth a million years from now makes thrilling reading.

THE BEES FROM BORNEO, by Will H. Gray. The work of the Apiarist is important, for the bee is one of the wonders of the world. The very limitations that control them are most interesting, for there are many variations among them and the Queen bee is one of the miracles of the insect world. This story is somewhat reminiscent of "The Eggs from Lake Tanganyika," which appeared in our magazine some time ago. This is even more instructive and absorbing.

TANKS UNDER THE SEA, by Harl Vincent. Here is another Vincent story, done in his best manner. It might be worth while to think seriously about some of the theories propounded here in regard to such important items as atomic motors, radium, the miracle element, and the many kinds of rays, for our author is not only a writer of note—he knows his science, too.

THE DRUMS OF TAPAJOS, by Capt. S. P. Meek, U. S. A. (A Serial in three parts) Part III. There seems no end to the amazing developments to be found in this wonderful tropical hidden city, and there certainly is no let-up in the excitement and thrill contained in this concluding instalment.

And other scientific fiction.

In Our December Issue

Our Cover

this month illustrates a scene from the story entitled "The Second Missile," by Ed. Earl Repp, in which the Jamosians are shown hovering over the scientist, who has been made a temporary victim of the specially prepared formula, carried on the tips of their arrows.

Cover by Morey

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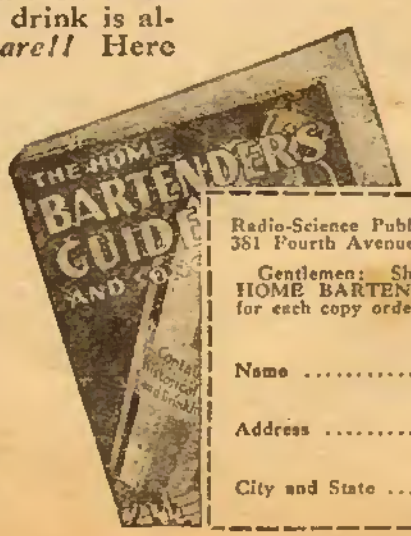

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VOLUME 5

AMAZING STORIES

THE MAGAZINE OF SCIENTIFICTION

DECEMBER, 1930
No. 9

T. O'CONOR SLOANE, Ph.D., *Editor*
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Extravagant Fiction Today - - - - - - - - - Cold Fact Tomorrow

Inefficiency in Engineering

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

IT is not going too far to assert that anyone who loses the faculty of astonishment has to that extent impoverished his appreciation of this world of wonderful achievement. In the travels of Gulliver, which is replete with sarcasm and bitter reproach of mankind for their foolish actions, we are told of Gulliver tied to the ground by the Lilliputians, little miniature men only six inches high. When they were ready they freed him from his bonds so that he could move once more. Is there any condition of things recalling, in a metaphorical way perhaps, the gigantic creature held tied and motionless until the time comes to release him, when he starts at once into motion, and is ready to traverse terrestrial space at the rate of twenty or thirty miles an hour? This is the launching of a ship, a Gulliver or more in size, built and powered by Lilliputian man and released from his bonds at the desired time. The person who can see a twenty thousand ton ship go down the ways into the water without a thrill of surprise, is lacking in the faculty of appreciation of the wonder of it all.

Here man surpasses the Lilliputians of the story for he has constructed his own Gulliver; Dean Swift's little people could only tie him as he slept. It seems as if the little creatures who built the *Europa* were astonishing in what they did and the ship was a sort of miracle. And one could go down the line and catalogue a vast list of things to excite our astonishment, but, with far too many of us, they fail to do this thing. It is the faculty of astonishment, which after all is a form of appreciation, that leads the great investigators of the world to their discoveries. But there is another side to the picture; there is something else to be astonished at, or rather many things. These things are the concrete evidences of the limitations of mankind, the inefficiency which marks all that he does in attaining such wonderful results in the fields of engineering and science. It shocks the engineering soul to think of the thousands of tons of coal it takes to get a great liner across the ocean. We stand by the railroad track and see the iron horse go thundering past at sixty or seventy miles an hour and are thrilled at the sight. But back of it all is the sad fact that the very roar of the monster means waste, and expends power uselessly. It weighs hundreds of tons, it pulls hundreds of tons of cars, but how many tons of passengers are in the great train? Probably no more than fifty tons of humanity, and this fifty tons is the useful load, the rest is waste and the creator of waste. Again we are surprised at the inefficiency of man.

We often see in the newspapers notes about some broadcasting station applying for permission to use more power. But how much of that power will be utilized in the receivers? The ignition of the tubes takes some power, but very little, and this little does not come from the broadcasting station but from the lighting circuit or from batteries. The great station, wonderful in what it effects, is a monument of inefficiency, so little of its power is used directly by the listeners-in. What interests them is the sound wave, and this needs almost an infinitesimal amount of power for its production. It is not a question of how much power is expended on the ether, all that is used and which figures as efficiency is what the receiving sets get, and the efficiency of the sending plant is to be measured by the power represented by the ether waves received by the hearers.

We cook on a gas or on an electric range. Unless we use as a partial palliation some form of fireless cooker, the heat expended in boiling a kettle of water is appalling in its waste from the engineering aspect. The fireless cooker helps, but that is all; it does not abolish waste by any means.

The old time candle and lamp were wasteful of power to an extreme degree; the old time open gas flame was about as bad. The Welsbach mantle increased the economy, but not to any approach to efficiency; the modern tungsten wire lamp is three or four times as efficient, but there is still a vast room ahead for the improvement of artificial light, from the side of efficiency.

The most efficient heat engine in principle is the internal combustion engine such as we have in our motor cars and aeroplanes and on the large scale on ocean liners. It is necessary for mechanical reasons to keep the cylinders cooled by water or air circulating around them. This cooling of the cylinders is a direct blow at the efficiency of the machine. It is the creation of waste, to use a homely comparison it is like the cow upsetting the pail of milk she has just given.

From the engineering aspect we use a shocking amount of coal to heat our houses. By using cheaper sizes of coal, buckwheat and one or two other sizes with a special feeding appliance we can save expense, but the efficiency is no better.

A crude illustration of inefficiency may be taken from a road. It represents capital, and this involves interest on the investment. Unless the road is full of vehicles it is inefficient. But from some points of view this form of inefficiency is to be desired as a sort of luxury. The modern crowded road affords little pleasure to those using it.

If we stopped to think about this feature of man's work we would have good cause for astonishment, but not of an agreeable kind. Man does wonderful things, but the pity of it lies in the wasteful ways he has to employ to get his results.

In war the inefficiency is appalling. Army officers may say that the object of fighting is to gain ground. But the gaining of ground is only done by killing men. A little pinch of strychnine will kill a man instantaneously. But in war it takes tons of lead, iron, steel and explosive to do what the little bit of strychnine does so cheaply. War is not only the abjectness of folly in its primary motives, it not only creates national debts and exorbitant taxation, but it is the most inefficient occupation that mankind indulges in. Inefficient in its methods it is stupid in its conception.

Will man ever learn the efficiency of common sense?

The Eclipse Special

By William Lemkin, Ph.D.
Author of "Cold Light" and "Vitamine Z"

THE total eclipse is one of the greatest cosmic phenomena that ever greets the earth. Yet the time for observation is measured by seconds, so that the scientists, despite their vast amount of marvelous apparatus, their large staff and careful rehearsing can only make limited observations—so valuable are the seconds. The contributions to science in the matter of total eclipses of the sun are, therefore, very insufficient. But—and therein lies the tale—if some means could be found to arrange matters so that hours, instead of minutes, could be spent in studying this phenomenon, what superb results might be obtained! Perhaps the ingenious suggestions made by Dr. Lemkin will prove to be a source of inspiration to some enterprising young inventors, for the story is scientifically sound and makes absorbing reading, to say nothing of its value as entertainment.

CHAPTER I

The "Solunaray"

"JUST think of it!" I repeated with growing emphasis. "Months of preparation, thousands of dollars in cost, a journey half way around the world to some God-forsaken desert island in the Antipodes—and for what? For just a fleeting, three-minute observation!"

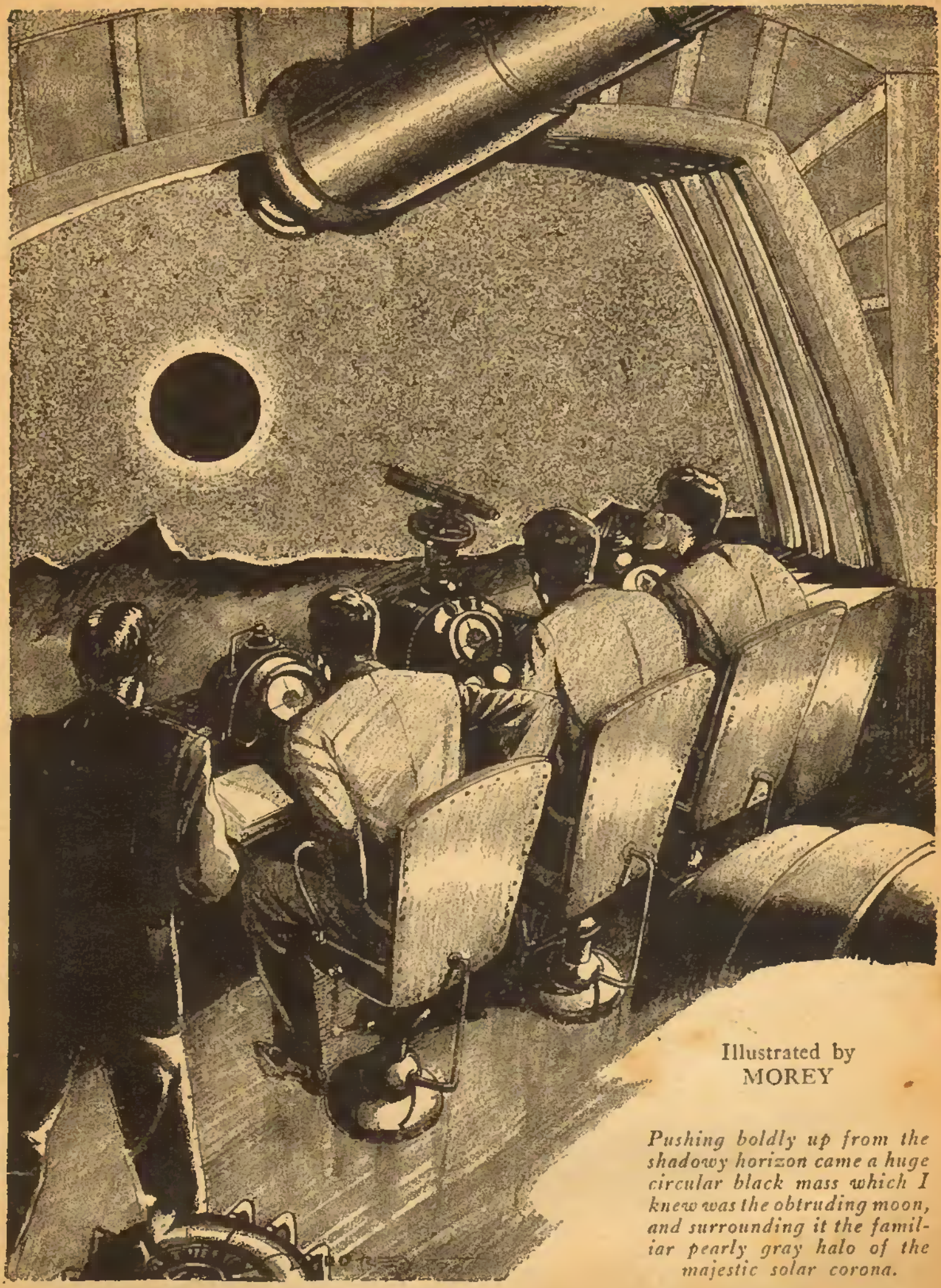
Dr. Boyd leaned back in his comfortable easy chair and smiled knowingly through a cloud of tobacco smoke at the third member of our party. "It's no use, Fleming," he chuckled. "I'm afraid we'll never get any scientific sense into this hard-fisted, ultra-practical newspaper friend of ours," pointing in my direction with his thumb, in semi-serious derisiveness. "You're a chemist, Fleming, and I'm an astronomer—and we both reason along scientific lines—more or less. But our dear friend Waldron over here—why he looks at things from a severely practical and a strictly cash angle only."

"Oh, no," I hastened to remonstrate, "I am just as scientific as the next fellow engaged in my sort of work—perhaps a trifle more so," I added with a broad grin, "because of my long association with you two gentlemen of science," and I bowed with mock dignity. "But seriously," I continued, "I'm mighty happy that my paper has sent me on this eclipse assignment. It isn't often that a mere reporter gets an opportunity to cover such a phenomenal event as this. And that's why I came over to see you, Dr. Boyd. I'm anxious to learn all about eclipses—and about the coming one in particular."

"I dare say, friend Boyd," ventured Dr. Fleming as he puffed thoughtfully at his cigar, "that I myself could stand a little enlightenment on the subject of eclipses. It is highly unfortunate that my chemical work does not touch, except very remotely, this highly fascinating theme. I might admit that I am familiar, only in a very general way, with the kind of observations that are ordinarily made during a total eclipse of the sun. For me, Boyd, this is indeed what our good friend Waldron would term a "lucky break"—my happening to be here just when he comes around to seek information on such an important matter."

"It appears to me now," smiled Dr. Boyd, "that I have *two* laymen to instruct, and not one, as I had originally supposed." He rose from his seat and retired to a massive bookcase built into the wall in the rear of his study. Presently he returned with a volume which he spread out before us.

"According to the information furnished to me by the Nautical Almanac Office of the U. S. Naval Observatory," he began, "as well as my own observations and calculations, the sun, moon and earth will be in almost direct line on September 9th of this year—which means, just about three months from now. On that day there will be a total eclipse of the sun which will be invisible in the Western Hemisphere, but will be clearly seen in parts of Africa, and in the far East. Appearing at sunrise on the eastern coast of Africa, in the neighborhood of Madagascar, the shadow of the moon will sweep across the Indian Ocean in a northeastern direction, following a slightly curved path, crossing Sumatra and the Malay Peninsula, traversing the Philippine Islands, and ending up at sunset at a point near mid-Pacific, just north of the Equator. This streak, which will be about 100 miles wide, will be darkened for a few minutes as the moon blots out the light of the sun."



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MOREY

Pushing boldly up from the shadowy horizon came a huge circular black mass which I knew was the obtruding moon, and surrounding it the familiar pearly gray halo of the majestic solar corona.

"And," I added, "there will be about a dozen groups of scientists scattered along the road at various vantage points, equipped with an enormous load of astronomical and physical instruments, all waiting for that precious moment when they can snap their pictures and take their various observations of the eclipse."

"Yes," chimed in Dr. Fleming, "I have always marveled at the elaborate preparations that are made by your astronomer colleagues to observe a total eclipse. Weeks before the time of the grand spectacle you transport tons of equipment to some isolated spot in the jungles of Africa, the icy steppes of Siberia, or on some coral reef perched in the desolate water wastes of the Pacific. And, as our very practical friend Waldron asks, for what? Merely for a momentary glimpse of the moon blotting out the sun. Of course, my dear Boyd, I realize that these fleeting observations are enormously important —in fact I happen to know that, from a chemical standpoint, which is my standpoint, we have derived much valuable information about our sun. And yet, I cannot escape the belief that much depends on pure factors of chance."

"True enough," rejoined Dr. Boyd thoughtfully. "It does seem to be a wasteful and circuitous process—this method of eclipse observation. Many a time an eclipse expedition consisting of a hundred men is sent to some distant spot on the other side of the globe. For weeks they toil energetically erecting their complex apparatus. They drill and rehearse to the very last detail. And then, at the moment of totality, a stray cloud obscures their line of vision, and all their efforts are for naught. But such are the unavoidable vagaries of our science. It is necessarily a slow, nibbling, halting process, beset with difficulties and obstacles, and each fact that is gleaned from our observations is derived after an exhaustive series of steps."

"But Dr. Boyd," I queried, "isn't all this observing and reobserving but an endless thrashing of old straw? For years astronomers have been pointing their cameras and spectroscopes at solar eclipses, and yet for each coming eclipse they continue to make the same elaborate preparations to take the same pictures and make the same observations all over again."

"To the layman," returned the astronomer simply, "this does seem to be an endless repetition, but you must remember that only by checking and rechecking the figures from year to year can we arrive at the fundamental truths and conceptions that underlie the structure and movements of our heavenly neighbors. Accurate eclipse observations were begun about the middle of the nineteenth century. We are now rounding out the twentieth century. In that stretch of less than 150 years the total period that has been available for the study of solar eclipses is just a trifle more than two hours. Is it any wonder, then that the progress in the field of eclipse knowledge has been so painfully slow?"

"I just cannot understand it," mused Dr. Fleming. "Here we are in an age of unprecedented scientific achievement—television—nullification of gravity—utilization of atomic energy—remarkable advances in aviation, chemistry, medicine—and withal, we must still rely upon the antiquated methods of eclipse observations that were good enough for the scientists of almost a century ago. Isn't that, my dear Boyd, a rather sad commentary on the progress in your branch of science?"

"Yes, good friends," admitted the astronomer ruefully, "it does look as though we have been at a standstill. And yet, you must admit the almost insuperable nature of the obstacles that lie in our path. I dare say that if my colleagues were permitted a clear, uninterrupted and continuous view of a solar eclipse for a period of several hours, it would be possible to reveal scientific truths that would be nothing short of astounding. I venture to state that such a prolonged observation would result in the clearing up not only of puzzling phenomena in astronomy itself, but also of some rather profound mysteries that deal with chemistry, electromagnetism, the nature of gravity and the structure of the atom. But," with a shrug and a laugh, "such a hypothetical observation is, as you know, purely within the realms of fancy. You realize, gentlemen, with what fleeting suddenness a total eclipse comes and goes. A brief three minutes of solar extinction, and the eclipse has passed into history."

SILENCE settled over our little group seated there in the astronomer's study—a silence broken only by the nervous drumming of Dr. Fleming's finger-tips on the arm of his chair. As far as my slender knowledge of astronomy was concerned I was ready to admit that eclipse observations would have to continue as they were in the past—painfully slow and halting.

"What do you say to this, Boyd," burst out the chemist suddenly, and he leaned eagerly toward his brother-scientist. "Assume that a flying machine could be constructed to travel at such a speed that it would keep within the moon's shadow throughout the entire period of the eclipse. Suppose that it were made large enough to bear all the various telescopes, cameras and other assorted instruments ordinarily employed at such times. Would that then afford you the continuous and uninterrupted viewing of the eclipse which you mention?"

Dr. Boyd weighed the matter with measured thoughtfulness while I sat speechless at the sheer audacity of the idea.

"Theoretically," drawled the astronomer deliberately, "you have there the conditions necessary for a minute and exhaustive study of a solar eclipse. But there are certain essential factors that you would have to include and certain problems to work out which I believe are well-nigh insurmountable. First there would be the matter of speed. Do you realize how fast this imaginary flyer would be compelled to travel in order to keep within the region of eclipse totality? Let me give you some figures." Here Dr. Boyd drew a sketch on a sheet of paper, and made some hasty calculations.

"When the moon passes between the earth and the sun the shadow of our satellite strikes the earth's surface in the form of a circular dark spot and travels across it from west to east. The trail of this black spot across the earth is the path of total solar eclipse. Out in space, the shadow of the moon, or rather the apex of the shadow cone that is cast by the sphere, moves about 2,100 miles an hour. But when it strikes the earth, on account of the turning of the earth on its axis in the same direction in which the shadow is moving, from west to east, the shadow has to overtake and pass a moving point, and so its motion with respect to the observer is less than it is in free space. At the equator the observer is moving at the rate of 1040 miles an hour, but in 45° north latitude he is moving only at the rate of 735 miles per hour. So at the equator the moon's shadow will pass the observer at the rate of 2100 minus 1040

or 1060 miles an hour, while in 45° north or south latitude it will pass at the rate of 2100 minus 735 or 1365 miles per hour. In other words, my dear Fleming, your *Eclipse Special*, if you wish to call it that, must be able to do better than 1000 miles an hour to keep up with the moon's shadow in its passage across the earth's surface."

"A prodigious speed," I ventured to remark, "but not impossible in the light of modern aviation achievements. By Jove," I added gleefully, "what a trip that would make! Just like watching the famous Intercollegiate Regatta on the Hudson River in my college days. Traveling on shore along the route of the race in the regatta special train, we used to keep accurate pace with the speeding shells, from start to finish. And how we used to pity the poor spectators who were fixed and stationary on the banks along the river, for all they saw of the race was just a fleeting glimpse as the crews swept by. Now wouldn't our *Eclipse Special* give us the same advantage over the earth-bound observers? Darned if I wouldn't give almost anything in the world for such a trip!"

"And then," continued the astronomer, "there is the matter of the precise adjustment of your instruments. For accurate observations they require a rigid foundation and careful alignment with reference to the eclipsed sun. Furthermore, there is the enormous atmospheric friction to be contended with at such tremendous speeds and the heating effects of such friction. And besides what of your propulsive power, and the accurate navigations necessary to keep your eclipse flyer in exact totality all the way across?"

Dr. Fleming rose with a merry laugh, and strode to the window. "It seems, Boyd," he grinned good-naturedly, "that you haven't much use for my ingenious little brain-child. Remember, I'm a chemist, not an aviator, navigator, nor astronomer. The idea just happened to pop into my mind, and I gave it to you for all it was worth—and perhaps that worth is not even the proverbial thirty cents."

"Look here, gentlemen," I interjected hastily, "does the scheme seem so impossible? It appears to me that, once the fundamental ideas of how to propel this craft, and how to stabilize it in flight are developed, all the other details can be worked out in time."

"Perhaps, Fleming," smiled Dr. Boyd in mock-seriousness, as though it were an after thought, "in the matter of propelling and guiding the ship you might be able to use that new and mysterious force which was discovered during the last solar eclipse—the queer 'sun-moon' beam of energy that has been tentatively given the name of the *solunaray?*"

Dr. Fleming strode back from across the room with questioning eagerness written over his features. I leaned forward inquiringly toward Dr. Boyd.

"What is this *solunaray?*" asked the chemist.

"Well," began the other, "it's a rather odd force or power that somehow escaped all detection until the total eclipse of last December. Professor Lautermann of the University of Hamburg expedition stationed on an island in the Pacific off the coast of Ecuador reported a peculiar shifting of his spectroscope at the moment of totality. Evidently it was drawn by some mysterious force to a new spot two or three inches from its original fixed position, in the direction in which the moon's shadow was traveling. The entire German eclipse party was tremendously upset by this unprecedented behavior, the more so because it resulted in the wasting of weeks of careful planning to obtain a true picture of the flash spectrum that has puzzled scientists for so many decades. In addition there were similar queer movements noted by the American Naval Observatory party stationed at the mouth of the Amazon River in Brazil, and the Johns Hopkins University expedition in the northeastern corner of Peru. In the three cases that were reported it is queer that only the spectroscopes of the parties were thrown out of adjustment. And stranger still, there was no such effect noted in the case of the other eclipse parties—and there were six of them stationed at points of vantage along the curved path of totality that swept across he central and northern portions of South America. Not a single one of these observation groups reported any unusual effects.

"Of the many theories which were promptly advanced to attempt an explanation for these remarkable occurrences," continued Dr. Boyd, "there is one which appears to be most plausible, namely, the *solar-lunar* force theory. According to this hypothesis, there must exist some powerful force or line of energy that passes through the centres of these two heavenly bodies, and in some unaccountable manner actuates objects in the path of this central force. Why this effect was never noted before, and why it manifested itself on only an isolated few of the almost limitless number of objects that normally lie in the path of a total eclipse, no one has satisfactorily explained. Regarding it as a *solar-lunar-ray*, some enterprising investigator—I don't know who he was—with a penchant for catchy word combinations and euphonious contractions, contrived the term *solunaray* —which, I dare say, is a very neat expression indeed, if it means anything to anybody.

"And now, Fleming, if you can do something with that astonishing force that appears to have manifested itself here, you may have the solution to the problem of continuous eclipse observation in your flying laboratory."

Our chemist friend fell into a deep study. "These facts bear investigating," he mused, half aloud. "I won't be a bit surprised if there lies the solution of our problem—the problem of our *'Eclipse Special.'"*

CHAPTER II

With the Aid of Chemistry

DURING the next few days I was busily engaged in making preparations for my eclipse assignment. My paper had made arrangements for me to become a member of the Sproul Observatory Expedition and travel with them to far-off Singapore to observe the solar eclipse of September 9th. My duties were to furnish the journal with a day-to-day account of the intricate preparations being made by the group of scientists, the setting up of their complex apparatus, the elaborate details involved in getting ready for the crucial moments. And then the accurate eye witness story of the approach of the eclipse, the instant of totality, the extraordinary phenomena associated with the blotting out of the sun from the heavens. All this I was to record faithfully and transmit to my paper, a running, vivid, human interest story of the awesome spectacle, its approach and its aftermath, written so that a layman could understand it. I felt proud to have been

picked for this choice assignment. Having been a close friend of Dr. Boyd for so many years and having been in regular contact with his astronomical researches, I regarded myself as in a peculiarly good position to do justice to the eclipse assignment.

For two weeks following our discussion in the astronomer's study I had no opportunity of seeing my scientific friends. When I did manage to break away from the press of newspaper duties, I learned from Dr. Boyd that the chemist member of our trio was attacking the subject of the *solunaray* with hammer and tongs. Dr. Fleming was evidently of the opinion that it was the manifestation of some chemical phenomenon—something by no means beyond the realm of possible solution. At any rate, he was having an interesting tussle with the problem. I came to see him at his laboratory one evening, several weeks after our initial conversation on the subject of solar eclipses. I found him busily engaged in his experiments, and I sensed a halo of mystery about them.

"Sit down, Waldron," was his prompt invitation, as he made a slight adjustment on the rheostat controlling a small electric furnace on his work-table. "Really, I should have gotten in touch with you earlier, but I knew that you were engrossed in preparations for your very thrilling eclipse journey half way around the world. And, to tell the truth, I haven't been idle myself—and because of the same reason—namely, eclipses. Dr. Boyd got me to do some serious thinking on the matter of this *solunaray*. If there exists such a mysterious force, and it is able to actuate matter with which it comes in contact, then there must be some common factor involved in those three spectroscopes that refused to stay put during the last eclipse. I communicated with my friend Professor Turner of the Astronomy Department down at Johns Hopkins, and he was kind enough to furnish me with the offending instrument. The Naval Observatory in Washington turned over their spectroscope as well. Through the influence of my former colleague Dr. Stern of the Hamburg University faculty I succeeded in borrowing their instrument as well. It arrived the day before yesterday by special messenger from Germany. The first and easiest point to be noted was that all three pieces of apparatus were manufactured by the Kaldbornn Optical Works of Leipzig. I promptly communicated with all the remaining universities and other agencies that had sent eclipse expeditions to South America last year. Not a single one of them had employed a Kaldbornn spectroscope. And that certainly narrows down the search, doesn't it?

"So far I haven't as yet gone deeply enough into the construction of these instruments to form any definite idea. I have a number of interesting theories, and each will have to be checked up carefully. At present I am engaged in making a minute inspection, both chemical and microscopic, of each part of the respective instruments, the stands, adjusting screws, optical tubes, lenses, prisms, etc. I feel confident, Waldron, that somewhere in these harmless-looking devices there lies hidden the secret which will bring into actual being our hypothetical *Eclipse Flyer.*"

Less than a week after my last visit to Fleming's scientific workshop I received a telephone message from him. I noted a trace of subdued excitement in his voice as he asked me to drop in that evening. When I reached the chemist's laboratory, rather later than I had anticipated, owing to some urgent matter at the office, I found Dr. Boyd had arrived ahead of me. The astronomer was in deep conversation with Dr. Fleming.

"Things are developing very nicely, Waldron," was the experimenter's cheery statement as I entered, "far better than I had anticipated. I was just showing Boyd here some of my results, and," with a sly laugh, "I've got him guessing. Now do you see these screws in my hand," holding forth six small, flat-headed machine screws of a dull silver appearance. "Well I've traced the strange behavior down to these innocent-looking objects. They belong to the adjusting device on the spectroscope, that regulates the position of the glass prisms. There is something queer about their composition. I believe I know what that something is, and I'll be definitely sure in the course of the next day or two, when the analyses I am now working on are completed."

"And," broke in Dr. Boyd, "he refuses to tell a soul—even you and me—about the real nature of his discovery! Not an inkling!—the tight-fisted old fogey—!" Our astronomer friend tried to look serious, but couldn't suppress a chuckle.

"Not even a shred of information?" I queried hopefully as Dr. Fleming placed his precious screws carefully into a cotton-lined pill box, and snapped it shut.

"Now, now, my good fellows," he said soothingly, "until I am absolutely convinced that I am on the right track the matter had better remain a secret with me. And Waldron, here are my plans. I'm making arrangements to join the Sproul eclipse expedition to Singapore, next month. Isn't that the party with whom your paper has assigned you for eclipse observation? It is only at an actual solar eclipse that I can verify my theory, and I'm going along with your group as unofficial observer."

"And I," chimed in Dr. Boyd, "intend to be there too. My original plans were to make my eclipse observations with the Naval Party that is to be stationed in Sumatra, but our chemist friend here has changed my mind for me. He informs me—and I perceive that he has familiarized himself pretty thoroughly with the coming eclipse—that the duration of totality will be the same in Singapore as in Sumatra, so that I'll be losing nothing by the change of locale. And besides, I want to be near him when he lets his fire-works go bang. I don't know what he's driving at, but I'm certain the old warrior will have something spectacular to show us."

"Now Waldron," continued Dr. Fleming, unmindful of his scientific crony's good-natured banter, "I need your assistance in getting my materials together, and making preparations for the trip to the Far East. Will you help me?"

I joined in the project with high enthusiasm, even though I was at a complete loss as to the meaning of it all. The astute chemist was exceedingly close-mouthed about his experiments and his plans. The almost schoolboy excitement with which he greeted me on my next visit was indicative of some phenomenal stroke of good fortune in his experiments. I assisted him in getting his various chemical equipment packed together, as well as some queer material which was very far removed from the subject of chemistry, or of astronomy either. But close friend though he was, I thought better than to pry into the mysteries of his strange research. I was willing to wait and see what the developments of the scientist's theory were. In fact, I was almost ready to admit to myself that I looked forward with more anticipation to Dr. Fleming's experiments and observations at the forth-

coming eclipse than to the actual spectacle itself. To tell the truth, I was beginning to get deeply interested in the project of an Eclipse Flyer, and I saw in my friend's earnest experimenting and in his buoyant enthusiasm a speedy solution of the problems which stood in the way of its success.

CHAPTER III

Dr. Fleming's Discovery

THE Sproul Eclipse Expedition which included Dr. Fleming, Dr. Boyd and myself arrived at Singapore on July 28th. Our point of observation was chosen several miles north of the city, on a clear and unobstructed stretch of sandy beach. Astronomical calculations determined that this point would be approximately in the centre of the moon's shadow band during the precious moments of total solar obscuration. Our party now had more than six weeks in which to make the necessary preparations. At first glance I was inclined to believe that time would lie heavily on our hands. But I soon realized that the work of getting the mass of apparatus ready was no ordinary task. For days a score of carpenters assisted by a generous supply of native help, toiled in the broiling, tropical sun erecting a huge tower with a box-like enclosure that sloped steeply from the top. This, Dr. Boyd explained to me, was to house the largest telescopic camera in existence, with a focal length of one hundred and forty feet. Shelters for the smaller cameras, spectroscopes, grating spectrographs, interferometers, and motion picture equipment had to be constructed. Several complete dark rooms for photographic finishing had to be erected and equipped. Besides, there were the human habitations to be put up, to house our party of more than forty. Included in the equipment of the party were two speed planes of the latest design for observation of the eclipse from aloft. How like our own pet idea, I contemplated, and I smiled to myself and thought of Dr. Fleming busily absorbed with his chemical manipulations.

In a tiny shack away from the main group of buildings the chemist worked ceaselessly at his task, stopping only once in a great while to drop a hint to Dr. Boyd and me that his work was progressing rapidly. We left him more or less to himself, and I think he was happiest when we bothered him least. I for one had plenty to do to fulfill my obligations to my reading public in far off America. There were so many things being done, so much complex apparatus to describe and explain, so many varied activities to record and analyze in non-technical language, that I found very little time to butt in on Dr. Fleming's work. And as for Dr. Boyd, he plunged vigorously into the more complex scientific activities, volunteering to the heads of the party his keen knowledge of astronomy in general and solar eclipses in particular.

About a week before the eventful day, I observed my two scientist friends pacing and repacing a level stretch of ground lying to the east of our encampment. They were going over the ground measuring distances, laying out lines and driving stakes. I thought at first that Dr. Fleming had now taken Dr. Boyd into his confidence. But no—the latter reassured me that evening that he was still in the dark.

"All Fleming wanted me to do," explained the astronomer, "was to help him determine as accurately as possible the exact path of totality. I made it clear to him, of course, that it is a physical impossibility to do so with our present methods of calculation. There are certain errors and irregularities existing in the movements of the moon, that make our most expert calculations merely approximations. As the moon's shadow cone sweeps along the surface of the earth, it is impossible to determine the position of its axis closer than fifty feet, one side or the other. I did the best I could, with my most minute calculations, to lay out on the ground the line that Fleming wanted. He appears to be a little disturbed because it is impossible to designate it any more closely. But he is still confident that he is close to the correct solution of his particular problem. And he still insists upon keeping his secret to himself."

The following day Dr. Fleming asked me to help him in what appeared to me a queer operation. He had arranged for the construction of twelve wooden frames, about ten feet square. Over each was stretched a sheet of silk, ruled off in a sort of checker-board or cross-word puzzle fashion. With the aid of a half dozen native workers, we set up these huge squares at intervals of fifty feet along the line that he and Dr. Boyd had previously laid out. The frames were placed parallel to each other and carefully adjusted so that, when one sighted across the tops, not a single one was out of accurate alignment. Immediately to the west of this queer column of squares, a wooden platform was constructed, whose height reached almost to the line passing through the centres of the screens. The whole made a rather bizarre appearance—and yet no stranger perhaps than the rest of the queer towers, telescopes and other appliances that had been constructed for the observations of the eclipse.

The morning of September 9th dawned bright and cloudless, with all indications of perfect atmospheric conditions to favor our observation party. When I commented to Dr. Fleming that the gods of the weather were certainly smiling upon us, he chuckled, and observed that his particular experiment was totally independent of clouds, rain—even a typhoon.

"If there is anything to my theory," he remarked, "then I shall get results in any kind of weather."

I could see that, as the fateful hour drew closer, he exhibited unmistakable nervousness. After all, I reasoned, he had put in arduous months of labor, and now the successful outcome of his idea—whatever it might be—was hanging in the balance.

According to Dr. Boyd's figures, 10:49 A. M. would mark the time of "first contact," that is, when the moon first begins to encroach on the sun's face. From then until totality would be a period of somewhat more than an hour. At 11:09 A. M., the total phase of the eclipse would begin, continuing until 11:12 A. M. Those were the fateful three minutes and formed the most dramatic episode of the entire heavenly drama—that fleeting period of complete obscuration into which so much scientific observation was to be crowded. The "last contact" would occur at 12:31 A. M., when the rapidly receding orb of the moon would uncover the last bit of eclipsed solar surface, and thus signalize the termination of the eclipse.

The scientists' camps were now bustling with the nervous activity that one would find associated with disturbed ant-heaps. Every man had been assigned to his

duties, every detail had been carefully rehearsed over and over again, so that there should be no chance of bungling during the crucial moments of totality. Each group at its respective instrument was checking up on its final adjustments.

A few minutes before the time set for "first contact," Dr. Fleming emerged from his make-shift laboratory, carrying a small parcel which he handled with extreme delicacy. I sprang forward to offer my assistance, but he needed none apparently. I followed him toward the platform facing his row of silk-covered frames. He undid the package, disclosing a shallow copper-colored dish that held within it a metallic sphere. It was about the size of a golf ball, and had the dull, silvery appearance characteristic of a tarnished spoon. He clambered up the ladder to the platform, and placed the dish with its queer metal ball on an iron tripod in the center. He sighted carefully toward the row of wooden frames stretching off for several hundred feet to the east. He moved his apparatus a fraction of an inch, sighted again, made another minute adjustment, another observation along the column of screens, and then descended to face me with a flushed and tense countenance. Dr. Boyd had torn himself away from his telescope to join me in watching the strange proceedings. The chemist smiled knowingly at us, but not a word yet about the meaning of it all.

"First contact," called the official announcer, one eye glued to his theodolite, and the other to the chronometer in his hand. We dashed back, Dr. Boyd to his telescope, I to my smoked glass observation screen, while Dr. Fleming hovered restlessly about his strange equipment. The rim of the moon could now be seen very plainly as it bit a thin cusp from the western edge of the sun. Slowly, as we watched through our various instruments, the bite deepened. More and more of the sun's surface became effaced, as the moon's bulk rushed across our line of vision. The minutes flew by, and soon about half of the sun's area was covered, the visible portion having become decidedly crescent shaped. And now the light had diminished to such an extent that the landscape began to take on a strange aspect, as if viewed through yellow glasses. About this time I observed that the birds were displaying a strange uneasiness, flying rapidly about in evident alarm. Even some of the native watchers were beginning to show unmistakable signs of terror and panic.

THE brighter planets now started to put in their appearance, with some of the first magnitude stars following shortly afterward. I observed a distinct drop in the temperature. The landscape was assuming a strange, unearthly aspect, with the shadows of all objects taking on fantastic edgings and distortions. Off to the west the sky appeared a peculiar deep-blue tint. The solar crescent was now narrowing to a mere line. I looked at my watch—only two minutes to go before totality. Tense and rigid each man stood at his post ready at the official word from the time-keeper to plunge into the multitude of observations. Only the motion picture group was active, for they had started operation about ten minutes before the expected time of totality. The slight breeze which had sprung up just a brief moment ago now died down to an ominous calm. One minute to go. I tore my eyes away from the thin crescent of the sun, and shot a glance at Dr. Fleming. He was standing like a marble statue at the foot of his platform, with his eyes riveted to the weird, metallic ball supported at the top. Then my eyes swung back to the almost eclipsed sun overhead. A sudden flash, and the remaining sliver of light about its eastern edge disappeared. The time-keeper's word "Go!" heralded the moment of totality. There hung the inky silhouette of the moon, surrounded by the beautiful pearly glow of the solar corona—the infinite, awe-inspiring beauty of a total eclipse.

At that instant a sudden shout from my left brought me back to earth again, and I wheeled swiftly. My chemist friend was dancing up and down and gesticulating wildly. Forgetting my reportorial obligations to record the eclipse and the attending phenomena, I deserted my post with the observation group and dashed over to where Dr. Fleming was acting like a schoolboy let out on a holiday. In the weird, almost supernatural twilight of the eclipse he cut a grotesque figure, darting from one screen to the next, waving his arms and whooping with glee at each new discovery. I chased after him, wondering, bewildered, plying him with questions to which he paid no attention. From one to the other of his frames he ran, examining each one closely, totally oblivious of the magnificent spectacle that was being revealed overhead.

To tell the truth, I was missing the whole show myself, in my eager endeavor to ascertain the cause of the scientist's enthusiasm. A sudden dazzling flash from above, and a terse "Third contact!" from the time-keeper announced the end of totality. I stopped in my tracks and gazed aloft as the lower limb of the sun was uncovered in a blazing flood of light. Larger and larger the crescent grew. The beautiful, tinted, silvery corona of which I had obtained only a fleeting glimpse was now gone. In turning my attention away from the spectacle during the two or three critical minutes of total obscuration, I had missed the grandest sight of all. But what did it matter, so long as Dr. Fleming had succeeded in his project? For certain I was that he now had in his possession the key to the mysterious *solunaray*, and the solution to the problem of his Eclipse Flyer.

Dr. Boyd himself had now abandoned his instruments as well, and had joined us at the silk-covered screens. From frame to frame we trooped, in the eerie shadowy light that still enshrouded the landscape, even though a distinct solar crescent was now visible, and growing wider each moment. At every screen we stopped and made a close observation of the fabric, although Dr. Boyd and I had no idea what had happened. All we saw was a small ragged tear in each frame, as if a stone had been thrown through it violently. In every case Dr. Fleming made a minute examination of the perforation, observing carefully the location of the tear with reference to the checkerboard of vertical and horizontal lines, and entering his findings in a small notebook. When we got back to the raised platform I gave a start and rubbed my eyes. There was the tripod, with the shallow, copper-colored dish as I had seen them before. But the dish was empty!—The dull, metallic ball was gone!

"Tell me, Dr. Fleming," I blurted out, almost impatiently, "what the meaning is of these strange occurrences? What have you found out about the *solunaray?* Does it really exist? Or is it just a myth?"

I could see that Dr. Boyd no longer bore that puzzled demeanor that had been very evident when he dropped his eclipse instruments and ran to ascertain the outcome

of the chemist's experiments. Evidently the true significance of the whole investigation had dawned upon his scientific mind and he was almost as feverishly excited as his chemist chum. I was the only one of the trio that was still in the dark about everything.

"Our Eclipse Flyer is now practically a reality," exclaimed Dr. Fleming earnestly, and the astronomer smiled and nodded an eager approval. "Three cheers for the *solunaray!*" he shouted with almost youthful exhilaration. "It solves the whole problem. And three cheers for Boyd!—for wasn't it he himself who suggested the possibilities that exist in the *solunaray?*" The chemist slapped his friend heartily on the back, as I stood by with doubt and hesitation.

CHAPTER IV

The Energy from Space

LATE that afternoon, after the excitement and intense activity that had permeated the eclipse party during the strained moments of totality had subsided, I sat with my two scientific partners in Dr. Fleming's laboratory, and he went into a detailed explanation of his work and the results he had that day attained.

"My dear Waldron," the chemist started, "we are going to view the next solar eclipse from aboard our *Eclipse Special.* That will be some time next summer, won't it Boyd?" he asked, turning to the astronomer.

"June 21st, to be exact," replied Dr. Boyd.

"And," continued the experimenter eagerly, "it will be just like watching the Intercollegiate boat races on the Hudson, while seated on your famous Regatta Special. Let me start at the very beginning. When you, Boyd, first broached the idea of a ray or line of force that intersected the sun and the moon, I was frankly skeptical as to the existence of any such thing. Yet, there were the observed facts in connection with the queer behavior of those three spectroscopes during the solar eclipse of last year. You both know that back home I began a minute study of these instruments, as well as collecting all the data I could find available, which would be likely to throw any light on the mystery. From the chiefs of the respective eclipse parties I obtained all the facts as to the direction in which the pieces of apparatus were displaced, the precise magnitude of displacement, the exact time of the motion, and any other observed peculiarities that attended the phenomenon. You remember what I told you back in New York about my careful study of the three spectroscopes. I showed you the six adjusting screws which I believed embodied the solution of the extraordinary motion. A careful chemical analysis of a small portion from one of the screws revealed that, along with the copper and zinc that went to make up the brass of which it was composed, there was also present an appreciable amount of the rare element zirconium. This, in itself of course, would not constitute a startling discovery, the substance being there probably by the purest of accidents. However, when I subjected small bits of the brass to ultra-microscopic examination, I was puzzled by the peculiar crystalline structure of the alloy, especially on the surface of the metal. Although I pride myself on possessing a fairly complete knowledge of crystallography and metallurgy, I admit that this arrangement of alloy crystals, which the high-powered magnification revealed, was totally unlike anything that I had ever seen before. A subsequent series of tests proved further that the crystalline configuration owed its existence to the minute quantity of zirconium present in the brass. Moreover, I discovered, after repeated experimenting, and a rather disconcerting number of failures, that this unusual alloy cannot be made except under the most exact conditions of temperature, pressure and concentration of the zirconium. With considerable effort I succeeded in preparing a small amount of brass with a composition and a crystalline structure closely resembling those of the spectroscope screws.

"But, gentlemen, what has all this to do with the *solunaray?* Well, from the very moment that I discovered the existence of the unusual alloy I suspected that there lay the solution to the motion of the instruments during the eclipse of last December. As my experiments developed, I became almost positive that this copper-zinc-zirconium alloy with its unique crystalline make-up held the secret of the *solunaray.* Of course, I was unable to adduce positive proofs, or to verify my conclusions, because I required a total eclipse during which to test the theory.

"And so, my friends, I packed up my effects, and journeyed here to Singapore with the eclipse expedition in order to observe the behavior of a sizeable quantity of my *solunar* metal during a total solar eclipse. You observed what happened this morning. The copper dish on my raised platform held a ball of this remarkable alloy. But, whereas the spectroscope screws revealed only the merest trace of the unusual crystalline structure in the form of a microscopically thin surface film, my synthetic *solunar* metal is uniform in composition all the way through. I reasoned that the extent of lateral motion, if any, would be proportional to the amount of crystalline compound present in a given weight of alloy. Since there was only the minutest quantity of it in the instrument screws as compared to the total mass of the spectroscopes, it is natural to presume that the effect of the sun-moon force was therefore correspondingly weak. But my synthetic metal, it was logical to suppose, should be one hundred per cent effective, because it contained no inert matter—nothing but live, reactive crystals.

"You were both witnesses of this morning's occurrences. At the moment of totality, or to be exact, in the very centre of the three minute interval during which the sun was obscured by the moon, my metallic sphere was whisked from its resting place on the tripod, and sent hurtling through the series of silk screens which I had set up. I plotted the path of the flying missile by reference to the exact location of the hole in each frame. By continuing its slightly curved trajectory until it touched the ground, I located the spot where the alloy had entered the sand. It was a relatively easy matter for me to estimate its velocity, its angle of incidence as it struck the ground, and the probable resistance offered by the earth to its passage. Having these data, I was able to calculate the approximate resting point of the metallic sphere below the surface. This afternoon I started a couple of husky natives digging at a point about six hundred feet east of the last screen. Sure enough, at a depth of eight feet, they came upon my chunk of *solunar* metal, still hot from its terrific plunge through the earth.

"There, my friends, we have all the corroborative evi-

dence which anyone would desire. The sun-moon force that has been so aptly termed the *solunaray* actually exists. Through some mysterious inter-molecular or intra-atomic arrangement there is a tremendous arm of energy that intersects the centres of those two heavenly bodies and sweeps through space as they follow their respective paths of motion. And strangest of all, this force seems to be able to actuate, in a powerful fashion, the crystalline alloy of copper, zinc and zirconium. Who knows what other portions of matter are able to respond to this force from stellar space? But we can be thankful to a fortunate accident that revealed its effect on the spectroscope screws.

"The queerest thing about the ray is the direction in which its effect is exerted. In the case of gravity, centrifugal force, magnetism and electrical repulsion or attraction, the direction in which the affected matter moves is along the axis of the body that is exerting the force, or upon which it is being exerted. But with our *solunaray*, the effect is at right angles to the line of the axis. It is as if a gigantic pole were sweeping through space, tending to drag the affected body with it. And this imaginary pole must certainly be an exceedingly thin one, in comparison with the diameters of the sun and the moon. It seems that the propulsive activity is most intense along the line passing through the exact centres of mass of the two bodies in space, but tapers off markedly as you get away from this axial line. I suspect that at a distance of one hundred feet on either side of this imaginary thread the energy effect is practically zero. When I learned from you, Boyd, that it was impossible to gauge the exact central line running through the shadowy band of totality which the moon traces on the earth's surface, I was keenly disappointed. For a time I was afraid that my efforts would be in vain. It was certainly by the merest stroke of good fortune that the approximate position which we chose for the row of screens lay well within this narrow ribbon that is traversed by the *solunaray*.

"And now, my dear colleagues in this great adventure, we are in possession of a powerful weapon for good. The idea which I offered so facetiously several months ago—the idea of a flying eclipse observatory—does not appear to be so terribly far-fetched. The *solunaray* will be our means of locomotion. Instead of waiting meekly until the moon's shadow races across our path in order to obtain a fleeting record of the eclipse, we shall race along with it, and make all our observations at great leisure. Just think of it—an uninterrupted view of the grand spectacle of the heavens—a view lasting from sunrise to sunset!"

CHAPTER V

The *Eclipse Special* Takes Shape

WHEN our party got back to New York about three weeks later, we started the real planning for our Eclipse Flyer. Even with my very elementary knowledge of astronomy and aviation, I could perceive a number of problems that had to be solved before the flyer could become a reality. There was first of all size. The vessel must be large enough to house adequately all the bulky instruments and observation machinery that is customarily employed by an eclipse party, as well as a large crew, both for the operation of the vehicle itself, and for the handling of the cameras and other devices. The flyer must be made perfectly vibrationless, so as to give firm support for the instruments. The slightest irregularity in motion, I realized, would make accurate observations and photographs impossible. There were the problems of how to get the flyer off the ground, how to propel it and navigate it in the path of totality until caught up by the *solunaray*, how to maintain or vary its distance above the earth's surface, how to overcome the tremendous frictional heating effect produced by the craft's swift flight through the atmosphere. I was aware of the remarkable strides that had been made in the science and art of aviation during the last half century. And yet, some of these problems appeared to my layman mind as well nigh beyond solution.

My two scientist friends refused to be stopped by such trifles, as they termed them. Dr. Boyd radiated the same contagious enthusiasm with which Dr. Fleming pitched into the task of evolving the Eclipse Flyer. Apparently, he looked at the chemist's successful research on the *solunar* metal and the ray as the crux of the whole matter. This development having been worked out satisfactorily, nothing but a handful of minor details remained.

While the chemist continued his experiments in working out some of these details, the astronomer journeyed to Washington and placed the entire matter before the scientific authorities of the U. S. Naval Observatory. He had very little difficulty in enlisting their resources in the project. He made similar approaches to a half-dozen of the larger astronomical observatories in the eastern part of the country, with the result that he soon had a group of scientific organizations who pledged wholehearted support to this novel idea of eclipse study.

At first the intention had been that the *Eclipse Special* was to be strictly a scientific laboratory, to be equipped with the most modern of instruments for the purpose of making accurate astronomic observations. However, when the news went abroad that so unique an air-vessel was being planned, there arose a noisy clamor from many private citizens for passenger privileges. These requests came from some of the wealthiest men of the country, who offered to pay handsomely in return for their passage aboard the flyer during the next eclipse. So strongly had the idea of this unique trip stirred the popular fancy, that these moneyed individuals were ready to contribute fabulous sums for the thrill of such a journey. Dr. Boyd immediately perceived the advantage of selling a limited number of such passages. Although the various scientific bodies that had subscribed to the project contributed substantially toward the expense of building and outfitting the flying observatory, this additional financial support would enable the construction and equipping of the vessel to lack nothing which money could buy.

While my two friends plunged into the scientific aspects of our projected *Eclipse Special*, I did my modest bit by giving the scheme as much publicity as possible through the medium of my newspaper, and the associated members of its news service. It was natural that I was to be the press representative on the coming eclipse journey.

At this stage of the project, I suffered a rather disconcerting hitch as far as my own personal plans were concerned. My chief suddenly called upon me to cover the International Conference for Naval Disarmament

in Paris. As far as I had heard, these arms conferences had been meeting regularly every few years, for almost a century, had accomplished practically nothing, and were continuing to meet with clock-like regularity. I tried to wriggle out of the assignment, on the plea that the plans for the Eclipse Flyer were beginning to show some interesting developments and that my place was right here to keep the public informed about the progress of the work. But I was merely wasting my breath.

"The eclipse doesn't come off until next June, Waldron," insisted the editor. "The naval parley is scheduled to go on in three days and will last only about two weeks. When you get back you'll have plenty of time at your disposal to catch up on the description of the Eclipse Flyer and how the construction is getting along."

So I packed up in a hurry, grumbling nevertheless, and caught the noon air liner for Paris. Although I had been traveling by air to a considerable extent, in fact almost exclusively during the course of my work, somehow the mechanical aspects of flying had never interested me much. I had merely taken all the various contrivances more or less for granted, and had never shown any more than a casual concern in the physical make-up of the plane. Now I found myself examining with keen interest every part of the operating mechanism which happened to be easily accessible to the passengers. Somehow, the advent of the *Eclipse Special*, although it was still in the nebulous form several steps before the blue print stage, served to quicken my desire to learn a little more about the operation of a modern trans-Atlantic air liner. I roamed about the huge ship, examining the structure of its framework and the layout of its various compartments. I peeked into the control room and was bewildered by the maze of wheels and levers whose manipulation regulated the vessel's every movement.

I even succeeded in getting one of the petty officers to allow me a look into the rocket room, and the fuel compartments. He explained to me that the propulsive force of the explosions in the combustion chambers were sufficient to drive the ship at a speed in excess of three hundred miles an hour. I laughed to myself at such a crawling pace, in comparison with the prodigious velocity of the *Eclipse Special* under the influence of the almost magical *solunaray*. I was permitted a glance at the electro-stabilizers, which maintained the liner on an even keel under all sorts of atmospheric conditions. Of particular interest to me were the gravity-nullifying shields located in special compartments fore and aft. I understood the principle of these least of all; even the officer whom I persuaded to show me these marvels of modern scientific achievement, could not himself give me an adequate idea as to what made them work.

I was in Paris in a little over ten hours from the time we started from New York. The conference of representatives from the principal naval powers of the world, as usual, got off to a belated and dragging start, and continued in the same fashion for two months instead of the original two weeks. What with proposals and counterproposals, argument and discussion, quibbling and bickering, the parley wore on monotonously, while I fumed inwardly at the absurd combination of circumstances which kept me several thousand miles away from the spot where I most wanted to be—Santa Monica, California. For Dr. Fleming radiographed me shortly after my arrival in Paris that all the preliminary planning for the *Eclipse Special* was now complete, and construction had already commenced at a plane building plant which had been chartered near Los Angeles. The actual construction, he asserted, would take about a month, and he urged me, on the termination of the arms conference, to come directly to the west coast.

Needless to say, the last word of the last speech of the last delegate had hardly ceased echoing through the meeting chamber when I was safely aboard the Paris-New York flyer, soaring westward beneath a midnight moon. While skimming above the waters of the Atlantic I prepared my last bit of copy covering the parley, and dispatched it to my editor *via* the air liner's radio. So that, when we dropped smoothly to the surface of the bay at the Battery just before noon of the following day, I had merely to dash to the office, exchange barely a dozen words with my chief, and dash out again to the trans-continental plane landing-stage immediately adjacent to the one which I had just left. My radio to Dr. Fleming flew swiftly ahead of me, informing him that I would be in Los Angeles before dinner that evening.

CHAPTER VI

A Flying Observatory

"CAPTAIN RENSHAW, late of Naval Air Squadron A, now chief pilot and operating officer of the *Eclipse Special*." I gripped the hand of the stalwart young man whom Dr. Fleming had just introduced.

"I'm glad, Waldron, that you got here at this particular moment," added my chemist friend, "because we are just making up the party to go through the flyer on her last inspection before her trial trip. And you can rest assured," he continued, "that the past few weeks have been mighty busy ones for all of us here. I really don't know how it was done in such a record time, but the whole tremendous task of constructing our vessel has been completed. Only a few minor details remain."

Dr. Boyd entered just then, accompanied by a small group of men. The astronomer welcomed me heartily. I was introduced to the various technical and scientific representatives in the gathering—aviation authorities, government officials, radio experts, and scientists from the various observatories who were cooperating in this project. Our party left the administration office and were presently admitted to the special hangar housing the Eclipse Flyer.

Although I prided myself in the thought that I had had a hand, even if it was a small one, in the original plans of the vessel, I really did not know what to expect in the shape of a completed job. In a general way I was prepared to see a ship constructed along the lines of ordinary aircraft, and when I first cast eyes upon her I received a distinct shock at her radical departure from the conventional types. The party was conducted by means of an elevator to a tiny balcony that circled the hangar at a dizzy height from the floor. Our initial look was to be in the nature of a birds-eye-view. Looking down from our elevated perch, I perceived a huge flat form resting on the floor below, a craft which was neither plane nor dirigible. It was roughly triangular in shape, about 300 feet long by 100 feet at its widest point near the stern. From where I stood, I judged its height from the floor to be about 40 feet. At about the centre of the vessel's flat back there swelled out a con-

spicuous dome-like structure, perhaps 40 feet in circumference, and about 10 or 15 feet at its highest point. This bulging, hemispherical prominence was smooth, lustrous, and transparent in contrast with the dull opaque surface of the rest of the craft. If you can imagine a stone arrow-head, such as was used by American Indians, flattened down considerably except for that circular, glass-like bulge and then enlarged to tremendous proportions, you will obtain some notion as to the general appearance of the flyer. It certainly resembled nothing that I had ever seen in the line of aircraft.

Our party descended to the main floor of the hangar and approached the flyer. We entered through a door that slid open in the side of the vessel near the blunt nose, passed through a long, well lighted passageway, through another doorway, and into an enclosure which was evidently the control room. I could see a number of familiar aerial navigation instruments, as well as a goodly collection of devices which I had never seen before in the control chamber of a flying liner. A series of transparent panels was strung along the semicircular front wall, affording an unobscured view over the nose of the vessel in the direction of flight, as well as through an arc of 180°. A large portion of the floor up near the front of the chamber was made of that same glassy material as the transparent panes set in the wall. Evidently, these were for observation of the ground. Similar panels formed a good portion of the roof above our heads, and enabled one to obtain a clear view upward. We next entered the radio room, lying just behind, and then through another long corridor that seemed to run in the direction of the stern. Passing through an arched entrance, the party emerged into what I could now perceive was the huge glassy hemisphere that I had observed from aloft.

"This is our eclipse observatory," explained Dr. Boyd, "—equipped for the most elaborate study of a solar eclipse that has ever been attempted." And he proceeded to point out one by one a host of astronomic and other scientific instruments. Most of them I was already familiar with, because I had seen them set up and operated them during our Singapore expedition. Several were brand-new to me, and I dare say to a few other members of our inspection party.

"There is one certain instrument," I remarked to Dr. Boyd, "which I miss. Somehow, I had the impression that no eclipse observation is complete without the massive photographic telescope. I recall that at our eclipse station in Asia several months ago we had to erect a tower about 75 feet in height. And that's one of the points that has puzzled me most—how you were going to incorporate such an enormous instrument in the equipment of the flyer."

"That's been taken care of very nicely," returned the astronomer reassuringly. He pointed out a long tube-like structure that ran along the side of the chamber, piercing the wall and evidently extending an indeterminate distance through the interior of the ship. "This is the telescopic camera, even larger than the one we used during the last eclipse. It has a focal length of over 150 feet, a specially ground lens of 13 inches aperture, and is capable of forming an image of the sun 16 inches in diameter. You can readily see that such a huge tube pointed aloft would be an exceedingly unwieldy affair, especially since its angle of inclination would need constant changing as the eclipsed sun altered its position in the heavens. To get around the difficulty, I had the camera constructed in this fixed position, and designed this special reflecting cœlostat which transmits the image of the sun into the aperture. As the sun's position changes, the angle of the mirror may be altered, so as to throw the reflection properly at all times. This device here is an automatic rotational mechanism that is so constructed as to respond to any variation in the speed of the flyer, and maintain a uniformly centered image of the sun on the plate of the camera."

I turned my attention to the enormous transparent dome that surmounted the observatory. It extended in one uninterrupted sweep from the floor of the chamber, taking in the circular wall, and reaching up to the topmost point. On closer observation I discovered that, instead of being a single unit, the dome was made up of innumerable sections, divided by thin partitions that reminded me most strongly of the meridians of longitude that radiated from the Noth Pole of a classroom globe. These thin lines were so nearly invisible, however, that one could obtain an unobstructed view through the transparent medium straight up, and to all sides. Presently I noticed that portions of the floor were made of the same glass-like material, so as to afford a view downward as well, just as in the case of the control room up in the nose of the vessel.

On questioning Dr. Fleming about the nature of the substance, he informed me that it was not glass but "silico-resin"—a synthetic resinous compound made from a formula which he had himself developed. He explained that "silico-resin" was practically 100 per cent transparent, nearly as tough as steel and could withstand tremendous pressure. In addition, he explained, this remarkable material was an almost perfect insulator of heat, and was unaffected by the highest temperatures obtainable—even by the terrific heat of the electric furnace.

"The last two properties are perhaps the most desirable of all," he added significantly. "You understand, Waldron, that our *Eclipse Special* will attain a phenomenal velocity—at times well over 1000 miles an hour. During some portions of the trip we shall travel close to the earth's surface, through the denser strata of our atmosphere. The great friction will generate an enormous amount of heat, but the silico-resin will turn back this heat just as a duck's back sheds water. There will therefore be no danger of fire, or of excessively uncomfortable temperatures here. I have incorporated the same heat-resisting compound in a slightly different form in coating the outer walls of the entire ship so that we have no fear whatever from the heat evolved as a result of atmospheric friction.

"You have no doubt already observed that the interior of the flyer, comprising the various chambers which we have visited as well as others in different parts of the vessel, are hermetically sealed from the exterior. We supply our own atmosphere, artificially simulating the outer air in composition and pressure. Remember that, in traveling through the upper strata of the earth's atmospheric envelope, we will find ourselves in a region where there is not enough oxygen to support life."

My paramount interest lay in the precise manner in which my scientific friends had embodied the *solunaray* principle in the flyer. After all, this had been the outstanding factor in the whole scheme. I recalled the idle suggestion of Dr. Boyd, which had precipitated the problem of the *Eclipse Special* during our original conversation months ago. I remembered the ingenious

work of Dr. Fleming, which had culminated in his spectacular demonstration of the tremendous sun-moon force on that Far East beach.

"What of the vessel's propulsive power—your *solunar* metal?" I inquired of Dr. Fleming.

For reply, he opened a door in the rear of the observatory, and peered into the semi-darkness of a small chamber. Part of the vessel's framework was revealed—a number of metallic beams or girders that criss-crossed through the narrow enclosure. In the centre of this maze of structural work was built a large box-like receptacle which appeared to be securely fastened to the ship's frame.

"That container," explained the chemist, pointing, "holds a mass of *solunar* metal weighing over 300 pounds. It is rigidly riveted to the duralumin skeleton of the flyer. In fact, the ship's entire structural make-up radiates from and focuses upon the point. The propulsive effect of the *solunaray*, when we enter its zone of activity, will sweep this mass of respondent alloy along, and of course carry with it the entire bulk of the flyer."

The party next descended a narrow stairway from the observatory and passed through another long passageway to the extreme rear of the vessel. Here we came upon a vastly complicated group of mechanisms designed to augment the work of the *solunaray* and its active alloy in the task of propelling the flyer.

"This installation of high frequency generators," continued Dr. Fleming, "energizes the three gravity-nullifying units located in the corners of the ship, and incorporated in her framework, as is the mass of *solunar* metal. We must thank our aviation experts for the successful development of this highly important adjunct to modern flying. You see, Waldron, by nullifying the earth's gravitational pull on these three units, the vessel can rise to any desired height before being caught up by the *solunaray* and carried along the path of total eclipse. No part of the ship except these units is affected, so that the passengers and crew feel no diminution in their weight, and none of the discomforts associated with the earlier gravity-screen methods. Another improvement in the gravity manipulation is a special adjusting device that enables us to maintain a constant elevation above the service of the water or land over which we are traveling. For example, suppose that our course is set at an altitude of 60,000 feet. Should the effect of the gravity nullification carry us even 20 feet above this level, an automatic relay cuts off the energizing current momentarily restoring the gravitational pull. This brings us down about 40 feet, at which point the high tension current restores the nullifying effect to the three units, and we shoot up again. In actual operation the relay effect is so rapid, and the response of the units so nearly instantaneous, that the total result is the maintaining of an even course, varying by no more than a few feet above or below the set elevation."

We were next shown one of the massive rocket tubes that protruded from the chamber through the rear wall of the flyer into space. Dr. Fleming announced that there were 24 such exhaust tubes lined up along the entire length of the stern, and spaced about four feet apart.

"Of course you will understand," said Dr. Fleming to me, "that we shall have to depend to a very considerable extent upon this auxiliary mode of locomotion during various portions of our flight. This powerful battery of rockets will enable us to swing into the path of the *solunaray* at the start of our journey, and also out of its zone of propulsion at the end. Then, in addition, we are planning to make short side trips from the path of total eclipse during the course of our flight, in order to conduct certain particular observations. For fuel we use the newly perfected chloramine oxone liquid. This rocket installation, the largest and most powerful ever constructed, will enable us to attain a speed of over 1500 miles an hour, which will be more than sufficient for our needs."

The inspection tour included a visit to the living, dining and sleeping quarters of the crew, scientists and personnel of the craft, as well as the group of laymen passengers whose substantial contributions had gone a long way toward defraying the cost of the flyer. At the conclusion of our rounds, every member of the party was prepared to vote the *Eclipse Special* the most phenomenal and remarkable vessel ever constructed to navigate the air.

CHAPTER VII

From Alaska to Sweden

THAT evening, back in Dr. Boyd's temporary workshop, which he had set up in the administration building of the air-field during the construction of the *Eclipse Special*, the astronomer and Dr. Fleming went into greater detail for my benefit. Dr. Boyd amplified his plans for the observation of the coming eclipse, giving all indications that he had mapped out the trip of the flyer to the very minutest detail.

"We are indeed fortunate," he began, "in the location and the extent of the solar eclipse of next June 21st. In all its aspects, it couldn't have been arranged more ideally for our purposes. My calculations show that the moon's shadow will first strike the earth at sunrise in the vicinity of the Alaskan Peninsula. The path of darkness will sweep in a southeasterly direction across the Pacific Ocean and touch land again near Portland, Oregon. Racing across the country, the band of total eclipse will curve slowly, passing just north of Denver. When it reaches the Mississippi River near St. Louis, it will be moving nearly due east. The shadow path will now speed toward the Atlantic coast, bearing gradually northeastward and across almost directly over New York. Over the ocean it will maintain its direction with only a slight curvature. The band of darkness is scheduled to strike the southern tip of England late in the day, cross the North Sea, and touch the European mainland in Sweden. At this point, the moon's shadow cone will sweep off the surface of the earth at an acute angle, and the eclipsed sun will set, to mark the end of the grand spectacle of the heavens.

"I consider ourselves particularly fortunate in this eclipse because it will traverse some of the most thickly populated sections of the world. It will enable us to lay out our path of flight with the utmost accuracy, because a goodly portion of the shadow path will be across the United States. It is indeed rare, in the annals of solar eclipses for the band of darkness to traverse a country with such mathematical precision. Most solar eclipses are, from the point of view of astronomers, wasted, because they spread themselves over vast stretches of ocean, across barren Arctic country, or

through trackless inland jungles. During a century of solar eclipses, only one has ever approached the coming eclipse in the matter of passing over well-populated territory. That was the one of June 24, 1925. Beginning at sunrise near Duluth, Michigan, the shadow path extended from the Great Lake region, across the state of New York, over New York City, across a portion of the New England states, and out to sea, where it was lost at sunset near the British Isles. But our eclipse of next June, sweeping the country as it will from coast to coast during that period of its passage when the sun is highest in the heavens, and affording us an unparalleled opportunity for accurate observations—that is what I would call almost a 'made-to-order' eclipse."

I questioned the astronomer further concerning the "side trips" from the eclipse path which he had mentioned that morning in the hangar.

"During most of the trip, of course, we expect to keep the nose of the flyer pointed accurately down the path of totality. In fact, there will be no need for any steering, because, once we have propelled ourselves into the sweep of the *solunaray*, we shall be carried along automatically. The only adjustments necessary will be such as are required in altering our altitude, for making various observations at definite levels above the earth's surface. However, during that portion of the flight when the sun is highest in the heavens, it will be desirable to get ahead of the moon's shadow or drop behind it, for perhaps an hour or so, in order to obtain certain data which have been lacking in previous eclipse observations. The scheme will be, at the desired moment, to employ the full force of our twenty-four rocket exhausts and speed ahead and beyond the one of the *solunaray*. Then, by making a wide swing, we intend to return to the path and gradually steal up on the eclipse, so to speak, until we reënter the propulsive sphere of the sun-moon force.

"The chief difficulty which we encountered here was the problem of how to get back again to the exact centre of the moon's shadow cone. Of course, during the first part of the flight, the *solunaray* merely carries us along. But, if you recall Dr. Fleming's observations at Singapore, the shaft of solunar energy is an exceedingly narrow one. Having left it, our task would be to manœuver our ship so as to get the mass of solunar alloy which is incorporated in her structure directly into that narrow focus of energy. No amount of steering or navigation would do it, because there would be nothing by which to steer or navigate. However, I believe we have solved the problem by what I consider a rather ingenious device. Our side trip observations will be made during that part of the flight between St. Louis and New York. At that time the eclipsed sun will be practically at high noon. I have mapped out as accurately as my calculations permit the line of totality covering this territory. Over that thin line the shaft of the *solunaray* will sweep, and it is to this line that we will have to navigate in getting back to our path after the side excursions. The scientific authorities of the National Government have very generously cooperated with us so as to enable the erection of a string of powerful stationary beacons along the line which I laid out across this portion of the country. At intervals of ten miles these signal lights have been set up, and they stretch in a smooth curve from the Mississippi to the Atlantic. Visible from an altitude of ten miles, this luminous string will serve as a guide line to enable us to return to our path with a minimum expenditure of fuel."

The following day the *Eclipse Special* was wheeled out of her hangar and made ready to be taken aloft for her first trial spin. Captain Renshaw was at the controls of the huge craft, while my two scientific friends hovered close by to check up on the gravitational and propulsive mechanism. In addition, a picked few, including myself, were on board as mere observers. At a touch from the pilot's hand, a powerful current was shot into the three anti-gravity units located in the far-flung corners of the triangular vessel. Instantly she rose perpendicularly with the swiftness and smoothness of a high-speed skyscraper elevator. After the first internal sensation of sinking there was no unpleasant effect, owing to the uniform velocity maintained in the ascent. I peered through one of the silico-resin floor panels to observe the air field and all its adjoining structures receding rapidly from us.

After what seemed like three or four minutes a sudden upward surge within me brought my attention back to Captain Renshaw, who had just applied the control that brought us to a halt in mid-air. I glanced at the altimeter to note that our altitude was 22,000 feet. There was not a trace of unsteadiness about the flyer. Apparently we were as rigid and fixed as though resting on the ground. I recalled Dr. Fleming's explanation of the automatic relay controlling the gravity-nullifying devices. This certainly was a demonstration of as nicely adjusted a mechanism as was ever perfected by human skill and ingenuity. Glancing again through the transparent floor panel, I perceived broken clusters of white clouds, through whose numerous interstices was visible the blue Pacific, miles below.

The explosive exhausts were now put into operation, the two outer tubes first. The flyer moved forward slowly, picking up speed as the remaining rocket chambers, in pairs, sprang into hissing activity. A look at the earth speed indicator almost took my breath away. The needle swept slowly across the face of the dial—300—500—800 miles an hour! And not a tremor, not a trace of vibration, or any other tangible manifestation of such enormous velocities!

By careful manipulation of the rocket units, increasing the force of some and curtailing that of others, Captain Renshaw manœuvered the ponderous craft to right or left, as easily and as gracefully as though she were a one-man glider of the early days in aviation. The *Eclipse Special* was put through all her paces, climbing both vertically and in a sweeping curve, accelerating from a standstill to breathless speeds of over 1,000 miles an hour, twisting and spiraling like some monstrous bird from a distant world. In all her cavorting, the leviathan of the air demonstrated an uncanny agility and response to her controls which were truly remarkable. When Captain Renshaw brought her gracefully to earth, after over an hour of aerial gymnastics, there was no doubt in anyone's mind about the airworthiness of the vessel. Jubilant beyond words were Dr. Fleming and Dr. Boyd. Handshaking and congratulatory phrases passed about freely as the pilot, the ship's mechanical crew, the two scientists, and the official government and aviation observers emerged from the control room entrance. Everyone was confident that the *Eclipse Special* was the last word in aircraft and a "sure bet" as a flying eclipse observatory.

More trial flights were made in the course of the next week—flights that put to severest test all the multitudinous equipment of the mammoth craft. In addition to

various portions of the driving and elevating mechanism, as well as the heating and ventilating devices of the craft, each piece of photographic and astronomic apparatus was tried out under conditions closely simulating those which were likely to be encountered on the actual eclipse journey. It was only after an exhaustive series of tests that its designers and builders were confident that it was ready for the crucial day.

CHAPTER VIII

"On Your Mark!—Get Set!——"

"ONLY a few days left, Waldron," was Dr. Boyd's greeting as I entered his workshop one day to show him my latest news dispatch about the *Eclipse Special* before sending it over the press wires. "We start up the coast on Thursday. I am planning on a slow trip by easy stages to Alaska and our starting point for the great adventure. Allowing three days for the journey north, and a day or two of preparation at our hopping-off spot, that will bring us right up to June 21st, the day of the eclipse."

The assembled party that boarded the *Eclipse Special* on Thursday morning was a good-sized and varied one. There were first the three original members (I humbly class myself with Dr. Boyd and Dr. Fleming, although my chief claim for distinction lay in my being present on that memorable evening when the idea of a flying observatory first took shape). In addition there were Captain Renshaw, our chief pilot, two assistant pilots, the operating crew, mechanics, and radio experts. Then came the various scientific representatives from the largest universities and observatories in the country as well as government scientists and several representatives from foreign astronomical organizations. A group of expert photographers with their assistants completed the scientific corps.

The party also included three renowned painters, whose task would be to depict in actual lifelike colors the glory of the eclipsed sun. I learned that many attempts had been made on former occasions to preserve on canvas the fleeting impression of a solar eclipse, but none had ever been either truthful or accurate. Whatever paintings had been turned out in the past were really very little more than memory pictures—and frequently the products of a fertile imagination. Now for the first time, the actual color scheme would be faithfully reproduced by expert artists, working with extreme leisure. And to be sure—I almost forgot to mention the group of about twenty wealthy "pay passengers"—those who were going along merely for the thrill of the journey, and who in return, had contributed handsomely to the financial backing of the expedition.

During the early hours of the morning, the task of loading the necessary supplies and equipment was completed, down to the last camera plate and the last canister of the precious chloramine-oxone fuel for the rocket engines. Shortly before noon the *Eclipse Special* took off gracefully from the Santa Monica air-field amid the vociferous acclamation of the thousands who had crowded in from all parts of Southern California to see the start of so novel a journey. We traveled leisurely up the coast, stopping at all the larger towns along the way. Everywhere huge throngs turned out for a glimpse of the flyer. Thanks to a concerted campaign of publicity which had extended over a period of several months, the country at large was fairly well informed about our novel craft and its projected observation journey. In San Francisco the Mayor and a group of high city officials extended a ceremonious greeting to us, and made a tour of inspection through the *Eclipse Special*. Similar scenes were enacted in Portland, Seattle and Vancouver, B. C.

Early Sunday morning we took off from Vancouver, steering northwest for an over-water trip of 1500 miles to Alaska. Dr. Boyd had executed an elaborate series of calculations to determine the exact spot where the moon's shadow-cone would strike the earth's surface at dawn on June 21st. His computations located this point at the eastern tip of Kodiak Island, which I observed from the large map that hung in the control room, to be a fairly large sized piece of land lying southeast of the Alaskan Peninsula. Captain Renshaw was a skilled navigator as well as an expert pilot, and he set a bee-line for the island. He kept the ship at a nearly constant speed of about 350 miles per hour, maintaining an elevation of nearly three miles. So accurate was the navigation, that by noon we came in sight of the low-lying hilly island, and beyond it the dark outline of the Alaskan coast.

We descended smoothly, and circled several times at an altitude of about a mile in order that Dr. Boyd might check his bearings and locate as nearly as possible the spot which he had previously selected on his charts. We came to a gentle rest on a flat rocky stretch that extended in a gradual slope from the waters' edge a half-mile away to the foot of the low barren hills that rose raggedly about two miles to the north. As we emerged from the comfortably warm interior of our vessel into the comparative chill of an Alaskan summer day, we were met by a handful of bewildered trappers and natives. Tumbling in haste and confusion from their shacks hidden in the hills they regarded with unconcealed amazement this strange craft that had dropped so suddenly from out of the sky.

While most of the party tramped about the vicinity with no immediate object except to get into the open air and stretch their legs, Dr. Boyd and a half dozen of his astronomer assistants busied themselves in locating the exact spot where the axis of the moon's shadow which meant, of course, the thin line of *solunaray* energy, would impinge on the earth. On second thought, I should not say "exact spot," for I remember what Dr. Boyd told me during the last eclipse expedition about the uncertainty of finding the shadow cone's axis any closer than within one hundred feet.

I hovered about the observation party as they sighted at the horizon through their sextant and at the low-hanging sun. In regard to the latter, I was no little disconcerted by its unusual position at such an early hour—one o'clock in the afternoon. This was my first trip to a latitude so near the Arctic Circle—one of the astronomers told me that we were only 8 degrees away—and I was unaccustomed to seeing the noonday sun at this time of the year anywhere else except almost directly overhead.

After a busy half hour of observation, computation and reference to astronomical tables and charts, Dr. Boyd drove a stake into the ground at a point about two hundred yards west of the spot where the *Eclipse Special* rested.

"Within a radius of fifty feet from this point," he an-

nounced tersely, "the *solunaray* will strike the earth at dawn on Wednesday. At the instant of sunrise on that morning the *Eclipse Special* must be over this spot, and traveling at approximately the speed of the moon's shadow and in about the same direction. Under those conditions we will enter the influence of the *solunaray* with a minimum of jar to the flyer and its equipment, and with least bodily injury to ourselves."

The next task was to lay out a hundred foot ring with the stake as a centre, and make this huge circle as conspicuous as possible when observed from aloft. The members of the crew were set to work in stringing a ring of powerful electric lights along the circumference. Similar circles of lights, inside the first, and concentric with it, were set up, the rings being spaced about five feet apart. The current to operate this concentrated mass of illumination was furnished by a portable generator unit that was erected close by. The finished product had the appearance, for all the world, of a gigantic bull's-eye on a target.

By sundown—which at this northern latitude occurred at the uncanny hour of nearly ten o'clock in the evening—the aerial target was complete. We retired to our comfortable quarters aboard the flyer to spend the night, and were certainly glad to get in out of the chilly Alaskan atmosphere. Before we "turned in" for the night, Dr. Boyd took a moment to explain the technique of our start at dawn Wednesday.

"We now know with fair accuracy the location of the center line of totality," he said. "By mathematical extrapolation of this curve back beyond its start at our circular marker, we can plot the position and exact direction of our flying start. Tomorrow we shall make a reconnaissance trip in a northwesterly direction for about a hundred miles, and lay out our course."

AFTER breakfast next morning we flew across the narrow island, traversed Shelikof Strait and on across the hilly terrain of the peninsula. Here and there, from our comparatively low altitude, we spotted human habitations, some in clustered groups, others alone. But for the most part the land stretched out in a barren waste under the feeble slanting rays of the Arctic sun. Captain Renshaw maneuvred the flyer around slowly, while the group of astronomers under the direction of Dr. Boyd continued their optical observations and their mathematical plotting on the map before them. Finally we dropped smoothly to earth in a depression between two sombre gray hills. Captain Renshaw announced that we were 126 miles northwest of our original position on Kodiak Island. A huge marker of concentric rings of light, similar in construction to the first target, was erected in the shallow depression. A last check was made on all the observational equipment aboard, the cameras and spectroscopes, elevating and driving units, the fuel-feeding devices and all the working parts of the vessel. By three in the afternoon the last screw was adjusted, the last button polished, and everything was declared in ship-shape fashion. The *Eclipse Special* was now ready for the eclipse.

As a last measure we made a quick flight back to the island for a final inspection of the first marker. Our chief of the electrical equipment checked up on the lighting units supplying the current to the vast rings of bulbs. He tested the operation of the radio relay switch which set the lights ablaze on an impulse from the flyer's radio room. The equipment was pronounced satisfactory, and so we piled in and were soon back again on the mainland. Since we were going to be up and active the entire night, all of the following day and perhaps a good part of the second night, Dr. Fleming urged all hands on board to catch a few hours of sleep.

CHAPTER IX

Racing the Eclipse

JUST before sunset—that eerie, near midnight sunset characteristic of these latitudes—activity began anew on the *Eclipse Special*. We were scheduled to take off shortly after midnight and get ready for our swift moon-trailing flight half around the globe.

"Take your last look, folks!" announced Dr. Boyd joculantly as he pointed to the red orb of the sun sinking slowly behind the distant range of mountains to the northwest. "We won't see old Sol again in full view for something like thirteen hours. During about eight of those hours he will be totally effaced by our silvery satellite."

The hands on the control room, chronometer pointed to 12:30 when Dr. Boyd gave the signal for our initial vertical ascent. Although I realized that the eclipse observations from our flying laboratory were independent of the atmospheric conditions which might hamper the work of an earth-bound party of scientists, nevertheless I could see that the weather factors were indeed favorable for a successful start. The sky was practically cloudless, and all indications showed that the brisk west wind whipping across the gray hills would clear away any stray clouds which might obscure the sun as it rose on the morrow. In order to keep our two markers on the ground in view, Dr. Boyd explained to me, that to fly a true course into the centre of the shadow-cone, we must be at an elevation of no more than a mile. Hence the necessity of good visibility at the start. It appeared to me as we rose slowly from our position in the small valley; that we could not have wished for better fortune at the hands of the weather gods.

At the latitude of Kodiak Island during this season of the year, twilight lasts all night, a phenomenon which was very disconcerting to most of us. Being accustomed to the profound darkness that is characteristic of the temperate zone, we regarded with curiosity and wonder this half-light which here went under the name of night.

Off to the north the ghost-like glow of the mystifying aurora played its fantastic rhapsody of colored lights in the sky. Overhead the stars twinkled weakly in the pale light. Below us the dark peninsula stretched like a shadowy arm to the west, punctuated only by our light-encircled target in the valley.

An essential part in our present program was the execution of several practice trips over the 125 mile stretch that separated the two markers on the ground. There was no denying that much depended upon the accurate navigation along this path, so as to bring us into the influence of the *solunaray* at the proper spot and at exactly the right instant.

At a short conference amoung the officers and the scientific heads of the expedition, at which I took the liberty to listen in, Dr. Boyd discussed the important points in connection with our take-off.

"During the beginning of an eclipse, and also at the end," he said, "the moon's shadow travels fastest, while in the centre of the path, or about midway between sun-

rise and sunset, its speed is not so great. My figures show that when the shadow cone's axis strikes the earth somewhere in the vicinity of our marker on Kodiak Island, its initial velocity will be 1526 miles per hour. That, Captain Renshaw, is the speed we must attain as we cross the target."

The pilot saluted and said modestly, "We'll do it, sir!"

The first practice flight was accomplished with considerable success. The radio signal to illuminate the distant marker was flashed out, and presently an answering impulse from the automatic recorder on the spot assured us that everything was in readiness. From a start at a point about 25 miles northwest of the mainland target we picked up speed gradually, crossing the first set of luminous rings at well over 600 miles per hour. For about half the measured distance to the island target, Captain Renshaw steered by dead reckoning exclusively, stepping up the speed smoothly until the indicator needle fluttered over the 1000 mark. Coming within sight of the distant target, he veered a hairbreadth to the left, meantime increasing the rocket propulsive force, notch by notch. In about three minutes we roared across the circle of light below us at a point which I took to be very close to the centre. A fleeting glance at the speed indicator told me that our velocity at the finish was 1497 miles per hour. Dr. Boyd, looking up from the eye-piece of the instrument with which he had kept the target in sight, announced that the flyer had missed the centre of the illuminated circle by 32 feet. For a first try, it certainly appeared to be a very meritorious performance.

The *Eclipse Special* was brought about in a graceful sweep and we headed back to the mainland for a second trial flight. This attempt met with better success. Seven minutes after our start, we flew across the lighted marker, almost bisecting it from the air. Two more practice trips were made, and these were characterized as being perfect in every respect. The four trial flights consumed about an hour and a half, and all on board voted them far more thrilling than anything ever experienced before. Everyone, down to the last staid and prosaic scientist, looked forward with unconcealed excitement to the real flight, of which these short spurts were mere samples.

Back at our starting point again, the huge craft loafed idly in the air at an elevation of 4500 feet, waiting for a touch of the control levers to plunge forward on her momentous flight.

"Dawn!" called Dr. Boyd, suddenly. There was a precipitous crowding of the laymen members to the observation windows facing the northeast. A dull glow was beginning to suffuse the horizon heralding the coming of the eclipsed sun. The stars above began to pale noticeably, while the dancing lights in the northern sky gradually dimmed. The astronomer stood tensely, watch in hand, counting the moments as they ticked by. At his elbow Dr. Fleming crouched, his eyes glued on the ever brightening horizon. Every man of the party was at his assigned post, either in the control room, the rocket chamber or the observatory, waiting anxiously for the signal to go.

"Six and one-half minutes to sunrise, Renshaw," Dr. Boyd breathed tersely. "Time to start!"

The pilot at his side stiffened slightly and he touched several controls on the panel in front of him. Slowly we picked up speed, the low sighing of the rocket exhaust increasing to a pronounced hiss as the huge craft tore through the night with mounting acceleration. In a minute and a half from the time we started, the vessel cut directly across the first blazing target on the ground, and we were heading with ever-growing speed toward the second. By this time the entire skyline on our left was aglow with a sickly yellowish light, unlike any sunrise I had ever seen, even in this far-northern country. The speed indicator now stood at 1130. Three minutes flew by and presently, far off to the southwest, I espied the dim speck of light which was our second target. The ground speed was now 1445. Dr. Boyd peered anxiously at his watch and turned to the pilot. "Just a trifle slower, captain," he cautioned, "or we'll get there too soon!"

For the space of thirty seconds we fell back to a speed of 1420, and then slowly picked up again. Sweeping along at nearly half a mile per second, we raced toward the glowing marker. Another tense minute elapsed. I judged that we were now about 25 miles from the target. The indicator stood at 1460.

"Fifteen seconds to go!" called Dr. Boyd. His strained voice resounded through the control chamber. It was carried by our intercommunication system to the other compartments of the ship as well. "A trifle more speed Renshaw, and everybody hold fast!" With a dull roar the mighty vehicle plunged forward, and as I peered through the transparent floor panel I caught a flash of the illuminated target as a mere streak of light beneath us. Instantly I felt the flyer give a pronounced shudder. By instinct I grasped an upright support and clung tenaciously while the vessel took a sudden and violent lurch to the right. And then a mysterious calm enveloped us. At first I thought we were suspended stationary in the air. The roar of the rocket exhausts was strangely lacking. Instead, the ship was plunged into a death-like silence.

Suddenly an exultant shout from Dr. Fleming broke the magic spell that seemed to have been cast over us. Releasing his hold on the edge of the control panel which he had grasped to save himself from being bowled over by the flyer's precipitous plunge, he pointed a shaking finger at the distant horizon, visible through the window. The rest of the assembled group in the room, shaken from their semi-stupor by the chemist's exclamation, relaxed their grasp on sundry articles of support, and followed his gaze. The awesome spectacle which met our wondering eyes I shall never forget, as long as I live—the rising of an eclipsed sun! Pushing boldly up from the shadowy horizon came a huge circular black mass which I knew was the obtruding moon, and surrounding it the familiar pearly-gray halo of the majestic solar corona. As I watched in spell-bound fascination, the entire sphere of the eclipsed sun burst into view, moving up from behind somber hills with startling speed. Seen directly above the horizon, the black mass gave the familiar appearance that is characteristic of the sun or moon in that low position—the optical illusion of great size.

"We're off!" blurted out Dr. Boyd hoarsely. "Right in the grip of the *solunaray*——off on the greatest adventure the world has ever known!"

Captain Renshaw, who had shut off the rocket propulsion mechanisms the instant that the flyer had been caught up by the powerful energy stream of the shadow axis, slid from his perch at the controls, and stood silently beside the astronomer, contemplating the scene with almost reverent awe. For the space of several

minutes the matter of scientific observations, photographing, measurements, tests—all was completely forgotten in the excitement attending our first glimpse of this far-north solar eclipse.

"That was an excellent piece of navigation, Captain Renshaw." Dr. Boyd broke the silence with extreme suddenness. "You cut the target clean through the middle, and our speed was exactly 1526. But unfortunately, in my laying out the circle on the island, I missed the correct spot by about 8 feet. That accounts for the abrupt jar the moment we hit the shadow axis. But we are now right in the centre—at least our mass of *solunar* metal is—and we have nothing but smooth sailing for the rest of the journey."

CHAPTER V

Across the Pacific

EVEN with an entire day of observation ahead of us, there were several matters that had to be attended to immediately. The pilot busied himself with the gravity-nullifying controls, sending the craft from its initial elevation of less than 4,000 feet above the surface of the Pacific to a height of about six and a half miles. This brought us well out of the thin haze that had developed close to the water, so that an unobstructed view of the majestic eclipse could be obtained. Dr. Boyd and his fellow astronomers hastened to the observatory to adjust the reflecting cœlostat connecting the huge telescopic camera, as well as to prepare the host of other observational devices. I joined Dr. Fleming and several of the engineers associated with the construction of the flyer in making an inspection of the *solunar* metal compartment. A thorough examination of the intricate beam and truss arrangement of the framework that surrounded the mass of magical alloy revealed that all was intact. The abrupt jolt at the beginning of our flight had evidently not been sufficiently severe to do any damage to the metallic skeleton of the *Eclipse Special,* or the firm anchorage of the *solunar* metal block.

Next we continued to the propulsion chambers, where we found the rocket devices strangely silent. Somehow, I could not become accustomed to the idea. Here we were, flying at the dizzy speed of over 1,500 miles per hour, with not a trace of propulsive energy coming from these powerful engines before me. Dr. Fleming made a careful check on the supply of the oxone fuel on hand.

"By George!" he exclaimed half to himself, with a flash of annoyance in his voice. "This stuff certainly goes fast! We consumed more of it than I had expected we would use in our trip up from California, in the four trial flights, and in our start this morning. However, Waldron, we have a comfortable margin of safety. I'm certain we carry enough fuel and more for all our purposes."

When we got back to the domed observatory, we found practically all of the remaining members of our party congregated there. With the vessel being propelled and steered automatically by the *solunaray,* there was no call for any attention of the operating crew. Only Captain Renshaw and his two aids remained in the control room to keep a check on our elevation, which was the only variable and controllable factor in our flight.

For the first time now, I obtained a really magnificent view of the eclipse. With the transparent dome above me, it was as though I were standing out in the open under a cloudless sky. The sun was now well up above the horizon, and had swung about so that it lay more toward the east than it had on rising. The most notable feature was the eerie appearance of the dead-black moon against the incomparably beautiful and radiant corona—a veritable study in "black and silver." The familiar weird light of our eclipse was about us—an illumination which was like neither moonlight nor twilight. The sky above us was dotted with the planets and brighter stars.

The laymen passengers were grouped on the side of the observatory facing the sun, and their frequent "Oh's" and "Ah's" demonstrated that they were getting as much of a thrill from the superb spectacle as they had bargained for. The scientists had already commenced their multitudinous photographing and measuring. Dr. Boyd was busy at the lens aperture of the long focal camera, adjusting the cœlostat and shutter, and telephoning directions to his assistants, who manned the plate-holding end of the long telescopic tube, located in the ship's stern. I watched him as he took picture after picture, with exposures varying from one-fourth of a second to one hundred and twenty seconds. His leisurely and methodical manner of working struck me as being in sharp contrast to the necessarily hurried measures that I had witnessed during our Singapore eclipse observation of last year. Each new plate was fixed with extreme precision, the reflecting device adjusted to the thickness of a hair, and the exposure made with the utmost nicety.

"Strange as it appears, Waldron," said the astronomer between photographs, "This is the first solar eclipse that I have ever *seen.* One might imagine that if anyone were to have the opportunity to see the eclipse at its best it would be the astronomer, but in general, he sees less of the eclipse than anyone else. In all previous eclipse observations, his undivided attention had to be given to the instrument or work assigned to him beforehand. Often he had no opportunity to cast as much as a glance toward the heavens when the corona was shining forth in all its glory. But now, with about eight hours of observation at our disposal instead of only three to five minutes as in the old-fashioned method, I can find time to get my full share of the wonderful view."

Having completed the series of photographs for this stage of the eclipse, Dr. Boyd was all too willing to go into details about some aspects of the heavenly drama that was unfolding before our eyes.

"I want you to observe, Waldron," he said, "the delicate pattern, the wealth of exquisite tracery and detail in the structure of the corona. Note the striking contrast between its pearly radiance and those vivid scarlet streamers that are known as solar prominences. Fortunately this happens to be a period of maximum sun spot activity, a time when the solar corona is evenly developed all around the surface, and is more than normally bright. This is the period also, when the flaming prominences are most conspicuous. And do you know what these scarlet off-shoots are? They are huge masses of incandescent hydrogen, mingled with other elements that rise to enormous heights of over 40,000 miles from the sun's surface. Dr. Fleming over there at the spectroscope, could probably tell you

a good deal regarding the chemistry of these flaming gaseous clouds—of the discovery many years ago of the element helium in the prominences—and of the belief now generally accepted that streams of electrons from them affect the earth's magnetism and cause the auroral displays which are familiar in these northern latitudes. Later in the course of the day's activities I am planning to photograph the solar prominences with a superchromatic, long focal camera. I expect information to be revealed as to their structure and composition which has never been obtained in former observations.

"As for the corona," he continued, "the present scientific knowledge about it is exceedingly meagre. And after all, what great accumulation of facts can be gleaned by two minutes of observation one year, three or four minutes, or none, the next year, and so on for a century? It is certain that the corona consists partly of minute particles of matter that scatter and reflect the light of the sun, particles that are probably driven off from the sun itself by light-pressure and in other ways. In addition, there is probably a photoelectric effect that accounts for much of the luminosity of the corona, produced by the passage of streams of electrons through the rare gases of which it consists. Probably the effect is similar to that in the light of the aurora, which is a photoelectric effect developed by a bombardment of the rare gases of the earth's upper atmosphere by streams of electrons from the sun. So far two hitherto unknown elements have been discovered in the corona, namely, coronium and nebulium. It is highly probable that the detailed spectroscopic analysis of the solar halo being made here today by our assembled observers will result in clearing away a good deal of the mystery which has always enveloped it.

"One series of observations on this trip will be of unquestionable value. It is still unknown whether or not the corona rotates with the sun. Also, efforts have been made for some time to determine whether rapid changes in coronal form take place during the time that elapses between the observation of the eclipse at points a considerable distance apart in the shadow path. So far it has either been impossible to obtain photographs for comparison at the widely separated stations, or else only negative results have been obtained. But there is no valid reason why we cannot make such comparative observations today. With the same equipment, the same observers and the same conditions prevailing throughout our series of tests, we shall collect a group of data which will in all ways be comparable. It is probable that our results will throw considerable light on the nature of the corona. Who knows?—perhaps we may be in a position to solve the whole problem of solar radiation. As this problem is so vitally associated with electric and magnetic as well as meteorological changes on the earth's surface, you can readily understand of what immense practical value our investigation is."

THIS certainly was a masterful lecture, I thought, as my astronomical friend returned to his instruments for the next series of observations. Each member of the scientific staff was absorbed in his own particular task at whatever instrument had been assigned to him. For the moment, none of them appeared to be willing to talk on the subject of the eclipse, so I strolled over to our group of non-scientific voyagers, each with his face pressed against the silico-resin panels so as not to miss a single detail of the eclipse. The eclipsed sun—an ominous black mass with a sparkling ring of silvery rays surrounding it, had climbed rapidly during the last half hour. I consulted my watch; 3.35 A. M.; and the sun appeared to be as high as I was accustomed to seeing it at six o'clock during this season of the year. But I recalled that we were racing to meet it at over 1,500 miles an hour, so that it was natural that it should appear to rise at such a phenomenal speed. This thought brought me back suddenly to a realization that the *Eclipse Special* had been traveling steadily at this velocity from our start, and yet I had been not at all conscious of such a fearful rate. The absence of even the faintest vibration or tremor made it appear that we were standing stock still. A look through the transparent floor revealed no palpable indications of motion, for the surface of the Pacific miles below us was shrouded in an unbroken mantle of pale gray mist.

My eyes reverted to the sun—after all, that was the chief object of observation. I picked out with ease the finger-like projections of scarlet flame that burst out here and there from the black edge of the moon's mass. One of the small telescopes that were set up for the use of the passengers afforded me a much clearer view of these enormous solar prominences. Sighting through the telescope, I was even more forcefully impressed than before by the delicate tracings of the coronal rays. Struck with a sudden thought, I dashed over to Dr. Boyd, who was enjoying a leisurely look between observations. Dr. Fleming was with him.

"Dr. Boyd," I queried, with a show of excitement that denoted a great discovery, "there is a point about photographing the solar corona that I should like cleared up. I have always known that, when taking a picture of a rapidly moving object an exposure of only a very small fraction of a second is allowed, otherwise you get nothing but a blur. Similarly, when photographing an object from a moving vehicle, you must observe the same rule. Right now we are traveling at about twenty-five miles a minute. And yet there you are snapping pictures of the eclipse as though we were anchored on the ground. Not only that, but some of your exposures require that the camera shutter remain open for two minutes. During that interval your camera has traversed fifty miles. I can't see why the finished plates should show anything better than a long smear of light."

The astronomer turned smilingly to Dr. Fleming with that same half-serious, half-jocular expression he had exhibited under similar circumstances when the three of us were sitting together in his New York study months ago, having our first discussion about the *Eclipse Special*.

"I'm blessed, Fleming," he commented, "if our young friend isn't becoming what you would call scientific. What you say is true enough, my dear Waldron, if you are observing or photographing objects that are relatively close to you. But you must not forget that we are taking pictures of a body that is over 92,000,000 miles away. Therefore our own motion, however breath-taking it might appear to us, introduces no appreciable difficulty or error in our observations. Let me give you some figures, and you'll soon realize what I mean."

Dr. Boyd hauled out his inevitable pad and pencil and proceeded to put down certain calculations.

"Assume that you are located at some point on earth taking photographs of the solar eclipse. The speed of the earth as it travels through space in its elliptical path around the sun is 65,720 miles per hour. In addition, being situated of course on the earth's surface, you are pursuing another motion, due to the rotation of the earth on its axis. Let us suppose that you are standing on the equator, where this rotational speed is maximum—about 1,040 miles per hour. For the sake of argument we shall consider that the two motions lie in the same direction, which would give you a resultant speed of 66,760 miles an hour. This means that your apparently fixed point of observation on the equator is hurtling through space at 1,113 miles a minute—186 miles every second. And yet you know that even under such circumstances, the coronal structure is revealed in its most intricate detail. At the end of a two-minute photographic exposure, the eclipsed sun will appear to have moved 2,226 miles from its original position in the heavens. This is equivalent to a displacement of six one-thousandths of an inch in an object twenty feet away. I defy anyone to record such microscopic motion, even with the most delicate camera extant. Now, if we go one step further, and take into consideration the motion of our *Eclipse Special*—1,500 miles an hour—and add that to the sum of our previous velocities, we have a total speed of 68,260 miles an hour. But even with this increment the apparent displacement is only about two and one-half per cent greater than it was before—an insignificant addition to an already negligible quantity.

"Of course, you must understand that all your results are vitiated if you have not a firm foundation for your instruments. The slightest vibration or jar will destroy the value of your photographic records. Thanks to the smooth and uniform propulsive action of the *solunaray*, as well as the efficient operation of our electro-magnetic stabilizers, our cameras and other observational devices are as firmly supported as though they had been set up on a bed-rock foundation. So you see, Waldron, your fears about my getting a lot of blurs instead of eclipse photographs are groundless. In fact, the plates of the first exposures have already begun to arrive from the dark-room, and they indicate a wealth of detail in the corona that has never before been revealed."

With my brain a dizzy whirl of figures, I left my two scientific friends at their instruments, and sauntered over to the other side of the observatory, farthest from the eclipsed sun. The western sky was a dull gray, giving an appearance similar to early dusk. I recognized some of the brighter stars by their familiar positions in the heavens. As my eyes became accustomed to the shadowy gloom, I could make out even more of them than seemed visible at first glance. I next turned my attention downward through the miles of space below. We were well above a heavy bank of clouds that extended in an unbroken stretch beneath us.

Suddenly I was startled by something which I had not noticed before. Far to the west a huge dark mass, somewhat elliptical in shape, was racing along with the flyer. So vast was its extent, that it encompassed almost the entire field of my vision. Dark and ominous, it flew swiftly beneath us like a monster speeding to devour its prey. For a few minutes I regarded it spellbound. Its color was a sort of blue black, resembling smoke, or a wall of fog. The outline was remarkably clear-cut, and surrounding it there was a pale orange-yellow border that thinned out gradually into the dull glow of the surrounding clouds. Terrifying beyond description was this forbidding mass of darkness. I watched it with open-mouthed fascination.

Then I gave a nervous start, and began to laugh softly to myself. Why to be sure! How stupid of me not to know it from the start! The black mass tearing along on the vast cloud formation below us was nothing more than the shadow of the moon! Since the eclipsed sun was now in the eastern sky, and still only about one-third of the way from the horizon to the zenith, the moon's shadow would naturally fall considerably to the west of us, and be shaped more like an ellipse than a circle. Reasoning further, I came to the conclusion that at noon, with the sun almost overhead, the shadow would be nearly directly below us, and circular, while late in the day the setting sun would throw an elliptical shadow of the moon far to the east.

I recalled some of Dr. Boyd's figures concerning the dimensions of this mass of darkness—that it was usually about 100 miles in width, although, in certain cases, when the moon is farthest from the earth, and the sun nearest to the earth, the shadow may extend as much as 170 miles in width. I turned to look at the sun and visioned that powerful beam of energy that at this very moment pierced in turn the centre of its mass, the centre of the moon directly in front of it, the puny block of *solunar* metal housed in the bowels of the flyer and finally the midpoint of the blue black shadow below. Even now I could not comprehend the full significance of that stupendous propulsive ray which was carrying us along at such an unheard-of speed.

Gradually, as I watched the huge oval mass of darkness, it appeared to be disintegrating before my eyes. Its uniform bulk was beginning to show breaks and patches. I realized that the cloud screen upon which the shadow had been cast was slowly thinning out. Presently the clouds were gone, and I could see the reassembled elliptical shade area sailing along smoothly upon the surface of the ocean.

CHAPTER XI

Scientists at Work

"LAND!" came a shout from the group watching at the forward side of the observatory. I dashed across just in time to see a ragged outline far below. It whizzed under our prow and flew off to the northwest. I noted the time on the ship's chronometer. It was some minutes past four o'clock, Alaska time. We had covered the stretch of ocean from our starting point to the American mainland in slightly more than hour. Now the most interesting portion of our trip was just ahead—the flight across the breadth of the country, from the Pacific to the Atlantic.

With the atmosphere considerably clearer than it was over the ocean, the *Eclipse Special* was brought down to an altitude of about three miles. I joined Dr. Boyd in the control room, observing him check up on the progress of the flyer over land. Dr. Fleming came in soon after to make inquiries.

"Our speed has dropped markedly," announced Dr. Boyd. "We are traveling now at somewhat over 1,000 miles an hour. With the sun climbing toward the zenith at such an unparalleled rate, I anticipated that the sweep of the shadow-cone axis would soon slow up materially."

"At what point did we strike land," I asked.

"About fifty miles northwest of Portland," was his reply, "near the mouth of the Columbia River. With our present reduced speed, which will become even less as we approach noon, we are going to cover the shadow path across the country at a comparatively leisurely pace. Let me see now, we started from Kodiak Island at close to three o'clock Alaska time. It is now approximately four o'clock by our chronometer, or six o'clock Portland time. We shall cross nearly midway between Denver and Cheyenne at about 5 o'clock our time, or 8 o'clock Mountain Time. You see, Waldron, we are now traveling in a generally easterly direction at approximately the same speed with which the sun is apparently moving in a westerly direction. So that for every 1,000 miles covered, we gain one hour elapsed time and one hour sun time, making a difference of two hours. Which means that when we strike in the vicinity of St. Louis it will be 6 A. M. on our chronometer and 10 A. M. down in that city.

"The distance to New York we shall cover in about an hour, in other words, at 7 by our watches, and high noon Eastern Time. We should traverse the Atlantic Ocean in less than three hours elapsed time. That means, we cross the lower tip of England at 10 A. M. Alaska time or about 8 P. M. by the Greenwich observatory clock. We shall bid good-bye to the eclipsed sun as he sets over the hills of Sweden close to 10 o'clock in the evening, when it is only 11 o'clock in the morning on Kodiak Island, our starting point, nearly half way around the globe. Although there are about nineteen hours of daylight available from sunrise to sunset at the latitude of 60° north, which is the location of both our starting and finishing points, we are traveling as I have said, opposite to the sun's motion, so that we should cover the distance in just about eight hours. But that will be more than sufficient time in which to make all the eclipse observations we want to."

From our elevation of about three miles above the earth's surface, it was difficult for me to distinguish landmarks very clearly. Particularly was this the case, because we were speeding along in perpetual twilight—a gloom that blanketed us like a vast mantle. Below us the enormous shadow of the moon kept pace with our flight, or rather crept up on us, for I perceived that the huge mass of darkness was gradually swinging closer from its first observed position in the west, as the sun with its coronal halo climbed in the heavens. The atmosphere was remarkably clear at this elevation so that the eclipse stood out in the eastern sky with such vividness and splendor as was probably never before equaled in eclipse observations.

I gazed down at the shadowy earth, and speculated at the vast thousands who, at this very moment, were craning their necks to view the magnificent spectacle of the sun being blotted from the heavens. How much superior was our position up in the flyer! A fleeting two or three minutes of totality, and the drama for the stationary observers below was over. And we, rushing through space under the influence of the magical *solunaray*, had been viewing the eclipse for nearly two hours and were scheduled for six more hours of almost continuous observation.

And the scientific aspects of this observation were now going full blast aboard the *Eclipse Special*. Hundreds of photographs and spectographs had already been taken, and the work was going on apace, with every man and every piece of apparatus in active service. Motion-picture recording, started at the very moment of sunrise, had scarcely been interrupted during our entire trip. The cameras ground away ceaselessly, to preserve on celluloid a continuous record, in full colors, of the beginning and progress of the eclipse. The three expert painters included in the party had prepared their easels, brushes and palettes at an advantageous spot and were already commencing the arduous task of recording the magnificent color contrast of the blue-black moon, the scarlet solar prominences, the matchless silvery radiance of the corona, and the sombre gray of the surrounding sky. The radio staff of the flyer had not been idle since the start of the flight. Throughout our progress across the stretch of the Pacific, our men had been in constant contact with stations on the mainland, sending information as to our position and speed, as well as the physical aspect of the eclipse. At this stage of our trip, the work of the radio force entered a new phase. By prearranged plan, we carried on a continuous exchange of messages with ground stations lying within the shadow path and others at definite distances on either side. Careful record was being kept, both aboard the flyer and on the ground, as to signal strength, fading, atmospheric disturbances, and any other attendant phenomena which might throw light on some of the remaining mysteries in radio transmission and reception.

Standing at Captain Renshaw's elbow, I checked our progress, as nearly as I was able, by reference, to the large map of the entire route before him. Presently I felt that we were climbing. Up to nearly nine miles we ascended, before the needle on the altimeter indicated that the flyer was racing along at even elevation.

"That's for several reasons," our pilot volunteered, anticipating my question from the look of inquiry which I directed toward him. "An area of rather thick weather is lying over the eastern portion of Idaho, according to radio advices which we have just received. Our present elevation will give us ample assurance that we will not be hampered by poor visibility. Of course, you know, too, that we are soon to cross the Continental Divide in northern Colorado, and we want to make sure that we don't run smack into the side of a mountain: Do you think, Mr. Waldron," and a mischievous smile played in his eyes, and curled the corners of his mouth, "that nine miles is a safe enough elevation? But seriously, the principal reason for our climbing is to enable Dr. Boyd and his men to obtain a number of photographs of the moon's shadow on the earth's surface. In fact, nine miles may not be high enough. We may have to go up to twice that height, or perhaps even higher, so that a good portion of the shadow, especially the edge, can be recorded. Of course, you will understand that we cannot expect to get a picture of the entire shadow, because of the extreme altitude to which we would have to climb.

"Dr. Boyd figured the thing out for me a short while ago—let me see now if I can recall the data—I think it goes like this: In order to make the moon's shadow on the earth appear as large as a ten foot circle held five feet from your eye, you must view it from an elevation of nearly fifty miles. To be sure, that is by no means an impossible feat for this ship of ours, but there are a number of reasons why it is not desirable. One is that it will take a considerable time to reach that altitude from our present location, and do so with least disturbance to the instruments aboard. It will take

almost an equal length of time to get back close to the earth's surface again. Remember that we must cross the Mississippi at a comparatively low altitude, so as to pick up the chain of beacons stretching to New York. And, I see by the chronometer that we have less than an hour now to St. Louis. But, Dr. Boyd sees no particular advantage in getting a picture of the entire shadow—at least, not just now. Perhaps later, when we have crossed the country, and are well over the Atlantic, we'll try our luck at real high flying."

The Rocky Mountains and Denver were passed shortly after 8 o'clock, Mountain Time, and presently we were racing over the Kansas plains. The rain and fog which we had hurdled in traversing the mountains were supplanted by an exceptionally clear atmosphere over the prairies. We dropped to an altitude of a trifle over a mile. Eastern Kansas, with its increasing thickness of population, its comparatively closer clusters of towns and cities, melted into the falling, somewhat hilly Missouri terrain.

Dr. Boyd approached and consulted the pilot with a touch of expectancy in his voice. "We'll cross the Mississippi in ten minutes," he explained to me. "You are familiar aren't you, Waldron, with our plans concerning the side trips on the stretch between St. Louis and New York. I'm looking forward to the next hour's journey as perhaps the most picturesque of the entire trip. When we pick up the trail of guide lights on the other side of the river, we expect to start the ship's rocket engines going and actually push ourselves forward *ahead* of the *solunaray* and out of its zone of power. By maintaining a speed equal to that of the moon shadow, but always slightly ahead of it, we shall have an opportunity of studying the phenomena which are evident only at the instant preceding totality and the instant immediately following it. But, instead of a mere split second of time which is generally allowed for such a study, we are going to take as much time as we please. In other words, this part of our observations will be directly in line with the entire series up to now, namely, we shall magnify and prolong, to suit our own purposes and plans, all those eclipse phenomena that always have been of an extremely evanescent character."

CHAPTER XII

Playing Tag with the Eclipse

DURING the past half hour, the rocket propulsive engines had been manned by their crew in readiness for action. In addition Dr. Fleming had made another check on the fuel cargo and the feeding and firing devices for each of the twenty-four tubes. Captain Renshaw eased the huge flyer down several hundred feet, at the direction of Dr. Boyd stationed by his side. At this relatively low altitude our speed of nearly twenty miles a minute reduced everything on the ground to a veritable smear of green and brown. I peered anxiously out of the observation panel into the gray distance to the east. Presently a low exclamation from Dr. Boyd told me he had located that for which he had been scouring the horizon.

"There!" he pointed with exultation through the panel. Far off in the shadowy twilight that lay directly in front of us, I perceived a pinhead of light; it grew brighter as we sped toward it. Beyond it there was another. A third was just barely coming into view. We were heading true toward the string of powerful beacons which had been erected to guide the vessel across the stretch of country to the Atlantic. A hasty glance downward gave me a flashing glimpse of the city of St. Louis sprawled out on the bank of the narrow brownish thread which was the mighty Father of Waters. I caught a momentary glimpse of the bridges straddling the river, and then a flash of light as the flyer sped directly over the first beacon located on the outskirts of East St. Louis, Illinois. In less than thirty seconds the next illuminated marker rushed from the east, flew squarely under our nose, and disappeared like a flaming meteor to the west. The next one was on us almost immediately.

Dr. Boyd glanced up from the instrument with which he had been studying and checking the passage of each beacon. A look of extreme satisfaction played upon his features.

"The string of lights ahead of us could not have been laid out more perfectly," he commented with a slight touch of pride in his voice. "Although," he added, hastily, and somewhat apologetically, "I need not claim any great credit for this piece of plotting. The portion of the eclipse path lying between the Mississippi and the Atlantic is to be covered by the moon's shadow in the vicinity of high noon. Of the entire eclipse band, this particular part traversed by the sun when it is at its zenith position can be laid out with greatest accuracy."

He turned hurriedly to communicate by telephone with his assistants and co-workers stationed at their instruments in the domed chamber behind us.

"A busy hour lies ahead of us," he said to me, "an hour that will be crowded with observations of a somewhat different nature than those we have been making all morning." Then, turning, he inquired briefly: "Well now, Captain Renshaw are you ready with the rocket controls? All right then, give her the gun!"

A faint hissing sound from the rear of our vessel told me that the auxiliary power was going into play. The hiss increased gradually, and soon rose to a dull roar. I looked up at the sun. Its location high up in the eastern sky corresponded to the position which it usually occupied at about ten-thirty o'clock on a summer day. I glanced back at the speed register. From its steady indication of about 1,320, which we had maintained for more than an hour, the needle began to climb very slowly, until it wavered about 1,350. Captain Renshaw kept his eyes glued upon the string of flashing guide lights which raced along below us in regular succession.

Suddenly a chorus of exclamations came from the handful of laymen observers who happened to be in the control room with me. I added my own cry of wonder as my gaze was fixed on the spectacle almost directly overhead. Like a flash was gone the beautiful corona that had surrounded the eclipsed sun from the moment of sunrise in Alaska. A thin thread of light became visible on the eastern edge of the dark mass of the moon. Only for an instant did this thread-like luminous line persist. Then in a twinkling it broke up into beads of light, some round, others oblong in shape. The effect was that of a huge string of flashing beads visible half way around the moon's circumference. I recognized the familiar appearance of the phenomenon which has so aptly been termed "Baily's Beads." I remembered Dr. Boyd's explanation of this odd and beautiful effect, the explanation that has been most generally accepted.

At this stage of the eclipse, the rough and irregular edge of the moon covers the edge of the solar disk completely at some points, while it just falls short of covering it at other points. In other words, we were actually looking at the sunlight coming through the valleys and depressions at the edge of the moon, while the highlands and mountains covered the solar disk at adjacent points. I recalled seeing this strange appearance at the Singapore eclipse, at the instant when totality began.

Captain Renshaw had now reduced our speed back to the original point, and so for several minutes, we raced along at the same rate as the advancing shadow-cone, but, figuratively speaking, just one pace ahead of it. I confessed that this required some expert navigation on the part of our pilot, for it meant steering a precise course directly over the vast stretch of guiding lights, as well as maintaining the proper velocity with the closest accuracy. But so perfectly were the ship's course and speed managed, that the spectacle of Bailey's Beads remained fixed and unchanged for a period long enough to allow a considerable number of photographs to be made. I was back in the observatory soon after the beginning of this phase of our trip, to get a better view through the telescope of the strange phenomenon overhead, and to watch the photographing. When all the work had been completed, Dr. Boyd directed the pilot to fall back just a trifle in speed.

"If we can do this right," said the astronomer to me, "you will see a very beautiful phase of the eclipse—one in which Dr. Fleming, with his chemical viewpoint uppermost, is very deeply interested."

Inch by inch, almost, we slowed up, while the beads of light on the eastern rim of the sun grew smaller and fewer. One at a time the spots of light disappeared, until the final one faded slowly from view. At that instant, a signal from Dr. Boyd halted our deceleration. Upon the disappearance of the last bead, an exceedingly narrow crescent of deep rose color sprang into view, contrasting beautifully with the black body of the moon and the pearly radiance of the corona which had blazed into being once again. With delicate precision, the enormous ship was kept at just the speed and exactly in the proper position to maintain this colorful rim while spectroscopes, color cameras, and other instruments were directed upon it. I was puzzled and bewildered by this unique spectacle—the more so because I had never seen it before. But I had to bide my time, and wait until my two scientific friends had completed their observation on this phase of the eclipse, before I dared interrupt with my questions. Dr. Fleming volunteered the explanation.

"Directly above the visible surface or *photosphere* of the sun," he said, "there exists a comparatively shallow layer of incandescent gases scarcely five hundred miles in depth which is known as the *chromosphere*. Near the moment of totality, as the moon advances over the photosphere, there will come a time, simultaneous with the disappearance of Bailey's Beads, when the light of the photosphere is shut off, while the rose chromosphere still remains visible. In an ordinary observation, the moon covers this layer in less than a single second. But a study of it is of immensely scientific value, because it tells us a good deal about the condition of this portion of the sun's atmosphere, the nature of the elements of which is consists, and its dependence upon other solar phenomena. I have just made some excellent spectrophotographs of the chromosphere, which, on careful study, ought to reveal some interesting data on the chemical composition of the sun's atmosphere, if nothing else."

We increased our speed again, which brought back the familiar luminous beads that we had just been observing. The spots of light gradually coalesced once more into a thin crescent of light, which was the rim of the sun peeking around the edge of the dark moon. The crescent widened steadily as the flyer roared along over the string of beacon lights below. We were now traveling considerably faster than the advancing shadow—actually running ahead of the eclipse! As I watched the ground below I suddenly perceived that we were swerving away from our path of guiding lights. Turning to Dr. Boyd in alarm I received a reassuring smile in return.

"This is our side-trip from the shadow line," he said simply. "We intend to study this eclipse from every possible angle before we are through."

The flyer swung swiftly to the south and made a wide circle at an ever mounting speed. I observed that the sun was now only about three-fourths obscured presenting an appearance that was indeed almost strange to us, because we had been viewing nothing but a completely eclipsed sun practically all the way from our starting point on Kodiak Island. In fact, the increase of light, compared to the dusk-like aspect during the long period of totality, was almost dazzling. The corona, of course, had disappeared long ago, while throughout the sky the stars had faded one by one.

Bearing around in an enormous sweep, we came in sight again of the trail of beacon lights strung across the country. Only we were now several hundred miles behind the huge shadow of the moon, which had plunged on relentlessly while we were manœuvering the wide circle. I judged, roughly, that we were somewhere over southern Indiana during this extensive circumnavigation. Once the row of lights was located directly beneath us, Captain Renshaw opened the power several notches, and we roared furiously down the path in the wake of the advancing eclipse. However, he was in no hurry to overtake it, because there were yet a number of radio tests that had to be conducted during this stage of our flight—an exchange of messages with land stations in order to determine the effect of the partial eclipse on radio transmission and reception. Gradually the solar crescent narrowed down, and we observed once again the succession of phenomena with which we were so familiar, the Baily Beads, the rosy chromosphere, the last spark of the obscured sun, and the flash of the glittering corona. At each step there was a perceptible slowing up, to magnify and prolong the effect, and to permit of check observations and photographing, to correlate with and supplement the earlier records.

The entire procedure struck me for the first time as being decidedly uncanny—this playing tag with the eclipse, jumping ahead of it, swinging around it, stealing up behind it, spying upon it from all angles. It reminded me of a cat worrying a mouse in its power. And it certainly meant no more than that—we had this inexorable cosmic phenomenon in our power, making it go through its paces as one would a trained seal—if you will pardon the mixed metaphor. By all means, it was unmistakably supernatural, and yet it was as real as cold fact itself.

CHAPTER XIII

"We've Lost the Solunaray!"

ONCE more we were back in the grip of the sun-moon power beam, as evidenced by the slight jar when this mysterious shaft of energy took hold, and by our sustained speed as the rocket engines were gradually throttled down. Dr. Boyd checked our location and determined that we were somewhere in the neighborhood of Columbus, Ohio. The sun being now close to the zenith, with the moon's shadow traveling at its slowest speed of the entire eclipse path, he calculated that we had about twenty minutes still to spare before striking New York. Following a hasty consultation of the scientists, it was decided to make another brief sortie to the north, and come around again behind the eclipse as before. This would give additional opportunity for corroborative observation and study from a new angle.

Accordingly, the rocket tubes blazed forth once more, and the *Eclipse Special* moved in a wide arc to the north. More methodical camera work, telescopic examination and minute study of the partially obscured sun from this new direction. Then a great sweep around again to pick up the luminous trail once more. With our chief pilot at the controls—Captain Renshaw had of course been relieved from time to time by his assistants during such portions of the flight when his acute skill in navigation was not urgently required—the massive vessel ripped along behind the flying wall of darkness that was the moon's shadow. Eastern Pennsylvania sped under us in a blur of landscape. In five minutes we would flash over New York and out to sea. The beads of light that represented the guiding beacons on the ground followed one another in a dizzy succession. We were now flying a true course over the line of luminous specks below—Dr. Boyd, sighting through the instrument in the control room, verified that to his own satisfaction.

Thirty seconds passed. A look revealed the sun again eclipsed—not a sliver of its incandescent surface could be detected—nothing but the glorious corona once more. I glanced through the floor panel—the moon's shadow was one vast mass of darkness spread out directly below, and covering almost the entire visible portion of the earth's surface. From our elevation of less than a mile, only a reddish glow was evident around the horizon—the reflected light from the unshaded portion of the ground sixty or seventy miles away.

Another minute passed. From all indications, our ship was traveling in the direct centre of the shadow cone. Everyone on board tensed himself for the now familiar shock which was to herald our contact with the *solunaray*.

It did not come!

Seconds passed—precious seconds, during which anxious eyes turned from the obscured sun overhead, to the string of beacons below and in front of us to the dial of the speed indicator on the panel and back to the blue-black orb above. Where was the *solunaray?* Had its mystifying power been suddenly extinguished? Or were we in the very centre of it without being aware of our position? The pilot shut down one of the rocket batteries. In five seconds the western rim of the sun poked its way around the dark moon and began to enlarge into a definite crescent. We were slipping back! With a roar the full rocket blast again cut the air sending us forward into the shadow once more.

Dr. Boyd, pale and silent cast a grave glance at Captain Renshaw. The pilot was making another effort to search out the elusive axis of the shadow cone. Dr. Fleming hovered close by, scanning the landscape anxiously. The rest of us in the control room were grouped in nervous huddles, not knowing what next to expect.

"It's no use!" muttered Captain Renshaw hoarsely. "This is my third attempt, and worse than the others. My speed is perfect—we couldn't be more accurately over the beacons—but that damned *solunaray!*—Where is it?"

Below us the state of New Jersey was flying by at about one-third of a mile each second. We were less than forty miles from New York and the end of our trail. Off to the west were the three remaining beacon lights. Two minutes to go—and still the dull roar from astern told us that our rockets, and not the *solunaray* was driving us along. Either the shaft of energy was no longer in operation, or else something radical was wrong with our navigation. In the excitement of the moment all thought of the eclipse vanished, and the magnificent drama above, now grandest and most spectacular because it was directly in the high-noon position, went on unheeded.

Two more guide lights ahead of us, and then the open Atlantic. The pilot still juggled his controls, sweeping the flyer through the centre of the shadow in search of the power beam. The last beacon now lay in our path. Sweeping relentlessly onward, the ship cut true across the lighted marker that blazed a last hopeful beam to us from atop the highest point on Staten Island. In five seconds we were across New York Bay and speeding over a corner of Long Island. In five seconds more the vessel was streaking madly above the waters of the Sound. Almost before we could realize it, we found ourselves cutting a swift path over the open Atlantic.

"We've lost the *solunaray!*" Dr. Boyd's words broke the ominous silence—and there was almost a note of tragedy in them as they were uttered. With something of a slight choke in his voice, he added ruefully: "I think I know the reason. It's the laying out of those last few beacons, and I'm afraid I am to blame, too. The portion of our path from St. Louis to about eastern Pennsylvania was laid out accurately enough—there's no doubt about that. But the shadow path of the eclipse, near the noon position, takes a swing that bears slightly to the north. And it's that small portion of the line of beacons that was in error. I knew from the start that this short curved stretch would be difficult to locate with the same degree of precision as the rest of the line. But I didn't think we could possibly miss the centre line entirely." He gazed mournfully through the window at the darkened ocean below, and lapsed into silence.

"Tut—tut, my dear Boyd," announced his chemist friend cheerfully, "There's no great harm done, I'm sure. Haven't we made enough study of the eclipse today to warrant our calling a halt? What if our trip is only half completed? Can't we just steer about and land at New York? Why, even if we quit this very minute, we can return with more eclipse data in our possession than has been accumulated in a century of former eclipse study."

Dr. Boyd remained standing in mute despondency.

"It would be a shame, indeed," interjected one of the government astronomers, gravely, "to quit right now at the most interesting and perhaps the most important stage in our marvelous trip. There is so much more to be done in the way of repeating and checking up our many observations on the eastern portion of the eclipse path, that we can truthfully say our work is only half accomplished."

A council of war was immediately held to ascertain the best plan of action. Meantime, of course, the flyer, under the skillful guidance of Captain Renshaw, was still plowing her way along, always in the moon's shadow, but never quite near enough to the mathematical centre to enter the influence of the *solunaray*. Which meant that our rocket motive power was in constant action.

In the brief, yet tense discussion that ensued, a number of plans were proposed, and the merits of each weighed. One course was, as Dr. Fleming had suggested, to abandon the trip at this point and return to land by the most direct route. His choice was based mostly, he was frank to confess, upon the apprehension that we might run out of fuel if we maintained our course over the Atlantic under our own power. There were some of the leaders of the expedition who were of the opinion that we should continue so under the driving force of our rocket propulsion, keeping within the shadow path, and completing the necessary observations which we had planned for this portion of the flight. The question was, how much further could our remaining fuel supply propel us?

Dr. Fleming, after a hasty calculation, admitted that we could probably reach almost to the coast of England under our own power. If such be the case, argued the proponents of the second plan, then by all means continue, and to blazes with the *solunaray!* After all, they asserted, the sun-moon power beam had carried us quite a comfortable distance, and we surely could negotiate by ourselves the intervening stretch of water to England.

A small, but exceedingly vociferous group insisted that we at least make some concerted effort to find the *solunaray* again, and have it carry us along to the end as planned. Some of the loudest advocates of this idea were among the paying passengers, who did not relish having this extraordinary flight abruptly terminated, just when they were beginning to enjoy it fully. Numbered also among the advocates of the "onward" policy were some of the scientists; even Dr. Boyd was somewhat inclined toward this plan of action. For, it became evident, that in addition to the valuable checking work to be done during this half of the journey, there were some highly important observations to be made at the very end of the eclipse, when the obscured sun was taking his final plunge for the day beneath the horizon. Somehow, it seemed a pity to come thus far, and not see the grand finale of the day's super-spectacle.

Captain Renshaw was now called into conference with the rest, while his chief aid took over the controls. Did he think he could juggle his way around in the moon's shadow, and navigate into the *solunaray?* Well, he willingly and frankly granted, so far his efforts were a failure. But he had, with all due regard to modesty, a great deal of confidence in his piloting skill. Obviously, with nothing to guide him but the eclipsed sun above, it was a difficult job, he admitted. However, if all aboard were agreed, he was willing to make another stab at it. That is, provided there was enough fuel left. A second check of the available supply was made. It was a great gamble. Could we afford to expend our last reserve of chloramine-oxone liquid? The matter was discussed back and forth. Precious time was being lost. Little, if any eclipse observing was taking place; in fact, the sun above was hardly being noticed, in the excitement.

Finally, a last vote was taken, and to my surprise the consensus of opinion was: "Go ahead!" Evidently, the element of "gamble" stimulated the sporting instinct of the group. And, in the last analysis, was there any real danger involved? Even if we ran out of fuel before we reached England, our vessel was seaworthy, and could remain afloat indefinitely. Or, if we chose to stay aloft, in the event of stormy conditions near the surface of the water, our anti-gravity devices would come into play, and keep us elevated for as long as was necessary. Then, when the time was propitious, we could descend to the surface of the ocean, to be taken in tow by some passing vessel. It was decided by the scientists to continue their observations of the eclipse without interruption. For, throughout all the manœuvering that would be necessary in order to locate the *solunaray*, the flyer would be constantly within the shadow of the moon. In other words, the eclipse would be on for us just the same, even though we would continue to employ our own power to keep within the darkened area.

CHAPTER XIV

Back in the Harness

AND so, there began perhaps the strangest stage of our unique journey. Most of the party returned to the observatory. I elected to remain in the control room in order to watch the details of navigation. With Captain Renshaw back at the levers and switches, and Dr. Boyd at his side to help in the manipulation, the extraordinary aerial hunt started. A systematic plan of action was evolved, which provided for a thorough fine-combing, so to speak, of the central portion of the shadow cone. Starting at one edge—the western one—with the first of the now familiar beads of light just barely visible around the rim of the moon, we accelerated slowly, passing through what the pilot judged to be the centre line of the shadow. We continued thus until the sudden appearance of Bailey's Beads on the opposite rim indicated that we had missed our mark. Then, slowing up slightly, we fell back again gradually through the entire width of the eclipsed area, to observe again the sparks of fire bursting forth from the sun's western edge. Back and forth we seesawed in this fashion, combing the shadow carefully—searching for that fifty-foot beam of energy concealed somewhere near the center of an area more than one hundred miles across.

The minutes piled up into an hour. I lost track of how many times the flyer ploughed her way ahead through the shadow, only to fall back in disappointment for another try. Dr. Fleming kept an anxious eye on his fuel gauge. He was still apprehensive regarding the rapid consumption of the precious oxone fluid, despite the assurance that no great harm lay in using the material even to the very last drop. Another hour rolled

by. With all the methodical juggling and twisting through which Captain Renshaw put the *Eclipse Special*, he was now practically prepared to admit defeat. Either something had really happened to the *solunaray*, and it had mysteriously melted into nothingness, or else it was too narrow and elusive a target to shoot at, particularly in view of the tremendous speed that had to be maintained, and the absence of anything tangible to use as a guide. It was a mere groping in the dark, figuratively as well as literally.

Our pilot was ready to give up, and so were most of the others aboard. After about two and a half hours of ceaseless battle over the Atlantic Ocean, we were now very close to the westerly tip of England. With deep disappointment in his voice, Dr. Boyd announced to our assembled group that the journey would have to be cut short upon our reaching land again. Our fuel supply had now been so greatly depleted that it was useless to continue the hunt for the *solunaray*. And to proceed on our own power would be hopeless, because we could never attain the end of the eclipse path. The point of sunset, somewhere in eastern Sweden, was still well over a thousand miles away, a distance entirely too great to negotiate without the aid of the *solunaray*. At the rate at which our fuel was being consumed, we could probably reach some spot over the North Sea. But then there was the uncertainty attached to such an ending, the unpleasant thought of delays, adverse weather conditions. Instead of a majestic finish to a majestic voyage, we would be towed in like a helpless derelict. What an anti-climax!

So that, with great reluctance, it was decided to call a halt when we touched England. Captain Renshaw calculated that our present course would bring us over land somewhere near Southampton. Dr. Boyd suggested that it might be best for us to continue in the path of the eclipse a short distance beyond this point and then make a swing north out of the shadow, to land in London. That seemed to be as auspicious an ending as could be expected under the circumstances. The plan was agreed upon, and advance announcements were radioed to the British stations, telling of our unfortunate situation and our final decision.

In all the turmoil and uncertainty of the last few hours, the eclipse was advancing with relentless and unerring precision. It was now past 7:30 P.M. English time, and the obscured sun, in all its splendor of corona and scarlet prominences, was sinking rapidly in the western sky. We had been on our way now for almost seven hours—trailing the heavenly spectacle and marveling at its matchless beauty. Too bad that we could not accompany the sun through its last hour of flight to witness its final dash below the horizon on the European mainland.

Most of us were now gathered in the observatory, watching the rapidly descending orb. It was to be practically our last look, and we wanted to get the most of it. Captain Renshaw, at the control panel, was holding the vessel unflinchingly in the eclipse path—figuratively "squeezing the last ounce of value" out of the solar spectacle.

Then, with startling suddenness, the unexpected happened. The huge ship gave a tremendous lurch that threw most of us off our feet. I found myself bruised and with brain swimming, in the far side of the circular chamber, entangled in the wreckage of one of the smaller cameras which did not happen to be fastened down to the floor. A bedlam of shouts reached my ear. It was several seconds before I had recovered sufficiently to scramble painfully to my feet. Not a tremor now in the leviathan of the air. All was as steady as though we were anchored to solid ground. The confusion of shouts from the other side of the observatory continued. Then suddenly one cry rang out clear and loud above the rest. It was repeated. It stilled the discord of noise:

"The *solunaray!* . . . The *solunaray!* . . ."

To be sure—the *solunaray*—I reflected, my senses still reeling from the hard jolt. Too often had I experienced that lurch—now more violent than ever before—followed by that sense of absolute calm, that total absence of vibration or tremor. But how?—what?—why this sudden last minute stroke of fortune? It was too good to be true—almost like a fairy-tale!

When calm had been restored aboard the flyer, and the otherwise staid and sombre scientists had gotten over the wild exultation of the moment, we took stock of our remarkable situation. True enough, we had, by the purest inadvertence imaginable, blundered into the *solunaray*.

"Think of it!" ejaculated Dr. Boyd. "A wild struggle stretching clear across the Atlantic, and then to stumble into the ray by sheer accident! And when we had given up the fight, too!"

"And just imagine," added Captain Renshaw, a bit ruefully, "after all my scouring and rescouring of the shadow area during the last three hours, we had to run plunk into it in this unexpected fashion!"

"Now, captain," interposed Dr. Fleming soothingly, patting our pilot on the back in a most affectionate manner, "don't you take it to heart. You have done a marvelous bit of piloting thus far, and no one could have combed that infernal eclipse shadow any better than you did. We'll just have to accept this fortunate stroke as an act of Providence. But come, we're wasting time. There's only an hour of daylight left—and a lot of check observations still to be made."

For the second time in the course of this epochal trip the cry of "Land!" announced the termination of a long transocean stretch. In the dim light below, I could discern an irregular coastline speeding at an angle across our path. At this stage of our flight, the eclipse path was bearing us in a northeasterly direction, just as our trail had pointed to the southeast at our starting point in Alaska.

Alaska! How far away it now seemed! And far away it really was—ten thousand miles—on the opposite side of the globe. Only seven hours ago we had plunged ahead on this unique journey—a journey that had carried us across two oceans and a continent, in the shadow of the magnificent drama being enacted in the skies. And now we were being whisked through space toward that not-distant spot where the grand climax of the performance was to be enacted.

Gathering speed each moment as the setting sun retreated in the northwest we swept smoothly onward, our rocket engines now silent, the vessel firm in the vise-like grip of the *solunaray*. We swept over the fog-enshrouded corner of England at an elevation of nearly five miles. In less than ten minutes the *Eclipse Special* was over the North Sea, and headed in a slowly curving streak toward the mainland. The obscured sun, now very low in the sky, appeared magnified to three times its natural size. Atmospheric refraction gave that same

illusion of great size which I had observed at sunrise in Alaska.

During our swift passage across the short water stretch, the final plans for the termination of our flight were discussed. Just as we had plunged into the field of the *solunaray* on Kodiak Island early that morning, we would plunge out of it again in Sweden. At a signal to be given by Dr. Boyd about five minutes before the scheduled moment of sunset, the rocket power would be turned on full blast. This mighty burst of propulsive energy would tear us from the grasp of the *solunaray* as it swept off the earth's surface. Then we would land at our leisure, and thus bring to a triumphant culmination this phenomenal eclipse journey.

It took us about twenty minutes to traverse the dark expanse of the North Sea. In five minutes we shot across the Danish Peninsula and in three more the flyer was dashing over Sweden. Every nerve aboard the vessel was tensed in anticipation of the climax. The seconds ticked off ruthlessly. It was now nearly 9:45 P.M. Swedish time. Vaguely, I thought of what an unearthly hour this was for a sunset—just as I had marveled at that 3 A.M. sunrise in Alaska that very morning.

We had dropped to an elevation of about two miles. Half of the Swedish Peninsula was already behind us. At our half-mile-a-second speed, the remaining portion would be covered in short order. One minute—two minutes—"Now!" came the word from Dr. Boyd. An ominous hissing broke the silence and welled swiftly into a steady roar. Twenty-four tubes shot their powerful exhausts into space behind us. The gigantic ship quivered throughout her entire frame. She shot forward. For a moment she appeared to be undecided. Then, to the horrified amazement of all of us, the flyer began losing speed. And at the same time the roar of the exhausts behind us dwindled to a sickly gasp, and then was silenced. A slight jar shook the vessel—that unmistakable tremor that meant but one thing—the clutch of the *solunaray!* Dr. Boyd looked questioningly at Captain Renshaw. He in turn cast a puzzled glance back. An electrified moment of silence—and then a cry from Dr. Fleming.

"The fuel—exhausted—gone!" he uttered the dreaded words hoarsely. A quivering finger pointed to the fuel gauge—its needle rested at zero. And then the full realization of our predicament dawned upon us. The long, hard fight over the Atlantic had eaten deeply into our oxone reserve—more than any on board, even Dr. Fleming, had realized. And now the last explosive burst from the rocket tubes had consumed the precious remainder. Powerful though the blast was, it had proved insufficient to get us clear of the *solunaray*. The irony of it all! An hour ago, squandering the liquid propellent, trying madly to enter the influence of the ray—now stranded, so to speak, without a drop of fuel to get out of that same, new sinister influence.

CHAPTER XV

A Titanic Struggle

WITH blanched features, Dr. Boyd turned from the instrument to face the group in the control room. It had taken him but a moment to size up the situation. He had visualized it spontaneously, while most of us were still floundering about mentally. His curt words, coming in low spasmodic jerks, burned into our consciousness like fiery brands. The awful import of his message made us gasp in wild horror.

"We're in the grasp of the *solunaray* . . . and it is carrying us . . . but where? . . . look . . . the altimeter! . . . 22,000 feet . . . 24,000 . . . 30,000! . . . It is taking us *upward* . . . the moon's shadow axis at this sunset position is just grazing the earth's surface . . . at a sharp angle! At the moment of sunset, in three minutes, the shadow cone, with the *solunaray*, will leave the earth—will carry the *Eclipse Special* with it—off into space—the sun constantly eclipsed—dragged along through interstellar space—forever!"

This bombshell, exploded in our midst, left us stunned and speechless. But the astronomer, with a gleam of hope in his eyes, added quickly. "The flyer is lost, but not we—nor our records! We have our parachutes! —Quick!—Everybody get them ready—and the eclipse data—the pictures and plates—parachutes for them, too! Hurry—seconds count!"

Galvanized into frenzied activity, every member of our party hastened to don his life-saving equipment, and to prepare for the rescue of whatever of the more important eclipse material the scanty few minutes permitted. I remember in a vague sort of way that I worked feverishly with the rest, dashing from control room to observatory and back again. The flyer, its slow ascent hardly appreciable a bare minute ago, was gaining speed every second. A fleeting glance shot at the dial as I passed it once indicated an elevation of over 50,000 feet. Almost ten miles!—Whew!—About time for us to drop off!

I found myself wondering what would be the plight of our Eclipse Flyer out in space. A dead hulk, rushing through the endless void, swept by the relentless *solunaray*, on and on in dizzy hopeless flight. In the space of seconds, as I worked, there unfolded before me the entire panorama of our marvelous flight. I felt an inward pang of regret at the ignominious fate of the gallant craft.

Then with a suddenness that startled us, and halted our labors, Captain Renshaw's voice burst forth above the confusion of the moment: "Wait! All isn't lost yet!—There's one hope!—Dr. Boyd, Dr. Fleming!—The gravity nullifiers!—aren't they still operating?—and helping the *solunaray* drag us upward? Dammit all—we'll shut off the power—and have Mother Earth *pull us back!*" His voice rose almost to a shriek as he uttered the last words.

Even before he had finished talking, the pilot lunged to the main control panel and yanked a lever violently. The rest of us stopped in our tracks and regarded the young officer with speechless amazement. Why, hang it, I pondered in a hazy far-away fashion, of course! How did we ever forget those confounded nullifiers? There was the gravitational force of the earth just waiting to give us a helping hand, and we shooting off blindly into space without giving it a thought!

A rending jar shook the giant ship from nose to stern. A low humming sound reached our ears, and a faint quiver ran through the vessel's frame-work. Dr. Boyd had dashed over to Captain Renshaw and they were both feverishly occupied at the instrument. The rest of us remained rooted to the particular spot where he happened to be at the time our pilot burst forth with his sanguine announcement. The quivering and trembling of the *Eclipse Special* increased to an alarm-

(*Continued on page* 819)

The Second Missile

By Ed. Earl Repp

FROM California comes the story that on September 15th of this year a meteorite plunged into the waters of the Pacific shore, throwing spray and evolving steam in a cloud. So that meteorites are not particularly a thing of the past. What might some day be found inside of these meteorites is left entirely to conjecture. For instance, it might be discovered that a foreign visitor of this kind might be more than a mere stray meteorite. The author of this story has apparently established, in his own mind at least, the possibility of a projectile from outer space. He continues from that point and gives us a fascinating story of unbounded plausibility and absorbing interest.

Illustrated by MOREY

Fifteen Years Earlier

DR. THOMPSON FARRINGTON, son of the late Dr. Miles Farrington, sat stiffly in a big roomy chair in the lounge of the Scientists' Club and peered intently into the face of his friend, Professor Phillip Brandon, who reclined lazily on a divan opposite him.

For a full minute he studied the older man before their eyes met in a flash of mutual admiration. He leaned forward presently, elbows on his knees, and spoke.

"Well, Professor Brandon," he said reflectively, "today is the fifteenth anniversary of your discovery of that interplanetary machine, which dropped into the Barringer Crater in Arizona. Fifteen years have passed since you located the machine and its cargo of Stellarites*."

Professor Brandon closed his eyes again for a moment as though to conjure mental visions of his discoveries which fifteen years before had set the blasé world on its ears and awakened it to the fact that a distant globe had sent a couple of hundred of its gargantuan natives through space to conquer and take possession of the earth.

Swiftly his mind raced over the events and he relived again the thrills of encountering the mass of metals that was previously thought to be nothing more than a huge meteorite under Meteor Crater. He recalled vividly his first glimpse of the Stellarites, obtained when he opened one of the metallic containers within the machine in which they were housed in a state of suspended animation.

It was with a slight shudder that he recalled Dr. Miles Farrington's efforts to revive the Stellarites by removing the living brain of his son, Thompson, for experimentation with certain drugs he had formulated.

His old friend, Dr. Farrington, Senior, had certainly made a terrible sacrifice in his efforts to bring about the normal animation of the creatures. But his efforts had proved fruitless and he had come well nigh to losing the life of his only son—the man who now sat not five feet away. He saved him at the last minute, after finding only sufficient drugs in the pollen of a tiny weed to revive him from the state of suspended animation in which he had been placed.

And when the Stellarites could not be animated by any known formulae on the face of the earth they were duly placed in a concrete vault near Meteor Crater so that they could do no harm to humanity, or be harmed by human ghouls.

Despite the fact that the Stellarites had obviously come to this world with the intention of conquering and taking possession of it, they had been given a decent burial, living in a temporary state of death.

Their mission to the earth had been partly deciphered from documents found in the machine by Dr. Dennison of the Ritchey Observatory. It was thought that their planet, a small world half-hidden from the sun's light by our own globe, was slowly dying for want of warmth. They had henceforth set out to take possession of it by wiping out all humanity, still in the primitive state though it was at the time of the machine's arrival, to pave the way for a general influx of those on their own darkening world.

All these things flashed swiftly through the mind of Professor Brandon as he lay upon the divan, to all outward appearances, fast asleep. But Farrington knew that the old geologist, who had been his father's closest and most cherished friend, was very much awake.

Presently his eyes snapped open and he glanced quickly at the clean-cut features of his late friend's son.

*Stellarites: strange, human-like beings found in suspended animation in an interplanetary machine.

In the instant he concluded that Tom was growing more like his father with each passing day. He had his father's hard, flashing eyes, in which could always be found a certain passion for winning.

Yes, Tom was like his father, even to his powerful physical structure, the cut of his black, neatly combed hair, and above all—what lay under it. At his father's death, he had fallen into his place of worldly importance in the profession of medicine and surgery, and since that time he had made many advances over his parent's past achievements in the art of alleviating mankind's suffering.

Moreover, he had never given up the hope that he would some day complete the formula that his father had started before his death. It had been his father's dying wish that he, Thompson Farrington, take up the

"... But I heard a sound as if all the houses would tremble and move away. Many windows were broken, a large strip of ground was torn away ..."

work of reviving the creatures, using the near-completed toxin that was to be left to him.

But the final ingredient that would make the formula a success was apparently not to be found on the face of the earth. Every known element had been utilized, every known plant drained of its sap and everything available had been used—to no avail. It was taken for granted that the only place where this final ingredient could be obtained was on the world of the Stellarites itself. But Tom had kept his hope alive and before his quiet conversation with Professor Brandon came to a close, it knew no bounds.

The geologist sat upright suddenly and nodded.

"Fifteen years!" he said, shaking his head unbelievingly. "It seems like yesterday or last week, Tom, when

we encountered the metal mass previously thought to be a meteorite. Time flies mighty swift for a man when he passes forty. Why I recall every word your father said right here in this room! They ring in my ears with vivid, distinct freshness. He certainly gave me a raking over that I never will forget."

"So I heard later," Farrington laughed. "You can't expect to call the hand of a Farrington and get away with it. I heard you called his hand in the matter of a toxin to nullify suspended animation."

"I did, Tom," said the geologist, "much to my chagrin and regret. When he got through telling us how little our brains were in comparison with the faculties of those Stellarites, I felt like a chattering ape."

Farrington laughed aloud in amusement.

"You must have gotten under dad's collar to stir him up to that pitch," he said, "but it's a fact, as you know, that those poor devils have mighty powerful brains. That's why we have been unable to create a nullifying toxin to revive 'em. With our brains, it's mighty hard to duplicate their findings. Take interplanetary travel, for instance."

"Yes," Brandon admitted, "and they had developed it while the world was still overrun by savages. Your father was right."

FARRINGTON paused for a moment and stared thoughtfully at his neatly polished Oxfords, then looked up again.

"You know, Professor," he said seriously, "I've been doing a lot of thinking lately. . . ."

"You don't say!" the other interjected with a humorous grunt. "Why a miracle has happened. . . ."

"Never you mind about that," Tom snorted jovially. "I have a perfect knack of thinking occasionally. Believe it or not. But here's what I've been poring over. . . ."

The professor nodded and became at once attentive.

"For a long time," Tom continued seriously, "I've wondered if that supposed meteoric fall in Siberia might not be a second attempt on the part of the Stellarites to take possession of the world. I've carried that thought in my mind for many months. If the Stellarites were in such desperate straits as their documents reveal, then it is hardly likely that they would give up their plans after one miserable attempt. Even if their first emissaries failed to return or make some sign that they had arrived here safely, it is no reason why those who sent them should lose heart and abandon the idea entirely. In my opinion, that Siberian meteorite is not a meteorite at all, but another stellar flyer, which not contemplating or understanding atmospheric conditions surrounding our globe, plunged into the earth with equally disastrous results. I have a report that no attempts have ever been made to recover the so-called falling star. What do you think of the idea?"

Professor Brandon nipped off the end of a cigar and toyed with a lighter.

"What you say is logical enough, Tom," he said after a bit. "There's no reason in the universe why the Stellarites would want to give up their plans to take over this world for their own habitation. In fact, I've had a deep-rooted fear, since we discovered their machine, that other attempts would be made, that other such ships would land here, but I doubt whether the Siberian meteorite is associated with the Stellarites. No attempts have been made to recover the fall, large as it is, because every indication points to its being only what is known as an aerolite, or rock meteor, containing no metals whatsoever. Usually when a meteor falls, that is, a meteor of any great size, it is accompanied by a tailing of small metallic fragments, which remain on the surface, while the main body buries itself in the ground from sheer force of concussion and weight. In the case of the Siberian fall, nothing has ever been found on the surface to indicate that the body was of metal. In fact, many aerolite fragments have been picked up, indicating that the buried body is also of rock and useless. Ordinarily, when a large meteor falls, some big concern undertakes to dig it out for the metals it contains. As indications point to the absence of any metallic matter in the Siberian fall, it is generally conceded that it is an aerolite meteor, a mass of rock of little or no value, even to science, because so many of them have been recovered. No, Tom, I don't believe the mass in Siberia has anything to do with the Stellarites."

Tom Farrington looked at his friend, disappointed, and then slapped his knee vigorously.

"I don't care a hang what the surface indications are, Professor Brandon," he said firmly. "It is my set conclusion that that Siberian fall is not a meteorite! Even if the surface shows aerolite tailings, it does not prove that the Stellarites did not change the structure of their machines. This time they might have used a form of heat-resisting quartz that may be unknown upon this world. I am told that certain forms of rock and quartz are harder than steel. Why, then, could not Stellarites build a machine with an outside hull of some form of rock or quartz? I've looked into the matter of the aerolite theory and it doesn't convince me at all that the so-called fall is worthless. I firmly believe that the Stellarites sent a second missile to this world to do, perhaps, what the first one failed to do, or at least to check up on it. I'll wager anything that you will find another lot of suspended Stellarites under the Siberian terrain, and I'm willing to wager, also, that we'll find the drugs with which to revive the unfortunate devils."

"What makes you think so, Tom?" the professor inquired quickly.

"Well, when the first missile hit the Arizona terrain," Tom asserted, "it struck solid rock for the most part, accounting for its shattered and demolished condition. The Siberian mass is said to have fallen in a bog or swamp, which offered little resistance. That leads me to believe that the machine, if it is a machine, has been damaged but little, though it was undoubtedly buried thousands of feet below the surface. Therefore, without the resistance to smash it up, we may find everything inside to be intact and undamaged. You know that dad found a broken vial that had contained the nullifying toxin we have long sought. It was broken because earth-resistance or impact on hard rock smashed everything breakable. Supposing that the same machine had struck a marsh or swamp? The resistance would not have been powerful enough to smash it up. That's why I think we'll find unbroken vials of the toxins and antitoxins in the Siberian body, assuming, of course, that the mass is a Stellarite machine. Personally, I believe it is."

"You offer an entirely new theory on interplanetary machine construction, Tom," the professor stated, his eyes flashing with a peculiar light. "They might have changed the surface material of their machines and built one, at least, of aerolite rock or quartz. Do you know, Tom, I'm beginning to believe that you have hit some-

thing worthwhile. The more I think about it, the more I can see where your deductions might be correct! But it would cost a fortune to prove them."

Thompson Farrington nodded affirmatively and grew tense in his chair, his features aglow with excitement:

"A fortune, yes," he said, "but not so big that the Farrington wealth cannot cover it all, if necessary. You know dad left an estate running into millions. I'd give almost anything I own to revive those Stellarites. It was dad's dying wish that it be done. If we fail to find a machine under the Siberian crater, I'll be disappointed, of course. But it will far from break me financially, I assure you."

A brief spell of silence reigned for a moment and then Brandon eyed the other decisively.

"Then we'll investigate that crater, Tom!" he ejaculated suddenly. "If that body is what you believe it is, and I'm beginning to agree it might be, you will stand no loss, for the American Meteorological Society will stand the expenses. I'll get hold of Dr. Dennison of Ritchey Observatory, and my assistant, Dr. Valeri, the anthropologist, and arrange for an expedition. Of course you will go along, won't you?"

Farrington grinned with anticipation.

"I wouldn't miss it!" he said. "Moreover I am prepared to leave any time you say. My staff can handle my affairs until I return. Go right ahead and make all plans. Consider yourself in charge of the expedition and let me have all the bills. Get whatever equipment is necessary and notify me when you are ready to depart."

The Expedition Starts

BEYOND the purchase of necessary equipment in Seattle, the flight to Kirensk was uneventful. Tom Farrington, Professor Brandon, and Drs. Valeri and Dennison made up the party. They had boarded a transcontinental airliner to Seattle, where they stopped long enough to obtain equipment and see to its freightage by special airfreighter to Kirensk, and then followed it in a direct airway.

When they arrived at the Siberian city, they found their equipment waiting for them. Not a moment was lost. Within three days, the equipment was on its way up the Tunguska River on motor-propelled rafts, with a hundred strapping, wild fur-clad natives manning them.

The air was filled with a lung-tickling frost, but it was not cold enough to chill the hopes of Dr. Thompson Farrington. He was still convinced that somewhere, under the supposed meteor crater lay the long-sought solution to the mysteries of suspended animation as applied by the Stellarites.

He and his three companions followed the rafts up the river in a motor launch. It was not long before they realized that getting the equipment to the crater was going to be a difficult project, for the terrain was becoming increasingly inaccessible and they were not near their destination.

Barren tundras lay on every side, frequently interspersed with dense conifer-filled swamps. Occasionally they swept past villages of Tunguse natives, fur-clad, and for the most part savage and bold. They lived in skin-covered huts and bared their fangs at the passing procession.

As they proceeded slowly, Dr. Dennison opened up his portfolio and began to pore over official records of the Siberian fall. He made notes of the location of the crater again and turned to Professor Brandon.

"We'll be turning off shortly to enter the Podkamennaja Tunguska river at about 60 degrees north latitude and 101 degrees longitude, east of Greenwich. The crater lies in the upper basin of the river and we ought to reach it sometime tomorrow."

He turned quickly to Farrington.

"I don't wish to appear pessimistic, Farrington," he continued, "but I'm really in doubt as to the existence of a Stellar machine at the bottom of the crater. It has always been conceded that this Siberian meteorite was connected with Pons-Winnecke's Comet, which passed over here shortly before June 30, 1908, at which time the missile was seen to collide with the earth. Have you ever heard the accounts of the fall? They might alter your conclusions before you spend a lot of money."

"No, I never have," said Tom without a trace of waning hope. "If you have the accounts, go ahead and read them. But I warn you that they will not alter my hunches."

The astronomer buried his head in his papers and began reading the accounts, obtained by a former survey from some of the Tunguse natives, who witnessed the collision.

"Well," began Dr. Dennison with finality, "about the best of the accounts were obtained from a peasant named S. B. Seminov. He says: *About eight o'clock in the morning of June 30, 1908, I had been sitting on my porch with my face to the north, and at this moment in the northeast direction appeared a kind of a fire, which produced such a heat that I could not stand it. And this overheated miracle I guess had a size of at least a mile long. But the fire did not last long. I had only time to lift my eyes and it disappeared. Then it became dark and then followed an explosion which threw me down from the porch about six feet or more . . . but I heard a sound as if all the houses would tremble and move away. Many windows were broken, a large strip of ground was torn away. . . ."

He paused to survey the features of the surgeon, but found nothing to indicate the slightest deviation from his set conclusions.

"That's one report, Farrington," Dennison said presently in resuming the relation of the various accounts of the phenomenon. "Here's another of equal interest and almost proof that the fall is a meteorite: 'Professor Kulik†, sent out just prior to 1921 by the Academy of Sciences of the U. S. S. R. (as the Russia Soviet initials read), learned from the native Tunguses that the spot where the mass exists was once used as a pasture for a herd of tame reindeer. After the fire, they went to find the herd and found only the dead, scorched carcasses. For 10 or 15 miles around, all the trees are now dead and bare and almost lie on the ground with their tops turned away from the crater. The natives assured Kulik that the whole valley was once heavily wooded. All the vegetation show the effects of constant scorching and the whole terrain around the fall is desolate and barren. The spot is pock-marked with numerous small craters around the large one and with the main mass as well as the fragment came a vast envelope of hot gases which performed the wide-spread damage.'"

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*From "The Great Siberian Meteorite," by Chas. P. Oliver, Ph.D., in July, 1928 issue *Scientific American*.

†Professor Kulik made the preliminary survey of the fall.

He paused again and glanced around the circle of his eager audience. Then he addressed Tom again.

"Isn't that proof enough that the fall was that of a meteorite and a swarm of fragments?" he asked hastily.

Tom Farrington looked into his eyes for a long moment and shook his head negatively.

"From present-known theories of meteoric bodies, it does, Dennison," he said. "But what's to prevent the Stellarites from sending a machine into space propelled by some rocket principle? Wouldn't the rocket exhausts create the fire referred to in the accounts? Wouldn't the fuel explode as Seminov claims the mass did? Isn't it possible for the tail of fire and the explosion to burn the countryside? Another thing in defense of my theory is this: Is it impossible for an interstellar machine to create such a terrific vacuum behind it during its rapid flight to attract meteoric fragments into its draught and carry them along with it? In my opinion that's what happened in this case as well as in the fall of the machine in Arizona. The small craters around the larger one seems to me to have been made by the fragments attracted from space by the machine coming here. No, Dennison, you cannot shake my belief with such meagre accounts. You are taking too much for granted."

"I'm trying to save you a fortune, Farrington," Dennison said, replacing his papers in his brief-case. He seemed a trifle exasperated at the steadfastness of the younger man. His vanity was hurt because this layman openly contradicted what he thought was better reasoning.

"Just the same, Dennison," Tom informed him crisply, "*my* money is being spent, and for a worthy cause. You'll have to admit that!"

"A worthy cause, right enough," the astronomer said, lighting his pipe, "but it's going to be a costly one."

"Well, what of it?" Tom snapped rather rudely. Dennison's unfounded argument was getting under his skin, tough as it was. "The Farrington estate can stand the loss. Supposing Brandon had listened to such talk before he began excavating for the machine he recovered in the Barringer Crater? Well, the machine would undoubtedly be there still!"

Dennison was silent, almost brooding, until Tom reached over and shook him by the shoulder.

"Snap out of it, Dennison," he said. "What's the odds if we don't find anything more than a mass of meteoric rock! Even that will be of interest to science."

The astronomer grinned good-naturedly. He filled his pipe again and they went on in silence. The rafts suddenly swung to the right and entered the mouth of a small river. The crews performed their maneuvering expertly and chanted raucous songs as they went about their duties.

FOR several hours they kept on up the small stream and finally Brandon blew a whistle and signalled to the leading raft. It swung inshore at once; the others followed to prepare camp before the fall of the arctic night.

Early the following morning the procession was on its way again, half-hidden in a shroud of murky gloom that hung low over the river. Gradually the river narrowed, until at times the rafts could scarcely get through without running aground or scraping the shores. But by skillful navigation, they kept on, laden with tools, lumber, provisions and mining machinery, including pumps, pneumatic drills and last but not least, the powerful, improved helio-acetylene cutting equipment. One raft was devoted entirely to carrying many liters of gasoline to turn the dynamos for driving the pumps and drills.

Despite their weight, the rafts progressed rapidly propelled by powerful outboard motors at the sterns. They were navigated expertly by the crew handling great oars for steering. It was a strange sight, a strange procession to go up this river, which had been deserted for years unnumbered, and ugly, uncivilized natives peered at them from behind the brush along the marshy banks.

But after a time they saw no more natives. The river suddenly narrowed and then opened again, but on neither side could the scientists see a single form of life, other than the shrubbery dotting the tundra. The terrain was becoming bare and barren and they realized that they were within the radius of devastation caused by the fall of the great missile from space.

And it appeared to be mysteriously shunned by every living thing capable of comprehending the untoward. To the four scientists, and undoubtedly the crews of the rafts, there was something sinister in the air, something vaguely portending the advent of some dread disaster. Just what it was they could not determine and laid the strange feelings that suddenly overtook them to the great barrenness of the land and its awesome silences.

"This place gives me the creeps," Dr. Valeri said finally. "I experienced just such a feeling once before. That was when Brandon and I first saw the grotesque Stellarites in suspended animation in their metallic containers inside of the Arizona missile!"

"Rather odd," said Brandon, growing suddenly tense. A weird tingling coursed through his spine causing him to wince strangely. He shivered slightly and continued. "It's oppressing, whatever it is, but it can't be anything but the silence and the barrenness of the terrain. It must be the silence of the north. There's nothing mysterious about it."

A sudden tension seemed to overcome the procession as it wended its way like a gliding snake over the thick, murky water of the upper river. There was something in the air, something uncannily mysterious, causing the suspicious raftsmen to look back frequently and nod at those in the small boat.

To Tom Farrington it seemed that a strange sixth sense, the sense that warns every living animal and human being of a hidden danger, put him upon his guard. Instinctively he slipped a high-powered rifle from a scabbard stuck in the straps of his personal luggage bag, and levered a shell into the firing chamber. The others stiffened when they heard the click of the gun's mechanism and stared at him oddly as though suspecting him of having designs on their lives. He grinned as though he had read their thoughts.

"Just a little precaution," he said hastily. "Something tells me to be ready. For what, I don't know. But Sally here has twenty slugs ready. Killed elephants in Africa at three thousand yards with this gun!"

He patted the scarred stock of the rifle lovingly and laid it across his knees. Dennison shuddered, and picked up his own rifle. He looked to its chamber and sat stiff and tense in the stern-sheets. He glanced at Tom and clicked his teeth.

"This place reminds me of the ghostly valleys on the moon as I've studied them through my telescopes," he muttered. "My blood runs cold when I scrutinize them."

"Do your records of the so-called meteorite say anything about the mysterious atmosphere that prevails hereabout, Dennison?" Tom inquired, cocking an eye at the astronomer.

Dennison appraised him sharply for a sign of open sarcasm and then withdrew his blackened pipe from between tensed jaws.

"Not a thing, Farrington," he said simply. "Only one or two men have been in this locality since Kulik made his survey. They didn't stay long, I understand. The records don't say why. They merely report that the natives are superstitious and the meteor-crater is inaccessible for extensive work. I can understand now why they might have left quickly."

The foremost raft began to lag and of necessity the others behind it were forced to slow down. The men on the first float congregated in a knot and their excited voices could be heard distinctly by those in the boat. Professor Brandon stood up and blew his whistle. He nodded at Dr. Dennison, who was pretty much of a linguist, and asked him to inquire what was wrong.

Dennison cupped his hands around his mouth and bellowed sharply at the knot of men.

"What the hell's wrong with you fellows?" he demanded in broken Russian, with a smattering of Tunguse dialect. The crew were perfectly capable of conversing in either language, and they looked up at the sound of his voice. One of them detached himself from the crowd and yelled back.

"Something's in the air," he said in Russian. "We don't want to go on. All the guns, except one or two, are on the last raft!"

"You men are crazy!" said Dennison curtly. "It's only the silence! There's nothing in the air at all. Keep going till we tell you to stop!"

The fellow faced the knot again, said a few words, and they returned to their posts of duty. But no song came from their lips now as the rafts proceeded up the shallow river. Their light-hearted attitude of a few hours before was gone. Now they worked or loafed on the rafts as though forced to do so by some predominating will, rather than of their own volition. And they were tensed almost to the snapping point and cast furtive glances toward the nearby shores as they passed close beside them.

"The man's right," Dennison whispered to his boat companions. "All the guns are cased on the last raft . . . the one in front of us. We should have handed them out this morning!"

"I disagree with you, Dennison," Brandon put in. "They're a wild lot and might take it into their heads to steal our equipment if they had guns to back them up. I've been out in the wilds before with seemingly contented natives, and I never permit them to have more than one or two guns!"

"Maybe you're right," admitted the astronomer. "A few guns might cause mutiny. After we arrive at our destination, however, it ought to be safe to arm every man. No telling what might come up in wild, God-forsaken country like this!"

"They're a superstitious lot, too," interjected Valeri.

"I don't trust several of them, Val," said Tom, shaking his head and peering intently at a clump of dead, hardened brush along shore. "Best we could do, though, and lucky to get as many men as we did!"

Threatening Mysteries

FOR another two hours the expedition continued on up the river. It was becoming so shallow now that the bottoms of the rafts frequently scraped on the muck. Long poles had now taken the place of the outboard motors, which had been detached and put away. They were useless in the shallow water because the blades clogged with mud. The crews began for the first time to earn the excellent wages which Tom Farrington was to pay out of his estate. They were forced to pole the heavy rafts through the murky water and they went on slowly.

The small boat floated like a duck behind. It was a flat-bottomed affair and the weight of the four men was insufficient to cause even the small propeller to bite into the mucky river-floor. But they expected momentarily to be forced to the rafts or to follow the procession walking along the shore.

It was not necessary, however, for soon the first raft became grounded. The end basin of the navigable river had been reached at last. The scientists studied their surroundings. On every hand stretched a weird desolation. Burnt tree trunks were bent over at a sharp angle, all in the same direction. The dread barrenness was awesome and, as far as they could see, nothing lived.

Now came the work of transporting the equipment over a low mountain range into the valley beyond. Everything must be carried on the broad backs of men for a distance of several miles beyond the end of the river. In the valley lay the great crater which had to be drained of water before the work of tunneling began.

But the men went at their work with something akin to fear. They wanted to get at it and have it over with. Not a man in the lot relished the idea of remaining in this dread locality for any length of time. Therefore it was but a matter of two long, hard days to transport the equipment into the valley.

The laborers were strangely silent. When they passed either of the scientists, they did so with their eyes on the barren ground. Something seemed to have shorn their tongues and made them speechless. But they heard all orders, which were issued by Dr. Dennison, who acted as interpreter for Professor Brandon. And the four were on hand to see that they were carried out.

A barrier appeared to have sprung up between the leaders and their men. The scientists were shunned entirely and the men brooded over a mysterious influence that seemed to hold them in a grip of deep-rooted fear—a fear of a sinister unknown. They were not exactly hostile toward the scientists, but neither were they friendly. For the most part they were sullen and morose, and huddled close to their night-fires like Africans, fearful of preying carnivors, which, once entering their *kraals* and eating human flesh, were bound to return.

The camp had been made on a narrow streak of high ground a short distance from the edge of the mammoth crater. The crew erected their shelters a dozen yards from the camp of the scientists, isolating them completely. Even a high-powered, low-wave radio receiver in Brandon's tent failed to bring the men to listen to the various European programs brought in each evening.

But the work of draining the crater went on method-

ically. Pumps worked day and night and ditches were dug to the rim to aid in drawing the water that filled the depression to a depth of twenty feet. The water ran in torrents down the slopes to find its way into the river, and the fear in the hearts of the men grew with each passing hour.

Even Dr. Dennison and Valeri felt the strange influence as they worked at the pumps or stood guard, rifles in hand for instant use.

"I don't like this one bit, Dennison," Valeri stated one evening as they blew the evening whistle as a signal to quit work for the day. "It seems to me that we're being watched every single minute by eyes that bore right into me!"

"That's how I feel about it," Dennison grumbled, "but of course this place is deserted. Must be our imagination."

Valeri stood silent for a moment, staring into the crater thoughtfully.

"Imagination, hell!" he swore. "Imagination could not possibly affect the whole expedition. There's something deeper, something of which we are ignorant, behind it all, and I don't mind saying that I don't like it."

Dennison laughed loudly but his voice seemed too brittle to display a genuine emotion of humor. And Valeri thought the laugh died too quickly on his lips.

He cast a glance toward Brandon, who was scrutinizing the walls of a new drainage ditch, not far away. Tom Farrington was bent over beside him, talking in low tones. The geologist rose erect suddenly and called to the two men at the pumps. Dennison and Valeri went at once to the spot, wondering what the geologist had discovered in the formation.

"Take a look at this, Valeri," Brandon invited. "One of the men drove his pick into the shoulder bone of some huge skeleton. I wouldn't be surprised if we found the remains of a woolly rhinoceros here."

"Let me look at it for a moment," said Valeri, who understood his paleontology as well as anthropology.

He jumped into the ditch and began searching along the drift. With his trained eyes and knowledge of glacial formations, he knew at a glance that the retreating glaciations had deposited there the carcass of a long extinct species of *rhinocerotid* known as the woolly rhinoceros.

THE find was not exactly important to their mission, but it served to somewhat relieve the tension that had gripped them. It took their minds off the sinister, threatening mysteries of the oppressing atmospheres hovering about them, and despite the unimportance of the remains they went to work to remove the great bones so that the workers would not destroy them the following day.

For hours they worked over them until finally they encountered the two-horned skull. The whole skeleton was removed carefully and laid aside. The bones had long been petrified but since petrification they had been burned the color of ambergris by the heat of the great flaming missile that had buried itself in the valley not so long before. Brandon decided that they had been literally boiled or baked in the earth seething from the heat of the missile.

Then, while Valeri continued to work on the bones, the others retreated to camp to prepare the evening meal. Because of the strange barrier of unfriendliness that had sprung up between them and the crew, they had not selected a cook to prepare their private mess, fearing that the uncertain man might salt their food with arsenic that abounded in the neighborhood. Such things had been done before, and Brandon was taking no chances on losing their equipment and their lives with it. Therefore they took turns to perform their own culinary necessities.

But Valeri remained at the diggings to clean the bones, prepare as many as he could for packing, and to do a little more exploring along the wall of the ditch. He worked with a persistent feeling of being watched by unseen eyes. Yet he knew that the work had to be done if the remains were to repose in the New York museum, and by sheer force of will he kept himself from bolting the spot in mortal terror.

After a time his interest in the work made him temporarily oblivious to his ominous surroundings and before long he found himself working with difficulty in a growing dusk. Continuing doggedly with his explorations so that the laborers might work on the morrow, unhampered by the discovery of more bones, he finally drove his pick into a hidden cavern. Instantly the earth under his feet loosened and he felt himself sliding into a hole.

As he slid downward with the crumbling earth, he became aware of a slight jab in his shoulder that seemed like the prick of a needle. Instinctively he let go his pick and clapped a hand to the spot.

From his shoulder protruded a thin, brittle barb scarcely larger than the dart of a blow-gun. His fingers clutched at it and his head swam with a sudden sweep of dizziness.

Then presently he realized that he had stopped sliding and was lying on a hard floor with his eyes facing the darkening hole through which he had plunged. The hole was like an evil eye, shot with red and orange. Yet his dizzy, foggy mind told him that the sun was setting and he was looking at its reflection from the clouds.

He felt a peculiar sensation surging through his vitals as he lay, seemingly unable to move a muscle. He had not emitted a single sound when he plunged into the hole. It had come so suddenly and unexpectedly that he had hardly time to call out. And his arteries appeared to be hardening; the blood in them was turning to a solid matter, and his heart was slowing rapidly in its beat.

Valeri knew that he was not dying; he felt no pain beyond the numbness of his shoulder and a dull ache under his arm. The barb still protruded from his shoulder. He had not been able to pull it out; his muscular control died after the first attempt to pluck the thing from his flesh.

Then, as his eyes began to flutter prior to the advent of a deep slumber into which he felt himself slipping comfortably, he thought he saw vague shapes looming up before him. He was not certain about it, but he seemed to visualize the strange, grotesque features of the Stellarites as he had seen them before in the machine in the Barringer Crater. But these shapes were very much alive! No suspended animation held them in a grip of temporary death here!

But of course, in his present state of mind, Valeri was uncertain as to the reality of the big-headed, barrel-chested, skinny-limbed beings that he pictured.

With indistinct feelings that a gargantuan brute was bending over him, Valeri's eyes closed. He could not keep them open; he was sinking into a deep slumber. But his foggy faculties seemed to tell him that the shapes were in reality the same kind of beings Brandon had discovered in suspended animation in metallic containers within the confines of the great machine under the Arizona desert.

Perhaps Tom Farrington had been right in his hunch after all. Perhaps the great Siberian Meteorite was not a meteorite at all, but another missile sent into space by the Stellarites!

With that in mind, Valeri felt himself being lifted in strong arms. Then followed a gentle swaying, which dully informed him that he was being carried somewhere. As he lapsed into complete unconsciousness, he drowsily concluded that the barb sticking in his shoulder contained the drugs that would send him into a state of suspended animation from which there could be no awakening by any means known to earthly man.

But he did not care now. All he wanted was to close his eyes and sleep. He seemed so deathly tired that nothing else mattered. Sleep, plenty of it, was what he wanted. And Dr. Valeri was destined to get more than he had bargained for at the moment of his capture.

Where is Dr. Valeri?

THE sun had long sunk behind a mass of blood-red clouds before Brandon, Dennison and Tim Farrington grasped the grim fact that Valeri had vanished as though in thin air.

When he failed to appear in camp for his supper, Farrington was sent to get him. When it was discovered that the anthropologist had disappeared under strange circumstances, a general search of the crater was made, but without results.

His rifle lay beside the ditch and the bones of the mammoth were piled alongside it. Not a sign of a struggle could be found.

And the hole in the ditch, through which Valeri plunged, had been closed! Consequently, the searchers failed to find any evidence of his plunge.

They found his boot tracks in the ditch and saw signs of his digging in the wall. But that was all. His tracks ended suddenly at a small area of hard-packed ground.

Mystified, they searched along the edge of the crater for signs of him. They found many tracks made by the laborers and themselves and could determine nothing there.

The pumps were droning steadily. The water in the crater was still ten feet deep. But surely there could be no reason for Valeri to commit suicide by hurling himself into the water-filled cup, as Farrington suddenly hinted.

"The idea is absurd!" said Brandon curtly. "Valeri has everything to live for! I can't picture a man like Valeri taking his own life!"

"But where the devil could he be, Brandon?"

The geologist peered into his eyes for a moment and then shook his head blankly.

"Why not ask me for an answer to the riddle of the Sphinx, Farrington?" he said caustically. "How the devil do I know where he went!"

"There's something mighty uncanny about his disappearance," said Dennison. "His tracks end in the ditch. Do you suppose any member of our party had anything to do with it?"

Brandon turned quickly and faced the laborers knotted together in conversation at the edge of the crater. They were paying no attention to the scientists and seemed ready to bolt in fear.

"Call that big fellow, Dennison." Brandon ordered sharply. "He's the leader of that pack. We'll question him."

Dennison turned.

"Hey, you!" he called crisply in Russian. The gang faced him as one. They looked at him questioningly. One big, surly-looking fellow who seemed to be the leader of the crew detached himself from the crowd and came forward slowly. Instinctively Brandon lurched his pistol and holster around to his front.

The fellow paused some ten feet away and leered evilly at Dennison. The astronomer's face reddened as he was incensed at the man's sneering attitude.

"Bolak," he said sharply, "you are recognized as the leader of your gang. Do you or any of your men know what has become of Dr. Valeri?"

Tensely the scientists waited for an answer, though they knew it would be a flat denial.

Bolak sneered and then sniffed arrogantly.

"No," he said flatly, "we do not know what has become of Dr. Valeri! None of us left our camp this evening after we reached it!"

"But you men have acted queerly of late," Dennison insisted. "Is there any reason why you would want to do away with us, beyond, of course making away with our equipment?"

Bolak's features turned purple and Brandon read in them just such a desire as Dennison had directly hinted at. But the big fellow shook his head and clenched his ham-like fists.

"No," he said with a kind of a wolfish snarl. "We have no reasons for wanting to do away with you . . . any of you. Valeri's disappearance has nothing to do with us."

Dennison glanced resignedly at Brandon and Farrington, and nodded.

"He says that they know nothing of Valeri beyond the fact that he remained here after they had gone to camp," he said. "I guess all we can do is wait for developments. Valeri was either kidnaped or he strayed away and was lost."

"Wrong, Dennison," said Brandon. "In either case there would be evidence. There would have been signs of a struggle if he had been kidnaped. Had he wandered away, he would have taken his rifle."

Dennison sighed and turned again to Bolak, who was striding rapidly back to his friends.

"Bolak!" he called angrily, "when I call you I want you to wait until you are dismissed! Come here!"

The man returned warily, his face clouded with a frown. His right hand hung close to a long bladed dagger that reposed in a scabbard at his belt. But he made no move to draw it. Lucky for Bolak, for Brandon's fingers hovered over the butt of his pistol. Brandon understood men and he was not mistaken in the attitude of one Bolak. The man was dangerous.

"I want you to throw a guard around the whole camp tonight," Dennison informed him when Bolak came up.

The breed nodded comprehensively. "Relieve the men every four hours and see that none of them sleep on the job! You hear me, Bolak?"

Bolak certainly did hear when his eyes fell on Brandon's gun-hand.

"We have but two rifles, Dr. Dennison," Bolak said, still frowning. "We can do nothing with so little for defense."

"That is enough," Dennison stated with finality. "Place the armed men nearest the crater. The others can warn us of any approach of danger by yelling. That's all, Bolak, and see that my orders are carried out. Twenty lashes on the bare back will go to the man I find asleep when I make a round tonight!"

FOR hours the three scientists sat in Tom Farrington's tent and discussed Valeri's disappearance, and by midnight they had reached no solution to the mystery. The world would have been given the news had they had the equipment for radio broadcasting. They had omitted that for the purpose of traveling the rugged country as light as possible. And they had no desire to listen to the musical programs broadcast from Europe, though Tom's light receiver was in perfect order.

In fact, they had left their prepared supper untouched, their hunger lessened to nothing by the mystery. But they boiled some coffee on an alcohol heater and drank it while they discussed the gloomy event.

"I just can't see Valeri jumping into the crater," said Brandon, dismally. "He's got a wife and some half-grown youngsters in New York depending upon him for a livelihood. He wouldn't do such a thing. I know him too well."

"Perhaps you're right," said Tom presently. "Still, there might be a chance of his doing it for some reason unknown to us. He simply could not have vanished in thin air!"

"That's true, too," Dennison interjected, shaking his head sadly.

"No, my friends," Brandon added. "Valeri is not that kind of a man. Suicide was something he always loathed. It couldn't be."

Silence reigned for half an hour before they spoke again and then Dennison's eyes snapped in the carbide lamp-light.

"Do you suppose," he said, "that this Siberian meteorite could have really been an interplanetary machine? Do you think that its cargo of Stellarites, in case it was, could survive the collision and settle in this vicinity?"

Tom Farrington laughed tensely.

"I wouldn't have come here, Dennison," he said, "if a good hunch had not told me that the missile was not a meteorite at all but a stellar flyer. As to their surviving the impact, I cannot say. But in my opinion we'll find a machine under that crater somewhere."

"And I quite agree with you, Farrington," said Brandon. "And I believe that a survival of some of the Stellarites within it is altogether possible. Supposing that many of the crew alive at the time of the collision were killed. If one or two survived, they could reanimate the creatures who were kept in suspended animation. You see, the globe of the Stellarites must be so far away, that many light years would be required for them to traverse the distance between their world and ours. Judging that their life span is seventy years and the distance between the two worlds was say 300 light years, the first crew operating the machine would be dead within forty years after their departure, if they traveled at the speed of light. Before they died, they animated the second crew, leaving others in suspended animation so they could take over the machine at the end of the preceding operators' lives. Then, they must keep a number of them in suspended animation throughout the trip so that they would be alive when the machine landed. In that case, it is possible for those in suspended animation who survived the collision to have been re-animated by the survivors of the living crew at the time of the impact. If that is true, then the mystery of Valeri's disappearance has been solved. He simply fell into the hands of the Stellarites who brought this second missile to our globe!"

Dennison's face paled and then became red. He laughed a peculiar, high pitched laugh and then swore.

"By George," he breathed. "I'm beginning to agree with you. I couldn't see it before, but neither could I see the Barringer meteorite as an interplanetary ship until I actually visited the thing. It *is* possible for some of the Stellarites to survive the impact of their second missile and re-animate those in suspension. By George, I believe you're right!"

"Moreover," continued Brandon, lighting his pipe with nervous fingers, "it is possible that these devils have created an underground domain around here in which to await the arrival of others or until such times as they have prepared to attempt to take possession of the world. In my opinion they lie low because of their weakness in numbers. I wouldn't doubt but that they are aware that their fellows in the first machine were taken by us and buried under a slab of concrete."

"I hardly believe that," said Dennison lightly. "How could they know?"

"They might know many things, Dennison," said Tom. "Dad established the fact that they are millions of years our superiors in brain capacity. Dad always held that they could converse through mental telepathy, and I don't doubt a bit but that they learned of the fate of their former expeditioners by just some such feat as intercepting thought waves from a distance of many miles."

"Even now," Brandon cut in quickly, "they might be intercepting our discussions. If any of them live they will undoubtedly hold Valeri as a hostage pending the release and delivery here of the poor devils under the concrete!"

"Possible, but not likely," said Dennison.

"Well, we'll have to await developments," Brandon insisted. "Only then can we tell how the situation stands or just what the situation is. I, for one, firmly believe that we've located ourselves in a nest of living Stellarites."

"We have found no signs of them, Brandon," Dennison reflected. "If they came to this world for want of sunlight, why would they create an underground domain?"

"There's truth in that," the geologist asserted gloomily. "The only reason I can see for their hiding away is to keep their presence unknown to the earth, until they are ready to expose themselves. Perhaps they are repairing their machine for a possible raid on the earth! On the other hand, their presence here must have been known to the natives, else they would have had no fear of the place."

"Then you really believe Valeri fell into Stellarite hands?" Dennison inquired seriously.

"Absolutely!" Brandon declared. "Moreover, I'm going to turn in. When do you plan to make a round of the camp to see that the guards are awake?"

Dennison studied his chronometer and looked up.

"In an hour," he said. "Meanwhile, I'll turn in, too, for a few winks. I'll waken on the dot."

"Then we'll go with you, eh Farrington?" said Brandon.

Tom nodded and lay himself on his bunk, dressed and ready for action.

A Mystery Solved

PROMPTLY at the appointed hour, Dr. Dennison arose, prodded Tom to wakefulness and roused Brandon. Armed to the teeth, they left their camp to make the round of the guards.

The valley lay quiet and in the deadly stillness the scientists picked their way to the edge of the narrow strip on which they had pitched their camp. Frequently Dennison called out in low undertones to identify themselves to those on guard, but no answering hail reached their ears.

It seemed that the strip was utterly deserted. Not a single ray of light was visible anywhere, to inform them of the location of the guards, who, they suspected, would be smoking their long, Russian cigarettes to keep awake.

Suspicion grew in their minds as to the failure of Bolak to carry out orders. When they passed the first eighth of a mile and still encountered no guards, all three swore softly.

"Not a guard on duty!" Dennison called out eventually. "They've ignored our orders, damn them!"

"We'll go to their camp and rouse Bolak!" Brandon said determinedly.

"Be careful of that fellow, Brandon," Tom Farrington warned. "He'd knife you if he got the chance. I don't trust him."

As they went toward the camp, the moon emerged from beyond a mass of threatening clouds. The strip was bathed in a gloomy light and the tents of the crew loomed up oddly in the murk. The campfires glowed with dying embers and not a man stood, sat, or lay near them.

"I'll wager the whole crew is fast asleep," said Dennison. "I'll put the fear of God in that Bolak!"

"If he hasn't bolted!" added Tom curtly.

They paused beside a dying fire and Dennison called aloud.

"Bolak!" he cried lustily, then paused to listen. He thought he heard a sleepy grunt from someone near by and then the huge figure of Bolak appeared in the open, knife in hand, and ready for mortal combat.

"What's the matter, boss?" he asked, approaching and sheathing his wicked blade as he came.

"I thought I told you to post guards tonight, Bolak!" Dennison growled. "Why did you ignore my orders?"

Bolak faltered as though stunned. He scowled darkly.

"I put out twenty-five men, Dennison!" he said quickly. "And relieved them twice. I made the round with the last watch and returned to sleep an hour ago."

"You lie!" Dennison snapped, advancing toward the man. Bolak stood his ground, trembling with fear.

"Dennison," he said with a snarl. "I don't lie! I put out twenty-five men an hour ago. If you don't believe it, go and count the men sleeping in the tents. There ought to be seventy-five!"

Baffled, the astronomer peered into the big fellow's eyes for an instant and then interpreted his words to Brandon and Tom.

"Well, that's damn funny!" Brandon snorted. "There's not a guard on duty!"

"He declares he put out twenty-five men an hour ago," repeated Dennison. "They must have bolted!"

He turned to Bolak again.

"Then you can come with us, Bolak, and see for yourself that there's not a guard on the place!" he said firmly. "Come on!"

Once again they started around the edge of the strip and Bolak halted presently. Brandon flashed a light at his feet to note several cigarette butts laying where a guard had thrown them.

"I left a man here," said Bolak seriously and now thoroughly frightened. "He was a brave man and would not bolt. See? He was smoking cigarettes to keep awake and then something captured him."

"There's no sign of a struggle," said Brandon, after studying the ground. "But I can see where he lay down on his back."

"Maybe he's with one of the other men up the line," hazarded Tom. "Let's look."

They went on up the gentle slope a short distance and Bolak paused again with a word that a guard should be there. But again they found only a few cigarette butts and the impressions of the fellow's body in the soft tundra.

"By George," Dennison said suddenly, "the thing that made away with Valeri has taken the guards!"

Brandon and Tom were silent, but Bolak's teeth were chattering. The air was brittle with frost but the chill was not the cause for his chattering. He was most thoroughly afraid and he hovered close to the scientists, seemingly for protection from some menacing unknown.

"We ought to rouse the camp and make a search, Dr. Dennison," he said in the Tunguse dialect. Dennison replied in Russian and they hurried back to the camp.

Arriving there, they went from tent to tent and awakened the men. A quick count told the scientists that twenty-five were missing. There was no disbelieving Bolak now.

Twenty-five men were missing! No doubt at all about it!

What had become of them? Where had they gone? The entire expedition was asking those questions of themselves and receiving no magic answers as they began to search the gloomy slope. The mystery had suddenly turned the near-hostile crew into a lot of frightened idiots, for they refused point blank to scatter even in pairs for a systematic search. As a result the three scientists were forced to lead the way while the men followed like a pack of whipped mongrels.

They made a complete round of the camp and failed to bring forth a single guard. They located twenty-five spots where men had waited, smoking one cigarette after another, but not a living thing was seen in the entire valley. A reconnaissance of the crater was made, and still nothing was unearthed to lead the searchers to the trail of the missing men.

But on the edge of the strip of ground where it sloped abruptly down to the crater, they found two rifles. That was all. They lay beside two wallows into which the armed guards had half-burrowed for comfort during their expected four-hour vigil. The find was proof enough that the men had not taken the opportunity to

quit the camp and return down-river. The rifles would have gone with them in that event.

FORLORNLY and fearfully the searchers returned to camp where the scientists, after little deliberation, handed out twenty rifles and a hundred rounds of ammunition for each. This was done despite their knowledge of the fact that guns were useless in combatting this strange, mysterious raider or raiders, who struck without leaving a single clue.

That the entire expedition was in danger of being captured, the scientists had no doubt, but if most of the men were armed, there was a possibility of defeating the raiders by a chance discovery.

There was little that could be done in the darkness and certainly sleep was out of the question. A great fire was built in the center of the camp and the whole expedition huddled around it for warmth and protection. Apparently, the raiders struck only in spots isolated from the main camp and would hardly be so bold as to appear against numbers so closely banded together in the glowing light of the great fire.

That was the opinion of Brandon, at least, and he had no desire to place any more of his men in jeopardy. They squatted around the fire, peering into the deadly gloom beyond the circle of light, but they saw nothing but vague, menacing shadows. Men clutched their rifles in numbed hands and the scientists themselves seemed to feel the presence of something evil beyond the range of their firelight.

Suddenly something whizzed with the drone of a wasp past his ear and he struck at it mechanically. A man sitting directly behind him emitted a groan and clutched at his throat. All eyes concentrated upon the man at once, and as Brandon turned he beheld a thin sliver of shining material protruding from his throat! It appeared not to have been buried deeply and wabbled with each spasmodic jerk of the fellow's thyroid cartilage.

Dr. Thompson Farrington crouched low and crawled to him. With deft fingers he plucked the barb from the man's throat and held it up in the firelight.

It looked like the shaft of a quill but was of transparent metal and half filled with a peculiar green liquid! He handed the thing to Brandon and felt the man's dying pulse. Within a minute the unfortunate native was sound asleep, and Farrington turned away, a fearful look in his eyes. He was amazed, mystified.

But before he could get sufficient command of his astonished faculties to make a stab at diagnosing the man's case, a veritable rain of the peculiar darts fell on the frightened men.

Instinctively, Tom hurled himself flat on his face. The others likewise flattened, but not before a dozen darts had buried their needle-points in the bodies of as many men.

Expecting momentarily to feel the sharp prick of the missiles in their flesh, the three scientists hugged the ground. Then came another rain of the darts and the camp went into pandemonium.

Terrified men leaped up and danced madly in the firelight, screaming the hideous cries of frightened humans. But the scientists remained flat on the ground despite the danger of being trampled by the men.

"Get down, you fools!" Dennison shouted in Russian. "Get down! You are making yourselves targets! Down!"

But the men were too horrified to hear him and one by one they sank to the ground, a shining barb protruding from the skin and clothing.

Fearful of the firelight, the scientists managed to wiggle beyond its circle, dragging their rifles as they went. Finally they reached almost total darkness and arose to survey the weird dance of fear-crazed men. Somehow, they could not grasp the fact that they were exposed to the darts in the firelight. If they did realize it, they were filled with too much fear of the darkness beyond to quit the circle in haste.

At a loss, the scientists watched until Tom handed his rifle to Brandon and made a dash to a nearby tent. There he grasped a large pail of water and lumbered under its weight toward the fire. He hurled the whole receptacle into the blaze. As he turned away, he saw Bolak grasping at his arm. From it stuck a dart, shining oddly in the dying embers of the fire.

Brandon came up suddenly with another pail and the fire was put out, the camp bathed in only the feeble light of a few distant stars. The moon was hidden behind a mass of silver-lined clouds. But the scientists felt that darkness was no protection from the shining darts, and their doubt proved justifiable when the arrows continued to strike the men.

SOMETHING tugged at Tom's sleeve and he recoiled. From the thick wool of his mackinaw protruded a dart, but it had not touched his flesh. He plucked the thing out and shoved it into a pocket, hoping, if he survived the deadly raid, to analyze its contents. He turned to his two friends.

"They danged near got me that time!" he mumbled under his breath. "We've got to get out of here! It's unsafe!"

The men ran wildly now and fell easy marks to the mysterious darts.

"We're just as safe here as anywhere, Farrington," Brandon snapped. "Darkness is no protection." He leaned closer. "Supposing we scout around. We might be able to nip this raid where it stands. Maybe some Tunguse natives have designs on our stuff."

"Tunguses?" Tom blurted. Then: "Not on your life, Brandon! You'll find we're completely surrounded by Stellarites or my name isn't Tom Farrington!"

Dennison sucked in his breath loudly and stepped closer to his companions.

"Stellarites!" he whispered, his voice trembling. "No Tunguse uses metal darts for devilment! We're doomed!"

"Doomed nothing!" Brandon snapped. "Not while I've got a rifle!"

He turned on his heel and walked away, crouching. Tom and Dennison followed him in the deadly blackness that just precedes the dawn. Rifles ready for instant action, they spread out and headed slowly for the slopes of the strip where they suspected the raiders would be lying out of sight.

Peering into the blackness, they saw many indistinct shadows that caused their blood to race and tingle. As they neared the slope the moon slid from behind the clouds on the distant horizon and for a moment the valley was bathed in a ghostly light.

Instantly a number of barrel-shaped creatures rose in front of them. Three rifles shot upward and boomed out to split the awesome silence with reverberating thunders.

Tom Farrington saw a hideous creature falter and sink to the ground. Then he felt the prick of a sharp barb biting into his chest. His automatic rifle beat a terrific tattoo, but the shock of the missile that struck him sent him off balance and his bullets went skyward.

As he fell to the ground, weak and nauseated and seemingly too tired to stand erect, he saw Brandon falter in his tracks. Then Dennison went down with a groan. At once the attackers rushed over the slopes and made for them.

Unable to keep his eyes open, Tom's numbing faculties raced. Where had he felt the peculiar sensations that were surging through him now? There was something about them that revived certain memories in his brain. Suddenly he found the answer, mumbled it to himself and sank into a not unpleasant coma.

He had experienced the same sensations years before when his father had inoculated him with the drugs producing suspended animation! That was it! He was going into a state of suspension.

Although oblivious to his surroundings, Tom knew that he was not dying. He felt that he had just succumbed to some powerful anesthetic and although something deep within him fought against it, he had no control over himself whatever. His muscles seemed like bands of brittle steel and simply would not respond to the urging of his foggy brain. Finally a deep blackness engulfed him and he was once again clutched in a temporary state of death in which he could sleep for ages without actually tumbling into the Great Abyss.

Brandon, Dennison and the others in the expedition were placed in the same dire state. The last of the maddened crew was finally laid on his back by the powerful suspension drugs contained in the darts, even as the dawn of a new day sent the night shadows retreating from the valley.

But for what end?

Surely the grotesque Stellarites had no desire to kill them, or they could easily have wiped them out. They would not have gone to the trouble of transporting every single inert body into their great underground dominion, surrounding a tremendous interplanetary machine that was slowly being repaired beneath the crater.

And had the scientists been animated and alive to their situation, they would have been amazed at the magnitude of the underground world into which they were taken. Great caverns loomed almost on every side of high, well-formed tunnels. Long galleries and roomy vistas ran like thoroughfares throughout and they were illuminated by a strange pale green light that seemed to come from the walls of the domain.

The strange radiations, that flowed to every nook from the ghostly green luminosity, warmed the underground domain, as well as bathed it in light. But the Farrington expedition was oblivious to it all for the time being.

The bodies were transported on broad planks to a great chamber and deposited on a long, low table of metal. By some trick of fate, the three scientists were placed together at the end beside another body.

That body was Dr. Valeri, sleeping as soundly and peacefully as if he had been prepared for some major operation! Not a single one of them was breathing. To all outward appearances they were dead, except for the color of their skin and a slight warmth of their artificially coagulated blood! They were as a fish encased in a solid cake of ice, living without air or its native element, waiting in a death-like sleep for release.

After the many bodies had been laid out, the huge-headed, barrel-chested, near human-featured Stellarites stood off and appraised them. They were silent and not even a grunt of satisfaction escaped their thin, not unshapely lips. But despite the silence, powerful thought-waves were vibrated between them in some lengthy discussion.

One Stellarite, standing a half a head taller than the others and who wore a green metal band around his head, appeared to be the leader, for the others looked to him for instruction. He merely concentrated his flashing yellow eyes on his subordinates and they mentally received his orders.

The Stellarites were grotesque, to say the least, yet there was nothing really frightful or terrifying about their appearance. In fact, their rather prominent features gave them the appearance of being somewhat human, firm and unbending from any set course of action. Their arms were skinny but sinuous and powerful, and they had ten fingers on each hand instead of five. The same number of digits had been developed on their feet, which were encased in metallic sandals, at the ends of long, narrow limbs. They wore no clothing other than a breech-clout that hid their loins, and their bodies were absolutely hairless, glistening in the pale green light as though freshly oiled.

For a long time they stood near the table and studied the forms lying upon it. Finally the huge Stellarite walked stiffly and majestically toward Valeri and ran his right hand through the scientist's graying hair. Professionally, he lifted the scientist's eyelids and peered into his retinas for a moment and then silently ordered the chamber cleared. He followed them out and the chamber became a living tomb of silence.

The Farrington Expedition Learns Something

HOW long he had lain in suspended animation, Tom Farrington could not guess when finally the giant Stellarite animated him by an injection of drugs into his cerebral passages. He lay on his back for minutes before he realized that he was awake and staring into the gargantuan eyes of the creature who was bending over him. His first thought was to snatch at the Stellarite's throat but he had not yet gained control of his muscles. He naturally tried to recoil at the closeness of the strange face, yet only his eyelids fluttered weakly, growing stronger with each passing second.

He felt a slight movement beside him and dully wondered what it was. Something had bumped him like a bony elbow. He tried to turn his head for a glimpse at whatever lay beside him, but the strange yellow eyes of the Stellarite held him in a grip of fascination.

Then he heard a curse in a voice that startled him. He tried hard to break the contact between his and the Stellarite's glowing orbs and was permitted to do so. Then wearily he sat up and stared.

In a half-circle around him stood a score of Stellarites, skinny arms folded across their bulging chests, lips set in a ghost of a smile. He glanced quickly toward the towering creature who wore the green band on his head. The huge man from the distant world was bending over an inert form beside him. And Tom Farrington instantly recognized that form.

It was Professor Brandon and he was the picture of death! He tore his eyes from the pale features of his old friend and glanced aside.

"Valeri!" he exclaimed as he recognized the anthropologist sitting on the table at his right.

Valeri turned his head slowly and blankly toward Tom and after a moment, his eyes lighted with recognition.

"Good Lord, Farrington," he said weakly. "You here too?"

"We're all here, Valeri!" said Tom, shaking his head savagely to clear it. "What happened to you?"

"I haven't had time to think it all out yet, Tom," Valeri said with a blank stare. "I'll tell you in a minute . . . Oh, yes, I have it! I was digging in the ditch when the ground under me caved in and let me down into an underground tunnel. Something hit me on the shoulder and I went to sleep. That was it! I went to sleep!"

"You were placed in suspended animation, Valeri!" Tom corrected him. "The thing that hit you on the shoulder was a drug-filled dart shot at you by some Stellarite."

"Stellarite?" Valeri gasped as though unable to recognize the creatures appraising them silently. "Stellarites? Oh, sure! They're just like the creatures we found in that Arizona machine years ago! No mistake about it! They're identical!"

"So that's the mystery of this valley, Valeri," Tom ruminated. "No wonder we felt the presence of something untoward, and we fell afoul of it! I wonder when they're going to start eating us or something?"

Valeri appraised the grinning Stellarites for a moment; then shook his head blankly.

"I don't know what's liable to happen to us, Farrington," he said. "There's something behind our capture, no doubt. Where's Brandon and Dennison?"

Tom jerked his head to the left, and glanced again at Brandon.

"Brandon's just coming out of suspension," he said. "Dennison is being inoculated for animation!"

"Maybe they're not the devils we pictured them, Farrington," Valeri asserted, sighing with relief at Tom's words. "They look like very intelligent people, the like of which I have long prophesied would inhabit our earth millions of years from now."

"They're far superior to us, no doubt," said Tom with finality. "But I'm mighty anxious. They have a helluva crust to take us captive."

He glanced sullenly around the standing Stellarites. His face went suddenly aflame with anger.

"Did you hear what I said, you grinning beasts?" he snapped at them. "You had a helluva crust to puncture us with your darts; then take us prisoners!"

As one, their grins died on their faces and they scowled, yellow orbs flashing with a peculiar, deadly light. Tom continued his tirade, brought on by the strain of his plight and the awesome, threatening silence of his captors.

HE had little fear of them and was not horrified at their appearance. He had seen others like them many times, both in his father's laboratory and in the metallic containers in which they had been buried under the concrete in the Arizona desert. Had this been his first sight of them, he might have been too terrified to denounce them. As it was his soul was filled with a sudden, mounting hatred for their unfriendly acts. Capturing all the members of his expedition certainly was a far cry from the treatment the others had received at the hands of his father.

And Tom Farrington always felt that the ceaseless work performed by his father to re-animate the Stellarites of the First Missile had hastened his death. In all there was little love existing in his heart for these grotesque creatures from outer space, though they had made no real attempts to endanger his life. Still, he felt that their brothers were largely responsible for the death of his father and he hated them with a true deadliness.

"Well, why don't you say something, you——!" he swore at them roundly. Valeri was amazed at the vocabulary of Tom Farrington. Never before had he heard him swear with such venom.

Tom did not think that perhaps they were unable to converse in his own language. That was remote from his mind. But surely, he thought, they could see from his attitude, that he in no way looked upon them as his friends. But the Stellarites understood every word that issued from his tight-drawn lips. Any mind that could be read like an open book could easily be understood. And to them, his mind was an open book filled with large type, to be read at a single glance. They knew what he was going to say long before words formed on his feverish tongue and it amused them when he spoke. Yet they felt the sting of his terrible thoughts and inwardly resented them. Still, they remained silent, glancing frequently toward the banded leader who worked over Dennison, as though for some advice.

He raged and fumed hotly from his perch on the table for a time and then a sudden weakness caused him to quiet. But he continued to glare venomously at his silent audience, then he felt Brandon's trembling hand touch his shoulder. He looked around quickly to see the old geologist perspiring uncomfortably.

"I'm a sick man, Farrington," Brandon said weakly. "They must have given me an awful dose and I'm an old man!"

Tom Farrington stiffened and then placed a hand on his friend's brow. He was cold and clammy. It came away wet with sweat.

Fever! A cold fever!

He jumped down off the table and grabbed Brandon's pulse. It was throbbing weakly; too weakly for safety and Tom was suddenly at loss what to do. His medicine chest had been left in his tent. Where that was, he could not know.

Quickly he looked at the Stellarite who was now working on Dennison.

"You!" he called loudly to attract his attention. "This man is ill! He'll die in an hour if something isn't done. If he does, I'll tear your pot-belly apart with my bare hands!"

As the Stellarite's eyes concentrated upon his own retinas, Tom Farrington faltered under the force of a projected thought wave. His brain swam for an instant and then in it was wormed the other's message.

"Your friend received an overdose of suspension drugs," the creature informed him. "It causes great weakness but I, Olandee, will see that he lives."

Tom could have been smitten down with a feather when he discovered that the Stellarites could project their thoughts without saying a word and in his own language. But as has been said, any mind that can be read like an open book, forms no incomprehensible language, and Tom was soon to learn about all that. Yet he was astounded, nevertheless.

"I suppose you think you're the Great-I-Am, Mister Olandee!" he snapped at the Stellarite. "Nevertheless,

if Brandon dies, I'll see that you go with him, if it's the last thing I do!"

"Never fear, my friend," Olandee stated earnestly, ignoring Tom's thrust. "Brandon will not die. In fact, I need him to carry out my plans!"

"Your plans?" snorted Tom. "You think you're going to take possession of this world? Is that your plan?"

"Hold your temper, Farrington," Valeri cut in sharply. "You'll put us in the frying pan yet!"

Tom glared at him, calming. Olandee chuckled silently, yet those present caught it. Brandon groaned and fainted from sheer weakness. For an instant Tom thought he had passed out and reached out for him. Olandee grabbed his arm and checked it.

"I, Olandee, will take care of Brandon!" he telegraphed mentally and forcefully. "You will look on! Your clumsy hands may kill him!"

Tom mechanically looked at his hands . . . hands that had performed dozens of delicate operations on the human anatomy, and then appraised those of Olandee for comparison.

Olandee's hands were as soft as those of a woman, and scarcely larger. Each of the twenty fingers tapered almost to a point at which there were no nails. They were indeed the most capable hands he had ever beheld despite the number of digits. And they appeared as sensitive as they were soft and capable. They could hold two or even three surgical instruments at one time where his own could hold but one, and then clumsily.

Tom Farrington suddenly decided that his hands *were* very clumsy and awkward in comparison with Olandee's beautiful, effeminate ones, and he made no further attempts to place them upon his friend. He began to realize that he was in the hands of creatures so far his superior that he could be considered, as his father had once said, nothing more than an undeveloped embryo.

Only millions of years of constant, unbroken evolutionary development could create hands like Olandee's. The absence of nails seemed to prove the fact, for man had slowly shed his claws as millenniums rolled by until finally the more sightly nails evolved. And Olandee had no thumbs, proving that his development had carried him a long way above the common species of the earthly *homo sapiens*. Instead of thumbs, the Stellarites had developed fingers, outnumbering man's fingers two to one.

And Tom Farrington was not long in recognizing humanity's superiors, for with a single injection of some form of pale green liquid into the spine of Brandon, the geologist regained consciousness instantly and sat upright as though nothing had happened.

The performance was like magic and Tom wondered at it as he had never before wondered at anything. He stared dumbly at the geologist, muttering.

"How do you feel, Brandon?" he asked, his voice trembling.

"Fit as a fiddle, Tom," he replied. "Why do you ask?"

"I thought you died a moment ago," said Tom, incredulously.

"Bosh! I was just sleeping," Brandon grinned. "I have a slight sore spot in my back like the sting of a hornet, though."

"Well, I'm mighty glad you're all right, Brandon," Tom said gloomily. Brandon stared at him curiously, "but I doubt if you'll ever get out of here alive."

Before Brandon could make a reply, Dennison groaned and regained animation. They watched him for a moment and finally he recognized them. His eyes swung to Olandee and they became riveted there, wide with fright. Then with a terrified yell he sat up to leap from the table. Olandee grasped him by the shoulders.

"Easy, my friend!" he warned softly. "Sudden exertion may prove disastrous to your health. Lie quiet!"

"His health isn't worth a damn in your hands, Olandee!" Tom flared again.

Olandee glanced at him scornfully—his first hostile look.

"You overlook the fact that you are living!" he vibrated with a terrible, brain-lashing snap. "I, Olandee could have destroyed every one of you had I desired! Your insults are grossly uncalled for, inasmuch as we have not as yet harmed any of you. You forget that you are mere savages in our eyes, and as such, should be killed on sight as too dangerous to be let live. But your lives are safe and will be spared as long as you follow my orders. Failure will bring annihilation to your entire expedition. That is final as a warning to you to keep yourself under better control!"

Needless to say Tom Farrington gained control of his racing temper and thereafter thought twice before he let it fly like an unloosed kite again. He seemed thoroughly subdued, but his heart seethed with resentment and deep-rooted hatred for these grotesque creatures who boasted of their superiority, despite the fact that he recognized it.

He glanced at Brandon and nodded.

"You are in charge of this expedition, Brandon," he said, meekly. "I'll stand aside while you handle this affair with Olandee. I presume he's in complete charge here. Find out what orders he wants us to follow. If they are sane, we shall do so. If not, well, we haven't forgotten that we're men and can fight!"

Brandon's Mission

WITH a forced, friendly smile on his face, Professor Brandon turned to the leader of the Stellarites. Dennison crawled down off the table and stood beside him, appraising the long row of bodies forming the crew still engulfed in suspended animation. Olandee made no gestures toward re-animating them, and Brandon studied him quizzically.

"Just what do you intend to do with us, Olandee?" he asked nervously. "Are you going to leave our men in that condition or do you intend to animate them?"

The grouped Stellarites shifted and let their arms hang down at their sides. Tom accepted the move for one of preparedness and crouched slightly. The Stellarites merely grinned at him, looking upon him as a bull might at a puppy snapping at his heels.

Olandee seemed to meditate for an instant and then with a mental force that caused Brandon's brain to reel, he addressed him silently, frankly. His yellow eyes flashed with a grim determination to carry out his plans.

"You, Brandon," he began firmly and earnestly, "located the first ship sent out from *Jano*, my world, to explore this globe as a possible place to establish our *Janosian* culture, and found within it some two hundred *Janosians* in suspended animation. . . ."

Brandon nodded, wondering how Olandee could know that he had been the man to discover the interplanetary machine 2000 feet under the Barringer Crater, near Winslow, Arizona.

"Yes, Olandee," he said voluntarily, "I located your first missile and found within two hundred living Stellarites, whom you call *Janosians*. But what has that to do with your unfriendly attack upon us?"

Despite the fact that Olandee's powerful thought waves were telegraphed direct at Brandon, all present could readily receive them, so strong were his mental vibrations. Tom, Valeri and Dennison remained silent, however, relying upon the geologist to arrive at some understanding with the giant leader of the *Janosians*.

"Just this, Brandon," Olandee continued firmly and with open frankness. "You are to be held as hostages pending the delivery here of every single *Janosian* you found in our reconnaissance flyer. . . ."

Brandon faltered.

"That is impossible, Olandee," he stated quickly. "Twenty-two of them died during our efforts to re-animate them!"

"Then twenty-two of your men will never be aroused from the suspension in which they now exist!" the *Janosian* snapped, nodding at the inert crew. "You had no right to kill them!"

"But our medical and surgical scientists only meant to re-animate them to learn from whence they came and all about them," Brandon argued. "Had it been our desire to kill them, we could easily have done so, and we had the right!"

"Why?" Olandee vibrated, his single thought-word impinging in the geologist's brain like the edge of a lance.

"Dr. Dennison here deciphered one of your documents," said Brandon tensely, "and from it we learned that your people came here with the intention of taking possession of our world—a world which belongs to us!"

"That is true," Olandee admitted, "but had you deciphered further, you would have learned that we meant to possess this world only if atmospheric conditions were found suitable to sustain our lives. Even then your so-called civilization was not in danger, for this world was, at the time of our machine's arrival, overrun by naked beasts. Your culture had not yet evolved. Nevertheless, we plan to return to *Janos* within thirty of your days. At the noon hour of the thirtieth day, we shall take off in our machine, which has been repaired, and if you fail to have every living *Janosian* delivered to me at that time, you and your companions will be taken to *Jano* or left here to sleep the sleep of doom!"

Tom grunted and nudged the geologist.

"That means," he whispered, "that one of us will have to go home, remove those Stellarites from their vault, and see to delivery. . . ."

"Exactly!" Olandee cut in sharply. "At the high hour of your sun, we depart for *Jano*. Three of you and all of your men will either die here or be taken with us. If it is the latter, there will be no return, for *Janos* does not want to possess your world. The density of its atmosphere is too great and would reduce the span of our lifetime to less than half. Moreover, we need our stranded brothers to enable us to navigate the space between this and our world. Olandee and his brother *Janosians* are humane. We seek no revenge; otherwise we could have swept your European and Asiatic nations from the face of your globe."

"Supposing some unforeseen delay interferes with delivery of your suspended brothers, Olandee; then what?" Brandon inquired curtly.

"It will be up to the one who goes to them to see that they are delivered to me by high sun on the thirtieth day!" Olandee telegraphed with emphasis. "Olandee allows you ample time. It rests with you four who is to go away from here!"

"And in the meantime . . .?" Brandon squinted cryptically.

"The three leaders of your expedition will be my guests," Olandee informed him with little tension. "Your men will repose in suspended animation as a measure of safety for Olandee and his ranks. But . . ." he tensed suddenly, "all friendliness will cease at high-sun on the day appointed for delivery. Failure on your part will finish them. I shall decide their fate at that time."

Brandon meditated thoughtfully for a moment and then looked up. Every *Janosian* eye was upon him and in the jumble of thought-waves projected at him, he found it difficult to think clearly.

"Fair enough, Olandee!" he said presently. "We have no desire to hold your suspended brothers and we shall do everything possible to deliver them to you before the appointed hour!"

"It is well," Olandee's thoughts impinged on their brains. "Olandee has no desire to harm any of you without cause, but it will be to your advantage to carry out my wishes to the letter. We shall not delay our departure for one instant. You will have every *Janosian* here in my hands at least five of your minutes before high-sun."

As though his word had been final, Olandee turned away and lifted the eyelids of the suspended Bolak. The four scientists eyed each other queerly and then silently Brandon drew four cartridges from his belt and proceeded to nick one on his belt-buckle. His hands trembled with haste and eagerness.

He looked into the eyes of his friends and then held out a shaking hand in which lay the four cartridges.

"The one who gets the nicked shell goes back to the States," he said with a quivering voice. "Good luck to you, Tom. Draw one!"

Tom Farrington hesitated for an instant and then realized the necessity of the procedure. Three of them must remain with Olandee and his horde. Upon one man would hinge their fate, success or failure to deliver the bodies of the suspended Stellarites before it was too late. Then he stuck out a shaking palm and drew a cartridge.

Brandon passed his hand around for Dennison and Valeri to draw from it, then looked at what was left. Simultaneously they looked for the nick on the chosen shell and Brandon's eyes flashed as he recognized what lay in his palm.

"Old friends," he said, his eyes glistening suddenly, "I leave at once. I rather hoped Tom would get it, being the youngest man present. But I'll return in time. Never fear about that."

He turned toward Olandee and spoke hurriedly.

"I depart immediately, Olandee," he said grimly. "I presume your *Janosians* took possession of our guns. May I have one?"

Olandee flashed an order to one of his fellows who departed silently from the chamber. He returned quickly, carrying a rifle and a pistol. . . . Brandon's own weapons, and handed them over to the geologist.

While Tom Farrington, Valeri and Dennison were detained in the great underground room, Brandon was escorted down a tunnel. As he passed from view he glanced over his shoulder. There was a flash of mutual

understanding between them, and he was gone, to be delivered into the open near the river from a hidden cave.

He paused for a moment alone, to get his bearings; then quickly made for the rafts to one of which was tied the motor launch. He jumped into it, checked over the tanks, filled them with gasoline and sped down the mucky river, his heart filled with hope, his brain awhirl at the turn of events.

A Personally Conducted Tour

DAYS passed into weeks and during that time the three scientists were treated with the utmost courtesy by Olandee and his horde, which numbered hardly more than four score, but never once were they permitted out of sight of three guards who had been detailed to watch them. No attempt had been made to re-animate the expeditionary crew. In fact, that particular chamber was shunned by all and at no time were Tom Farrington, Valeri or Dennison permitted to visit it.

They made a startling discovery during the first week when Olandee personally escorted them through a mile-long tunnel into a tremendous chamber in which lay a monster machine shaped like an egg.

The flyer from *Jano* was dwarfed by the greatness of the chamber which was being enlarged by hundreds of sweating Tunguse natives who had been captured by the *Janosians* to perform the labors of freeing the giant missile from its vault of pulverized earth.

No wonder the Tunguses were suspicious of the place, Tom thought. Here was the reason why they shunned Crater Valley as they would avoid some dread, carnivorous monster. And their wills seemingly had been broken until they performed their work like robots, going about it methodically and systematically with but a half dozen Stellarites guarding them.

There seemed to be no limit to their endurance, for the scientists learned that they worked ceaselessly for sixteen hours at a stretch, scooping up the soft earth from all sides and attacking the roof of the cavern, and carrying it away like so many gophers.

They worked overhead in platforms suspended by metal bars driven into the earth and supported on the corners by taut lines. For tools they used quaint picks and shovels fashioned after the common principles, but they were crude affairs.

And the *Janosian* flyer was a thing of wonder. By some queer coincidence, Tom Farrington had guessed correctly as to its surface structure, when he approached the subject months before with Professor Brandon in the Scientists' Club.

The machine had a surface of transparent quartz that was vastly different from any such element of our own earth-structure. It looked like pure, white quartz, but Olandee, sensing their curiosity, at once explained the material as being a rare type of transparent metal obtained from deep deposits on *Jano*. It consisted of many metals in one, he had said, being alloyed with radium, thalium, uranium and others alien to the scientists.

And above all, they learned, the material resisted friction and was totally immune to heat so far as the hull was concerned, though a certain amount of warmth penetrated it from heat-waves radiated from what he called the Invisible Dimensions of Space.

"But what I can't understand," said Tom to Olandee eventually, "is how the heavy machine escaped destruction when it collided with the earth."

Olandee, who was proving himself an ideal host and a humane one, snapped an answer without hesitation.

"It was destroyed to a certain extent," he informed them politely. "But not to the degree where we could not repair the damage by rebuilding the entire flyer. That meant re-rolling the hull, making it smaller, and re-building the internal mechanism from materials left over from the surface reduction."

"It must have been a difficult job," said Valeri, warming slightly toward the *Janosian* who could be as genial and pleasant as he had seemed threatening and murderous. "I follow that many of your *Janosians* were killed by the impact."

"More than half our number were destroyed," Olandee vibrated sadly. "Only two of the animated crew were left alive and they re-animated Olandee and those in reserve suspension. Of course, many of the reserves were killed. The job of rebuilding the machine was a tremendous one, but it was a case of necessity or . . . being left stranded on a world that would very soon destroy us."

"Then you cannot exist here?" Dennison asked.

"No," Olandee replied silently. "The atmosphere here is too dense. *Janosians* are acclimated to extremely light air on our world of *Jano*. In fact, we could exist where there is no air at all."

"Then that accounts for your being able to work underground in repairing your ship?" Tom said. He was beginning to like this Olandee and his *Janosians* immensely. They were, indeed, intelligent company.

"It does," Olandee telegraphed quickly. "After the impact, caused by the error in our estimation of your earth's atmospheric density, we eventually burrowed out and started this underground domain. We discovered many savages later and put them to work. Soon they shall be released."

"When will that be?" asked Valeri, glancing up toward the men scooping out the roof.

"They will have finished their work in one more of your weeks of seven days," Olandee informed him. "Our machine lies not far from the surface and in seven days the slaves will have removed the roof entirely, creating an exit through which it will rise."

"They must have been working for years," put in Dennison, speculating on the magnitude of the cavern.

"Many years," volunteered Olandee thoughtfully. "Many of them grew old and died in the work. Others had to be captured to replace them."

"I've been wondering, Olandee," Dennison continued, "how near right was I in calculating that your former machine came here from a black planet beyond Alpha Centauri, as we call it."

"I know of what you speak," returned Olandee, "but your calculation was entirely wrong. Our world of *Jano* is what you would call the 'lost Pleiad!'"

Dennison gasped.

"Then there's something to the ancient belief after all," he said. "There really were seven alleged stars in the original Pleiades and one faded away? Eleven are now visible."

"There are forty-nine in your so-called Pleiades," Olandee corrected him. "You behold but eleven from here because some of them are so close together that they appear as one. But one of them was thrown from

its orbit by a celestial catastrophe, and that one was *Jano* or the lost Pleiad. Our world has been flying away from its sun, which you call *Alcyone*, resulting in the necessity of our deserting it for a new world or facing total destruction. That is why we came here . . . in search of an inhabitable world."

Dennison was silent for a few moments.

"But there are many habitable worlds closer to the Pleiades than this world," he said, casually.

"Yes," said Olandee, "but many of them are unfit for our habitation. Others are inhabited by greater strength than we, therefore we could not conquer them. The globe you call Mars, seethes with life. Most habitable planets are already densely populated, but we shall locate upon one soon."

"I hope you do, Olandee," Dennison said softly. "I hope you do. I suppose you are going to return to *Jano* after leaving here?"

"That is our destination," Olandee informed him. "Some of us shall never arrive, for many *deva yas* will pass before the machine lands on home soil."

"Deva yas?" Dennison queried blankly. "What's that?"

Olandee made a mental grunt and his eyes twinkled.

"Olandee forgot that you do not understand the mental language of *Jano,"* he said silently. *"A deva ya* is, in your terms, a dimensional year. When you get into velocity beyond the speed of light, you enter the dimensions. *Jano* is many *deva yas* away. Olandee's life is too short of span to cover the space between unless, of course, suspension of animation is utilized to reserve me."

Olandee Explains Much

IN the interior of the *Janosian* flyer machinery was everywhere, crowded into every bit of available space. Every object was of the transparent metal, even to the minutest controls, instruments and living paraphernalia.

Many transparent containers, standing upright, ran around a grated gallery above the labyrinth of mechanism. But they were empty.

The three scientists were allowed to inspect the interior, but never once did they get beyond Olandee's all-seeing orbs. His eyes followed them constantly, with some distrust. He seemed unable to accept the fact that they had resigned themselves into his hands for life or death. Yet he was genial, nevertheless, from all outward indications. What lay behind his lackadaisical visage, they could not know, of course, unless he projected his thoughts.

Had they been able to read his mind as he read theirs, they would have shrunk from him.

Twenty-one days had passed, all too swiftly, and Brandon, seemingly, had been swallowed. No word had been received from him and the hour of the delivery of the Stellarites was drawing perilously near.

And Olandee knew in his heart, if he had one, that he did not want to destroy the lives he held in bondage. But he had given his word that he would take those lives if Brandon failed, and take them he would! Therefore, if Tom Farrington, Valeri and Dennison had been able to read that powerful mind, they would not have been so light and blindly secure in their attitudes.

There was no changing his course once Olandee had set himself upon one. It was a peculiar twist in the *Janosian* brain that no set plans be changed, except by force of necessity. There was nothing to change his mind now, and as the three scientists speculated upon the strange machinery, he speculated silently upon the results of Brandon's departure.

It was with some dread that Tom eventually made note of the passing days and finally discovered that only a matter of hours now lay between them and certain death at the ten-fingered hands of the *Janosians*. And it was to that, that he grimly laid the reason for Olandee's eventual refusal to even see them. He had strangely drawn into a shell of aloofness and doubled the guard around his captives.

Six powerful *Janosians* now dogged their every step and those steps were confined to a limited area. By no means were they permitted to go near the great flyer nor could they even bribe or induce the guards to bring them food.

All *Janosian* hospitality had ceased and in its place existed a deadly, hostile silence.

For two days the flyer had been exposed to the open air after the Tunguse slaves had finally removed the earth above it. They had been on hand when they were released from slavery, and escorted into the open where their imagination pictured them scattering like so many frightened rabbits. Shortly thereafter, Olandee's genial attitude had changed to one of loathing.

Now the scientists huddled together in a small chamber and speculated upon the delay of Brandon.

"I can't see any reason why he would fail," said Tom resignedly. "Olandee did give him plenty of time. It's only a matter of two days from Kirensk to New York. Allowing him a day in New York to make arrangements for the opening of the Stellarite vaults, he ought to have been hard at it within a week after his departure from here."

"What if he ran foul of some hostile Tunguses on his way down the river alone?" Valeri put in with a shiver. "They'd kill and rob a lone man."

"Not when Brandon has a rifle," Dennison defended. "He's an expert and could hold his own. Yet he might have had some accident."

"That's what I'm afraid of," said Tom tensely. "He might have been killed in some sort of a smash-up in his haste."

Valeri leaned forward tensely and whispered into Tom's ear.

"If one of us could reach the machine," he hissed in low, almost inaudible undertones, "we could wreck the electronic propulsion units and delay their flight to *Jano!"*

Tom and Dennison nodded simultaneously and glanced at their guards who stood nearby in a group, eyes ever upon them.

The astronomer shook his head gloomily.

"Not a chance," he said. "Not a chance with these devils watching our every move!"

"Men have been in tougher places than this," Tom reminded him, gritting his teeth. "I don't propose to let them jab me with their suspension needles without some kind of a resistance."

"They'd kill us outright if we did anything like that," said Dennison after a bit. "No, I think we ought to wait. Maybe Brandon will show up at the last minute."

THE torture of waiting, the terrible fear of being killed or placed in suspended animation to sleep the slumber of doom, soon began to take its toll in the

minds of the three. They huddled together in a corner like rats and glared at the guards who seemed to derive some amusement from their predicament.

The *Janosians* were armed and fully aware that their captives might spring at them at any moment, and they held their peculiar weapons at threatening angles. The weapons were nothing more than transparent cylinders, thick at the grip, pointed and hollow at the apparent business ends.

The scientists had not seen them in action at any time, but they were not unable to guess at their deadliness. They appeared innocent enough, yet they had calculated correctly that they shot some kind of terrible rays, probably emanating from a form of radium, for they glowed like the walls of the underground domain. And Tom had already analyzed the illuminating elements in the walls as radium.

The underground domain was virtually filled with it!

But it was of no aid to them and would never be if Brandon failed.

Hours passed swiftly. Frequently the captives thought they heard the drone of air propellers coming to them through the opening over the machine. It was with dropping spirits that they determined each time that sounds came only from the *Janosian* flyer, which was being tuned for the take-off.

Filled with terror they grovelled now and cast furtive, hopeless glances at the guards. Their spirits, their wills and their strength were flitting away. Ravenous with hunger, crazed with thirst, they gnawed at their nails until blood flowed freely from them.

Then presently Olandee appeared in the opening of the chamber, appraised them for a time and then addressed the guards. The scientists were jerked to their feet, maddened and horrified. Tom lashed out with bared fangs and sank them into the arm of a *Janosian*. The creature jerked away and clouted him savagely across the head with his weapon.

Tom Farrington's knees sagged under him but he was yanked erect and half-carried forward. His senses reeled, yet vaguely he caught Olandee's thought vibrations.

"Your friend has evidently deserted you," Olandee snapped with finality. "Olandee gave him a fair chance and it grieves me to face the necessity of executing my plans. I do not intend to kill you. You shall be placed in suspended animation and carried along with us to aid in piloting our machine to *Jano*. Had Brandon returned with the bodies of our brothers, you would have been released. Olandee needs reserves to enable him to reach his own world."

"Give him time, Olandee!" Valeri screamed frenziedly. "He will bring your Stellarites!"

"In five of your minutes, Olandee takes his flyer into space!" he snapped curtly. Their senses reeled under the force of his thoughts. "To delay may mean disaster for us. *Jano* is closer to this world now than it has ever been before. Olandee will not delay!"

"Good God!" raved Tom suddenly. "Think what it is for us to leave our world forever!"

"Olandee thinks!",the *Janosian* vibrated stiffly. "Olandee thinks of his own welfare and of his brothers who are here, many *deva yas* away from their world!"

Olandee's thoughts impinged on their minds with the snap of finality and crazed as they were, the scientists realized the utter futility of escape. They swore bitterly; cursed him frenziedly and with unprecedented venom direct to his face. But he stood firm, with no sign of wavering from his premeditated course. Olandee was a creature of iron with a will that could not be broken by the pitiful pleadings of his captives.

It seemed a case of life and death with him. Without the help of Tom, Valeri and Dennison and their crew of one hundred men, his return to *Jano* was well-nigh impossible, for his own ranks of four-score were insufficient. But with the 200 Stellarites from Arizona, the return to his own world would not be so difficult, though trying indeed.

Yet despite his seeming cruelty, Olandee felt sorry for his captives. He realized what it meant to them to be taken away from their world forever. He, himself, would have preferred death under similar conditions, but now it was a matter of self-preservation and, anyway, the scientists were little more than uncivilized savages to him.

And uncivilized though they were in comparison with the higher *Janosian*, they were important factors in his return to *Jano*. He did not ignore that fact.

He would suspend them from animation until their services were required to relieve others; then he would bend their wills to his every desire.

Eventually they reached the chamber containing the long table on which had lain the hundred Siberian natives. They had been removed. But whither? The terrorized scientists could easily guess.

They had been loaded into the flyer and placed in the metal containers, there to rest until needed!

Two *Janosians* picked up Dennison's heavy body as though it was a feather and laid him flat on the table. Olandee produced a glistening injection instrument and quickly jabbed the point into a spot behind the astronomer's right ear. He screamed like a mad man and fought with the strength of a super-human, but the creatures held him down until his struggles ceased.

Dennison had been suspended! Valeri was next. He accepted his fate with a deadly silence. His face was pale, his lips blue and bloodless. His body stiffened when the injection was made and a comfortable smile passed across his lips which slowly tightened in a grip of temporary death.

Stunned and bewildered, Tom Farrington stared about him dazedly. His legs grew suddenly weak; he seemed to have lost his voice for he could not vent a scream. He felt himself lifted to the table. The needle in Olandee's calm, rigid fingers looked like a sabre and he recoiled when the *Janosian* brought it up toward his cerebal passages.

As the thing pierced his skin he had a vague feeling that someone was yelling loudly. It sounded like Brandon screaming at the top of his voice for Olandee.

"Olandee! Olandee!"

Then came a sudden crash of propellers from somewhere above. Tom stiffened as the needle was suddenly withdrawn from his neck, his eyes wide and appealing.

"Brandon!" he called shrilly, insanely, "Brandon!"

A nausea flitted through his vitals. He felt strangely ill as the power of the suspension drugs surged through his veins, but he fought to keep his senses. Olandee bent over him suddenly, a ghastly smile on his thin lips.

TOM felt his powerful thought-vibrations impinging on his brain even as he lapsed into unconsciousness and for an instant or two thereafter he understood what Olandee had telegraphed to him.

"Brandon has arrived!" Olandee had informed him. "He comes now with Olandee's brothers from across the seas. You will be released."

But when Tom Farrington was able to sit up and make note of his surroundings, he found himself in a blaze of sunlight. Beside him sat Valeri and Dennison, nursing dizzy heads. Brandon stood over them, grinning contentedly. A dozen strange men dressed in flying garments appraised him from behind the geologist.

"Brandon!" cried Tom, painfully leaping to his feet. He staggered and the geologist steadied him.

"Yes, Farrington," said Brandon, smiling. "I got back just in time. Olandee had you all pickled up to take you away. How do you feel?"

"Still dizzy, old friend," said Tom, nursing his reeling head. "Who are those fellows?"

Brandon nodded.

"They piloted three government transports over here full of Stellarites," he said simply. "The poor devils are on their way home now."

"Home?" Tom gasped.

"Sure! Olandee put 'em all aboard his interplanetary flyer and dropped off the earth like a meteor. Look!"

The geologist swung Tom around and pointed skyward. Valeri and Dennison gazed upward. A flashing object sped across the heavens like a flying mirror.

"There they go!" said Brandon. "I hope they arrive safely on *Jano!*"

Within a minute, flashing like a silver-backed glass, Olandee's flyer shot out of sight and Tom turned quickly to his friend.

"What the devil delayed you, Brandon?" he asked, frowning. "Another minute and we'd have been in that thing out there in space!"

"Couldn't be helped, Tom," the geologist explained. "Shortly after we first came in here with our equipment, some international complications set in between Russia and Asia. As a result, Siberia is over-run by Russian troops and I was detained until I could establish my identity. It was a toss-up whether I was to be shot as a spy or lodged in a prison camp until our government finally established me. Then I was allowed to proceed home and from there arrangements were made to permit our three transport planes to come through. Yes, you had a narrow escape, Tom, but then, so did I. I felt sure I'd be shot at dawn following my capture!"

"I'm mighty glad you weren't, Brandon!" said Tom extending his hand. Brandon took it. "Going to take our equipment along?"

"That's up to you, Farrington," Brandon said. "It's useless to us now."

"Might as well leave it then. It's money well spent after all," Tom said. "I learned a lot from Olandee and his crowd."

Three amphibian transport planes of the new, short-winged class, floated in the mucky river. In a few minutes they were in the air and headed back to the United States.

Then Tom Farrington suddenly turned cold as he remembered the crew. He grasped Brandon by the arm and shook it savagely.

"The men, Brandon!" he shouted. "What became of them?"

Brandon surveyed him quizzically, his mouth drooping.

"The poor devils are on their way to *Jano,*" he said evenly. "Olandee double-crossed us at the last minute and I had to agree to it to get the release of you three. Olandee said he needed the men, so I had to let 'em go to save your lives. He'd have taken 'em anyhow!"

"Damned!" Tom exploded. "That's what I call a dirty trick! I was just beginning to think that Olandee was on the level, too!"

"Well," Brandon shrugged. "It's a consolation to know that they have no further designs on the earth anyway."

They all agreed to that.

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 text-book. 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 hours have been available during the last 150 years for scientific observation of total eclipses of the sun? (See page 776.)
2. Does an observing astronomer see a total eclipse? (See page 790.)
3. What are the flaming prominences seen emanating from the sun in a total eclipse? (See page 790.)
4. What is their height measured from the sun's surface? (See page 790.)
5. What is a recent theory of the aurora? (See page 791.)
6. What elements have been discovered in the corona? (See page 791.)
7. What is the speed of the earth around the sun? (See page 792.)
8. What are Bailey's Beads and what causes them? (See page 795.)
9. What are the photosphere and chromosphere of the sun? (See page 796.)
10. How could you locate a sending station? (See page 845.)
11. What is the atom composed of and what determines what element it is? (See page 845.)
12. How do chemists prepare chemically pure metallic iron? (See page 846.)
13. What is the relation of the radii-vectors of an eclipse and of its foci to the curve? (See page 848.)
14. How could adhesion affect the pouring of a liquid from a vessel? (See page 849.)

The Eclipse Special

By William Lemkin, Ph.D.

(*Continued from page 799*)

ing extent. I could almost hear the metallic framework of the colossal flyer creaking and groaning, as though a prodigious force were trying to twist it out of shape.

I could readily understand the ferocious battle of titanic forces which was now going on in our ship. The powerful *solunaray* was exerting its tremendous upward drag on the block of alloy fastened in the vessel's skeleton. Opposing it was the enormous force of gravity. With the nullifying current through the three gravity units shut off, the earth was pulling on the massive ship with the full force of its thousands of pounds of dead weight. And what a phenomenal struggle it was! With all the trembling and groaning within the bowels of the *Eclipse Special,* I thought that the mammoth flyer would be torn asunder.

Wide-eyed and breathless we stood, clutching for support whatever solid object lay closest. The fatal seconds sped by. Supremely dramatic was this extraordinary battle between two seemingly adamant forces of nature. Each conclusive lurch of the ship hurled us first one way and then another, as the opposing fields of energy gained a momentary advantage. All I can remember of those horrible minutes was a seething turmoil and commotion that threatened to rip the vessel wide open and spew its contents, human and otherwise, into the sombre sunset atmosphere ten miles above the gray Swedish hills. Somewhere back in my turbulent mind was the recurring thought: "Nothing can save us—except the parachutes—we must use them—before it is too late!" Later I learned that the entire struggle consumed scarcely two minutes, although it seemed like hours.

And then, quick as lightning, a death-like calm befell the flyer. The bouncing, the violent convulsions ceased as though by magic. For a breathless split second the ship remained suspended on an even keel in mid-air. No palpable evidences of any motion whatever. Then suddenly that queer "elevator" sensation within me, that seeming upward flight of the internal organs, that queer pressure in the abdomen and chest, told that we were falling. In my dazed condition I could think of only one thing: "Gravity has won!—gravity has won!"

I believe we fell fully three miles, accelerating to a fearful speed, before our drop was arrested. Then Captain Renshaw at the levers seemed to burst out of the trance-like state which had apparently overcome him, and he bent over them eagerly. Slowly, almost imperceptibly, our downward plunge slackened. I guessed that the gravitational force which had been dragging us down to what looked like violent destruction, was now being checked by the gradual re-application of the nullifying powers. It was fortunate that throughout our meteoric descent the ship's stabilizers functioned flawlessly, so as to enable her to maintain an even keel. Otherwise the vessel would have hurtled down nose first, and given all of us even more severe a shaking up than we had been accorded by the cyclonic battle of the two forces.

It took several minutes before the terrified assemblage of scientists, passengers and crew realized that we were safe—released from the awful grip of the *solunaray,* and bound for earth once again. Dr. Boyd, pale and trembling, uttered words of cheer and encouragement to the rest of us. Dr. Fleming, with the terrible ordeal over, sat humped up in a nearby chair, his condition verging on collapse. As for the rest of us, blanched faces, shaken nerves and the haunted look in our eyes gave unmistakable evidence of how the trying adventure aloft had affected us.

I peered through the floor panel at the earth now coming to meet us at a comfortable speed. In the excitement of the last five minutes I had given not even a passing thought to the rapidly waning eclipse. Now I looked for the sun and discovered that it had already set. The horizon in the northwest was tinged with a dull silvery glow. The heavens above were darkening rapidly. Star after star appeared to join the few which had been visible above us throughout the period of the eclipse. The long near-Arctic twilight was commencing—the mysterious half-light that characterized the entire period of night in this latitude at this time of the year. I looked again at that smear of pale silver along the horizon. Beyond it, I visualized the sun, with the moon still obscuring it, swinging its powerful, mysterious *solunaray* through space, sweeping vast stretches of the limitless void that separated planets and suns. I shuddered at the thought that we might now be racing along in its relentless grasp. And then I became aware that we were approaching the ground. A cheery, encouraging call came from our pilot. Our altimeter now registered well under 5,000 feet. Below us I could make out in the dim twilight the dark green patches and shadows that indicated hills, with here and there gleaming areas to denote the abundant lakes. We settled slowly now, the well-controlled gravity power bringing us down with feather-like smoothness. And then a faint jar announced to an over-wrought, exhausted group of men that we had slid gently to a landing. The most unique, the most exhilarating, the most dramatic flight in the annals of aviation was now at an end.

THE END.

Again he manipulated the dials and a few hundred feet inland from the stream a grotesque nightmare suddenly came into view. . . . As we watched, the creature opened its mouth and displayed to our gaze three rows of long pointed teeth . . .

CHAPTER X

The Examination

THE stone block that was the doorway to our apartment slid slowly down and we saw Nahum standing in the aperture. He had changed his crimson-bordered robe for one edged with blue like ours. The collar was still around his neck, but instead of the silver sword, a golden disk engraved with the semblance of a flaming sun hung from it.

"Welcome to our city, Brother Senior Deacon," exclaimed Nankivell. "Come right in and pass from labor to refreshment. I would be glad to offer you a highball and a cigar but alas, I have no highballs and no cigars. What is the hour?" Nahum entered smiling at Nankivell.

"This is the seventh hour of the fourth day of the week," he said. "Mister Nankivell, I congratulate you more upon your powers of observation than on your discretion. I trust that you have all rested?"

"We have, and feel much better," answered Mariston.

"And from that I take it that you are ready to partake of refreshment?" Nahum went on.

The Drums of Tapajos

Part II

By Capt. S. P. Meek, U. S. A.

Author of "Futility," "The Last War," etc.

THE drums of aboriginal peoples have undoubtedly played a wonderful part in their life's history. They act, to an extent, like radio in the transmission of intelligence. What changes a perfected combination of radio and television might bring about can be predicted at the present in only a limited degree. Certainly the possibilities seem unlimited. It no longer seems far-fetched and fantastic to expect, within a short time, to be able to view and listen to the theatre, or a concert, while comfortably seated in the home. It appears quite logical that a carefully selected group of scientists, inventors and educators should evolve scientifically in a comparatively short time, beyond anything that our present-day civilization has seen. Read what went before and continue this fascinating serial in this issue.

Illustrated by PAUL

What Went Before

MARISTON, Duncan and Nankivell, all of the United States Infantry, have their doubts as to the advisability of settling quietly down to normal life without some real excitement, now that they are about to be released after the war. Willis, a veteran "revolution" man wherever the chances seemed to be most promising, is called in by Mariston, an old friend of his, and is told by Nankivell (backed by the rest of the boys), that he will finance an exciting revolution anywhere, if Willis is willing to lead them.

Willis, however, has had enough of revolutions to last him awhile and suggests something entirely new in the way of excitement.

On one of his return trips from an unexplored region in the interior of Brazil, Willis found a man, in his death throes, who very incoherently related a story and offered a map to substantiate it. Also he gave Willis a mysterious knife, which apparently came from this wilderness in central Para. According to Willis, an expedition into that country would furnish plenty of excitement, and also might prove exceedingly lucrative to all of them.

After several days' deliberation, the four men set out on their new adventure. They arrive in due time in the outskirts of the *tierra prohibitiva*, where they find it almost impossible to get enough Indians to go with them. They finally do get, because of the men's friendship with the master, the services of Pedro, who had gone more deeply into the wilderness than any of the other natives, and returned—though not to tell of it. More Indians were willing to go with Pedro.

Nankivell, during this trip, saves the life of Pedro from a water reptile. In return, Pedro forfeits his life by telling the men his story of the interior, in an effort to make these men give up this mad adventure.

They continue, however, and soon enter the Unknown Gateway, with its corresponding dangers of flying arrows and jungle terrors. By this time they have learned the truth of much of Pedro's story. But the most dangerous signal is the sound that later becomes known to them as "the drums of Tapajos," for this generally heralds at least one death. They have lost all but Pedro and two other Indians of all the men they started out with. When they get off the boats and start afoot, they learn that the poisoned arrow shots that had taken toll of some of their Indians are now used for the purpose of guiding the travelers. Following the directions of the arrows, they soon come to an enormous door, which opens quietly while they are wondering what to do, and Nahum, the Warder of the Outer Gate of the Crypt, appears. The five strangers follow Nahum through the gate and are made comfortable.

We assured him of our readiness and he faced the wall opposite to the door and spoke some words in Hebrew. A block of stone similar to the one that had fallen to admit him moved down and Nahum courteously motioned us to precede him. We did so and entered a room similar in size and shape to the one we had left but furnished with a low broad table about which were grouped five divans. On the table were a number of covered dishes which, from their color and luster, I took for gold. Willis gasped at the sight and Nahum smiled again.

"The table service would make a pretty good haul, would it not, Mister Willis?" he asked.

"I'll say it would. It would set us all up for life," replied Willis, "but if it is as heavy as it looks to be, it would take a pack train to carry it away."

"I doubt whether so old a soldier of fortune as you are could be badly mistaken on the weight," laughed Nahum, "but the removal of it might present difficulties other than the lack of a pack train. I trust that you gentlemen will not be discommoded by the lack of chairs to which you are accustomed. You will find with experience that the divan is more comfortable and that eating in a reclining position is a real aid to digestion. I have tried to arrange, as far as our capabilities permit, to have the food that will be served to you resemble the meals of your native land. Should you remain with us, you will doubtless become accustomed to our more scientific diet. Pray recline and we will be served."

We took our places at the table and Nahum softly clapped his hands. From behind a screen in the corner advanced five Indian girls attired in white robes, each bearing a golden dish in her hands. These dishes were set down before us. The odor rising from them was highly appetizing and when we saw Nahum raise a spoon to his lips we lost no time in following suit. The dish was a delicious soup made from one of the turtle or lizard family. It was splendidly cooked and we all did full justice to it.

The plates were removed and a large fowl of some sort was set down before Nahum and before each of us was placed a golden goblet containing sparkling red liquid. I watched Nahum as he raised his goblet, his lips moving in silent invocation. He raised it first to the east, next to the west, and last to the south and then poured a few drops forth on the ground before raising it to his lips.

The meal proceeded with great ceremony. The dishes were numerous and all were delicious. To half-starved travelers who had lived on *zarque* and *guarana*, pieced out with monkey-meat and such fruits and vegetables as the jungle provided, it was a veritable feast of Lucullus. The wine was abundant and our cups were kept constantly filled by the white-robed Indian girls, but I noticed that, after his first draft, Nahum drank none and indeed ate very little. What he did eat was almost entirely made up of delicious tropical fruits of which there was a great abundance and a large variety. Conversation languished until the demands of our appetites had been satisfied. At last we had eaten until we could eat no more and we lay back, replete with food and highly satisfied with life.

"Now if I just had a good cigar to top off with," said Nankivell with a sigh. "Susan, my dear," he went on to one of the Indian girls, "you don't happen to have a spare smoke in the antechamber, do you?"

The girl looked inquiringly at Nahum, who spoke in some language that was entirely different from the melodious Hebrew he had heretofore used. The girl bowed deeply and left the room, returning a few moments later bearing a golden tray on which were a dozen mellow looking cigars and a small brazier of glowing charcoal.

"Ask and you shall receive," said Nahum with a smile as we smothered exclamations of surprise. "I trust you will enjoy these cigars. They are really of an exceptionally fine grade of tobacco although they are rather mild for one accustomed to the more acrid weed of your native land. Let us return to the other room and smoke and take our coffee."

WE followed him back into our "drawing room" and relaxed at full length again on the divan, puffing at the excellent cigars with contentment while the silent footed girls served us with tiny cups of steaming coffee.

"Brother Senior Deacon," said Nankivell, "where the dickens are we and who are you and what is this all about? Are we guests or prisoners, or what is our status?"

"All of that shall be revealed to you in due course if the Master so orders," replied Nahum. "In the meanwhile, have you not told me that you were brethren from a far distant land seeking at my hands the blessings of aid, relief and fraternal assistance? You so named yourselves and have been so treated. What your status may be later, I have no way of knowing until it is communicated to me in the proper manner. Tonight you will be brought before the Master for his judgment as to your worthiness. For the present, pray ask me no further questions, for I have told you all that it is lawful for you to know at the present time."

"The whole affair is a puzzling matter to us," said Mariston. "We have been treated as honored guests, yet we are confined in these rooms after being taken prisoners and brought here and our arms have been taken from us. We are rather puzzled as to our status."

"You are distorting the facts of the case, Mister Mariston," answered Nahum. "You were not taken prisoners in any sense of the word. No hand was laid on you and you came hither of your own free will and accord. Neither were your arms taken from you. You were requested to lay them aside as a matter of courtesy which you gladly did, again of your own free will and accord; all except Mister Willis who has a small automatic pistol and a knife concealed on his person beneath his robe. You were at all times free to decline to follow me and retrace your footsteps to the outer world, until you once entered within the confines of the city."

"We were brought here by force," said the blushing Willis in a surly voice as he unbuckled his belt and laid aside the pistol and knife which he had concealed under his robe unknown to the rest of us. "We came here because we had to or would have been killed by those infernal arrows."

"You were never in any danger from the arrows," said Nahum. "You were for a time in real danger from the *Guardian of the Jungle*, a danger from which our emissaries rescued you. Again, you were in real danger from the quicksands and quagmires that surrounded you and which you had escaped as far as you did by almost a miracle. Had the arrows failed to guide you, you would long ago have sunk in the marshes. Had you failed to heed the arrows, sinking in the marshes would have been your death and not death from the arrows as you feared. But enough of this profitless discussion. The time approaches for you to go before the Master and the Council and I must ask that you prepare yourself in the due and proper manner."

When the preparations had been completed to Nahum's satisfaction he led us back from our quarters into the corridor through which we had entered earlier in the day. We turned to the right and proceeded for a hundred yards or so. Nahum paused and addressed some remarks to the wall before him and a block of stone slid down, opening into a small room similar to the one in which we had taken our places when we first accompanied him. We entered and seated ourselves at his invitation.

"Are we moving again?" I asked.

"Yes, Mister Duncan," he replied, "but at a somewhat slower rate than we did this afternoon. This conveyance is merely for transportation within the limits of the city and we are at our journey's end already. We will leave here and take another conveyance."

We followed him through another doorway that opened at his word of command and as the door, or rather block of stone, closed behind us, I had a sudden feeling as of pressure on my feet. I looked at our guide inquiringly.

"We are rising," he said in reply to my unspoken question. "The place where we are going is well above the level of the rooms where you are quartered."

"On the tops of mountains or other high places," murmured Nankivell.

"Exactly," replied Nahum. "We have arrived."

We stepped from the elevator into a large hall where we saw for the first time members of the colony other than Nahum and the Indian girls who had served our meals. Standing around in groups were perhaps two hundred men of all ages of somewhat the same type as our guide, but with a subtle difference. For a few moments I was unable to place just where this difference lay, but it suddenly flashed over me that these men had not quite the look of power and intelligence that characterized Nahum. As we entered, all talking ceased and the entire assemblage bowed deeply. Nahum raised his hand and said something in Hebrew and the men straightened up and formed themselves into a double line facing one another at a distance of several yards. Down

the lane thus formed we followed Nahum. As we walked down the lane I studied the men who formed it. They were evidently of the same race as Nahum but they were sturdier and gave promise of more physical strength, but of lower mentality. Their attire was similar to Nahum's and ours except that their robes were bordered with yellow instead of the blue which was on ours.

"Who are these?" asked Nankivell.

"They are Hewers in the Rocks, or Craftsmen, as we call them," replied Nahum. "The Council awaits us in the next room. Now may I request again that you refrain from questions until you have been through the ordeal which awaits you?"

We acquiesced and followed him in silence down the hall and halted before a wooden door, the first I had seen since the one that had barred our way at the end of the road. Nahum approached and knocked loudly and distinctly. There was a pause and then the door swung open and a figure, very similar to Nahum and garbed in the same manner, barred our way. He and Nahum exchanged some remarks and he stood to one side and allowed us to enter a small room which was quite bare of all furnishings.

"It is necessary, as you can doubtless guess, to blindfold you and to partially bind you," remarked Nahum, "but I can assure you that you are in no danger."

There was nothing to do but submit and we were tightly blindfolded and lightly bound.

"From this point, you will advance one at a time," said Nahum. "Mister Nankivell will be taken first. Will the rest of you kindly remain where you are?"

I heard the sound of Nankivell's footsteps retreat for a short distance and then stop. There was a sound as of knocking, followed by a short colloquy between two voices in Hebrew, one of which I easily recognized as Nahum's. Then there was the sound of a door opening and footsteps moving on again until they were silenced by the closing of a door.

"Bob, this don't look so good," remarked Willis.

"You are requested to keep silence," said a stern voice at our side.

"Silence, nothing!" began Willis truculently but Mariston's voice cut in sharply.

"Shut up, Ray," he said. "Nahum told you that you were in no danger. I am beginning to see light, and so will you if you will keep your mouth shut and your ears open and try to think what this reminds you of."

Willis grumblingly relapsed into silence and half an hour passed in tedious waiting. Then came the sound of the door reopening and Nahum's voice sounded beside us.

"Mister Mariston, will you accompany me?" he said.

"Ray, remember the word," said Mariston as he moved forward.

"Thunder!" shouted Willis. "I've got it now. Dunc——"

I silenced him by a sudden pressure on his arm. I, too, had suddenly realized what it all meant and understood what was before me. As I thought it over, I cursed myself for a fool for not having sooner realized what Nankivell had meant by his light-hearted remarks, which I had taken for his usual carefree banter.

Mariston's footsteps retreated and again came the sound of knocking and conversation. The wait was somewhat shorter this time and it was not over ten minutes before Nahum returned to get Willis. Apparently his examination was somewhat more prolonged, for it was an hour, as nearly as I could judge, before I heard Nahum return.

"Mister Duncan," he asked, "will you accompany me?"

I nodded eager agreement and he gripped me by the right arm while someone else took me by the left and led me forward. At the door Nahum whispered to me to knock. I did so and it opened and from the doorway came a voice speaking Hebrew. Nahum replied and several questions and answers were asked and returned. I was then led forward and the door closed behind me. I was conscious of a sensation of spaciousness, but I had little time to reflect, for my guides led me forward for what seemed an interminable distance. At last we paused and Nahum spoke. A melodious voice answered him and several remarks were exchanged. The voice spoke again but this time in English.

"Mister Duncan," it said, "is this entrance here of your own free will and accord?"

"It is," I replied boldly.

The conversation between the voice and Nahum was resumed. The replies given by Nahum were apparently satisfactory for presently Nahum turned to me and said, "Be seated." I stepped backwards and found a low stool behind me on which I sank with a sigh of relief.

"Mister Duncan," said the voice in English, "before you can be restored to light in our presence, it will be necessary for me to subject you to a minute and searching examination relative to the events of your life and it will be necessary that you answer every question put to you categorically. Nothing will be asked that you need fear to answer, for the worst that may befall you is that you may be reconducted to the place whence you came and replaced in the same condition as you were before our emissaries found you. With this assurance on my part, are you ready to proceed?"

"I am," I replied.

"It is well," answered the voice. "When and where were you born?"

IT is needless to give in detail, even if I could remember them, the many questions that were asked me. Suffice it to say that the examination was thorough in the extreme, and when the voice had finished questioning me, I am sure that there was no detail of any importance in my past life that was a secret. I answered truthfully and I am afraid that some of my answers did me little credit. At last my questioner had apparently quenched his thirst for knowledge for he paused and there was silence for perhaps a minute.

"Are the brethren satisfied?" it asked at length.

"We are!" came a deep-toned chorus and I almost jumped out of my skin at the realization of the size of the audience that was present.

"Restore the brother to light," directed the voice, "and remove his bonds, for bonds become not the freeman who has been proven."

Nahum rapidly unfastened the bonds about me and then turned his attention to the blindfold. It fell away under his manipulation and I blinked and stared around me in amazement.

I stood in a hall perhaps three hundred feet long by one hundred wide, floored with blue and white slabs set in a checkerboard effect. Seated around the hall were between two hundred and fifty and three hundred men, as nearly as I could judge, of all ages and all attired in the blue-bordered robes worn by Nahum and myself.

Before me, behind me, and on my right were raised seats, each occupied by a man of venerable and imposing mien, before each of whom sat guards armed with spears. All of this I saw at first glance and then my attention was drawn to the man who sat on the throne before me and who, I judged, had questioned me.

His resemblance to Nahum was startling. There was the same hooked nose, the same massive brow, the same piercing eyes and the same air of power and majesty. It took an effort to realize that Nahum stood by my side and was not seated before me. He was dressed in the same blue-bordered robe as was worn by the rest of the company, but he alone of the assemblage wore a headpiece. He wore a flat blue cap somewhat resembling a tam-o'-shanter, and on a stand before him rested a beautiful golden crown, flashing with gems. I surmised that it was his ceremonial headpiece and that the flat blue cap was worn for comfort.

"Brother Duncan," he said in a voice vibrant with power and yet rich with melody, "you have been tried in the balance and found not wanting. I extend to you the right hand of fellowship and with it remind you that you are bound by the most solemn oaths taken long ago. The penalties are not the same, but are equally effective with those with which you are familiar."

He rose and advanced and gripped me in a way that was familiar to me and I answered the pressure with a feeling of relief.

"You will take your place among the brethren," he said to me, "and I will announce my decision. They are all worthy and are to be received with all honor due their rank and made welcome. Nothing is to be concealed from them which it is lawful for their rank to know. Brother Senior Deacon" (here Nahum bowed deeply), "I give it you strictly in charge to receive and welcome them into our midst, to instruct them in our language, if such be needful, and to do all for them that is lawful and for their comfort. Conduct Brother Duncan to a seat."

Nahum gripped me warmly by the hand and led me to a vacant seat on the north side of the hall next to Nankivell. Willis sat on Frank's other side. I looked around for Mariston and found to my amazement that he was seated on the seat side of the hall near the one who had questioned me. Nahum bent over me as I seated myself.

"We will turn to refreshment in a few minutes," he said, "and then I will introduce you around."

The Master turned to other business and for half an hour the work of the Council went on. Presently it was finished and the Master struck on the table before him with a gavel and all rose. I rose when the rest did and noted with surprise that I could follow the work of closing with ease, despite the fact that it was in an unfamiliar language. Presently the ceremony was over and the Master removed his flat cap, turned to Mariston and taking him by the arm, led him down to where the rest of us stood.

"I am Brother Zephaniah," he said, shaking each of us warmly by the hand. "It is a great pleasure to me to welcome you less formally, but none the less heartily than I have before had the pleasure of doing. You are more than welcome, although I don't mind telling you that you hung in the balance for a while. We are not used to receiving strangers and we had to assure ourselves that you were true and worthy."

"I am glad you found us so," I said.

"There was never a question that you were true," he said. "It was only your worthiness to remain here that was being tested. Had not Brother Amos insisted, I would have been content to make it a mere formality, but once you were challenged, I had to examine you rigidly. Now I realize that you are tired and I will not detain you to meet all of the brethren. You will find that they will all welcome you and will accord you due honor and fraternity. My brother Nahum, who by the way is my brother by birth as well as in the craft, will take good care of you. I know that you are very curious and he assures me that you have been very patient. Your many questions may now be answered without reserve. I will bid you good-night now, for I must wear the crimson for a while. Brother Nahum has been excused from the crimson conclave of the evening and if you will retire with him, I am sure that you will have plenty to ask to keep him busy. Tomorrow, I hope to make your closer acquaintance."

He shook hands with us again and moved away. A number of the others approached us and shook hands and assured us that we were welcome. I was so tired that I was almost dropping from fatigue, but I managed to smile and meet the friendly handclasps. It was with a feeling of great relief that I finally saw Nahum approaching to rescue us from our new friends.

Under Nahum's guidance we retraced our way through the bowing files of Craftsmen and along the corridors to our rooms. When we reached them, Nahum clapped his hands and gave some orders to the Indian maid who responded. She retired and returned in a few minutes with five goblets and a pitcher of the same red wine that had been served us at supper. We thankfully partook of it and threw ourselves on the divans.

"Now, my brethren," said Nahum, "I am ready to answer questions."

CHAPTER XI

Troyana

"WHERE the dickens are we and who are you and who are the rest of the men we saw tonight?" asked Nankivell. "Where did you learn your work and what language do you speak and how do you do the things you do and——, Oh, the devil! Tell us all about everything."

Nahum smiled broadly at Nankivell's questions.

"You are in the halls of Troyana," he replied. "I am Nahum, the Senior Deacon of the Blue Council and the rest of the men you saw tonight in the inner chamber are the Layers-out of the Work, or Planners, who wear the blue. Those you saw in the antechamber were Craftsmen of the yellow rank. The work has always been and I learned it here in the same manner as all others have done before me. I do the things which I do by the use and control of natural forces which are very simple and which Brother Duncan will readily understand with a minimum of explanation. As to your request to tell you all about everything, I do not know all about anything, let alone about everything, so I regret that I cannot comply with your modest request."

Nankivell's ears got red and he started to make some reply, but Mariston spoke first.

"Keep your shirt on, Frank," he advised. "You are

getting off on the wrong foot. Brother Nahum is at our service but his knowledge merits intelligent questioning. The only one here who knows enough to ask for information in a logical way is Duncan. You two fellows shut up and let him do the asking."

Nankivell agreed gladly and Willis from force of habit. I tried to protest against the doubtful honor that was thrust upon me, but to my surprise, Nahum agreed with Mariston and I was, perforce, obliged to act as the mouthpiece of our party in their search for information. I considered for a few moments in silence before I asked my first question, Nahum waiting courteously for me to break the silence.

"You have used so many new terms that we are naturally confused," I said to Nahum at length, "and it is hard for us to understand all that you tell us. To start out with, what is your racial strain and where did your nation, tribe, or family, or whatever it may be, originally come from?"

"Brother Duncan," replied Nahum, "you have asked me a question which I cannot answer in its entirety, from lack of knowledge rather than from lack of inclination. It may be that the three wearers of the purple who guard the Sacred Treasure know, but of that I am not certain. Our racial strain is Semitic, as you have no doubt observed. As to our original habitat, tradition informs us that our forefathers fled from a battle in the east and came to a land which stood to the east of this land and sojourned there for many thousands of years. The land finally sank and they came to this place not over five thousand years ago. We have written records that prove this, but before that time, I do not know."

"A land to the east?" I said thoughtfully. Suddenly inspiration struck me and I almost shouted "Atlantis."

"Atlantis lay somewhat to the north and east of our home," replied Nahum. "Our records tell of its existence and record the fact that we had an extensive commerce with the Atlanteans. They were rather an inferior race, although thrifty and rich and excellent sailors. When their land sank, about five hundred years before ours did, some few of them took refuge with us and their descendants still remain with us. That part of our history is clear and distinct, but when we try to go far back of the time that our race has lived here, it becomes dim and indistinct. Tradition informs us that we had records in cuneiform writing, but when our land sank, they were too heavy to move. It may or may not be true, but at least, if we had them, they are now gone forever."

"Your language seems to be rather a pure form of Hebrew," I suggested. "From that and from your institutions, I think that some inference might be drawn."

"Two main inferences have been drawn by two opposed schools of thinkers," he replied. "One theory, based on our language and our institutions, and drawing much from tradition, points to the ten lost tribes of Israel as being our forbears. This theory has many supporters, but I personally do not believe it, because our physical characteristics, for example our cranial indices, do not harmonize with such a belief. I am inclined to think that the ancient Atlanteans may have been the ten lost tribes, but I think that we come from an older and much more honorable strain."

"And that is?" I asked.

"Ancient Troy," he replied.

"But the Trojans were a branch of the Phoenicians," I objected, "and they spoke Trojan, not Hebrew."

"The Phoenicians and Hebrews were both Semitic," he answered, "and no one alive can say what language ancient Trojan resembled. It may have been identical with Hebrew, for all that we know to the contrary. However, we will gain nothing from such an argument. No one has solved the riddle to his satisfaction, and we are forced to be content with six thousand years of written history and guess at the far-distant past. You doubtless have other questions to which I can give more satisfactory answers."

"WHAT is your form of government?" I asked.

"It is an absolute despotism," he answered, "and yet one where the ruler derives his absolute power solely from the consent of the governed and may be replaced by another at any time. Perhaps a short outline of our social system will make our method of government clearer.

"To begin with, we are divided into six classes or degrees. The lowest class of these, the Cowans, is entirely Indians who serve us and who can rise no higher in the social scale than what they are by birth. They form our outer cordon of guards and furnish some female servants for our homes. They are either born in our service or are recruited from villages on the outskirts of our domain. They are bound by inviolable oaths of secrecy and service. From the latter they may be released if they wish to leave our service, but from the former, never. They wear their native costumes in the jungles, but the selected few of them, who are allowed to enter Troyana, wear plain white robes without borders when here. Thus you may distinguish them.

"The second rank, known as Bearers of Burdens, are distinguished by robes with a black border, or on ceremonial occasions by solid black robes. They seldom, if ever, leave the confines of the city and they perform all of the menial and disagreeable tasks that are to be done. They are by far the largest class of our population and number in all, with their families, about twenty thousand. They have no rights to property, save of a communal sort and are in many ways but little above the Cowans. They have, however, one precious privilege; they may be passed to the next higher rank if found worthy."

"Does this often happen?" I asked.

"Very seldom. There have been but two cases during my lifetime. The prime requisite for being passed into the next class is that of knowledge or rather intelligence. They are typical hewers of wood and drawers of water and few among them have the intelligence, ambition, or ability to acquire knowledge. They know only the handling of machines, and while some of them are very skillful in the use of tools, without a higher intelligence guiding them, they are helpless. They are never admitted to the upper levels save in gangs under overseers, and are generally considered to be merely what their name signifies, bearers of burdens. They are, I might mention, the descendants of the ancient Atlanteans, who sought refuge with us when their land submerged.

"The third class are those whom you saw in the antechamber this evening. They are the Craftsmen and are distinguished by their yellow bordered robes, or on ceremonial occasions by robes of solid yellow. They know the uses and underlying principles of practically all the machines and do almost all of the actual construction work. They are freely admitted to every place except the one upper level, where the higher classes live and are

carefully trained and educated to their tasks. They also have the privilege of being raised to the next higher rank."

"Is this privilege, like that of the Bearers of Burdens, largely a theoretical one?" I asked.

"Not at all," said Nahum earnestly. "It is from their ranks that the number of the Planners is kept filled. They are a very intelligent and well educated class and many of them are raised. They number at the present time about fifteen hundred and in the last five years, three of them have been raised—one of them permanently."

"Permanently?" I asked, puzzled by the term.

"I forgot that many of our terms are new to you. By permanently, I meant that his family was raised for all time. When a Craftsman is raised, only he himself is raised. His sons are still Craftsmen and must be raised on their own merits, if at all. When, however, a man is raised, and it is found that his father and both of his grandfathers before him were Planners, he is considered as being permanently raised and his sons are born in the blue. Then and not until then are his family considered as being permanently in the higher grade.

"The next grade is that of the Planners, who are distinguished by the blue borders of their robes. They are the real governors of the land and the Blue Assembly or the Council, as it is commonly called, is the place where all questions of welfare are considered. They number three hundred, thirty and three. They consist of the sons of Planners who marry into their own rank, and of Craftsmen who have been raised. We are not an especially prolific race, and it is necessary for us to continually recruit our circle from that of the Craftsmen in order to keep it at the prescribed number. We have knowledge of all except the most secret matters and we are the repository of all the knowledge and science that is possessed by our race except the secrets of the Crypt and of the Sacred Treasure. From our ranks the Master is chosen by ballot in which every wearer of the blue participates and he governs all. He normally holds office for life, but being an elected officer, the Council may, at any time, declare the office vacant and elect a successor. This has been done twice in the last five hundred years, the second time about thirty years ago when the present Master was chosen."

"Is the Master's rule absolute? Is there no appeal?"

"An appeal can be taken to the Council where a majority vote governs," he replied, "but no Master is ever overruled unless the Council immediately afterwards declares the chair vacant. The Master is chosen for his fairness and wisdom and he has the aid of the Council and the individual advice of the brethren."

"I thought that I saw something voted on tonight," interrupted Mariston. "Was that a deciding vote?"

"The only place where a vote of the Council is a deciding vote is in the election of a Craftsman to be raised when the ballot must be unanimous, in the election of a Master, where a majority rules, and on an appeal to the Council from the Master's decision, where a majority of two-thirds must be had to overrule him. All other votes are advisory to the Master only. He usually follows the vote and orders it accordingly so done, but he is not bound to do so and often overrides the vote of the Council. The Craftsmen, by the way, have their yellow assembly where matter may be discussed and recommended to the Council. If not incompatible with the Master's policies, these recommendations are usually approved."

"You spoke of two higher classes," I remarked. "What are they?"

"The fifth rank is that of the Keepers of the Crypt, or the Conclave, as they are usually known. They wear crimson borders on their robes except on ceremonial occasions when their robes are solid crimson heavily decorated with gold. They alone know the secrets of the Crypt and of the machines kept therein. They number thirty and three and are chosen for life from among the wearers of the blue by their own assembly. Their descendants are Planners or Craftsmen, as the history of their ancestors warrants. They have no power other than that of greater knowledge and their responsibility and duties are heavy. They are governed by their own Master whom they elect themselves. He is usually the Master of the Blue Assembly, but not necessarily so. There have been times when the two were different. In fact, such is the case now."

"In such a case, who is the higher authority?" I asked.

"The Blue Master governs except in the Red Assembly," he replied. "There the Red Master is, of course, supreme, and once elected cannot be recalled, even if he be the Blue Master and is recalled as such. The only times when the two Masters were not one and the same, have been times like the present when the Blue Master has been recalled.

"Above and beyond all these is the highest class, that of the Keepers of the Sacred Treasure who number three, are elected for life, who choose their own successors and who are distinguished by the purple on their robes. They have no power as such, but they guard and keep the Sacred Treasure and have all knowledge that is known."

"What is your rank, Brother Nahum?" asked Nankivell.

"I am a wearer of the crimson," he replied. "As it happens, I am an officer of both the red and blue assemblies and may very possibly be chosen as one of the three Keepers in time."

"YOU spoke of varying degrees of knowledge and of the Crypt and of the Sacred Treasure. Will you kindly explain those terms?"

"I will do so gladly, but the information will be much easier for you to grasp when you go with me around the city. Our knowledge is divided into classes. The Cowans have none. The Bearers of Burdens are trusted only with hand tools and such simple machines as aid them in the performance of their labor. They know no language other than their own and the Indian tongue. The Craftsmen have access to practically all knowledge that has emanated from the city itself and that has been acquired from outside. They are instructed not only in their own tongues and that of the Indians, but also in Spanish and Portuguese as a minimum, for they have at times occasions for the use of them. Many of them who are farther advanced and are nearly ready to be raised are expert linguists in most of the tongues of the earth and are excellent scientists.

"The Planners have access to all knowledge that we possess, except, of course, to the secrets of the Crypt, and through our instruments they have access to all of the knowledge of the outside world. Practically all of them speak from six to a dozen modern languages fluently and I doubt if there is one among them who does not understand English. They have an intimate knowledge of the

politics and history as well as of the sciences of the outside world.

"The Crypt is the source of all the power that we use. Since you are not of the Cryptic Degree, I must beg you to excuse me from going into particulars, but I may tell you that the source of our power is that mysterious force toward which the scientists of the world have been slowly groping and of which radio-activity is only one manifestation, the internal energy of the atom. The power is generated in the Crypt, to which the three and thirty wearers of the crimson alone have access.

"What the Sacred Treasure is, I cannot tell you, for I do not know. One part of it is the supply of raw material which is converted into usable energy in the Crypt, but of what else it may consist, I have never been informed. Rumor says that in part it consists of books of ancient lore, too high and holy to be displayed to the common gaze, but when I have said that, I say only what is surmised."

"What is your religion?" I asked.

"Since you are wearers of the blue, you should know that we worship one Supreme Being who is unseen and unseeable, who rules and governs the universe and who receives the spirits of the faithful after death and rewards them with rebirth according to their merits. This, however, is not what is taught to the lower degrees. Some few of the Craftsmen have progressed mentally to the stage where they realize the great truth which is never taught, but which comes from inward contemplation, but most of them still worship the Golden Calf."

"The Golden Calf," I exclaimed, a thought of Aaron leaping to my mind.

"The Golden Calf," he repeated. "But that is no evidence of our identity with the lost tribes. Our records in the Council show that the idea of the calf as an object of worship and a means of controlling the lower degrees was developed less than four thousand years ago. As I said, to some of the Craftsmen, the Golden Calf is merely an inanimate object with no symbolism. To most of them, it is a symbol of deity, but to some few and to all the Bearers of Burdens and the Cowans, it is a veritable living God, to be worshipped, feared and propitiated as such. The ceremonies and rituals surrounding it are very elaborate and awe-inspiring to the uninitiated. You will have an opportunity to observe them soon."

"What position do the women hold in your community?" asked Nankivell.

"I was expecting some such question from you, Brother Nankivell," said Nahum with a smile. "I will let them answer it themselves. For tonight, you will remain here, but tomorrow I will have suitable chambers in my home for your reception and will invite you to move into them. My granddaughter, Estha, has been learning much about you and desires your acquaintance. You will find that women throughout the world are very similar and very curious. When you meet Estha, she will be glad to answer all your questions, provided she can spare the time from the many questions that she will ask you. Now it is late and I will leave you to your repose. Before I leave, is there anything that I can do which will add to your comfort or welfare?"

"Yes, there is," replied Nankivell. "I would like to have Pedro with me."

"Your servant is only a Cowan and so would not ordinarily be admitted to the regions where you are going," said Nahum, "but the wishes of a guest are sacred and he will join you tomorrow. He has been well cared for. Now I will leave you for the night."

We rose with him and returned his bow and the cordial handclasp which he bestowed on each of us. He spoke to the wall and the doorway opened.

"Before you leave, Brother Nahum," I said, "will you explain to me how the doors work here?"

"Gladly," he replied. "They are arranged with counterweights set in the wall and are connected with motors which are actuated by certain combinations of the human voice. I have not had time to teach you the words and inflections which you must use and which must reproduce very accurately the combinations to which the motors are set, but I did have this door set to open either at command or to the tone of this whistle. Had you not asked me, I would have forgotten to give it to you. Blow three blasts, each one second long, to open the door, and one blast, two seconds long, to close it."

He handed us four small golden whistles and bowed again. As he moved out, I blew the little whistle for a period of two seconds as nearly as I could judge time and the door closed.

"Well, I'll be damned!" exclaimed Willis.

CHAPTER XII

Estha

MY bed was comfortable and I believe that I could have slept the best part of the next day if I had been allowed to, but I was awakened early by the sound of splashing in the bathroom and Nankivell's voice raised in matutinal song. Nankivell's voice has rather more power than melody in it and, as Mariston was wont to say, "he couldn't carry a tune in a bucket." Despite this handicap it was his great delight to carol forth what he fondly imagined were the strains of "Benny Havens, Oh" at the most inconvenient hours that he could pick out. I turned over on my divan and cursed softly at being awakened. As I lay there striving to summon enough energy to shout, I saw a movement on Mariston's bed. Slowly he roused himself, picked up a shoe from the floor and slipped softly across the room. At the doorway to the bath he paused, took careful aim and let fly. There was a thud from the bathroom and the singing was interrupted by a roar of pain. In a moment Nankivell dashed into the room, dripping wet, grabbed Mariston about the neck and vociferously announced his intention of drowning him.

Sleep was out of the question and I rolled over in bed, only to be joyously tackled by both combatants and dragged into the bathroom and ducked in the tub of icy water in which Nankivell had been disporting himself. When I had been ducked to their satisfaction, the three of us dragged Willis out of bed and served him in the same cavalier fashion. It took all three of us to do it, too, for he was an unusually husky specimen. He put up a good fight, but we ducked him at last and donned our blue-bordered robes and entered the drawing-room ready for what might befall. Nothing happened for several minutes and then Nankivell arose and facing the door to our dining-room, announced gravely that he was ready for breakfast.

Instantly the stone block moved out of the way and there before us stood the table from which we had eaten supper the night before. We entered, somewhat dazed at

the happening. As we threw ourselves down on the divans, one of the same Indian girls who had served us the night before approached and handed Mariston a folded bit of what looked like paper. Mariston opened it and turned to us.

"Listen, fellows," he said, "it's a note from Nahum. He says, 'I am very sorry that my duties at the Crypt place me in the embarrassing position of having to neglect my guests temporarily. All arrangements have been made for your morning refreshment and I trust that your meal will be adequate and palatable. I will join you shortly.'"

"Bully for the old boy," said Nankivell. "Let's eat. Susan, my dear, bring on the fruit."

The Indian maid bowed and left the room. She returned with three others in a few moments, each carrying a golden plate on which rested a slice of papaja and a sliver of lemon. This was followed in due course by the most modern of breakfasts, cooked and served in a manner that would have done credit to the most luxurious hostelry of New York. There was a cereal of some sort that resembled cracked wheat, toast, soft-boiled eggs and excellent coffee. When we had ended the meal, more of the excellent cigars which Nahum had provided the night before were brought in and we lay back and puffed in luxurious contentment.

"That was the most civilized breakfast I have had since we left New Orleans," announced Mariston. "Now I am ready for whatever may befall."

"I am glad that you enjoyed it, Brother Mariston," came in a familiar voice from behind us, and we started up to find that Nahum was standing in the doorway.

"Good morning, Brother Nahum," said Mariston rising. "We are glad to see you. Truly, our breakfast was a most enjoyable affair. We only regretted that you could not join us."

"My duties prevented me from having the pleasure," said our host. "Now, if you have quite finished, it will be my pleasure to welcome you to my home. You need not bother to carry anything with you. Servants will bring them after you."

We followed him through the corridor into one of the conveyances. Apparently, Nahum's home was some distance from our apartment, for we "changed trains," as Nankivell put it, twice before we took an elevator which carried us up for some time.

When we left the elevator, we passed down a short corridor, turned a corner and found our way blocked by a solid wall. Nahum spoke some words and a block of stone slid down and the full beauty of a carefully kept tropical garden lay before us. We followed Nahum into the sunlight and drank in the beauty of the scene. Hedges of scarlet, white, mauve and orange hibiscus shut in the garden from the outside world and partially hid the low wall of apparently solid rock from which we had emerged. Inside the hedges was a riot of color—gracefully nodding palms, lilies of endless varieties and flowers of dozens of other sorts made a dazzling panorama, while everywhere grew orchids of the most rare shapes and hues. In the center a tiny fountain threw a sparkle of water into the air, which fell back into a pool where several gayly plumaged waterfowl disported themselves. The garden was perhaps four acres in extent and at the far side rose a dazzlingly white stone house, solidly built, but so perfectly proportioned as to give the effect of airy grace and unreality to it. The style of architecture was vaguely familiar to me, but I could not place it and I asked Nahum what it was.

"The style is individual to Troyana," he replied. "Architecture, as you know, is the greatest of all arts, and it has risen with us to the highest peak of perfection that the world has ever known. Only in one other place can such proportions be found and then only in ruins. Brother Willis will probably know to what I am referring."

"It has a certain similarity to the Maya temples that are in the Yucatan jungles," replied Willis, "but they seem to be a great deal more solid and substantial, if I may put it that way. Also they are much larger."

"You err in both points," said Nahum. "The house before you is larger than most of the Maya ruins and is of a much heavier and more substantial construction than they are. This house has stood as you see it for over four thousand years. It is only by better designing that we can gain the air of frailty that deceived you."

A NOTE of girlish laughter sounded from behind a clump of hibiscus to our right and Nankivell pricked up his ears sharply at the sound. Nahum turned to us with a smile.

"I fear that my granddaughter could not wait for a formal presentation," he said, "and has slipped out with some of her companions to spy on us. We will join them."

We followed him around the clump of hibiscus and came face to face with a group of three girls. All of them were young and all of them were more than pretty. They had coal-black hair, rippling in waves down their shoulders from golden fillets which circled their heads. Their dress was a robe of white material coming down to their ankles and cut rather tight, but their freedom of movement was assured by the fact that the robes were slashed on each side well up to the thighs. The robes hung in graceful folds from golden clasps on the shoulders, leaving the arms bare and were caught in at the waist by broad blue bands heavily embroidered with silver. All of them were more than pretty, as I have said, but it was no task to pick out Nahum's granddaughter. She was at least two inches taller than either of the others, standing fully five feet five in the flat sandals bound to her shapely ankles with blue and silver that she wore. Her face had none of the terrible majesty and power that marked Nahum's, but it radiated intelligence and enough of command to show that she was more used to giving orders than to making requests.

She was a glorious specimen of womanhood. Her eyes were such a deep brown as to be almost black, and while they now sparkled merrily, I had an uneasy impression that they could glitter like steel points when she was aroused. She was about nineteen as nearly as I could judge and the lovely curves of her young womanhood were accentuated rather than concealed by the garb she wore. Her complexion was rather dusky compared to Molly's, but through the warm olive glowed the pink of perfect health, and her coral lips made a vivid contrast to the pearly teeth that punctuated her smile. She advanced to Nahum and kissed him, saying something in Hebrew in a voice that reminded me somehow of the clear note of a flute. Nahum greeted her affectionately and turned toward us.

"This is my granddaughter, Estha," he announced, "and there are her cousins, Adah and Balkis. Estha, you

already know who our guests are, but to make it proper, I suppose that I had better present them. Captain Mariston, Lieutenant Duncan, Lieutenant Nankivell and Mister Willis."

We each bowed deeply as Nahum spoke our names and Estha extended her hand in greeting. Mariston bowed over it in his courtly manner and I essayed to do the same, but was rather awkward, I fear. Willis bowed deeply and gracefully in the manner that years of knocking around the Spanish-American countries had taught him and acquitted himself very creditably. When it came Nankivell's turn, that graceless scamp not only bowed over her hand, but proceeded to kiss it with rather more gusto than ceremony. I looked at Estha in alarm, but to my astonishment, a slight blush was creeping over her cheek. She was plainly embarrassed for a moment, but her dignity came to her rescue and she withdrew her hand with a laugh.

"Really, considering your lack of experience at that sort of thing, you do it very nicely," she said to Nankivell.

"Señorita," he said, bowing again and trying to recapture that hand she had withdrawn, "it is the custom of my country."

"Yes, it's quite common, I know," she replied. "Why, just fancy, Granddad, at times the traffic in Times Square is held up for hours by the throngs of men kissing the hands of young ladies to whom they have just been introduced. Really, Lieutenant Nankivell, your English pronunciation is so much better than your Spanish that you ought to stick to it."

The rest of us roared with laughter at Nankivell's discomfiture.

"When were you last in New York, Miss Estha?" asked Mariston.

"Oh, I've never been there," she said, "but I have seen it so often that I am quite familiar with its customs—more so, I think, than Lieutenant Nankivell is. I love the United States and especially New York and I am crazy about Paris, but Granddad is so settled. He much prefers London and Berlin."

"I confess that I don't understand," said Mariston. "You have never been in New York and yet you talk glibly of Times Square and how much you love the city."

"No, I've never been away from Troyana," she said. "None of us ever have, but we can see and hear everything in the world through our instruments. We followed you all the way up the river from Belem and we listened to your talk as soon as we found that you were coming here and that the Council had decided to admit you. I lost one part of it, though. Lieutenant Nankivell, did Captain Mariston let you bring your razor?"

Our laughter broke out afresh at her sally and Nankivell subsided into the background temporarily squelched and proceeded to talk in un undertone to Balkis. Estha looked at the pair and her eyes hardened ever so slightly for an instant and then the look was gone and she had turned back to me.

"Lieutenant Duncan," she said, "you haven't said a word yet. I suppose that the correct thing to do is to ask you how you like our city."

"I haven't seen it yet, or at least only a small portion of it," I said, "but from what I have seen of the people, I am much impressed. If those that I have seen are fair specimens of the female inhabitants, a man should be content to stay here the rest of his life."

"Fickle man!" she exclaimed. "What would Molly say if she heard that?"

It was my turn to blush and stammer and Nankivell howled with glee and joined us, bringing Balkis with him.

"That's right," he said, "give it to him straight from the shoulder. He is a heartless and fickle libertine and he has a sweetheart in every port. He's really a bad character, Miss Estha, watch out for him."

"Surely he can't compare with you, can he?" she countered. "Isn't that the smile that wrecked a thousand lipsticks? But really, Lieutenant, I am surprised at you. You haven't tried to kiss Balkis' hand yet."

"I can't," said Nankivell with another blush. "My lips are chapped."

"Are you sure they aren't calloused?" asked Estha demurely.

MARISTON and I howled with laughter again and even Willis and Nahum joined in. Nankivell's ears turned a fiery red and he stammered for a moment.

"Look here, young lady," he said with mock severity, "I think that you could stand a little investigation. How did you learn so much about my more or less shady past?"

"Oh, I know all about you," she said merrily. "So do Adah and Balkis. As soon as Granddad told us that you were to be admitted to the city, I called them in and we have followed you and listened to you all the way from Belem. It has been thrilling and I was so afraid that the *Guardian* would get you before the guards called the pack off."

"This is very interesting, Miss Estha," broke in Willis. "How the dickens could you see us and hear what we were saying when we were there and you were here?"

"I wear the blue," she said carelessly, "and so, of course," I have access to the instruments. We have a sound receiver and a projecting telescope at the house. Granddad will show them to you later if you wish."

"I would like very much to see them," I said.

"Do you really wish to see Molly that badly?" she asked archly. "Please forget her for a while. If you don't, Adah's heart will be broken. She has quite set it on making a conquest of you."

"I haven't said any such thing," said Adah hotly.

"No, but you have looked it many a time," retorted Estha. "You and Balkis drew straws to see which one was to have first chance at him. Don't tell me that you didn't. I know that you did."

"We never did," chorused Adah and Balkis in one breath.

"You advised us to when you said that Lieutenant Nankivell was to be your undisputed prey," said Balkis, "but we didn't do any such thing."

Nankivell's ears pricked up at Balkis' speech and Estha was momentarily confused. Nankivell approached and whispered something in her ear. I saw her eyes flash again momentarily and I mentally congratulated myself that it was Nankivell and not myself that she had picked on. Her eyes cleared again almost instantly and the glance she sent at Nankivell was full of girlish mischief.

"Now that you know the worst, Lieutenant," she said, "you can be on your guard against my wicked wiles. I don't want to take you without fair warning from the dozens of fair ones who would mourn your loss."

"I capitulate, horse, foot and guns," replied Nankivell.

"I am taken prisoner without a shot being fired. From now on, I am your abject slave."

"I thought at one time that you might be my slave," she laughed, "but when Granddad found out that you were entitled to the blue, of course I had to give that idea up. I was awfully sorry, too, because you are the only blonde in Troyana and it would have made every one of the girls furious to see me have you."

"Do you have slaves here, Miss Estha?" asked Mariston.

"Oh, no, not really," she said. "Of course, the Cowans are in a measure slaves, but the slavery is wholly voluntary on their part and the Bearers of Burdens are really more slaves than the Cowans, for they are born to it and have very little chance of rising higher. However, don't let's talk sociology now. How would you like to see New York?"

"It would be delightful," said Mariston.

"Fine," exclaimed Estha. "Balkis, take Captain Mariston into the house and show him New York. I know that Granddad has been wanting to have a talk with Mister Willis for some time, so they can have it right now. Adah, you keep Lieutenant Duncan amused, while I start training my new slave, Lieutenant Frank Emerson Nankivell, late of the Air Service, United States Army."

CHAPTER XIII

The Guardian of the Jungle

"WOULD you care to see New York, too, Lieutenant Duncan?" asked Adah.

"I am very anxious to see your instruments," I replied. "I imagine that they are somewhat allied to our radio telegraph and I am much interested in such things."

"Perhaps you had better wait until Uncle Nahum can explain them," she said rather doubtfully. "I know the operation, of course, but I am not sure of all the details of construction."

"Such a pleasant guide will more than make up for any slight lack of technical knowledge that she may have," I said gallantly, rather wishing that it were Nahum who was going to do the explaining. She apparently divined my thought, for she smiled slightly.

"I'm not really beautiful but dumb, Lieutenant," she said. "I think that I will be able to make you understand with Balkis' help. At any rate, we'll try our best."

I blushed and stammered my apologies and Mariston and I followed the girls into the house. The air of lightness and airiness that characterized the exterior of the house persisted in the interior, although I noticed, as we entered, that the walls were eight or ten feet thick and were made of huge blocks of stone coated with some sort of a plaster that reflected the light with dazzling brilliancy. The air had been quite hot outside but inside the house it was delightfully cool. I remarked on the pleasant relief from the heat.

"The walls are well insulated," said Adah in reply to my remarks, "and the house is also cooled by a spray of liquid air. The temperature can be regulated to any desired degree of heat that you wish to maintain. We keep some rooms warmer than others and the thickness of the walls enables us to do so very readily. I rather like a warm room myself, although it is not supposed to be good for you. The receiver is in here."

Balkis and Mariston were already in the alcove where Adah led me. Balkis was turning some dials that were set in the face of a cabinet before her and Mariston was standing beside her, trying vainly to look as though he were helping her.

"Let me take the controls, Balkis. You haven't tried this new instrument that Uncle Nahum had put in last week," said Adah as we entered. "Now what do you want to see first?"

"Let's see New York," suggested Mariston.

Adah drew out an atlas and studied it for a moment and referred to a table of figures that stood beside the dials. She turned several of them and then pressed a switch on the side of the wall near the cabinet. Instantly the room was in darkness and she touched my hand and pointed at the far wall. As I looked, there was a slight whirring sound and out of the darkness materialized a scene. For a moment I stared unrecognizing and then I realized that it was as though I stood on the edge of Battery Park looking out across the harbor. There was the Aquarium and beyond it the water with Governor's Island in the foreground and Bedloe's Island with the Statue of Liberty in the distance. I heard Mariston gasp audibly.

"Do you want to hear it as well?" asked Balkis.

Mariston signified his assent and Adah turned some more dials by the light of a small lamp on the cabinet and a confused roar struck our ears. There was no doubt that it was the noise of New York, but somehow the noise didn't quite jibe with the scene before us. I noted a boat in the harbor blow its whistle. The steam rose plainly enough, but the sound did not arrive.

"Bother, I haven't got it synchronized," said Adah as she snapped on the lights and worked carefully with the dials. "There, that's better. I'll have it in a minute."

She turned an adjusting screw and the scene shifted slightly. Again she made an adjustment and at once the scene and the noise came into coincidence. A traffic policeman blew his whistle and we saw the movement and heard the noise at the same instant.

"Wonderful!" exclaimed Mariston.

"How does it work?" I asked.

"It is all a matter of wavelengths," explained Adah. "You see, all sight is effected through the impact of wave motions on the retina of the eye and all sound is heard through the impact of wave motions on the tympanum of the ear. Every wave that ever started is still moving in some degree, although the normal damping or decay of the waves is comparatively rapid, especially for the longer waves. You cannot hear sound for any great distance when it travels through air. You can hear it for a greater distance, when it travels through a denser medium like water. You can't hear it at all in a vacuum. The fact that you can't hear it in a vacuum doesn't mean that a sound does not set up air disturbances, but only that the human ear is not attuned to catch them. Now this device picks up the sound waves and magnifies them and then transforms them into air waves that you can hear. I can increase the volume very easily by increasing the current or I can cut it down to a mere whisper."

She manipulated the dials as she spoke and the sound rose to a deafening roar and then faded away to a mere whisper and then returned to its normal intensity.

"The light waves are handled in the same way," she went on. "We don't bother to catch the visible light rays any more than we do the audible sound waves. You know that you can hear a high pitched whistle for a greater dis-

tance than you can a low pitched one, even when the waves are of the same original amplitude? Well, the same is true of all wave motions. Given equal amplitudes, the shorter the wave length, the slower the decay. If we omit the audible and visible waves and set our apparatus to catch instead of them, the harmonics or shorter waves, we can get them at full force for almost any terrestrial distance. For example, this receiver and projecting telescope operate on the eighteen-hundredth harmonic of the shortest ray of sodium light."

"Why do you use sodium light as a standard?" I asked.

"For the same reason that you use it as a standard for all photometric measurements and that Michelson built his interferometer on it," she replied. "It is the easiest monochromatic light to get and is the easiest to duplicate in a hurry. This system has its limitations, however. The waves are so short that they will penetrate almost anything, but for some peculiar reason, tin and tin compounds are impervious to it. As a result, the assembly rooms, the Crypt and every place where secret or semi-secret meetings are held are lined with tin sheets or painted with a paint containing tin salts in suspension. Similarly, all sleeping and bathing apartments in the city are so guarded and all clothing is made of a material which is impregnated with tin salts."

"Can you read the inside of a book if it is not opened?" I asked.

"No, we cannot," she replied. "You see, the effect of the instrument is to place an eye or an ear, or both, at any given point in space. You can see nothing with the instrument that you could not see with your eye if it were placed at the point where the instrument is focused. For example, I can place the lens inside a building, but unless the building is lighted, I can see nothing. Similarly, I can place the lens inside a book, but with the book closed, there is no light and I cannot read it."

Mariston coughed and Adah looked inquiringly at him.

"That is a very lucid explanation, Miss Adah," he said, "and I have no doubt that Dunc is in Heaven, but to me it is just as clear as mud."

"Excuse me, Captain Mariston," she said, "I just didn't want Lieutenant Duncan to leave here thinking that I was as dumb as he thought I was, when he came in. I'll continue the lecture to him at some other time. Just now, we'll go sight-seeing. Was there any part of New York that you especially wanted to see?"

"I'd like to take a walk up Riverside Drive," replied Mariston.

ADAH shifted the dials slightly and Riverside Drive was spread out before us. We could see it exactly as we could if we had been standing on it. Slowly she revolved a dial and the scene moved before us at about the same speed that it would if we had been walking up its pathways. A man approached and apparently walked right into the room. Just as he was about to enter, the entire scene was blotted out in darkness for a moment.

"That darkness was caused by the instant that the focus was inside of that man's body," explained Adah. "There was no light there and so you could not see any more than you could if your eye were suddenly placed inside of him. Shall we enter one of these apartment houses and see what we can see?"

We assented and she manipulated the dials and the scene shifted as though we had entered the door. Through the lobby we walked, or seemed to walk, and up the stairs and entered one of the rooms. It was vacant and we turned into another. As we did so, the scene went blank.

"Bother," said Adah, "that room is painted with a paint containing tin salt in the pigment."

She adjusted the dials and the exploration went on. The intimate glances of the lives of the occupants which we received were highly illuminating and often amusing, although on several occasions Adah had to shift the dials rather quickly, when we unintentionally broke in on scenes that were not intended for spectators.

"That is the worst of using this instrument," laughed Balkis as we suddenly retreated from a dressing room that was in use, "hardly anyone has proper protection against it and you are always seeing things that you aren't supposed to see and that you don't want to see. Still, it *is* fun to go to the theatre and when the curtain falls to shift your vision back of the curtain and watch them change scenes and get all ready for the next set."

"I suppose that this is the way you learn foreign languages and learn what is going on in the scientific world," remarked Mariston.

"Oh, yes," said Adah with a sigh, "we all have to go to school regularly when the universities are in session. We pick out a school that is giving an especially good course in something that we are interested in and sit in on all the lectures. It has one great advantage, we can attend a lecture at Vassar or Harvard one hour, and one at Oxford or Cambridge the next, if we want to. It is really lots of fun, but Uncle Nahum is a regular slave driver as far as we are concerned. We have been going to college for years and years."

"Not so very many, I expect," I said smilingly. "I imagine that you were in grammar school not so very long ago."

"You'd be surprised," she answered cryptically.

"How old are you?" asked Mariston.

"How old is Ann?" said Balkis teasingly. "I beg your pardon, Captain, I really didn't mean to be rude, but your question was funny. Our life span is so different from yours that you are going to be shocked when I tell you how many years old I am. I'm sixty-two and Adah, for all her kittenish looks, is three years older than I am."

"Sixty-two?" I asked, amazement and disbelief in my tones, I have no doubt. At any rate, I certainly felt them. I would have taken an oath that neither of the two was a day over eighteen.

"Yes, little boy," said she mockingly, "sixty-two. I'm plenty old enough to be your grandmother, so see that you are properly respectful to me in deference to my gray hairs and feebleness."

"I don't believe any such foolishness," I replied. "Why, Nahum can't be much over sixty."

"Nahum is nearly three hundred years old," she said, "and he expects at least another hundred years of life. I expect to live to be four hundred myself, so you see, I am only a gay and giddy young thing after all. Really, though, Lieutenant Duncan, there is no mystery about it. I can explain it very easily."

"I wish you would," I answered humbly enough. Despite the evidence of my senses, her voice rang true.

"Our scientists found out long ago that age was caused solely by cell decay, which was hastened by the action of certain of the ductless glands and retarded by others. Once that fact was definitely established, it became a simple matter to repress the activity of those

glands which promote old age and to stimulate the ones that retard it. That has been done to every wearer of the blue and to every one of the Craftsmen whose work is such as to give promise that he will be raised in degree some day. Uncle Nahum will have them working on you in a few days; you are wearers of the blue, you know."

Footsteps were heard in the hall and Nahum and Willis joined us.

"Are my nieces explaining things clearly, Brother Duncan?" asked Nahum courteously.

"Very clearly indeed, sir," I replied, "so well, in fact, that my head is in a whirl. I thought that I knew something of science, but I am a mere babe in the woods compared to them."

"They have much to learn," he said indulgently. "It will be my pleasure to take you over the city and the laboratories later and I think that you will find many things to interest you and possibly some to astonish you."

"I haven't the slightest doubt of it," I assured him, "and I know that I will thoroughly enjoy it."

"The pleasure will be largely mine," he said with the grave courtesy that always distinguished him. "Where is Estha?" he went on turning to Adah.

"Out mooning with her latest conquest," she replied.

"That is not a respectful way in which to speak of your cousin, considering her position," he answered reprovingly.

"Bother her position," returned Adah. "That is all right to bluff the Burden Bearers with and we will be as respectful as you can ask when we are out in public, but I refuse to respect her at home, just because she takes a leading part in some disgraceful ceremonies that are nothing but moonshine, and you know it, Uncle Nahum."

She rumpled his hair affectionately as she spoke and Nahum turned to Mariston with a smile.

"It is the age-old complaint of the elders," he said with a chuckle, "the youngest refuse to respect us and yet, as I think back, I am not so sure that our conduct when we were young was much different. I will call Estha."

HE pressed a button on the wall before him and said a few words in Hebrew. Estha's voice replied promptly and Nahum released the button. In a few minutes Estha came in, flushed and laughing, and dragging Nankivell after her by the hand.

"Grandad," she said impetuously as she entered, "I want this man very severely punished. I really think you should have him reduced to the rank of Burden Bearer."

"Of what heinous crime has he been guilty now?" asked Nahum, the twinkle in his eye belying the severity of his words.

"He refuses to admit that I am prettier than any other girl in the world," she pouted.

"I never did any such a thing," said Nankivell indignantly.

"Well, you said something like it anyway," she insisted.

"I told you that you were the prettiest girl I had ever seen," he answered.

"And then when I asked you if that meant the prettiest in the world, you said it didn't," she maintained.

"I did not," he replied, "I only said that I hadn't seen every girl in the world."

"Well, after you have seen them all, what are you going to say?" she demanded.

"I hope that I can see them all soon, so that I can truthfully tell you that you are the prettiest," he replied gallantly.

"Lieutenant Duncan," interrupted Adah, "that seems to leave Balkis and me out in the cold. Aren't you coming to our rescue?"

I blushed and stammered but it was Mariston who made the *amende honorable.*

"Once upon a time Paris of Troy had to make choice of one to whom to award a golden apple," he said. "He did his best, but ten years of war followed and the topless towers of Illium went up in smoke, yet I will venture to say that he had no more difficult task than would confront one of us, were we to try to make a selection between the three of you. My opinion is that the three most beautiful creatures that ever lived are here and I hope that I never have to be any more definite."

"Cleverly done, Brother Mariston," said Nahum approvingly. "I will be glad to take you to your rooms whenever you are ready to go and there unite Brother Nankivell with his long-lost Pedro, for whom he has been pining, unless there is something else you would like to see first."

"There is," said Willis. "If it isn't too much trouble, I'd like to see the ungodly creature that was howling at us just before those arrows started to fall. I have seen his tracks and heard his voice several times but I have never had a glimpse of him."

"I'd like to see what happened to Oton and Diego, those two Indians who refused to come with us," said Mariston.

"Both of your requests are very easy to grant," said Nahum as he went to the instrument board and began to turn dials. In a few moments the river up which we had come lay before us. In their canoe in the middle of the stream were Oton and Diego, their faces ashen-hued and distorted with fright, their bodies drooping forward with weariness, yet paddling down stream as fast as their tired muscles would allow. As we watched, Diego, who had the stern paddle, slumped forward, apparently fainting from exhaustion. There was the familiar and hateful *whish* of an arrow and a thud, plainly heard, as the missile buried its head in the side of the boat. Diego screamed and grasped his paddle and drove the canoe forward with a fresh access of energy engendered by fright.

"Is it necessary to kill them that way?" I asked with a shudder.

"No orders have been given to kill them," answered Nahum. "It has been left to the discretion of the Warder of the Outer Ways. Your Pedro went through that ordeal once and lived. If found worthy, no harm will be done them."

We turned again to the scene before us. As we did so, there came again to our ears that weird, bubbling, howling grunt, mixed with a hiss, that had greeted us that fateful day from the river bank.

"That's it," muttered Willis in an undertone.

Nahum manipulated the dials and we were on the bank. Slipping through the undergrowth, keeping always abreast of the canoe, went a half-dozen Indians armed with bows.

"Cowans," explained Nahum. "There is their leader."

One figure leaped into prominence. It was that of an elderly man of the same general type as Nahum and wearing a robe with a blue border, girded high on his leather covered thighs for ease in going through the jungle.

"The Warder of the Outer Ways," said Nahum. "He is the lowest officer of the blue degree but his position is a very responsible one. The position often lasts for a great many years but this man is a new one. The last Warder was exalted to the Crimson four years ago. He was the one who turned Pedro back some twenty-five years ago. He had held this position for nearly fifty years."

"I should think that it would be a very unpleasant detail," I remarked.

"It is," he replied, "but it is one that is much sought after, for it is one of the surest, albeit one of the slowest, roads to the Crypt. But we are neglecting Brother Willis' request. I will give you a glimpse of the *Guardian of the Jungle*."

Again he manipulated the dials and a few hundred feet inland from the stream a grotesque nightmare suddenly came into view. It was the size of a small horse in height but in form it resembled a giant frog walking on its hind legs and only occasionally touching its forefeet to the ground. The forelegs, while short, were heavy and powerful and equipped with vicious claws fully eight inches long. The head more nearly resembled that of a frog than anything else, except that the snout was somewhat elongated. As we watched, the creature opened its mouth and displayed to our gaze three rows of long pointed teeth, besides four tusks, each fully a foot long, which protruded from its mouth when its jaws were closed. In color it was a brilliant green on top with the exception of long spines projecting from its back and tail which were a dull blue. The color faded to a dirty yellow on the underside and toward the end of the huge heavy tail, which seemed, contrary to nature, to be larger and heavier toward the end than close to the body. The face was grotesquely splashed with orange and crimson. The brute must have weighed well over a ton.

"God, what a hideous beast," exclaimed Willis.

"What on earth is it?" asked Nankivell.

"Can you identify it, Brother Duncan?" asked Nahum.

I studied it for a while in silence.

"It must be one of the smaller carnivorous dinosaurs which are popularly supposed to have been extinct for a good many thousand of years," I replied, "but I can't identify it by any fossil remains that I have seen. So far as I am concerned, it is a new species."

"Your classification is correct," replied Nahum. "It is, so far as your world is concerned, a new species. Its original habitat was Atlantis and it was at that time somewhat larger. In the center of Atlantis was a huge swamp, fed by hot springs of volcanic origin where conditions did not change for millions of years and where some few antediluvian animals remained until recent times, although evolution went on in the balance of the land. Some of these dinosaurs were brought to our land from Atlantis before it sank and we constructed a place where they could exist. By thousands of years of scientific breeding, we have developed them to the state where they are small and so hardy that they thrive in this locality. They are now completely tame and are born practically in captivity. We regulate the breeding and allow only a very few of them to live at one time —thirty-three, to be exact. They are divided into eleven packs of three, one male and two females to the pack and each pack, with a body of Cowans, is allotted a certain section of the jungle to guard. They are quite tame to the Cowans whom they know, but they are very ferocious to strangers."

"I should think that some of their bones would have been found by explorers," I remarked.

"Most of this country is unexplored and we mean that it shall remain so," replied Nahum. "The Guardians are few in number and when one dies, the body is completely dismembered by the Cowans and dragged into the interior, where it is completely destroyed by being sunk in the swamps. Then another egg is allowed to hatch to replace it. Thus there are no bones to be found."

"He looks as if he might be an ugly customer to tackle," remarked Nankivell.

"He would be," smiled Nahum. "Their nervous system is singularly undeveloped and the brain is very small. You could hardly hope to find it with a rifle bullet and even if you did, it would live for many hours. Now let us leave the creatures. The luncheon hour is approaching and with your permission, I will conduct you to the apartments which will be your home henceforth."

CHAPTER XIV

Pedro Scents Trouble

WE followed him through several rooms and up a flight of stairs—the first we had seen in Troyana. He led us to a suite of rooms on an upper floor consisting of four bedrooms, each with a bath attached, and two spacious living rooms. The rooms were delightfully cool and one of the living rooms opened on a large screened porch where Nahum told us we might have our meals served whenever we did not care to descend to the dining room for them. He instructed us in the method of regulating the temperature (it consisted merely of setting a dial to the desired temperature which was then automatically maintained by heat or by a spray of liquid air as the case might be) and the method of turning on the lights.

"Servants have been assigned to care for your wants in every way," he said, "and you can summon them by depressing this key and speaking. You can be assured of complete privacy here, as all the rooms are lined with sheets of tin and you cannot be spied upon. There is an internal communication system in the house. To use it, depress this key and speak in a normal voice. By first speaking the name of the person with whom you wish to communicate, you are automatically connected with that person. If you are called, depress your key and speak in a normal voice, and it will be plainly audible to the person who called you. I will leave you now to rest and refresh yourselves. If you have any desires, do not hesitate to make them known. I will send Pedro to you."

The old gentleman bowed himself out and Mariston turned to Willis.

"What were you and Nahum discussing?" he asked.

"Wait until Pedro gets here," replied Willis. "I think that he may have something to say which will throw some light on the matter. We have got to hold a council of war right away."

In a few moments there was a knock at our door and in response to Mariston's call Pedro entered the room. The change in Pedro was quite marked. The haggard look of fear and despair which he had worn ever since the arrows started to fall in the jungle, had vanished. He still had the air of one who had seen his fate and knew that it was soon to overtake him, but he had apparently ceased to fear it. As he entered, he hastened across the room and knelt for a moment at Nankivell's feet, doing homage in the native fashion. Nankivell caught him by the shoulders, raised him up and shook his hand warmly.

"Well, Ray, Pedro is here, so go to it," said Mariston, dropping comfortably on a divan. "I don't know why you want to hold a council of war when everything is so peaceful, but you might as well get it out of your system. What did Nahum want of you?"

"I didn't find out," replied Willis ruefully. "The old boy was too sharp for me. He gave me a lot of information of various kinds and I suppose that I must have given him some, for he appeared satisfied, but to save my life I couldn't tell you what it was that I told him."

"What did he tell you?" I asked.

"Well, for one thing, he told me who the old chap was who went west in my tent two years ago. He was a Planner according to Nahum, who had got a little too ambitious and tried to get at the secret of the Crypt, whatever it is, without having been exalted to the rank which entitled him to it. As a punishment he was degraded to the rank of Burden Bearer and set to work. He escaped some way and fled into the jungle. How he had ever eluded the guards and especially those damned frogs we saw, is beyond me, and Nahum either couldn't, or wouldn't, tell me. At any rate, it seems that he had taken along a cloth impregnated with a tin compound so that the instruments couldn't locate him. He didn't have it when I saw him, so he must have lost it. Nahum knew all about what had happened in my tent and how he had died."

"He was a Planner, was he?" said Mariston meditatively. "That sounds queer. I thought that they all knew foreign languages and you told us that he couldn't speak any."

"I thought of the same thing and mentioned it to Nahum, but he grinned and gave me to understand that there were ways of doing things to a man's memory that would have that effect on him and that, whenever a man was reduced in rank, they treated him in that way to prevent further trouble. I asked him point blank what that drumming sound was that we heard. He looked solemn and muttered some stuff about the 'hooves of the golden calf,' and changed the subject. I tried to press the matter and he evaded me and finally told me straight out that it was none of my business and that I had better not inquire, but instead, that I had better pray that I never heard it again. I took the hint and talked about something else. Well, let's get on. Pedro, where have you been?"

"I have been well cared for, *Señor* Ray, and but for my sadness at being separated from you, I was happy. I was in a building where others of my race live and where everything that a man could desire could be had. Also I saw the great white wizard who turned me back many years ago."

"You did?" ejaculated Willis. "Where was he?"

"I, with others, was taken by some of the wizards who wear blue robes, to guard a number of slaves who were carrying burdens. We came to a door that was massive and which was guarded by two men whose robes were red. The door was opened and one of the slaves allowed to enter at a time, guarded by one of us. When it came my time to enter, I did so and the one who received the burden which my slave was carrying was the wizard. He knew me at once and he received me with kindness and told me that he had known that some day I would come to serve here, for he knew that I was a loyal servant. He told me that he was glad that I was happy and contented, for such as came here came but once, but that once was for always. I was much frightened at his words, but he smiled and reassured me and told me to fear nothing, for I was safe here."

"That is interesting and relevant," said Mariston. "I wonder if his statement that you would remain here always included the rest of us?"

"Not if I know it," said Willis with a laugh. "That is precisely what we have to plan now; our course of future action. How and when are we going to get out of here?"

"Never, I hope," replied Nankivell dreamily.

"Wake up, Frank," said Mariston kicking him. "Come back to earth and quit dreaming about black hair and eyes."

"Like midnight under tropic skies," murmured Nankivell.

"Which is just what your eyes will look like if I get mad and poke you one," snorted Mariston. "Go on, Ray, he is hopeless; he has seen a new girl. It will take him three days to get over it and then he'll be normal again."

"Well," replied Willis, "we have got to make some plans. I am in no particular hurry to leave here for some time. We might as well look the place over well and possibly Duncan can pick up some ideas that will be worth more than any gold that we could carry with us. However, unless we are willing to stay here the rest of our lives, we have got to plan on three things; first, how to get hold of the stuff; second, how to get out of this place, and third, how to get back to civilization."

"Willis," said Mariston, "I am disappointed in you. I am glad you have given us your viewpoint, but I will tell you right now that you will get no sympathy or help from me in any such program. Nahum has made us honored guests and is doing his best to entertain us royally, and it is, to say the least, inexecrable taste for you to sit here in his home as his guest and plan on robbing him and running away like a thief in the night."

"I agree with you, Bob," I said and Nankivell chimed in an assent.

"Nahum would give us anything we asked him for," went on Mariston, "and there is no reason for robbing him. As far as getting back to civilization is concerned, things are more civilized here than in any other place that I know of. I, for one, am perfectly willing to spend the rest of my life here."

"Turn off the fireworks, Bob," protested Willis. "I didn't mean to burglarize our host. We came here to make a haul and I wanted to sound you fellows out and get your viewpoints. I can't say that I am willing to

spend the rest of my life here. I like action pretty well and this would get monotonous, especially to me, who am no scientific genius. I am willing to stay here for quite a while, but sometime I will want to leave, and when I leave, I wouldn't want to leave empty handed."

"I have no doubt, if you put that up to Nahum, that he would send you away loaded with treasure and with his blessing," I said. "At least, you ought to give him a chance to do so."

"By all means," assented Willis. "That would be the first step. I agree with you that if he let us go at all, he would load us with all the treasure that we could carry, but I am not so sure that we could leave at all. Still, it will be time to make other plans when we ask him and he says no."

"Now that that is settled," said Mariston, "we had better get ready for lunch, for Nahum may call us at any moment."

We agreed and started for our rooms. Pedro followed Frank and we heard their voices indistinctly for a few minutes. Frank was evidently questioning him and the answers he received must have roused him from his day-dreams for he called to the rest of us to join him.

"LOOK here, fellows," he said when we entered his room, "I think that Pedro has some real news for us. Tell it over again, Pedro, and tell it carefully. We want to be sure of it."

"Señores," said Pedro, "I have been for a day and a night and half a day in the building where my countrymen live and I have learned many things. The white wizards with the blue robes who rule this city are not loved by all, especially by those whose robes are marked with black. Those who wear the robes of yellow are loyal to their masters and the Indian guards are loyal, for they are well treated and happy, but those who wear the black hate their rulers and would kill them if they could. It is common talk that some day they will try, and so it is that my countrymen carry always poisoned knives with them."

"A revolution, eh?" said Mariston, "This grows more interesting. Ray, you may get the action you crave right here. Proceed with your story, Pedro. Why do those who wear the black hate their rulers?"

"Señor Bob," went on Pedro, "you have seen but a little portion of this city. You have seen the part where the rulers live and rule, but below in the mountain, there are places where the sun is never seen to shine and where joy never is, nor laughter ever heard; where men labor day and night, where food is coarse and where there is not leisure, good food, nor pleasure in life. There the people of the black robes are born and die. They say that the wizards live forever and could grant them longer lives if they would, but they will not, and it is well, for they do not wish to live long, as they must live now. They gather and whisper and mutter and some day they will strike."

"If it is such a secret matter, how did you gain so much information in so short a time?" asked Willis.

"My people are crafty," replied Pedro, "and the black robes trust them. They listen and hear all and say nothing. They will not tell the rulers for they do not love them and they care nothing who rules in this place. If the black robes rise and strike, my people will fight neither for them nor against them for they do not hate the rulers who are kind to them, yet love them not. They carry weapons to protect themselves against all and will strike whoever first attacks them. My people belong not to this place but come here voluntarily and may leave if they so desire, so they listen and do not speak."

"What do the black robes want?" I asked.

"They want to live in the light and to take their ease like the rulers and to live long and gain knowledge," he replied. "Not yet are they ready to strike, but soon they will be, and they are many to the ruler's one and when they strike, they will carry all before them. They would have struck before, but they want a leader and they fear the hooves of the golden calf."

"The 'hooves of the golden calf' again," said Willis. "What do they mean by that, Pedro?"

"It is a God whom they worship," he said, "and they fear him, for so long as the rulers serve him and make the proper sacrifices to him, the God will support the same rulers. I tried to talk about it and asked information from my people, but they feared to answer me, for the God can hear their thoughts. All I could learn was that he who hears the hooves of the golden calf is lost, for none can save him."

"Are the black robes organized at all?" asked Willis. "You said they were waiting for a leader. Have they any in prospect?"

"I did not learn. I only know that when they get one, they are to rise and smite the rulers. My people seek not information but what they hear they remember."

Nahum's voice interrupted us. I hastened to our communication key, depressed it and answered.

"The noonday meal will be ready shortly," he said. "When my guests are ready, I will come and conduct you."

I told him that we would be ready in a few minutes and released the key.

"Had we better say anything to Nahum about this?" asked Mariston.

"I rather think not," I replied. I had been considering the matter while I had been speaking to Nahum. "We haven't anything very definite to go on and to mention it would be too much like calling wolf when we saw a dog track. I think that the best thing to do is to keep our eyes open and see if we can get hold of something more definite before we speak of it."

"That is my idea," said Nankivell. "I think it might also be a good idea to send Pedro back to live with his countrymen. He can learn a good deal there, and he is well treated and in no danger. He can report to us as soon as he gets anything definite to go on. Will that suit you, Pedro?"

"My life is yours, *Señor* Frank," answered Pedro. "I would rather stay with you and serve you and guard you, but it may be that I will serve you better by doing as you say. What you order done, I will do."

"By all means, go back to your people, Pedro," said Mariston. "That will give us a spy in the enemy's camp, and he can probably learn more in a day than we can in a month, especially as only one of us can speak the Indian dialect and none of us can speak either Hebrew or Atlantean."

"All right, Pedro," said Nankivell, "you do as *Señor* Bob says and let me know at once when you hear anything. Meanwhile we'll do a little high class detective

work and see if we can't get a clear case before we start spilling the beans to Nahum."

"That's all right," said Willis. "You must remember that we are of the class of rulers, as Pedro calls them, and that we go down if the rest do. I notice that our guns have been returned and I would suggest that it might be a good plan for us to carry them under our robes."

"It might be at that," said Mariston, "provided that we let Nahum know that we are carrying them and don't make him think that we distrust him or that we are trying to slip anything over on him. Buckle them on, fellows and I'll tell him about it at lunch."

"I think that it would be better to tell him first," I demurred.

"Maybe it would," assented Mariston. "We won't carry them to lunch. We had better get ready now. He'll be up here in a few minutes."

Lunch with Nahum and the girls proved to be a delightful affair. The meal consisted largely of fruit, but it was present in an endless variety, most of it familiar, although there were a few varieties with which not even Willis was acquainted. When lunch was disposed of, Nahum asked us how we chose to spend the afternoon, offering to put himself entirely at our service. We protested against his hospitality and told him that we would not think of taking up his time, at which remark Nahum smiled.

"Time is of little account here," he said. "I am more than glad to be able to serve you. This evening there will be a ceremony of great importance, which you will attend and which I hope you will find interesting. It is one of the few relics of the truly archaic religious ceremonies of the world. Estha takes a leading part in it with Balkis and Adah among her attendants. For the afternoon, if it suits your fancy, I will take you through the city and explain some of the things you will see. As you are not all scientifically educated, I will omit the laboratories until a later date and will take Brother Duncan through them alone if the rest of you are not interested. It is my custom to repose for an hour after eating, a habit which I can recommend highly to you. With your permission, I will retire and call for you in an hour."

CHAPTER XV

The Upper City

"TROYANA," said Nahum when he rejoined us later, "lies in the middle of a huge tract of what is, to the outside world, unexplored ground. This tract is a huge impassable morass with no navigable streams fully penetrating it, and, aside from a few roads which we have constructed, practically pathless. There is nothing here to attract anyone, for we have been careful to eradicate the rubber trees for a belt of one hundred miles on the outer edge. The fate of Pedro's expedition is the one that is inevitable to any exploration parties, save such as we choose to allow to enter. The river which you happened to choose is the most open one that penetrates the country and, as you found, there is a distinct limit to the distance which you could go up it, even though you were unopposed, save by the forces of nature. In fact, since your arrival, orders have been given to the Warder of the Outer Ways to close that stream some thirty miles below the point where you left it.

"Once a party left the river, the arrows of the Cowans, the jaws of the *Guardian* and the impassable quagmires will effectually prevent them from reaching a road. Should they do so in spite of our efforts, nothing short of high explosive in large quantities would enable them to force their way into the antechamber where you were first received and that point is over fifty miles from here. All of this presupposes that we in the city made no attempt to hinder an approach. You can see by my description that for all practical purposes, Troyana is a 'lost city', as far as the outside world is concerned."

"What about exploration by aircraft?" asked Nankivell.

"Equally impossible," he replied. "We have placed all around our domain on a circle that has a ninety-mile radius, projecting tubes that will create atmospheric disturbances through which no aircraft could pass and live. Aside from this, we have devices that would enable us to short circuit the electrical equipment of any aircraft that passed the first circle of defense and prevent the motor from functioning."

Nankivell nodded and Nahum looked at us inquiringly. There were no more questions and he resumed.

"The city proper consists of three sections. It is built on a hill and the Blue City, the section in which you now are, occupies the crest of the hill and the slopes. Here the wearers of the blue and those of the higher degrees live in dwelling houses, of which the one you are now in is a fair sample. From time to time you will enter these houses as the guests of your brethren, so I will not endeavor to show you any number of them today. They are all detached houses with beautiful grounds and are cared for under the direction of Craftsmen, who act as overseers for the gangs of Burden Bearers who are from time to time admitted here under guard for the purpose of labor. In this section, there are no machines or power-generating appliances, except the emergency generators in the sanctuary, a term which I will explain later. Heat, power, light, liquid air and everything else essential to our comfort is supplied by means of wires or pipes from the underground city, where the generators are located and where the Bearers of Burdens have their homes.

"The yellow city is built above ground on the lower portions of the slope and forms a cordon around the blue section. It consists of blocks of houses, in each of which ten Craftsmen with their families live. Their grounds are nearly as extensive as ours, but of course they are communal to the families occupying one house. They do not have the luxury that is found here, but they are as comfortable, perhaps, as a man with an income of twenty thousand dollars a year would be in New York City. In other words, they live in comfort, have a limited number of servants and are satisfied and happy. Beyond the yellow city on the lower slopes are the cultivated fields where the food needed for the entire community is raised.

"Included in this area are the dormitories where such of the Cowans as are admitted to the city proper, either as guards or as house servants, live. They are given great comfort as compared to their natural jungle surroundings and are also happy and contented with their lot.

"Underground are the generators, the laboratories and the black city where the Burden Bearers dwell. From the interior of the mountain, light, power and other things are delivered to the blue and yellow races. The black city, which is wholly underground, has not as comfortable living conditions as the other two areas. Some of the Burden Bearers are used for agriculture and for care of the grounds, but not many, as it is uneconomical. Most of the agricultural and horticultural work is done by Craftsmen with the aid of machines which require no effort beyond that of a guiding intelligence for their operation. Most of the lowest degree are used underground for practically their entire lives, caring for and operating the machines which enable us to live in the luxury which you see around you."

"Is it a wise procedure to hold your lowest class down to that extent?" I asked.

"That is a matter for debate. Personally I have little doubt of the wisdom of it. Had proper efforts been made sixty centuries ago, I believe that better living conditions could have been gradually developed without disruption to our social fabric, but I am not sure. One of the main things with which we have to contend is the birth rates of the various degrees. The birth rate in the blue city is much smaller than the death rate, with the result that we are continually forced to recruit our ranks from those of the Craftsmen, and this despite the fact that the average length of life in the blue area is well in excess of three hundred years, and that infant mortality is practically unknown.

"The yellow city has a birth rate large enough to enable them to supply us with enough recruits to keep our ranks full without depletion of their numbers, but it is significant that the number of Craftsmen has increased in two thousand years only from fourteen hundred and forty-three to fifteen hundred and six.

"The birth rate in the black city, however, is very high and despite the fact that the average length of life is only about sixty years and that the infant mortality is nearly two per cent in the first five years, it becomes necessary every few generations to judiciously increase the death rate in the area in order to keep the numbers there to a figure that we can safely control. The Bearers of Burdens, by the way, are of a totally different race from the Planners and the Craftsmen. They are, as I once told you, the descendants of the ancient Atlanteans and they have neither the mental capacity nor the moral integrity that is essential to the higher degrees.

"You spoke several times of the Crypt," I remarked. "Where is it located?"

"The Crypt is located underground in the center of the section of the black city that is occupied by the machines," he replied. "In the Crypt are located the generators which supply the energy which other machines transform into a usable form. They are tended and operated solely by those of the crimson rank. These operators number thirty and three, including the three wearers of the purple, and ten are on duty at a time. This duty lasts for a year.

"Opening from the Crypt is the Vault, which is the home of the Sacred Treasure, into which I have never penetrated. This is guarded by one of the three wearers of the purple, who also serve for one year at a time in it. Only sufficient of the material from which the energy is derived to last for four days is delivered to the Crypt at one time. Aside from these twice weekly openings of the door, at which time food and other supplies are delivered to the Keeper on duty, the door of the Vault is never opened."

"I should think that the small supply of potential energy which you have on hand, combined with the geographical location of the Crypt and Vault, would be a source of weakness to you if internal trouble ever developed," I suggested.

"It would be, had we not provided for such a thing," he replied. "In the exact center of the blue city is a walled area wherein are three houses, occupied by the wearers of the purple, with the council chamber, the main laboratory, and a large amount of dwelling space. There is kept also a reserve supply of potential energy, emergency generators and food supplies, in abundance. This area, which is called the sanctuary, forms an impregnable retreat for the people of the blue and yellow cities, should trouble develop. It is connected directly with the amphitheatre underground and with the Crypt. I may also mention that the generators of the Crypt are so arranged that they may be wholly destroyed by their guardians in an instant. The Vault is so arranged that the Keeper inside may lower over five miles of solid rock between himself and the Crypt at need. Now, if you are ready, I will show you around."

"One question before we go," I said. "What is the Golden Calf and what is meant by the drumming of his hooves?"

"The Golden Calf is merely a statue, the meaning and use of which I have explained to you before. The drumming of the hooves is the mysterious noise that troubled you on your journey here. It heralds death to one of the party who hear it and is used practically as a means of calling and directing the outer cordon of guards from the city."

"How is it produced?" I asked.

"That is a secret of the crimson degree, to which in time you may be exalted, if found worthy," he replied with a smile. "Not only the drumming, but also the tragic after effects which you, Brother Willis, have witnessed, and which Pedro has described to you, are also secrets known only to those who have been exalted. You will see the Calf at a ceremony tonight, but I trust that you will never have occasion to hear his hooves again. Shall we go?"

WE followed Nahum out of the house and through the garden into the corridor from which we had first entered the garden. Nahum paused long enough to instruct us as to the location of the controlling levers by means of which the doors and elevators could be operated. He told us that we were free to roam the city at will until such time as positions and work were assigned to us, but cautioned us never to use the levers when any of a degree inferior to the blue were within sight or hearing, and to learn as quickly as possible the phrases to which the doors responded. I asked what work would be assigned us and he told us that each Planner was required to work an average of thirty hours a week, as well as to attend the weekly meetings of the Council, where the welfare of the community was discussed. After several changes of conveyances, we entered one which carried us far upward.

"I have brought you to the sanctuary first," explained Nahum, "for it is the highest point in the grounds and you can get a general idea of the upper city."

We emerged from the elevator and stepped into the sunlight. We were enthralled by the beauty of the scene laid out before us. We stood on the exact top of a rocky mound perhaps three hundred feet high. Around the base of the mound was a huge wall which constituted, apparently, the defense of which Nahum had spoken. Below that the ground fell in a gentle slope to the jungle, several miles away. Inside the wall were the buildings of which Nahum had told us. I marveled at the airy grace and symmetry of the three dwelling houses. They were similar in their general lines to Nahum's but were even more ethereal and beautiful. My attention was attracted by a low, solidly built mound of rock without windows or apparent means of egress. I asked Nahum what it was.

"That building contains the laboratory, the emergency generators and the assembly room," he replied. This area is really a self-contained city, protected by air-disturber tubes and other implements of warfare. There is stored here a reserve supply of energy producing material and enough concentrated food to last fifty years for everyone who could possibly be imprisoned here. This is a wonderful view, is it not?"

We gazed around over the landscape. Beyond the stone wall that enclosed the area in which we stood, stretched the halls of Troyana. Each edifice seemed to be more fairy-like and beautiful than its neighbor, although none quite equalled the magnificence of the three dwellings that stood close at hand. Each building stood in its own detached grounds with glorious gardens and groves of trees stretching out around it. There was no question as to the luxury in which the Planners lived.

Nahum pointed out his dwelling, some distance away. Despite our knowledge of the huge size, it looked like a tiny doll-house made of filigree. Beyond the far-flung reaches of the blue city we saw two things. The first was a row of three stone buildings that, despite the distance, looked large. Nahum informed us that they were the dormitories where the Cowans who were in the city were quartered. The second thing was a series of long, low buildings, not without architectural grace, each set apart in its own spacious grounds, the whole forming a cordon about the central area where the separate dwelling houses were located.

"Those are the homes of the Craftsmen," explained Nahum. "We will visit their area shortly. In the meantime, if you will use these glasses, you will be able to see beyond the yellow city the cultivated fields where our food is raised."

We entered the elevator and descended to a lower level and changed to another conveyance. In a few minutes we arrived at the yellow city. We realized then that Troyana was built on quite a hill. The rocky center, occupied by the sanctuary, towered above us fully six hundred feet and from its base the ground descended in a gentle slope, which extended several miles beyond the point where we now stood. The blue city was about three miles in diameter and was roughly of a circular form. Outside the limits of the blue city came the row of dwellings of the Craftsmen, about one hundred and sixty in number and extending in a circle about nine miles in circumference. Beyond this belt of houses and extending for about a mile and a half was a belt of cultivated fields. Where the fields ended, the ground had dipped enough to be at a considerably lower level, and here began the jungle and the impassable swamps and morasses which Nahum told us extended for hundreds of miles in every direction. Our attention was drawn to the dwelling house before us.

It was a massive stone affair that had none of the embellishments of carving that had rendered the other houses so beautiful, but it had the same grace and air of lightness that marked all of the architecture of Troyana. It was enclosed in spacious grounds and gardens with groves of stately trees surrounding it, among which I noted many lignum vitae and mahogany trees. While the building was in one piece, it had ten separate entrances, so that each family had entire privacy. The building was two stories high with a false roof over it to shelter it from the glare of the sun.

"That false roof detracts from the beauty of the building," remarked Nahum, "but it conserves energy. It relieves us from the necessity of supplying so much liquid air as would be required to properly cool all of these edifices."

"Could we see the interior of one of them?" I asked.

"Only by invitation of the occupant," he replied. "The Craftsmen have as much privacy as the Planners. To be sure, any one of them would be more than glad to invite you in at any time and feel honored that you visited him, but we will not have time today, if you wish to see the black city. I have shown you the way and you will have an abundance of time in the future to make as extensive an exploration and examination as you desire. We will now go underground into the hill. There you will find conditions somewhat different."

CHAPTER XVI

Underground

NAHUM led the way to a door set in the side of the hill which reminded us a great deal of the doorway through which we had made our first entrance into the approaches of Troyana. This door was evidently not set to open at command, for he manipulated a lever set in plain sight in the rock beside it and the door dropped, opening the way before us. We entered a long corridor and Nahum turned to the left and pressed another lever. The door closed behind us and another of the now familiar doors opened. We stepped into the waiting conveyance and were soon speeding noiselessly into the interior of the hill.

"We are now almost under the sanctuary," he remarked as the car came to a stop and a door opened. "I am taking you first to the generator and compressor units and then to the observation section."

He opened a door and we followed him into a huge room, where a number of large machines were humming at high speed. They were attended by groups of men attired in black-bordered robes, with here and there a yellow-bordered robe, apparently directing operations. In one corner at a desk sat a Planner. Toward him Nahum led us.

"Brother Habbakuk," he said, "these are Brothers Mariston, Duncan, Willis and Nankivell who have recently joined up from the world without. They are now familiarizing themselves with the city."

"You are most heartily welcome," replied Habbakuk, rising and greeting each of us in turn. "I was on duty and was unable to be present at the Council when you were officially welcomed and it is my first opportunity

to meet you. Make yourselves entirely at home here and I will be glad to explain anything that is strange to you."

"What are these machines?" I asked.

"Merely multiphase electric generators," he replied. "They are driven by the small atomic engines which you see on the ends of the shafts. These engines operate on atomic power supplied to us from the Crypt. Taking charge of a unit of this type is one of the simplest tasks that are set to a Planner to perform and one of the least important, but I was raised only last year and naturally the simplest tasks fall to me. Many of the other units will be more interesting to you."

"I never saw electric power generated on such a scale before," I remarked.

"No, I don't expect so, although this is the smallest electric generating unit in the city. It feeds only the heat-lines and light-lines of half of the yellow city and also drives the air compressor unit in the next room. There are three generator units similar to this, although each of the others is larger."

I looked around at the eighteen huge generators whirling in the room and marveled at what the size of the other units must be. Nahum told us that we would have to hurry in order to get a glimpse of the rest of the city, so after expressing our regrets to Habbakuk that we had no more time and promising to visit him again, we entered the next room where one of the air compressor units was located. Twenty-four large four-cylinder air liquefiers were working here while the final product, liquid air, was led out in huge insulated pipes from one corner of the room.

"Why do you need so much liquid air?" I asked.

"It is used not only for refrigeration and cooling of the two thousand houses and apartments that make up outside Troyana," replied Nahum, "but it is vital to the black city. The ventilation of the whole inside of the hill is insured by releasing air under great pressure at various strategic points. There are two more compressor units under the city."

"Where on earth do you get such a super-abundance of power?" I asked.

"You will notice that these compressors are electrically driven. This is true of all of our energy consuming devices. We generate our power as you saw in the last room by means of generators driven by atomic engines. They, in turn, derive their power from the disintegrators in the Crypt, which I regret that I am unable to show you because of your rank. Let us go to the observation station."

WE entered another room where a deep silence succeeded the hum of machinery that had been evident in the other rooms. Here, as we glanced around, we saw no black-bordered robes and only a few with yellow borders. All of the rest of the company were of the Planner rank. Each of them sat at an instrument panel with a pair of what looked like goggles over his eyes and a pair of headphones on his ears.

"What are they doing?" asked Nankivell in a whisper.

"They are watching the world," replied Nahum. "Day and night, we have thirty-six observing units manned. Each observer has a certain district which he watches. The size of these districts varies according to population and activity and are often changed. Each observer continually searches his district, watching and listening to all that happens that may by any chance be of value to us. Such things as are worthy of note, he puts down for the benefit of all. Anything of extraordinary interest is at once communicated to Zephaniah, who may assign extra observers or who may cause any or all of the dwellings which have receivers, to be notified, in order that those not on duty may also observe, if they so desire. A receiver and telescope similar to mine is located in each house where Planners dwell."

"I note that you have some Craftsmen employed here," remarked Mariston.

"They are men of unusual intelligence who have had their life span lengthened and who are being tested for elevation to the blue. If found worthy, they are raised as vacancies occur. If they are found not worthy, we have means of so treating them that they retain no memory of what they have seen and heard here, although in point of fact, many of the more advanced among the Craftsmen have quite a little knowledge that is not ordinarily supposed to be a part of their inheritance. Would you like to try on one of these face sets?"

I assented eargerly and Nahum tapped one of the Craftsmen on the shoulder and motioned him to remove his set. The man obeyed and I donned it. I stood on the bridge of a huge liner and listened to a conversation going on between two of the ship's officers. The conversation had no meaning to me and I took off the face set and turned to Nahum and told him what I had seen and heard.

"That is the liner *Ventura,*" said the Craftsman who had been using the receiver. "That conversation is valueless to us and I was listening in merely to relieve the monotony of studying the action of a new type of condenser that the vessel is testing."

Nankivell wanted to try the face set but Nahum smilingly refused his request.

"You will spend many hours wearing one of them in the future," he said. "At present, we want to get a glimpse of the black city before we are forced to return to the blue area. We must return early tonight as this is the day of the great ceremony of the year, the Adoration of the Golden Calf."

"Is your projecting apparatus here also, Brother Nahum?" I asked.

"No," he replied, "that is in the Crypt and the secret of its use is restricted to those of the Cryptic Degree. There are three types of projectors—one projects sounds, which you have heard; a second projects visions, which I trust you will never see; and the third projects rays that have varying effects on the recipients according to the intensities and wavelengths used. The peculiar flaming of the dial of your watch, which you noted one night, was due to the fringe of a stream of rays which were being directed on an entirely different object. Let us hasten on."

We left the observation section behind us and entered a car which took us to the dwelling places of the black city. As we emerged from it we were confronted with a long wall in which there were doors but no windows.

"Windows would be useless," said Nahum in response to our questions. "We are eight hundred feet underground and since all lighting must obviously be artificial, why should there be windows?"

"What about ventilation?" asked Willis.

"Forced draft from the compressors," he answered. "Air, water, food, heat and light are supplied to each dwelling from a central storehouse. We will enter one of the dwellings."

(*Continued on page* 855)

. . . We had surprised the three aliens at the Martian headquarters.

Sequel to: "Paradox" and "Paradox +"

By Charles Cloukey

Anachronism

Illustrated by MULLER

A VERY few years ago television was definitely spoken of as "impossible." Yet now even the most skeptical know that it has been achieved and that it holds many possibilities—and these skeptics must add—some of which will not be realized for many hundreds of years. Be that as it may. Certainly there is no doubt that, although radio has made great strides, only its surface has been skimmed. Now that a start has been made in transmitting and receiving picture visions of people and objects, how can it be said that it will be forever impossible to learn the secret by which man will be enabled to transmit the actual object or person to be received at its destination? But this is only one theme dealt with in this story, which so adequately concludes the series of "Paradox" stories by this author.

THREE men have penetrated the future. I have had the good fortune to retell through these pages as much of their stories as I knew. This is the third and last story there is to be told. The road to the future has been closed, not forever, perhaps, but for many years.

Raymond Cannes was the first who traveled through time-space, the four-dimensional universe, to the year 2930 and returned to tell the tale. He was killed by a truck, near the City Hall, in the city of Philadelphia, on the 7th of October, 1928.

It was Dr. Endicott Hawkinson who made the time-journey possible. He was killed by a fire in his laboratory before Cannes returned to the present era. His records and much of his scientific apparatus were destroyed, but the machine that had sent Cannes into the future remained undamaged.

Among the group that listened to Cannes' story, from his own lips a short while before his death, were Crandell Sherman, a brother-in-law of Dr. Hawkinson, and Eugene Preston. Because of Sherman's relationship to the Doctor, he obtained access to the burned laboratory and ventured into the future with Preston.

Only Sherman returned this time. He and Preston had become involved in the third Martio-Tellurian War, late in 2930, and Preston had been killed near the South Pole while heroically trying to defend Greta Bonn, a lovely earth-girl of the thirtieth century, from the Martians.

Sherman was mixed up in this war, too, but eventually he had been able to return to the present.

One evening late in July, Sherman was telling his experience to a little group in the lounge-room of a Philadelphia club. That group, of which I was one, was the same that had heard Cannes' story, almost a year previously, in the same luxurious room. During the course of Sherman's story he was interrupted twice by phone calls, and the second time he had rushed out in a hurry, leaving his narrative disappointingly unfinished.

In my first manuscript I retold Cannes' story, and added the facts about his death. In the second I told as much of Sherman's story as he had told before rushing away. The present narrative concerns itself with the finish of Sherman's story, and the exciting, horrible events that followed. Few people know of the secret reign of terror in Philadelphia during the month of August, 1929, but among those few is the (then) coroner of the City of Philadelphia, for that quiet, efficient man was among the heterogeneous group of eight that heard Sherman tell of the end of that third Martian war.

Crandell Sherman was unusually grim and serious when the group again assembled, a week later. He apologized briefly for his sudden departure the week before and went ahead with the interrupted story, which follows:

"To recapitulate slightly, gentlemen, the Martians had met with some success in the war of 2930. They had established an immense, well-organized spying system; they had destroyed many lives and much property with their first explosion of *brarron;* they had annihilated the air forces of the earth that had tried to reach their polar headquarters; they had killed Dwar Bonn, conceded to be the greatest scientific man of the earth at that time.

"But that Martian explosive, *brarron,* had proved to be a two-edged sword. Due mainly to Jac Vanon, an assistant chemist at Dwar Bonn's laboratories, our scientists had learned how to explode the stuff by means of a wave at long distance. Two interplanetary ships, coming from Mars with re-enforcements, and carrying additional supplies of brarron, had been located by astronomers and destroyed by the great beam of radio

waves from Dwar Bonn's great establishment at Sydney, Australia.

"There is no use repeating details I told you last week. Ben Yun, the Japanese scientist who had taken charge of Dwar Bonn's affairs at the latter's death, together with the young Jac Vanon, myself, and one pilot, had reached the Martian south polar headquarters in a totally invisible rocket plane, the only vehicle that passed the Martian's automatic anti-aircraft barrier without being shot to pieces. We had found only three Martians at the station, one of them Commander in Chief. They were in human bodies, as were all Martians that came to the earth. The frail Martian bodies did not stand the terrestrial gravity well, and by marvelous surgery the scientists of the red planet killed men of our earth, emptied their skulls, and transferred Martian brains and eyes to the human bodies. The entire process was done with incredible rapidity, and the bodies were revived by a process involving adrenalin. Thus the Martians could be distinguished from earthmen only by their eyes, which were pupilless and purple.

"AT the pole we also found the missing girl we were in search of, Greta Bonn, daughter of the scientist who had been killed, and sweetheart of Jac Vanon. She had been cold with death for an hour, and Jac had given way to grief. But we had surprised the three aliens at the Martian headquarters. One of them was very unconscious, and the other two were being covered by the two wicked thirtieth century slug-guns in my hands. Ben Yun, the Japanese, had shown the Martian commander, through the commander's astronomical telescope, the destruction by the radio-beam of the two spaceships coming from Mars. Then Yun had told him of the earth's plan to send an even more powerful beam all the way to Mars. This would cause disaster at all the factories where the explosive was being manufactured, and would greatly hinder the Martian plans. Ben Yun then offered to call a halt in the projection of the radio-beam for twenty-four hours. This would give the Martian chief time to warn his own planet by radio in the Martian code, and they could insulate the dangerous explosive from the radio waves. In return for this, Ben Yun demanded that the Martian furnish immediately the adrenalin necessary to revive Greta Bonn, and also the necessary blood-pump and a supply of *rannvor*, a substance known to Martian chemists, which, when injected into the veins, purified the blood, dissolving all coagulations. He also demanded that the Martian permit us all to return safely to Sydney.

"The Martian agreed to these terms. Ben Yun used his pocket radiophone and directed his assistants to halt the preparations for the projection of the beam. The Martian disclosed the secret subterranean vault where the chemical and surgical supplies were kept. Ben Yun descended into the vault with a light, while I kept the two conscious Martians covered. Jac Vanon was preparing the cold, lifeless body of the girl he loved for the attempt at revivification.

"Ben Yun returned from the depths of the vault in about fifteen minutes. Before my astounded eyes he drew a gun and killed the three Martians. Then he took out his pocket radio and commanded his assistants to go ahead with the plans. A few minutes later a beam of radio waves swept over unwarned Mars and two hundred and nineteen explosions took place.

" 'He tried to double-cross us,' explained Ben Yun, as we quickly loaded the supplies he had taken from the vault in the rocket plane. Jac Vanon entered, bearing the lifeless form of the girl, and the pilot shut the heavy airproof door, preparing to start our swift flight back to Australia. Yun continued: 'I treated that Martian as officer and gentleman of honor. He, thinking erroneously that I did not understand intricate Martian script, of which I have made intensive study in previous years, told me that adrenalin essential to us was in Martian bottles bearing numerical label R37a. I found such bottles, but on them also was fine script. The bottles contain germs, bacilli imported from Mars, of terrible virulence, that were soon to be released in our air. Germs are in special culture medium. If I had taken Martian's word and not read script, I would have probably injected same into heart of this girl, in mistake for adrenalin! I obtained real adrenalin, in entirely different containers; then, since I could not trust the commander who lied so dishonorably, I killed him, as I knew he never intended to let us depart, as he said. We could be too valuable to him! By quick departure in lightning-rapid rocket aircar, we may hope to pass antiair-barrier before it is put back in operation. You remember Martian told us it had been stopped for short period so delicate photo-electric and gravitational range-finders might be adjusted.'

"Ben Yun was right. In six minutes we were safe in Sydney, and Yun and several others had started the task of bringing the girl back to life, aided by adrenalin, a delicate blood-pump, and the miraculous substance of Mars, *'rannvor.'* Other scientists started the task of analyzing rannvor and reproducing it in quantity for the future benefit of the world.

"Beautiful Greta Bonn came back. She hovered on the borderline for weeks, and then fought through to her second lease of life—and love. She and Jac Vanon were married very quietly.

"The Martian war was practically over. The terrific explosions had completely disorganized life on Mars. We had destroyed the two interplanetary flyers bringing reenforcements in mid-space. Finally we had killed the supreme commander and paved the way for the ultimate success of the earth-forces over the other Martian forces within the Antarctic Circle.

"The scattered remnants of their great espionage system were ferreted out, one by one, in all parts of the world. I remained in the year 2930 for two months after the war was over and I still heard of one or two being captured somewhere every day or so. The inhuman pupilless eyes of red-flecked purple were the absolute giveaway to the alien brain in the stolen human body. Few of them could keep their eyes hidden long, under any pretext.

"But I was tired of the far future. I wanted to return to civilization that I understood. I was miserably homesick, though I tried to work off the feeling by assisting in the pursuit of one of the most notorious of the Martians, who had not yet been captured. He got away, for the seventh time, through a careless oversight of mine. I quit the hunt, more discouraged and disheartened than ever.

"Ben Yun saw how I felt and guessed the cause. He searched through the records of Dwar Bonn, the earth-scientist who had been killed by a Martian spy, and found the data and instructions for constructing the machine that made possible travel through the fourth dimension into the past. He constructed such a machine,

and after I had said good-bye to the newly-wedded pair, I came home again, without that heroic friend who had gone with me, across the gap of a thousand years."

Crandell Sherman was silent, and I could have sworn that the expression on his countenance was one of anxiety, worry, and—fear.

The Sealed Letter

THE note of fear was very evident when he spoke again, yet it was not fear for himself. Sherman is not a coward.

"You recall that I had gone into the future without in the least understanding time-space, relativity, the fourth dimension, or the confusing apparent paradoxes connected with the process. The man who understood those, Dr. Endicott Hawkinson, was burnt to death in that unfortunate fire. One of my first acts when I returned to 1929, more than a week ago, was to go out to Hawkinson's laboratory and satisfy myself that his machine, the one that had sent us into the future, was still intact. It was, for which I was glad, for I intended to have it investigated by the one scientist in America peculiarly fitted for such work. Mr. Cloukey, here, knows whom I mean. He's a personal acquaintance of yours."

"Bradley Bowman Blake," I stated.

"If anyone could recapture the secret that was lost when Hawkinson died, Bradley Blake is the man," went on Sherman. "When I was speaking to you a week ago, I fully intended to interview Blake the next morning. Then that phone call came and I rushed off. I'll explain why I left you so abruptly.

"That call was from my sister, Helen, the widow of Hawkinson. She had just returned home after an absence. The house, which has been repaired, is adjacent to the partially burned laboratory. She had seen a man jump out of a laboratory window and escape in the darkness. She had entered the laboratory to investigate and had found everything in it, including the complicated electric time-machine that Hawkinson had made, utterly demolished, and she said a sealed letter was left for me.

"As you know, I rushed over there very excitedly. Everything was smashed clear to glory, beyond the faintest hope of repair. So I read the letter. It was in good English. I have it yet. *It was from that notorious Martian spy I had tried to capture, when I was existing in the far future.*

"The military detectives of 2930 were slowly but surely closing in on him, and he had taken one desperate last chance, he told me in the letter. He had killed Ben Yun, destroyed all records of the machine that had sent me into the past, had planted a time-bomb near the actual machine, and then had used it to transport himself into our twentieth century world, allowing just enough time for the machine to function before the bomb destroyed it. The adjustments on the machine had not been changed since I had used it, so the spy arrived in modern Philadelphia just a few days after I did.

"Then because he knew what I had told Ben Yun about Endicott Hawkinson, he had searched out the latter's laboratory and destroyed everything there. He had irrevocably burned his bridges. No one in 2930 could follow him through the depths of time. He had escaped at last. And by destroying Hawkinson's machine he had cut off any possible return.

"I wondered why he was writing all this to me. The last part of his letter told me why. I can quote it: 'Revenge is not satisfying to the avenger unless his victim realizes that revenge is being done. Now I am safe and I shall take revenge, upon your world in general, and upon you in particular. When Philadelphians drop dead for no apparent reason, two every day, you will know that I am responsible, and you will be powerless to stop me. Eventually I shall attend to you. Now you may rejoice in the knowledge that your part in that war, and in the ceaseless pursuit of me after the war was over, will cause two innocent deaths a day, to commence the first of August.'

"Today is the twenty-eighth of July. What can I do? The police, the press, the people at large would laugh me to death if I published this letter. The average person would pay no attention. I know only too well that what I have gone through is contrary to all recognized science at this date. There is nothing I can do to avert the catastrophe."

The coroner of Philadelphia spoke quietly. "I investigate all mysterious deaths," he said. "Perhaps if you and some of this group will work with me and a few of my assistants, and we enlist the help of Bradley Blake, we can find this Martian and deal with him without publicity. The newspapers do not necessarily have to be on the inside. Publicity would expose us to ridicule, and would warn and aid the Martian to escape us."

As we rose to leave, Sherman spoke again.

"Somewhere in Philadelphia, this minute, is an incredible anachronism, an intelligence from the Mars, one that will exist a thousand years from now. And he is planning death."

The next morning Sherman and I laid the problem before Bradley Blake. The scientist was skeptical for a time, but soon became convinced that we were in earnest. He questioned Sherman minutely about many details of his story, the Martian war, the civilization and living conditions of the future, the scientific devices and discoveries of 2930, and various other subjects. He read copies of my two narratives and put them aside for future study. Then he took the letter Sherman had received and examined it closely under several microscopes. Seeing something that interested him, he at once proceeded to take several microphotographs, develop them, and then make enlargements. All this took time, and Blake said very little. When about three and a half hours had passed, Blake turned toward us with a photographic print, still damp, which showed one single letter "e" from the letter greatly enlarged.

"I can reassure you somewhat, Mr. Sherman," he said to my companion. "Your anachronism is not destined for a long life. As I understand you, we are dealing with a Martian brain in a human body. Now, in the first place, the human body in the case is not in good condition. Certain organic diseases of the heart will leave a microscopic tremor in the handwriting. The original of this 'e' looks firm and is well-formed, but when enlarged seventy diameters, it shows plainly the unsteadiness of the hand that wrote it. Of course, my diagnosis is open to question. Various other causes could be assigned for this microscopic wabbling. Perhaps it could be formed by some trivial nervous disorder. But I believe that there is at least an equal chance that whether or not the alien intelligence knows it, his stolen body is suffering from advanced heart-disease of one form or another. If the Martian incautiously puts his body under any violent strain, it is liable to surprise him and cease functioning.

"So much for the body. But consider the case of the individual, the personality, the brain or whatever you call it, that is now actually inhabiting that body. A being of superior intelligence, a highly civilized Martian of a far future era, he became a spy and submitted to the change in bodies in the belief that he was aiding his entire race in its desperate fight to conquer another planet, for Mars had very nearly reached the stage where it would become absolutely uninhabitable. Surviving the war, he finds that his sacrifice has been in vain, that he is hunted every second, and he realizes that the last hope of his entire race is gone. They have failed to conquer a planet to live on, and they are doomed to die out, their place in the universe to be taken by the younger human race. The spy realizes this, and he gives way to hate. In a desperate attempt to prolong his own individual life, he dodges through the depths of time, and plans a fiendish revenge on individuals who are not his enemies and who have never harmed him or any of his kind. Do you not see how hate has warped that intellect? He writes a childish threatening letter to make sure that you suffer. He is no longer a highly civilized being; he is insane, monomaniacal. He survived the change of bodies, he withstood the change in living conditions, climate, and so on, that came when he crossed the gap of fifty millions of miles of empty space. But add to them the bitterness of defeat and the shock of dropping a thousand years into the past, and even his powerful mind has been affected. I think it likely that he will soon be totally demented, and he may die of brain-fever. I do not believe he can survive long in this alien world. From that letter I believe that his mentality is already slipping. It is what one would expect from a normal, intelligent individual of a species possessing greatly superior civilization.

"I do not expect him to live long. But while he is alive he will be doubly dangerous. He undoubtedly possesses scientific knowledge far in advance of ours. Perhaps he has brought a death machine with him from 2930. He has demonstrated that he is daring. And he is utterly devoted to one idea—revenge on the human race.

"If you will keep me in touch with any developments, I will be glad to help in this case to the limit of my ability. What I have told you today is only guesswork, but I believe it will strike close to the truth.

"He hasn't given us much to go on," said Sherman, as we left the scientist's laboratory.

"We didn't bring him much to go on," I reminded him. "He may have been merely guessing, but his 'guessing' in the past has so often been correct that I have a remarkable confidence in it. I have known him to solve mysteries without ever leaving that place of his. He listens to all the details, thinks a few hours, and then announces the solution. You notice he didn't kick us out for bringing him something any other scientific man would have refused to consider."

"Yes," said Sherman as I left him to wait for his bus, "that's so. I wonder why he didn't. I can hardly believe it myself."

The Metal Ball

ON Thursday, August the first, I was enjoying my customary lunch at Linton's with my friend Bill Simons, and we were discussing the case of the Martian, when Oscar, our jovial head waiter, informed me that a Mr. Blake wanted me on the 'phone. Blake told me very little over the wire, so Simons and I went over to Blake's laboratory as fast as Bill's car would take us. Crandell Sherman and the Coroner arrived at the same time we did and with them was an excited grey-eyed girl whom Sherman introduced as another sister of his, Mary Sherman.

Blake was waiting for us. When most of us had been seated, the coroner spoke. "The first mysterious death turned up today, Mr. Blake, and I believe an attempt was made on the life of Miss Sherman here. The killer must be trying to strike very close to Mr. Sherman. You know of William Wentworth, the broker?"

"Yes."

"He dropped dead today in his office. Miss Sherman is the only eye-witness, and there are some mighty queer details connected with the death. I'll ask her to tell you."

All eyes turned to the girl. She made an admirable and successful effort to control herself and told us in a low, even voice what she had seen.

"I was taking dictation from Mr. Wentworth. He has always seemed to be in the best of health, but today he suddenly stopped in the middle of a letter and complained of an intolerable fever. I glanced up at his face. It was terribly red, and I saw sweat suddenly burst out on his forehead. Then he groaned and fell forward with a gasp. It all happened in a minute. I was terrified, but I didn't think to call for help.

"Then something warned me instinctively. I jumped up out of my chair. Just as I did I saw a tiny bright light flickering just where my head had been. It grew larger and larger. It was too bright to keep looking at, but it sort of hypnotized me. I couldn't look away. There seemed to be a little ball the size of a marble in the center of the light. Then the light went out and the ball, red-hot, fell down on the chair, rolled off and down to the floor, and started burning into the carpet. Then I rushed to the outer office and called for help. None of the office force entered the private office until the police came."

The coroner spoke. "Luckily I arrived in a few minutes and heard Miss Sherman's story before any reporters got there. I got that ball. It had cooled off a little. There is a doctor across the street with X-ray apparatus. I got rid of the newspaper men by telling them it was nothing but heart failure, and then had the doctor X-ray the skull. He had the film developed immediately. There is a metal ball one inch in diameter inside his brain. If Miss Sherman hadn't changed her position, the other ball would have materialized inside of her brain too."

"You have the ball?" inquired Blake. The coroner took from his pocket a ball that looked like a large ball-bearing that had lost its luster, and gave it to Blake, who rose abruptly and left us, entering the room I knew was his chemical laboratory. He returned eventually.

"What is it?" asked Sherman.

"Pure iron. Not any form of commercial iron or steel. They contain carbon and other impurities. This is pure iron, very slightly tarnished. Our Martian has mastered the process of sending solids through space, at least elements such as iron. Sending even a simple compound like table salt through space would be a more difficult matter. He has some system of taking this iron apart into its component protons and electrons, and putting it together again wherever he wants to. By ma-

terializing the ball in Wentworth's brain, he caused rapid death as the iron displaced the grey matter."

That was all that Blake had to tell us. It was hardly satisfying, and it gave no clue to the whereabouts of the Martian. Sherman was more worried than ever, and explained the predicament in detail to his sister, as all of us except Blake rode back to town. Bill Simons spoke for the first time.

"How about a radio-direction finder?" he suggested to the coroner. "This machine for transmitting solid iron through space must be something along the line of a radio transmitter. If our malignant anachronism intends to pull his little trick every day we may be able to get a line on him. He must have established some permanent or semi-permanent headquarters, for the apparatus that would perform a feat like that could hardly be portable. And he must use a tremendous lot of power, which would be liable to create radio interference, static. I'm going to get Ralph White and a couple of the others who know about this Martian to help me, and a couple of direction finders. We'll listen for unusual disturbances. If we establish two listening stations and get a fairly accurate reading from each we can find the Martian's station by triangulation."

Sherman seconded his suggestion with alacrity, for it provided a course of action. Sherman was not formed or adapted to play a waiting game, and inaction taxed his patience to the utmost. Besides, Sherman had very little confidence in Blake, being unacquainted with his methods of investigation. When I left them Simons and Sherman had already completed their plans for establishing stations to listen for any unusual disturbance in the ether. Simons was an electrical wizard, and he was fully capable of handling such a job.

LATE that same evening I told Blake about the plan. He almost smiled, for once.

"Good," he said. "It will give Sherman an outlet for that pent-up nervous energy of his. But don't expect any satisfactory results. When I first heard of the threat I decided that any device for causing people to fall dead at a distance might create a disturbance, so I got a couple of my 'ham' friends* to help me, using the latest thing in direction finders. They both reported an unusual disturbance, but neither was able to take a direction reading on it. The needles vibrated, fluctuated, and otherwise acted uselessly. The answer is that the Martian has two stations, an appreciable distance apart, or maybe more than two. The interference emanates from both of these at the same instant, hopelessly confusing the direction-finder, as so far it has proved impossible to tune out any part of the interference without losing it all. But we've only tried once so far. If the Martian repeats tomorrow we'll get another chance. At least, I've checked the time of the disturbances, and they agree perfectly with the time of the tragedy."

"Why would the Martian have two stations?" I asked.

"He is astute. It may be for no other reason than to confuse us, or the two stations may be essential to his process. Do you remember that Raymond Cannes repeated to you some facts that Dwar Bonn told him in the year 2930? About Bonn's most recent discoveries in physics? You recorded the conversation in your first manuscript."

"About electrons, protons, and photons? Yes, I remember, but I haven't the slightest idea what it's all about. Please explain to me in non-technical language."

"I could talk hours on the subject and only scratch the surface. But very briefly, it's this:

"All of what we call matter, whether it's carbon or chlorophyl, cabbages or kings, consists, in the last ultimate analysis, of only two different things: the proton, and the electron. And they are considered to be positive and negative charges of electricity. They are the components of the atom, and the number of them in the individual atom determines whether it is an atom of hydrogen, or chlorine, or lead, or iron, and so on. No one has actually seen an electron or a proton, which raises the question, How do we know they exist? But I'm not going into that, not now at least.

"Now about the photon. The generally accepted theory of light at the present time says that light consists of etheric waves, vibrations. But without going into details, physicists have found facts, phenomena, that the wave-theory of light does not explain. To account for these circumstances, a theory was proposed that light consists of tiny corpuscles, smaller than atoms. This theory also fell down when it came to explaining all observed facts. The latest theory, though it is not perfect, comes much closer to explaining all the phenomena of light than either of the others. It is sometimes called the wave-corpuscular theory, and it says that light does consist of these infinitesimal *photons*, or light-corpuscles, *but that they move in waves*. If this be true, the dual nature of that mysterious thing called light should explain all its properties.

"So, ultimately, our entire infinite universe** consists of only three things, the electron, the proton, and the photon. But 1929 science stops right here. So far we have tried to penetrate the mystery of matter, but no farther.

"But we have word from the thirtieth century that a great scientist, Dwar Bonn, will go farther. His discovery, paradoxically reported to us a thousand years before it will be made†, tells us that the proton, electron, and photon are different manifestations of one and the same thing: that is, they are only variant forms of the one thing of which everything is composed. Scientists today do not believe this, as they have no evidence to even hint at such a truth, but we have the word of a scientist of tomorrow."

"What has all this to do with this Martian?"

"Try to be patient, and soon you'll see where I'm leading you. Our Martian has given proof that he is a scientist, and he undoubtedly is aware of this 'unity of the universe.' Even the most abstract of scientific truths eventually find some practical application, and this inhuman, infernal anachronism is making use of his knowledge. He knows that the electrons and protons that compose an atom of iron are similar to, and according to Dwar Bonn, identical with the tiny corpuscles of light, the truly infinitesimal specks that scientists call photons. He also knows (and so do we) that it is a very simple matter to project a beam of light through space. The light, consisting of photons, passes readily through some substances, such as air, water and glass, for in-

* These were probably "DC" of W3QP and "KN" of W3ZF, although Blake did not definitely tell me so. They, and several others of the A. R. R. L. have often greatly helped the scientist in many ways, without thought of reward.

** Blake later took pains to retract the term "infinite universe." Einstein's theory, he said, supported by recent observations of nebulae many light-years distant, indicates that the universe may be finite, after all.

† For a more complete discussion of the *apparently* impossible situation, the reader is referred to my first narrative, the story of Ray Cannes, entitled "Paradox," recently published in this journal.

stance. It is my guess that the Martian has been able to break up atoms of iron, and project through space rays or beams similar to those of light, but invisible; rays consisting not of photons, but of either electrons or protons. The indication we have that there are two stations suggests that there are two different beams, one consisting of the dissociated protons, and the other consisting of the electrons. These beams apparently pass right through brick walls and such things as easily as a light-beam passes through glass.

"OF course, a lot of this explanation goes contrary to science as it is now known. If someone explained radio by saying offhand that voices go thousands of miles through the air, a person not understanding the complicated scientific process that makes this modern miracle possible would say that such a thing was impossible, going contrary to science as he knew it. The machine that sent that iron invisibly through space and materialized it inside the brain of a human being must be very complex. It is the product of a thousand more years of scientific research, and undoubtedly employs principles of which nothing is now known. But we have seen its work. Those balls are solid iron. They were not created out of thin air. I believe that the Martian crossed his rays: at the intersection the electrons and protons, coming together, and following some tendency of which we are ignorant, recombined to form iron atoms, making that almost perfectly spherical mass of red-hot iron that killed Wentworth this morning."

"How could he make his trick rays intersect inside of the man's brain?"

"That would be a minor problem, if he had suitable apparatus. He must have brought a lot with him from the future. If he was able to break into Dwar Bonn's laboratory and escape detection long enough to use that wonderful time-machine for penetrating the fourth dimension, he was probably able to steal whatever apparatus he wanted from that great laboratory and take it into the past, our present, with him. He must have some kind of range finder. Perhaps two rays that are invisible and harmless, but give some kind of indication to him when they are crossed inside of solid matter. Then he shuts them off and turns on the electronic and protonic beams. He was successful in the case of Wentworth, and he undoubtedly had the correct range on Mary Sherman, but she moved out of the way a second before the iron started to materialize. Something in her brain, some intuition, sixth sense, or semi-dormant protective instinct, warned her in time. Wentworth's masculine brain was not sensitive enough to save him."

"Where do you think the Martian is now?"

"If I knew, I'd tell you. He's some place in Philadelphia, and eventually I'll locate him. I hope it will be before he kills anyone else. When I got that iron ball this noon, I made inquiries among the various chemical supply houses in the city, and from Brenner's I learned that a man wearing very dark glasses had purchased a large amount of C. P. iron oxalate. That is the source of the pure iron that seems to be essential to our enemy's process. Terrestrial chemists occasionally prepare pure iron by reducing the oxalate in a stream of hydrogen; perhaps our Martian has some other method of obtaining the same result. The purchase was made Monday, and now on Thursday the first murder takes place. The Martian also purchased quite a lot of other chemicals and apparatus, paying for his purchases with the new small-sized twenties. What does that suggest to you?"

"The hold-up of John Henderson's private messenger late Sunday night," I replied, recalling the newspaper accounts of the robbery of the millionaire's trusted servant. "He was carrying three thousand dollars in new twenty-dollar notes."

"Yes. I've got two leads on him. A very good private detective that I occasionally employ has been set to work to try to trace the purchaser of the chemicals, and I have tipped off the police to watch for men wearing dark glasses, as they are very anxious to make an arrest in this robbery case. I assured the chief that I knew the culprit was afflicted with a disease that turned the eyes purple. He took my word for it. I've helped him before, so quite a percentage of the police in this city will be regarding every wearer of dark glasses with deep suspicion, and trying to detect purplish eyes. They may find him, and they may not; but I've done all I can just at present. Tomorrow will probably bring further complications. I pity the poor devil who gets in the range of those rays."

"One thing I'd like to ask," I rejoined. "If the Martian has split the atom, wouldn't that release a tremendous amount of energy? The reason our scientists now want to split the atom is, that such a process, under control, would release a terrific amount of power. If the Martian has at his command atomic energy, what might he do with it?"

"I doubt if he has it at his command," was the reply. "If he did he could destroy the city all at once, instead of killing a few scattered inhabitants. He undoubtedly does release this power when the atoms 'split,' as you say. But remember, his electrons and protons combine again, which would probably require every bit of that energy, if the process were 100% efficient, which it isn't. The iron that he disintegrates is undoubtedly more than the amount that materializes, due to the loss in power. Perhaps a little of that excess energy is dissipated as heat. You remember that the ball was white-hot, while forming and red-hot afterward."

"Are you planning any scientific method of locating the culprit?" I asked.

THE scientist shook his head wearily. "No. So far I'm using straight detective methods. I have also asked the electric companies to cooperate with me by informing me if there is any unusually heavy consumption of current tomorrow, and recording the exact time of such a drain of power. I don't think the Martian is able to harness any of his hypothetical atomic energy to operate his machine or apparatus. If we discover an excessive current consumption and check the time accurately with the time of some death tomorrow, it will be comparatively easy to trace the user of the current. This may be our best bet, or we may draw a blank.

"What you fail to understand is this: my whole lengthy explanation to you is nothing but the flimsiest hypothesis. If you were technically trained, you could go over it and pick out flaw after flaw, from the point of view of a scientist of today. I can pick flaws in it, but it is the nearest I can come to finding an explanation that will fit the facts we have encountered. The weapon we're hunting is based upon scientific principles greatly in advance of what is called science today. The intelligence we're fighting is tens of centuries farther advanced than we are, though he is handicapped by the fact that he is not in his own surroundings. What will

eventually defeat him is the literal fact that he is a living anachronism.

"To return to your question, I wish I did know some scientific way to locate the untimely menace. I have been trying to devise one all day, with a pathetic lack of success. My conscious mind has given up the problem as hopeless. I see no way in which it can be done. It's up to that mysterious thing called subconscious cerebration. Three-fifths of the problems I have ever solved have been done by my subconscious mind. Some psychologists say the subconscious possesses ten to a thousand times the ability of the conscious mind, but it's too uncertain. Sometimes it's a willing servant, but few people can harness it. I can't."

So ended Blake's discussion on Thursday evening.

The next ten days were days of horror and disappointment for those who knew of the Martian. There were no more failures. Two people dropped dead every day in the central part of the city. Their deaths were attributed to various causes, and I know of no case in which the ball in the brain was discovered by people not in the secret. Of course, the coroner did not have every skull X-rayed. There was no need for such confirmation. The times of the deaths all checked with the times that mysterious radio disturbance was detected.

The newspapers began to get a trifle suspicious about the seventh day. Some of the reporters began to think that too many people were falling dead, and gave guarded hints that the deaths might not be all as accidental as they appeared to be. But the press was never on the inside, and this is the first time the truth of the matter has been revealed.

Apparently the Martian was operating with definitely limited power, for all of the deaths occurred well within the rectangle formed by Market street on the north, Spruce on the south, Fifth street on the east, and Sixty-third on the west. It was Bill Simons who pointed this out to Bradley Blake, who made a note of it.

Simons' radio-direction finding plan was unsuccessful, and Blake's amateur friends had no better luck. Simons was aided by Ralph White, John Stevenson, and a number of the others, particularly Sherman; the best readings they could obtain indicated that both of the unknown sources of the disturbance were within the central part of the city, but we knew that already. The circumstances made it impossible to obtain accurate readings, so the plan of location by triangulation failed.

Significantly, all of the twenty who died in those ten days were men.

We obtained no help from the electric company, though they co-operated with Blake cheerfully. All unusually heavy current consumptions, when traced, proved to be entirely innocent, and none of them checked in time with the radio disturbances and deaths.

The private investigator was not able to trace the buyer of the chemical supplies, and no robber with purple eyes was apprehended by the police. We were baffled.

There is no reason to list the twenty victims here. Any interested person may find their names and learn of the details concerning their deaths by referring to the files of any one of the Philadelphia papers. Some of the men were important figures in the world of business and finance, such as Lee W. Craighead, the beet-sugar baron, and others were only commonplace citizens, as was Iskor Sardanateliapolos, a Russian-Greek fruit-store proprietor of high standing.

The last two deaths were on Sunday, the eleventh. On Monday evening the group met at Blake's house, in response to a request of his. He was not present himself at the time he had set, but his servant told us that he would soon arrive. Sherman was mysteriously absent, also.

While we were waiting for Blake, we commented upon the fact that there had been no deaths that day, and speculated upon the next move of the Martian. Ralph White suggested that perhaps he was dead from heart-failure. While we earnestly hoped that this was so, not one of us really believed it. We spent some time organizing ourselves and reaching a plan of action. Working in shifts, whenever we could afford the time, we determined to go over central Philadelphia with a fine-tooth comb. We assigned territories to various groups. After a score of deaths, we realized that the situation was truly serious. We were ready to try any plan, however small its chances of success seemed to be.

Bradley Bowman Blake walked in, something cheerful and confident in the way he strode to greet us. I glanced at his face and recognized the light in his eyes. He had the answer!

BEFORE he could speak, Sherman arrived, breathless. Fighting for control, he told us that his sister Mary had been missing since noon. I saw Bill Simons' face go very white. Blake took a paper from his pocket. We crowded around him to see it. On it were two downtown addresses.

"The Martian," said Blake, "is at one of these two places. I don't know which. There are two cars outside. Half of us will investigate one place, and half the other. There are firearms in that cabinet in the rear corner. I have just been talking to the Chief of Police. He promises that there will be no trouble for any member of my parties, even if we don't all have gun permits."

We hurried out to the cars. Blake, Bill Simons, White, Penderton, and I were in one party, and our heavy car was soon racing down Marshall road toward the nearer address. Blake's countenance was grim. He spoke to me.

"A few minutes are liable to be precious, if that monster has captured Mary Sherman," he said. "I am considered an expert upon abnormal psychology and the psychology of hate and fear, and I'll stake my reputation that I've analyzed that Martian correctly. Nothing in the world would delight him as much as a chance to torture her."

The accelerator pedal went down, and the car responded with more speed, as it threaded its way through the comparatively light traffic of the late evening.

I had not expected that our destination would prove to be an apartment house, but it did. Blake located the janitor and inquired if any of the apartments had been rented to a man who wore dark glasses. Our suppressed excitement reached its height when the man replied in the affirmative, and volunteered that the renter had been away the last two days. Blake showed his special police badge and credentials, produced a search-warrant, and we entered, using the janitor's key. The warrant only authorized us to search for the stolen money, which we incidentally found and identified, as the new twenties had been consecutively numbered and the numbers had been recorded. But the real purpose of swearing out the warrant was not to recover the money. Blake could not have obtained the warrant, if he had stated that he was hunting for a Martian anachronism.

On the oak table in the center of the living room was a small but solid metal tripod which supported a brilliantly polished metal tube, three inches in diameter and four feet long. It was mounted so that it could be turned to point in any direction, but it was locked in its present position by a small gear-like arrangement. At one end was a smooth round hole. On the other end was a thick and wide flange, upon which were many small binding posts. From these a network of fine copper wires, each insulated by a covering of varicolored silk, led to a cabinet at the side of the room. A two-way plug had been inserted in the lamp socket and one cord led to the cabinet, while another connected with the flanged end of the tube on the tables.

The cabinet at the side of the room was undoubtedly a radio receiver. Above it was a ludicrously small aerial shaped somewhat like a gridiron.

"Radio control," muttered Blake.

We left without disturbing anything and started for the other address.

"Would you mind telling me," I asked Blake as the car wound in and out of the traffic of Walnut street toward the heart of the city, "how you located these places?"

"You remember that Simons pointed out that all the deaths occurred within the long narrow rectangle formed by Market and Spruce streets, Fifth, and Sixty-third?"

"Yes."

"That put me on the trail. I got an accurate map of Philadelphia and carefully marked the locations of all the deaths with red ink. By the time I had located five of them I was excited, and when they were all plotted on the map I knew that we were near the end of this terrible business. Those twenty-one points determined a perfect ellipse. Through them, using precision instruments, I could trace an elongated ellipse."

"You presumed that the Martian's two stations were at its foci?"

"Yes. It was merely a problem in plane geometry. I made the construction on the map and located the sources of those rays." He glanced at me and half smiled. "You might figure out the construction some day, when you feel the need of some mild intellectual exercise. It's quite a neat geometrical problem." He saw some of the doubt and questions in my eyes, and his manner became serious again as we waited for a traffic light to change.

"About the first thing we learned in this case was that the mysterious killer was operating with definitely limited power. But he had two stations. No matter how he divided his power between them he had only so much. If you know what an ellipse is you know that the sum of the distances from any point in the curve to the two foci is a constant."

This wasn't quite plain to me, but I was beginning to see vaguely what he meant. He elucidated further.

"If he used most of his power for one ray and made it penetrate to a comparatively great distance, the other would receive less power and be correspondingly shortened. But it was necessary for the two rays or beams to co-operate, to intersect. As the sum of their effective distances was a constant, and the points of their origin were fixed, all of the deaths would have to take place on the circumference of the ellipse or within it. Also—"

Blake stopped talking and applied the brakes as the car approached the corner where Walnut and Thirty-fourth streets both intersect with Woodland Avenue.

Directly across the right of way, completely blocking traffic, was an ambulance. From its rear were emerging two white-coated internes with a stretcher. Another ambulance was leaving, the commanding note of its bell growing fainter and fainter. Up on the sidewalk on the north side of Walnut was a Mack truck bearing a "Z" license plate, which denotes the heaviest vehicles permitted on Pennsylvania highways. The driver of the thirteen-ton monster had apparently tried to avoid the crash he had seen impending. Near the truck, but in the street, was a sedan, on its side. The way its hood and front fenders were crumpled showed how hard it had hit the truck. Broken glass was all around. The internes were lifting a man from the street. They had bandaged some of his larger cuts. His condition did not appear to be critical.

Blake recognized him the same second I did, and we hurried over to him, disregarding the bawled command of the policeman who was near by to keep away from the internes. The other members of our party were close behind.

The man on the stretcher was John Stevenson, one of those who had gone in the other party with Sherman. I glanced again at the wrecked sedan, and recognized it.

"What happened, Steve?" asked Blake gently.

Stevenson saw us for the first time, and we saw that one of his legs was broken. Otherwise, his injuries were minor, and he answered us readily enough.

"Sherman took a chance. He was in a hurry, and he was worried about his sister. It wasn't the truck driver's fault. We smashed into the truck and turned turtle. Sherman was caught under the wheel. He's dead; the broken glass got him. They've just taken him away. I was in the front seat with him, but I'll be all right. The others weren't hurt much." He motioned with his arm toward the drug store on the corner. "They're in there getting fixed up."

By the time he had said this much, the internes had placed the stretcher in the ambulance and were closing the doors. The hospital truck moved away, clearing a path through the traffic with its gong.

THE blank reality of the tragedy stunned me. Indirectly, at least, the Martian had been the cause of Sherman's death. The last of the three who had taken the incredible time-journey was gone, and the astounding machines based on advanced electro-physics and the non-Euclidean theory of hyperspace were destroyed. The road to the future was closed, as were the lips of all those who traveled that road, or who had possessed the knowledge that made such travel possible.

All except the Martian!

Sober and shaken by Sherman's death, and anxious for the safety of his sister, we proceeded to our destination. It proved to be one of the large metropolitan hotels. The thought crossed my mind that whatever electricity the Martian had used had passed unnoticed in the great consumption of the entire hotel. One more fact was explained. We were all tense, confident that we were near the end of our tragic trail.

Blake interviewed the clerk. We learned that a man answering the Martian's description had taken an expensive suite on the second floor, paying for weeks in advance, and requesting that under no circumstances was he to be disturbed. He had explained that he was a scientist, the clerk told us, and was performing delicate work with complicated apparatus. Therefore he did not

want even a scrubwoman to clean his rooms. The suite had been let strictly alone.

After a conference with the resident manager, and the production by Blake of his credentials and warrant, we obtained a pass-key and proceeded to the second floor, followed by the manager. The door to the suite was locked. We obtained no answer by knocking or calling, but all of us were certain that we heard a noise within.

Blake used the pass-key and swung the heavy door inward, his Ortgies automatic in his right hand.

In the center of the room we saw a table. On it was a small tripod, such as we had seen at the apartment house, but of heavier, sturdier construction. It supported a metal tube not quite so long as the other, but much heavier and thicker. Many more wires led to it, some from a transformer of some kind attached to the light circuit, some from what was obviously a radio transmitter, and which I assume was used to manipulate the other unit at the apartment house by radio-control, and the rest of the wires connected to the tube led to several cabinets on the shelf under the table, each of the units below looking precisely like the other ones. There was a dial and an indicator of some sort on the panel of each.

It was a truly imposing array, and I have given it only a sketchy description in this account. I tried to get Blake to write a technical account of the apparatus and as much as he knows about its operation. Such a description would greatly enhance the value of this story, but Blake is much too busy these days and I am not qualified for the job.

We spent not a second gazing at the machine, however, for we heard a noise in the adjoining room. Two well-placed bullets from Blake's gun demolished the lock. We pushed the door open and entered, five of us, and five guns were ready to start spitting lead.

We didn't shoot, however.

Blake's fantastic fear had been justified. His uncanny ability at psychoanalysis was again demonstrated. The Martian had been torturing the girl.

On the telephone stand to the left of the door was an almost empty chemical bottle and letters of raised glass on it read "CONC ACID SULFURIC H_2SO_4."

Mary Sherman was tied to a table so that she could not move her head. Her face and dress showed evidence of a struggle. One tanned shoulder was bare.

The human body that contained the alien brain and the purple eyes flashing with hate was standing at the head of the table. The hand held a beaker full to the brim with a colorless oily liquid that I recognized as the concentrated acid. It was directly above her eyes. If the Martian moved, or if we shot him, she would be blinded for life, if not killed, to say nothing of the hideous way it would scar that beautiful face. She could not move her eyes, and the acid was two feet above them. Exquisite torture!

WHAT had happened was this: By chance Mary Sherman had happened to see a man on the street with dark glasses. She had watched him closely. When he passed her on the sidewalk, she had watched him sidewise and had caught a glimpse of the purplish eyes. As Sherman had explained the whole situation to her, and as she knew of the score of deaths that had taken place since her former employer had been killed, she followed him, thinking herself unobserved. She did not have time to get in touch with her brother. If she had taken time to phone she would have lost the trail. She had shadowed him to the second floor of the big hotel and had seen him enter his suite. She intended to come to Blake immediately with the information that we had wanted so badly, but the Martian had suddenly emerged from his door, attacked her with some piece of metal apparatus that made an excellent blackjack, had rendered her unconscious before she could call out. He had dragged her quickly into the suite and had tied her to the table, waiting calmly until she regained consciousness to question her.

He had also gagged her, but he had not tied her strongly enough. She had almost escaped soon after she came to, but after a short fight had been secured to the table again. Then the torturer had removed the gag, holding acid above her face and threatened to pour it over her if she screamed.

He had asked her over and over again to disclose her brother's address. Though he had located Hawkinson's laboratory with ease and had destroyed the machine there, he had never been able to find Crandell Sherman's residence. It happened that Sherman had just bought a new house, and though the phone was connected, he had not yet been listed in the telephone directory, which seems to have been the chief guide of the Martian.

She had bravely and steadfastly refused to say a word, knowing instinctively that as soon as she gave, or seemed to give, the desired information her questioner would kill her.

So it was that we found them.

Five guns were leveled at the Martian, point-blank range, and we dared not shoot.

But the insane brain behind those purple eyes knew that the game was up for him, whether he killed or did not kill. He had reached the end. So he decided to kill. He tilted the beaker to pour out the liquid fire. Yet Mary Sherman lives today and her face is not scarred. It was not a miracle that saved her, but a scientific fact.

Have you ever tried to pour the cream off a full milk-bottle slowly and had the cream run down the outside of the bottle instead of pouring the way you wanted it to? Then you understand. The Martian tilted the full beaker slowly, and instead of flowing through the air and falling in the girl's terrified eyes, the heavy oil of vitriol flowed down the outside of the beaker, burning the Martian's fingers. What saved Mary was the property of adhesion, as contradistinguished from cohesion.

When a child puts his fingers into a flame and they are burnt, he immediately and involuntarily withdraws them by reflex action. The Martian brain was highly developed and very sensitive to pain. The same reflex took place when the acid touched the fingers of his stolen body. His arm jerked involuntarily backward, as if it were being withdrawn from a flame, and the beaker of acid fell harmlessly on the rug. The Martian stood for a few seconds as if petrified, and I saw a full realization come to his eyes. Then he fell forward and crumpled in a heap on the floor.

Bill Simons cut the girl loose as Bradley Bowan Blake bent over the prone figure of our enemy. The scientist straightened up triumphantly.

"Heart failure," he said.

Reaping the Whirlwind

By Alfred I. Tooke

CONTROL of climate is not an altogether new thought. Several attempts at it may even have been tried from time to time—attempts about which we know nothing as yet. Tornadoes and cyclones annually take their toll of innocent lives and vast fortunes in the form of property. It would be a godsend, indeed, to devise some means of controlling these demons of the elements or even limiting them to definite places. But with all the advantages attendant on weather-control, we cannot overlook the dangers such possibilities might hold under some circumstances. Our new author gives us an absorbing story of scientific fiction based on this idea.

Illustrated by PAUL

"TRICKED out of the results of thirty years of hard work!" Professor Crockett gasped, as he slumped into a chair and tore a telegram into shreds.

The telegram had climaxed a week of furious endeavor to prevent the disaster, but that week of hectic effort was as nothing to the five minutes since the telegram had been delivered. In the ten years I had been Professor Crockett's assistant, I had never seen him in such a towering rage. I feared he would have a stroke. Sometimes his voice rose to a piercing scream; then with dramatic suddenness it broke and became a hoarse whisper, terrible in its earnestness. He swore vengeance on those who had tricked him. He cursed them and their descendants for ever and ever. He called down curses on the ground they trod upon or ever would tread upon. He pronounced curses too terrible to repeat. I was aghast, but I remembered, too, that his supposed friends had done a dishonest and a terrible thing to him.

When his rage burst itself out it left him limp and exhausted. He slumped into the chair and tore the telegram into shreds, and there he sat for hours, fully conscious, yet motionless except for the occasional twitching of his fingers or his features.

As you may be aware, Professor John Crockett was a world-wide authority on the power of the wind. His research work concerning tornadoes, cyclones, cloudbursts, and other so-called "freak" atmospheric disturbances had been of tremendous service to humanity, and he had given freely of his knowledge. He had also utilized it along inventive lines for his personal gain, so that he might secure funds for further research. He it was who invented a wind-machine to circulate air through orchards to prevent injury to the trees during a cold spell. He invented many pieces of apparatus to safeguard airplanes and airships in flight. He revolutionized the science of ventilation as it applied to submarines, mines, schools, and buildings where large audiences congregated. He it was who discovered how to neutralize the deadly carbon monoxide exhausted into the air of our big cities in such enormous volume by automobile motors. His latest invention was a wind-driven motor capable of generating enough power from the wind to drive a ship along at thirty knots or more.

He proposed to adapt the principle to the automobile, but his funds being exhausted Professor Crockett was induced to place his inventions with a company of which he was appointed the head. He secured the funds he required, but at what a price. In business and finance he was but a child, and by trickery and stock manipulation he quickly found himself ousted from control.

No wonder his rage had been so terrible. No wonder he was a broken man for many weeks afterwards. He had only a few thousand dollars in cash to show for inventions worth millions; but what hurt him most was that those he had trusted had tricked him. He had lost his faith in humanity—the humanity for which he had done so much and for whose welfare he had given of his knowledge so freely.

He closed his workshop, and dismissing his servants he lived alone. Needing no assistant, he released me also, and I took a much needed holiday.

IT was six months later that I received a telegram from him, saying: "Come at once, if free," and, being free, I packed up and went.

It was as I thought. The habits of a lifetime had asserted themselves. Shut up there all alone, with nothing to do but think, what more natural than that his inventive faculties should have triumphed. I found him, his eyes a-glitter with enthusiasm again, working over a model mounted on his workbench.

"The greatest invention yet!" he greeted me. "I have solved the secret of the tornado. I can create one. I start a gyratory motion of the atmosphere around a central point where an ascent of warm air takes place. Once the motion is established, I increase it rapidly, exactly as nature creates a real tornado. Presently my manufactured tornado sustains itself by its own volition, just as a schoolboy's top spins. Then—and here is my triumph—I can control the speed and direction of my tornado by means of radio waves, attracting it or repelling it or holding it stationary, as I desire. Watch!"

He threw a switch on the machine, and immediately there was a low hum that grew rapidly into a shrill whine. His eyes began to glance strangely about the room and as I followed the course they took I noticed the leaves of a book begin to flutter, a card stood up on edge, the curtains began to dance, and a newspaper performed strange gymnastics, for no apparent reason. Finally he looked at me, and as he did so some force whisked my necktie up over my face for a moment.

At my look of evident astonishment the Professor laughed happily.

"You see!" he said. "It works! Here, take this bag of flour and scatter it about the room."

"Won't it make an awful mess?" I protested.

"Yes!" I shouted. "Yes! Stop it! Turn it aside or we will be destroyed!"

"Scatter it!" he insisted, and I did so.

"Has it ever occurred to you," he asked, as I poured a stream of flour about the workshop, "that a small tornado, in a tame state, would make a splendid vacuum sweeper! You could run it around the room, march it out to the garbage burner, and let it dump the rubbish there for you. Or you could harvest a field of grain with it, by using just enough force to pick the grain up and leave the straw standing, and deposit it direct into the barn or granary."

'Handy thing to have around, providing you could control it!" I agreed.

"Then again," continued the Professor, his expression changing, "Think what could be done in wartime with a battery of tornadoes, directed at will upon the enemy's country, his airships and airplanes, his battleships, his supply depots, his troops!"

There was a peculiar glitter in his eyes as he said that, and I remembered several vague rumors I had heard to the effect that the Professor had been very queer at times since being tricked out of his fortune. However, he seemed sane enough from his talk and he gave me no time for idle conjecture.

"I have solved the secret of the tornado!" he declared, indicating the model. "You scattered that flour about the room. Now I will pick it up and put it back in the sack. Stand over in that corner, hold the sack with the mouth open, and watch."

When I had done as he suggested he threw a switch, and again came that low hum that changed so rapidly to a shrill whine. He threw a handful of flour at the machine, and immediately I saw it whisked up into a small spiral funnel that gyrated above the machine, exactly resembling a miniature tornado.

"Watch closely!" he said.

At the words he did something that made the machine jerk violently, and the spiral funnel began to travel away from the machine, much as a soap bubble floats away from a pipe when a child jerks it.

"I will make my tame tornado pick up the flour you scattered," he said, manipulating some dials on a small switchboard. "I can control its speed and its direction, or I can smash it instantly, by means of radio waves. I will make it give the flour back to you."

Sure enough, as he manipulated dials and switches, the whirling spiral travelled with remarkable speed and accuracy over the places where I had scattered the flour, and in less than a minute it was whirling toward me.

"Hold the sack at arms' length!" the Professor commanded sharply.

It was fortunate that I obeyed quickly, or the whirling flour might have blinded me. The column remained stationary for a moment over the mouth of the bag, and then collapsed, dropping most of the flour into the bag.

"That is the most extraordinary thing I have ever seen!" I gasped.

"It is nothing!" the Professor deprecated. "Given certain conditions, Nature creates a tornado. I duplicate those conditions and produce the same result. The course of a natural tornado is governed by natural atmospheric conditions. By duplicating such conditions I create a course along which my tame tornado will travel. It is simple!"

No doubt it seemed simple to him with his tremendous knowledge of the science, but to me it seemed little short of a miracle.

"Have I your permission to mention this to anyone?" I asked.

His face hardened immediately. "Not a word to anyone!" he commanded. "I have hardly perfected the model. When I have done so, I shall build a machine capable of creating a full-size tornado. You shall be the first to see it in action. Now I want you to get for me. . . ."

I WILL not weary you with the details of the work that fell to my lot as Professor Crockett's assistant. Suffice it to say that for many months I supervised the making of the parts for a huge tornado machine. From factory to factory I travelled, inspecting here, checking up there, so that everything might be perfect. Then came the delivery of the parts, the construction of a foundation strong enough to resist a full-size tornado, and finally the assembling of the parts.

By the time the massive creation of fans, dynamos, and other equipment was completed and hooked up to the radio control board so that everything synchronized perfectly, the Professor had become his old cheerful self again. He seemed to be looking forward to the first trial of the huge machine as a kid looks forward to a picnic.

"Everything is ready!" he said, finally.

"Are you going to test it now?" I asked.

"It will not be necessary to test it as a whole," he said. "We have tested the various units. Every part is perfect—exact! It will work whenever I want it to."

"Is it your intention to make tornadoes by the dozen, and sell them through jobbers," I asked jocularly, "or will you just rent them out by the day or the hour? Possibly you could fix them up with cabins and use them instead of steamships for foreign travel!"

Too late I realized that my allusion to steamships was not a happy one, for his previous invention, stolen from him by his so-called friends, had been a wind-driven motor for ships. Nevertheless he still smiled.

"That reminds me!" he said. "I am going to present the first tornado to my friends over there!" He pointed toward the town, dimly seen in the distance, where the factory that had been built to produce his inventions showed faintly against the skyline.

"Present them with one!" I protested. "I think they have got enough out of you already."

I felt the conversation was bordering touchy ground now, but he still smiled genially.

"Then you don't believe in turning the other cheek? What they have secured from me by methods that were legally honest but morally dishonest, they will pay for eventually," he said. "Those who sow the wind, you know, are likely to reap the whirlwind—and what a harvest there will be!"

There was a note of triumph in his voice, but I put it down at the time to his success in building the machine.

"I have already communicated with them, and offered them a demonstration," he continued. "They demurred at coming here to witness it. Thought I might be revengeful, I suppose. I let them fix their own time and place. They are all going to meet at the factory tomorrow at noon. I am going to march a small tornado down there and back again for them. I must say they are very skeptical about my powers. By the way, I promised you should be the first to see the big machine in action. Be here tomorrow at a quarter to twelve."

I REACHED Professor Crockett's place next day a few minutes before the appointed time and watched his preparations with intense interest. Somehow, I felt this was going to be different from what I had seen. In what way I expected it to be different I did not know. Possibly it was the machine itself that gave me the impression. It stood, or rather it crouched, in a bowl-shaped pit of concrete, and with the huge antennæ arms sticking out one on each side just below the circular chamber at the top of the machine it looked for all the world like some huge sinister monster about to spring upon its prey.

The entire apparatus, bowl and all, was admirably concealed by the trees that surrounded it. The machine proper stood in the exact center of the concrete bowl. To one side, near the rim of the bowl, was the radio control board. The wiring that connected the two had been run through the concrete. In front of the control board was a sturdy metal chair, the legs of which were riveted to steel posts sunk into the concrete floor. This chair was housed in a jacket of fine-meshed wire netting woven from specially toughened steel wire, and the "jacket," once the operator was seated on the chair inside it, could be fastened up the front by an ingenious zipper arrangement.

The idea of the underground wiring, the anchored chair and the wire "jacket" was, of course, to prevent the apparatus or the operator being whisked away by the force of the manufactured tornado.

I should mention, too, that there was an old-fashioned cyclone cellar to one side of the concrete bowl, fitted with ship's portholes through which one might observe and yet be safe.

'How are you going to carry out your demonstration, Professor?" I asked, as I noticed it was almost twelve o'clock. "Alone? Or will you need my assistance?"

"Alone!" he said. "I will telephone and see if they are ready."

When he returned, he handed me a pair of long range field glasses.

"They have all arrived at the factory," he said. "They are no doubt in a very merry mood."

"Why should they be merry?" I asked.

"Because the contract I originally signed with them gave them a fifty per cent interest in all my inventions past, present or future. I understand the agreement is still valid, although I am no longer connected with them in any way. Doubtless they think I am not aware of the fact. They are probably discussing plans even now as to what they are going to do with my latest invention if it turns out all right."

"But—but surely they will not try to take this away from you. Why, they can't do anything like——"

"It was a separate agreement—nothing to do with the factory. Ah! They were clever, and I was a fool. Now I am clever, and they are fools. Come, it is time. Help me into the wire suit, and then hurry into the cyclone cellar and watch from there until I signal that it is safe to come out."

He threw switches and turned dials. In a few seconds the noise increased from a low hum to a deafening howl. The machine quivered under the strain. Even the earth beneath me seemed to tremble, and though the machine was set in a thick base of concrete I began to fear that the force of the man-made tornado would tear the whole machine away, base and all.

Even the Professor could hardly withstand the force of that suction. He was not sitting on the chair, but was lifted from it, the only thing preventing him from being sucked into that whining cone being the jacket of tough wire netting against which his body pressed. Then at last he threw the lever that jerked the tornado loose, and I could see his body flop back into the chair.

The strain on him must have been terrible. I could see little trickles of blood in some places where the terrific pressure against the netting had broken the skin. But my attention was soon diverted from Professor Crockett.

The released tornado whirled through the trees, stripping them of leaves and branches, and picking up dirt and loose stones, the whole mingled into a whirling spiral column that roared its way along uncontrolled, until suddenly the Professor recovered himself and began manipulating the radio control waves.

When he had the tornado completely under control, he beckoned me to leave the cyclone cellar, and I did so. His eyes were glued to a map drawn on the concrete floor beside him, and without looking up he said: "In the field on your right, in the far corner, there is an empty barn. I want you to watch it, and——"

"I can't see the field," I reminded him. "The trees are in the way."

Without a moment's hesitation, the tornado moved rapidly toward the right and swept a path through the trees so that nothing obstructed my view.

"Can you see the barn now?" the Professor asked.

"Quite clearly," I said.

"Very well. I cannot raise my eyes from the map and the instruments, but when I raise my hand the tornado should strike the barn. Tell me if it does."

His fingers played over the delicate controls and I watched the tornado, now a whirling black spiral, swoop toward the barn. Then, suddenly, the Professor's hand shot up, and at the same instant the barn vanished, and the spot where it had been was nothing but bare ground.

"It's gone!" I shouted excitedly. "It vanished completely as you raised your hand."

"Perfect control!" he muttered triumphantly. "Now watch the factory. All those who tricked me out of my fortune, my inventions, the work of my lifetime, are waiting in that factory for this demonstration. They will be looking out of a window in this direction, as I told them to do. They will be watching for a small tornado—but they will see a big one."

His voice—in fact, his whole body—was trembling with excitement, and as I shot a quick glance at him, I knew it was the gleam of insanity that shone from his eyes.

"The factory!" he screamed at me. "The factory. Watch the factory!"

"My God!" I shouted. "You're not going to——"

"The factory! Quick! Look!" he screamed.

A maniacal laugh issued from his lips, and as I snapped the glasses to my eyes I was just in time to see that devastating tornado swoop down upon the factory and sweep back and forwards over it. For a moment I was stunned as I saw the walls of the factory crumble before the force of that terrific suction. Too late I knew that Professor Crockett's mind actually had given way; that with the cunning of a madman he had planned and perfected this terrible method of reprisal.

They had been looking out of a window, he said. Then they must have seen that awful fate bearing down upon them. They must have realized, during their last few moments, that there was no escape for them. Caught like rats in a trap they had helped to build.

I was recalled to myself by a shrill scream.

"The factory! Is it gone?"

He must have read the awful answer in my eyes, for he burst into terrible uncontrollable laughter. Then his face suddenly cleared as a vestige of sanity returned.

"Mustn't destroy others!" he said, manipulating the dials feverishly. "I will bring it back, and them with it. They have paid now for all they took from me. They sowed the wind; they have reaped the whirlwind. Watch! Watch! Is it coming back?"

Compelling myself to keep calm I peered through the glasses again, and saw the dark whirling spiral travelling towards us at terrific speed.

"Yes!" I shouted. "Yes! Stop it! Turn it aside, or we will be destroyed!"

Feverishly he was whirling dials, pulling levers, pressing switches; but still that terrible messenger of death whirled directly towards us with undiminished speed.

"For God's sake turn it!" I shouted, but Professor Crockett simply turned toward me and smiled insanely, as he held a broken wire in his hand.

"I can't stop it!" he said. "I can't even turn it. I can't do anything with it. This wire was the most important in the whole machine. Here they come!"

A terrible roaring filled my ears. Suddenly I thought of the cyclone cellar and raced toward it, but I had waited too long. A tremendous force sucked at me and I threw myself flat on the ground.

I saw a whirling black cone descend upon the infernal tornado machine that had created it but a few seconds before. The smaller parts of the machine were whipped away so swiftly that their flight could not be followed. Massive steel bars warped and twisted under the tremendous strain as the tornado wrecked the machine beyond repair.

I experienced a sickening sensation as my fingers were torn from their hold. Suddenly the earth seemed to leap away from me. The air pressure was such that I could hardly breathe. All about me seemed dark as I whirled dizzily upward. My body was being pounded unceasingly by the objects whirling about me, until I thought I must soon be crushed to a pulp. In the state of semi-consciousness that next enveloped me it seemed that I was being sucked up in that vortex of blackness for ages. But through it all I held the memory of the last thing I had witnessed as the tornado whipped me up. I tried to believe that it had been imagination—that it could not be true. It was too horrible to be true.

THEY tell me, here at the hospital, that the tornado dropped me in a lake in a suburban park, from which I was rescued just in time.

When the tornado picked me up its force was almost spent. I can readily understand that, because the machine could no longer sustain it, and it was travelling of its own volition. It was as though, having wreaked its will on the machine that created it, its work was done. The few seconds that I fought to retain my hold on the ground must have made the difference between life and death for me; the difference between being sucked into the vortex of that devastating tornado and being whirled up on the outside fringe of the upward current.

Those who were caught by the tornado at the height of its power have never been found; not even the slightest trace of them. Even bricks and stones and mortar were crumbled to dust by that terrific force. My escape was nothing short of a miracle. Though nearly every joint in my body was dislocated, several bones were broken, and my body was one mass of bruises from head to feet, I escaped with my life, and somehow the doctors managed to pull me through.

Now they tell me I may read, and they have brought me the newspapers of the day following the terrible tragedy. I know now that what I thought I saw, as I whirled up through the air, actually happened. It was no figment of the imagination nor the hallucination of a nightmare.

Here is what the newspaper says:

> **Policemen following the trail of yesterday's devastating tornado made a weird discovery on the estate of Professor John Crockett. In a concrete bowl, in front of a wrecked machine of huge proportions, was a metal chair, riveted to steel supports sunk in the concrete. The chair was covered with a jacket of strong wire netting, and inside the jacket were the larger bones of of the skeleton of a man.**
>
> **It is possible that they are the bones of Professor Crockett, who has been missing since the tornado swept over the country yesterday.**

The paper says: "It is possible that they are the bones of Professor Crockett."

I know that they are! I saw how he died—with a smile of triumph on his face.

THE END

COMING SOON!

"Television Hill"

A new serial

by

Charles F. Locke

The Drums of Tapajos

By Capt. S. P. Meek, U. S. A.

(*Continued from page* 849)

At the door he paused and rapped sharply and called out something in Hebrew. Immediately a man wearing a robe with a black border appeared in the doorway. At the sight of Nahum, he dropped on his knees and touched his forehead to the ground.

Nahum spoke sharply, but not unkindly, to him and the man arose and backed before us into the house. As he did so I had a chance to study him. There was not the slightest doubt that he was of a different race from the wearers of the blue and yellow whom we had previously seen. His frame was short and squat and gave great evidence of physical strength, but it also suggested coarse breeding, for the wrists and ankles were heavy and the hands and feet large and awkward. He had a low forehead, showing only a narrow expanse of white between his bushy eyebrows and the heavy crop of almost kinky black hair that covered his head. His eyes were small and pig-like, his lips coarse, thick and protuberant and, while his nose was as hooked as Nahum's, it was thick and of poor shape. There was a lack of real intelligence in his expression, although there was something of low cunning in the shifty-eyed glances which he bestowed on us. I have described him at full length, for he was quite typical of all of the Bearers of Burdens whom we saw.

We followed him into the house. It was evidently hewn from solid rock and was illuminated from a source of light in the ceiling. The room was bare and plain and the only furniture consisted of four divans covered with what looked like rough canvas.

"This is his dwelling room," remarked Nahum. "A carefully measured amount of light is furnished to each room, according to the use for which it is designed. This light is regulated and is turned on and off at the proper times from a central control-station. The temperature is also controlled from a central point and the amount of illumination, heat and ultraviolet light furnished is carefully calculated to keep him and his family in maximum physical condition. The amount of water and the amount and kind of food is regulated in the same way. We had some trouble about five thousand years ago when the Bearers of Burdens started to go blind due to lack of light, but since then we have perfected our lighting system and the correct amount of ultraviolet light is transmitted together with the visible rays to keep them in perfect health. Sickness is virtually unknown. We will go into his sleeping room."

He spoke again to the man who bowed to the floor and backed before us into another room. This was equipped with a single wide divan. There was no sign of blankets or other bedclothing and I spoke to Nahum about it.

"There is no need for any," he replied. "The temperature is regulated from a central point and there is no need for bedclothing. Each Burden Bearer and each member of his family wear only a single garment similar to the robe you see on him. At night each one removes his or her robe and places it in a receptacle and puts this in a pneumatic tube. It is whisked away to a central cleaning plant, where it is cleaned and returned seven hours later, ready for wear. They sleep naturally."

He spoke again to the man who said something in reply and backed his way into another room.

"His wife and three children are in the children's room," said Nahum to us. "We will go and see them."

We entered the third room and a fat and rather shapeless woman sprang to her feet and then prostrated herself as she caught sight of the blue on our robes. The three children were about three, five, and seven years old respectively. The children, as they caught sight of us, also grovelled on the floor, the youngest clutching at its mother's robe with a wail of fear. Nahum spoke kindly to the child, but I noticed that he made no attempt to touch it. The room was equipped with three small divans.

"The three rooms and bath, which you have seen, constitute this man's dwelling," explained Nahum. "As his children grow older and it becomes necessary to separate them on account of the difference in sex, he will be given additional rooms. As his meals are prepared for him and delivered by means of pneumatic tubes, there is no need for additional space and we are strictly limited in dwelling space by the capacity of the hill. That is why we endeavor to restrict the birth rate and why, when this fails, we are forced to artificially stimulate the death rate to a point where the population is held stationary."

"You treat them as we do cattle," exclaimed Mariston.

"Hardly," replied Nahum. "Cattle are raised for food. We treat them rather like horses, useful beasts of burden, but of insufficient intelligence to govern their own actions. I do not altogether approve of it. Even as horses are being displaced in your civilization by machines, so over eighty per cent. of these could be replaced by machines and I have held for a long time that it would be better to reduce their number to a minimum. If we went too far in the matter it would amount to little for they breed very rapidly. However, there is a large section of the Council who are humanitarians and will not listen to me. Our present Master, Zephaniah, holds with them. In fact it was over a division on this very question that Amos, the present Red Master, was recalled from the Chair in the Council thirty years ago. Do you wish to see more or shall we return?"

"I've seen quite enough," replied Nankivell with a shudder.

"So have I," chorused the rest of us. For the last part of our inspection was sad enough.

End of Part II

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 WARRIOR AROUSED FROM HIS LETHARGY

Editor, AMAZING STORIES:

Aroused from my customary lethargy by the challenges to combat emanating from one John W. Campbell, Jr., I am now galloping joyously into the lists, with my visor sternly down and with my trusty pencil, sharpened to a lethal point, couched and ready for the shock of the jousting. For I hold Mr. Campbell to be a foeman worthy of the most knightly steel. His stories rank high. They are soundly thought out, well-written, logically developed, and interesting —four requirements which are simultaneously fulfilled by the works of all too few writers.

In addition to Mr. Campbell there may be other "sprightly and courteous gentlemen" who would like to splinter a lance or two—or at least a pencil point—upon my somewhat porous and decidedly pregnable armor of imagination, science, and mathematics. Therefore, mounted though I am upon a young and as yet untamed steed of ninth-magnitude forces and fourth-order rays, I shall cling to the saddle and fight with lance, mace, and halberd until my old gray head is forced to bow to a superior force. And, to descend briefly to the language of the *hoi polloi*, I expect to nibble at least a lunch off a bunch of you "Discussers" while you are gnawing a square meal off of me!

Having thus cleared the way, I shall proceed right chivalrously to insert a delicately-barbed point into what appears to be the widest chink in the armor of my present opponent. In the foreword to "Skylark Three" I did not say that I believed any of its major events probable, nor did I offer to prove them even mathematically possible. I did say, and still say, that I could not prove any of them impossible—and between those two thoughts there is a vast difference. By implication I did, and still do, challenge anyone in this tournament to prove anything in "Skylark Three" scientifically or mathematically impossible, by means of *exact* mathematics, as referred to in the "Author's Note."

I know, and admit, that there are such things as impossibilities—many of them. There are impossibilities by convention; thus, it is impossible to secure any correct answer other than six when three is multiplied by two. There are impossibilities by definition; thus, a circle cannot be a cube. There are impossibilities by observational findings; thus, it is impossible to cross the elephant with the mosquito. All too often impossibilities fully as definite as these and almost as obvious are found in so-called "scientific fiction"—some of which is really pseudo-science of a trite and stereotyped kind; and in which stupid and forced situations and illogical sequences are usually added to the defects already mentioned, to form a nauseous whole.

However, even a probability of thousands of millions to one against any event (and higher mathematics, as Mr. Campbell knows, deals usually with probabilities, and only seldom can yield an exact result) does not render that event impossible. Perhaps some of you think that I am quibbling—that such a low degree of probability should be regarded as an absolute negation. In that you are wrong. According to one widely accepted hypothesis it was through the eventuation of one exactly such hare possibility that our own solar system came into being—and that was, for us human beings at least, a highly important event. Also, it was only a few years ago that traces of iodin in the thyroid were regarded as being of no significance!

Even our axioms are getting shaky when studied in the light of present-day science. A straight line may not be—in fact, probably is not—the shortest distance between two points; and it may be possible that two bodies can occupy the same space at the same time, or that one body may be in two different places at the same time. In this connection, a great many of you probably swallowed without a qualm Edmond Hamilton's shaft ("The Other Side of the Moon") and his many other sheer and demonstrable impossibilities, and yet regarded Cloukey's stuff as the hunk. Indeed, at first glance, it might appear that Cloukey's most interesting situation—that of having one man in two different portions of space at the same time—is an impossibility of observational fact; the same as Hamilton's shaft or the mosquito-elephant hybrid. Such, however, is not the case. We understand quite well the fundamental mathematics of the relative motions of the moon and the earth, and biologists are quite well informed upon the basic principles of hybridization—whereas in a mathematical sense we can neither understand nor define either time or space. Therefore, while we must watch our stories very carefully for the types of impossibility mentioned, we can take almost any liberty conceivable with time or space without fear of unquestionable mathematical refutation. While I, personally, do not believe that the fundamental mechanism of "Paradox" is possible, yet I cannot prove it impossible—and Cloukey writes so plausibly, so ingeniously, so logically and so consistently, that each of his stories is a real treat.

Even though to say "you're another" is to employ a very weak form of argument, seldom used by persons of mental age above six, I cannot refrain from reinforcing Ye Ed, in pointing out that Mr. Campbell is a pot calling a kettle black. For while I do not say that I can prove, mathematically, that his molecular-motion drive is absolutely impossible; yet I believe that I can set up a probability against it greater than any assigned figure, however large. At least, I can state positively that any mathematics proving its possibility would be highly abstruse.

Now I shall muster a few defenses for the "Skylark." The acceleration which I applied to unshielded human bodies was one of the two impossibilities I confessed in my foreword. In extenuation I can plead only that "The Skylark of Space" was written before AMAZING STORIES appeared, and promise that I will do my best to keep such things out of my stories hereafter. As to the field of force around the dud star, Mr. Campbell cannot prove his statements, since any such proof would, of necessity, be extrapolation far beyond the limits of observational data—and it was just such extrapolation that caused the failure of the Quebec Bridge. Also, I await in scarcely controllable eagerness his proof, in detailed celestial mechanics, of the absolute impossibility of the Green System of suns and planets. Our own planets circle about the sun, and satellites circle our planets, some of them in orbits making very large angles with the ecliptic. Neither from analogy nor from my own slight knowledge of celestial mechanics and astronomy have I been able to find anything strictly impossible in the Osnomian solar system. Please remember that it was not represented as being stable, but as undergoing slow but constant shifting in orbits and in the two ecliptics. Furthermore, Mr. Campbell will note that in the derivation of the canonical equations, which underlie celestial mechanics, as well as the classical physics, certain assumptions are made, as follows: (1) A steady state, or condition of equilibrium: (2) the MOST PROBABLE configuration at that state, and (3) that it is allowable to neglect all powers of a small

(*Continued on page* 858)

Sonnet to Science

Miles J. Breuer

Thou art sweet Nature's suitor, high-browed youth;
Thou hold'st her hand, thou gazest in her eyes,
Deep orbs, where many a thrilling secret lies,
Thou Shining One, of patience, wisdom, truth.
Who says thou dost not love that splendent maid?
Dost thou not woo her, ceaselessly and aye?
Is not thy whole life hers, thy night, thy day?
And wondrous, thy devotion is repaid.
For look! She leaneth ever nearer thee!
No query thine, thy deep-eyed mistress shuns;
She does thy tasks for thee by sorcery,
By winds and levins and her thunders' guns;
She tells thee secrets of the pulsing sea,
And whispers mysteries of the distant suns.

(*Continued from page 856*)

unknown above the first in order to render possible integration in N dimensions. I ask you, fair-minded readers, do or do not these assumptions vitiate ABSOLUTE mathematical exactitude?

To save space, I must skim rapidly through several other points at issue. (1) The ammonia cooling plant did really refrigerate; the heat being absorbed by the latent heat of evaporation of the boiling cooling-water—the steam, of course, being exhausted outside the vessel. Seaton was all ready to drive the "Skylark" into the ocean to replenish his water, but it lasted until the battle was over. (2) Red paint *will* stop ultra-violet light, and that was all they wanted to do. Blue or any other kind would have done just as well, but it would not have looked like blood. See? (3) I look forward to reading "Islands of Space" with keen enjoyment, and have no intention of attacking it unless, as seems highly improbable, it contains some real impossibilities. (4) The ray screens themselves did not heat up, since they were immaterial, but actual, areas of blanketing frequencies. They did, however, radiate wavelengths corresponding to incandescent temperatures while neutralizing enemy rays. This radiation would make them appear hot, and would probably have a heating effect upon any solid near them.

Now to the mathematics in Mr. Campbell's article in the November "Discussions." The formula $E = Mc^2$ has never been proven, and in all probability never will be proven. Whether or not I believe it true does not enter into this discussion. From the standpoint of rigid mathematical accuracy—such as the statement that two plus two equals four—its underlying assumptions are as full of holes as a colander. What happens to it, Mr. Campbell, if at some future time it should be demonstrated that the structure of matter is really something like what I postulated in "Skylark Three"—a system in which the electron is itself an almost infinitely complex structure; a system in which there exist orders of rays and particles even below the level of the ether?

In this connection Eddington, Jeans, and Millikan started with the same data, and by irreproachable mathematics arrived at what conclusions? Eddington and Jeans showed that the universe is doomed to the "Heat-Death"—that is, to a state of universal motionlessness and stagnation. Millikan came to the conclusion that the universe as such is even now in a state of equilibrium—that new galaxies and suns are coming into being as the old ones die. Now, when such masters as those (each of whom have forgotten more than Mr. Campbell and myself combined ever will know) can come to two such diametrically opposed conclusions, simply by their judicious selection of equally plausible assumptions and by convenient selective neglect of mathematically negligible quantities, how is any ordinary mortal to know what to think? I would suggest that both Mr. Campbell and myself continue to stretch our imaginations as before, staying carefully within the bounds of factual and mathematical possibility, but making no effort to have our creations particularly probable.

Having, as I believe (or should I say "hope"?) neatly unhorsed Sir Campbell, yon prostrate plumed and panoplied knight of scientific disputation, I shall forthwith relapse into my wonted condition of torpor until the welkin again resounds with the call to arms.

Edward E. Smith, Ph.D.
Hillsdale, Mich.

(Dr. Smith's compendium of good humor and science makes wonderfully good reading, and we are glad to publish it at length. Our space is limited, but we hope Mr. Campbell will answer Dr. Smith and that others, who are interested will write in also.—EDITOR.)

RELATIVE MERIT OF ARTISTS

Editor, AMAZING STORIES:

This letter is going to be short, but not sweet. First, you insist on having Morey illustrate the cover, when Paul and Wesso could do it much better. Second, Morey does most of the illustrating even though the readers like Paul and Wesso the best. Third, PAUL is your Best artist, yet he does the least illustrating, why?

Thomas L. Kratzer,
3598 Tullamore Road,
University Heights, O.

(Opinions of good critics on these artists we have found to differ. If you have followed our discussions columns you will find various opinions expressed. The nearest and certainly most obvious approach to their relative popularity is to be found in these letters from readers. Many disagree with your views. Read the next letter.—EDITOR.)

ANOTHER VIEW OF THE RELATIVE MERIT OF ARTISTS

Editor, AMAZING STORIES:

The September issue was fine. The Cover, however, could have been better. Why don't you let Wesso do the covers for a change? He is much better than your other illustrators. Paul looks like a child compared to him. Morey is a little better than Paul. Give Wesso a chance and see what your other readers think about *his* cover illustrations.

"The Troglodytes" was excellent. I should like to see more from Barclay. "The Inferiority Complex" was good. All Harl Vincent's stories are excellent. "Free Energy" was no exception. "The Passing Star" was very good. Nathanson is the best new author you have. I liked "The Translation of John Forsythe" least of all. It did not hold one's interest very long. Putnam reserved his punch for the last couple of pages.

I am glad to see Otis Adelbert Kline and L. Taylor Hansen coming in the next issue. They are two good writers. But where is R. F. Starzl? He has them beat to ashes. I would like to see something by Jack Williamson. Is that booklet idea ever going to be put into operation? I am for it. Please answer that!

Gabriel Kirschner,
Box 301, Temple, Tex.

(Read the preceding letter and tell us what an unhappy editor can do about artists. As the boy remarked, "Nuff said."—EDITOR.)

APPRECIATIVE AND AMUSING COMMENT WITH A PURPOSE

Editor, AMAZING STORIES:

In April, 1926, I paid a quarter for a magazine on a subway station newsstand, principally because it contained a story by that patron saint of Scientifiction, Jules Verne. Since that date I have never missed a copy of that magazine, AMAZING STORIES. I have never had the cash on hand to subscribe, but I have always managed to have the necessary quarter. Up to the September, 1930, issue I have had 66 copies of the monthly and I think I have never missed a quarterly or an annual. I figure that I have spent about $23 altogether. If I ever get a better money's worth, I'll write you about it.

In all of your 66 issues there have, in my opinion, been only two stories as good as "Skylark Three," the "Skylark of Space" and Verne's "Journey to the Center of the Earth," which ran in the fall of 1926. I think that, other than what I have just said, it is useless to try to list the best stories you have printed. I have enjoyed nearly all of them and those which haven't appealed to me undoubtedly have been enjoyed by others. The quality of a story depends entirely on the viewpoint of the reader; among a large number of readers there must be every conceivable viewpoint; therefore, every story must have quality.

I owe a debt to AMAZING STORIES; a debt that neither $23, nor $23,000 will pay. Though that sounds a bit sentimental, it's true. AMAZING STORIES opened up for me the whole field of Scientifiction and I must say that I have plowed it pretty well. I have read all the Scientifiction I have been able to lay my hands upon, and I can say without boasting that I am about as well read as anybody in that branch of fiction. I have read everything H. G. Wells ever wrote, lots of Jules Verne, Garrett Serviss, Hyatt Verrill, and a dozen others.

Much has been said by individuals as to why they read Scientifiction, but I think that I have the best reason of all for liking it. Scientifiction is not colored by the salacity which passes for realism in most modern fiction and this quality alone is sufficient to make it popular. So "Keep the show clean" and keep the show going; there are enough decent people in this country to make Scientifiction a very popular branch of modern fiction.

Brook Webb,
127 West 11th Street, New York City

(Jules Verne has not proved to be a popular writer with our readers and we have published several of his stories. We can assure you that we will, in your words, "keep the show clean." We are closely watched by our readers, but our desires are just as strong and defined as theirs. We want, not only good science and good literature, but want it to be unexceptionable. Your "twenty-five-cent quarterly published twelve times a year" seems to fit the regular issue of AMAZING STORIES.—EDITOR.)

WE HOPE TO HAVE THIS CORRESPONDENT AS A STEADY READER OF AMAZING STORIES

Editor, AMAZING STORIES:

I am not a steady reader of your magazine, but when I read it I enjoy it immensely. I started reading AMAZING STORIES two years ago when my friend gave me a copy to read. I enjoyed the story and, therefore, I bought the next issue. Ever since then, whenever I feel blue, I purchase a copy.

In the August issue, which I have just finished, I find that "Skylark Three" is not definite enough for us readers who have not read the preceding story. Otherwise it is excellent and has skillful workmanship.

"World Atavism" was a great story except for the fact that if evolution was stopped the human race would not go backwards, but could remain as it is, never advancing.

In my opinion, "The Last War," was the best story in the whole issue. It was much more practical than the others. It should have ended in a romance or something of the sort instead of its abrupt ending.

"South Polar Beryllium Limited" was pure rotten. It did not contain even a sensible idea. The last story, "When Inca Land Revolted," was too fantastic. It looks as if a dope fiend wrote it.

But on the whole the magazine is improving. It is at last cutting down the serials to one an issue, and having mostly short stories. It shouldn't have more than three stories an issue. Altogether, I am still going to keep up reading the magazine whenever I can purchase an issue.

Sheldon H. Mendelson,
Monticello, N. Y.

(We hope you will continue to be a reader of AMAZING STORIES. Your criticisms show that you are a good reader, although we do not agree with you in your criticisms, we are glad to give them place. We wish to have our magazine taken seriously, and such letters as yours tell us that that is the case—it is commented on and criticized by serious readers.—EDITOR.)

A PLEASANT LETTER FROM A VETERAN READER

Editor, AMAZING STORIES:

I notice in the letters from readers so many calls for stories of abstract (imaginary) science, without excitement, action or plot, that I'm putting in a squawk right now for some of the other kind, to protect myself and other readers who like to have something doing once in a while. By all means print some of the actionless stories to satisfy that wing of your constituency, but let's also have some by master writers like Murray Leinster, Ray Cummings, Chas. Diffin and R. F. Starzl. It is true that you did run a story by Starzl last spring, but even that writer seemed more concerned with so-called "science" than with story interest when writing a story to sell to you. "Madness of the Dust" certainly was better than the average, but compare it with "On the Planet of Dread" and "The King of the Black Bowl" by the same writer in other magazines!

Besides Starzl, you have one other writer who consistently puts real story interest into his offerings. I refer to Dr. Breuer. "The Inferiority Complex" was good. In fact, I think if you'd only give Breuer his lead he'd do a lot more for science fiction than he is doing now, simply because your policy is too much influenced by a bunch of kids who have nothing to do but write and get their letters printed, while the grown-up reader, who only buys AMAZING STORIES for his personal amusement, and cares nothing about parading his opinions (except when thoroughly roused) has to take what is handed to him.

Come now, give a veteran reader a break!

Donald Sedge,
1136 North Church Street,
Rockford, Ill.

(We can assure you that we do not try to influence our authors except by occasionally trying to keep them in the track of science. Dr. Breuer is an author, who stands in the front rank of our writers, and we certainly would not attempt to dictate to him. His scientific standing is so high, that we use him as a critic when some story requires its correctness to be verified. But remember that this is a magazine of science and fiction blended. As regards the influence exerted on us by our correspondents their opinions lose force by being so varied—one wants one thing and another wants something else.—EDITOR.)

"The very stillness of the room was utter proof that the fiend had again been at work."

SCIENCE IN STORIES—INTERPLANETARY STORIES AND ASTRONOMY

Editor, AMAZING STORIES:

I have been a reader of AMAZING STORIES for the past three or four years and up to this time have thought a great deal both for and against your stories, but have not voiced my opinion.

There have been a lot of stories published in your magazine that did not interest me due to their lack of what might be termed a real scientific background, as I see it. I am very much interested in science myself and am always trying to pick up new theories and new ideas. I am hinting at your stories which deal with conquering new worlds, etc. When an author wants an especially death-dealing machine for offense or defense he invents a new so-called "Ray." But what I am getting at is that they never tell how this so-called Ray could possibly be made in this day and year. In some cases the Ray has been explained to my satisfaction, as in the case of heat rays and short wave radio waves. But what is this Dis-integrating Ray?

I am much more interested in the type of story that deals with an old idea in a new way or creates a new theory and shows its possibility than in these which deal with a new type of ray that no one can possibly explain the nature of, or how it could be produced.

On the other hand your stories which deal with space meet with my whole-hearted approval inasmuch as the authors give real facts concerning the study of astronomy. A story that will teach its readers something that is a known fact by experts, and will teach them in a way that they will not readily forget, is to be commended.

Also, there are the stories regarding radio and the science of electricity which are usually explained in detail, so that the average man can see their possibilities.

Hence, I merely wish to say, "Give us Scientifiction, but not Fairy Tales."

George W. Spooner,
361 North Main St.,
Barre, Vt.

(The destructive rays introduced into our story by their imaginative author are not susceptible to explanation, but you must remember that the x-rays have death and maimings to their credit, so that it is hard to say what a ray may not do in the way of destroying life. Our magazine is distinctively a magazine of fiction and unfortunately some stories contain comparatively little science, less science than would please us, and we would like to have more. We agree with what you say about our stories dealing wtih space. Some of them certainly do abound in exposition of the laws of nature.—EDITOR.)

ORDER OF MERIT OF STORIES IN OUR JANUARY ISSUE

Editor, AMAZING STORIES:

It seems to me that I have always had an inclination and liking for the unusual, the unique and the imaginative.

Before the introduction of your incomparable monthly magazine of science fiction to the reading public, I had avidly devoured anything savoring of science fiction. My first efforts in this direction was the reading, amassing and rereading of Edgar Rice Burroughs' novels. Then in swift sequence followed Jules Verne, H. G. Wells and H. Rider Haggard classics.

As these became exhausted I turned my attention to your magazine and am now a subscriber to both AMAZING STORIES and AMAZING STORIES QUARTERLY.

In the January AMAZING STORIES I will arrange the stories in this order:

A—Excellent. Beyond the Green Prism. The Sword and the Atopen.

B—Good. When the Atoms Failed. The First Ornithoper.

C—Average. Fourth-Dimensional Space Penetrator.

D—Poor. The Corpse that Lived. The Hungry Guinea-Pig.

Julius Unger,
786 Blake Ave.,
Brooklyn, New York.

(This very short letter tells a good deal. It is interesting to see how a reader can follow a definite course of topics for so many years. At least, we presume that it was many years in your case. We are using every effort to make AMAZING STORIES good and in spite of brickbats and uncomplimentary criticisms, we are being continually encouraged.—EDITOR.)

FIRING A RIFLE ON A MOVING TRAIN

Editor, AMAZING STORIES:

I have read a little article in discussions column in the November issue, about the action of a bullet fired from a rifle on a moving train, in which I have found a slight error.

It was said that if two men were standing on top of a moving train 50 feet apart, and the rear man had a rifle, which he fired at the man in front of him, it certainly would be too bad for the man in front. You said, that the bullet would leave the rifle at the rate of 2700 feet per second, plus the speed of the train, the velocity of the bullet would amount to over 2700 feet per second. Is it true that the bullet would pass over that much ground in that second, or does the bullet detach itself from the influence of that moving train, and become influenced by some other body or mass of matter? Or does the speed of the train really help the bullet cover more ground, in relation to the earth, or some stationary object on the earth, or is it the same, as if fired from the ground, at an object on the ground.

I mean that a bullet fired from a moving train would cover the same distance (2700 ft.). If that train was 2700 feet long, this bullet would cover that distance, slightly retarded by wind resistance in relation to the train, but it would increase the amount covered, in relation to the earth, if the train was moving.

Well, I would say this, the relation of the bullet to the train is the same as the relation of the moving train to the revolving earth. The only speed derived, would be that of the force of the powder on the bullet, that is, if fired from the moving train at an object on that same moving train.

The man in front, fired upon from the man in the rear, would get hit with an impact of 2700 feet per second, the same as if both men were standing on the ground.

But if the rifle man stood on the ground and fired at the man on the train, why he would hit him with less than the velocity of the bullet.

On the other hand, if the rifle man stood on top of the moving train and shot the standing man, the man on the ground would get hit by an impact of 2700 feet per second, plus the speed of the train, if he was in front of it.

I hope that is clear.

Nick Sichak,
1203 Floyd Avenue,
Richmond, Va.

(The proposition of the bullet fired from a moving train is quite simple and we think that it is covered very well by your explanation. It is surprising how often this question comes up. If the bullet is fired in the direction the plane is moving the speed of the train will be added to its velocity. If fired in the other direction, the velocity of the train would be subtracted from its velocity. We do not approve throwing things from train windows, but if you do throw anything out and watch it, it is quite interesting to see how it travels along with the train until it reaches the ground. In ballistics of guns, when shrapnel explodes, it is calculated that an additional speed of 250 feet per second is added to the bullets. This is like the rifle discharge in the direction the train is moving.—EDITOR.)

FROM THE LAND OF THE MAORIS

Editor, AMAZING STORIES:

As a regular reader of your magazine I would like to offer some honest criticism.

In my opinion the magazine is in danger of losing its prestige so deservingly won in the past. This danger arises from the fact that a marked tendency towards the common fiction type of story has made itself felt of late. There is scarcely a story which hasn't some "sex interest" stuffed into it. And when one considers the vast number of common fiction periodicals which flood the market and the superabundance of cheap "yellow backs" which delight Jack and Sue, it is very difficult to find any legitimate reason for the contamination of a scientific journal by the introduction of Sex Matter. As an example: "Callisto at War." An excellent story—a classic of its kind. But why, amid the narration of such colossal happenings, the introduction of Lola and the absurd dough-boy Eddie? The jargon relative to this precious dough-boy might well please the "yellow-back" reader, but surely, sir, you are catering to a different class. The same censure can be brought against "Lanterns of God." In fact, as I intimated at the opening of this letter, it is now the common tendency to flavor all stories with "Sex" and the situations are not even logical. I do not think it probable that a Callistonian Princess would wed a dough-boy Eddie.

And apart from the effect of the introduction of "Sex" stuff, there is another matter directly relative to your publication which merits your attention and consideration. It is most noticeable that all chief characters introduced into your stories are *Americans*, all interplanetary operations carried out are so done from U. S. A. cities. Now sir, while we are only too well prepared to applaud your people, and they have some fine characteristics, we are all the same time mindful of the great European powers. What about the German Empire? What about Great Britain? It must be apparent to you that the people of the U. S. A. are blamed for egotism and your periodical most certainly warrants that assumption. It may seem that I am touching upon a matter which is not relative to the criticism of a periodical, but when your authors set themselves to depict futuristic events, they should at least reckon with the fact that Great Britain may still be dominant and that Germany may be a power able to make her influence felt in a conflict of planets. It is pardonable to call to mind the fact that we are still master of the sea, and when it comes to air or sky prestige, well U. S. A. will not have things all on the soft, so when writing of the future, would it not be as well to write from a foundation of present day prestige and not let the wish be altogether father of the thought?

I shall continue reading your periodical in the trust that my criticism may bear print in the shape of preserving its well merited prestige which thus stands in danger through a too ready leaning to common fiction.

E. R. Kirby,
Willis St.,
Wellington, N. Zealand.

(The Germans after the War sunk the surrendered fleet in Scapa Flow an action certainly more patriotic than ethical. If all the nations of the earth would take their warships out to the ocean and sink them in good deep water we think it would be an excellent thing for humanity. We think you will find very little about international relations in our stories and as they are written by few except American authors there naturally is a touch of United States in them. We have published some stories bearing on Russia but have avoided internationalism. We wish we could hear more on the subject of this letter from our readers.—EDITOR.)

RE REPRINT IN BOOK FORM: INTERNAL COMBUSTION ENGINES, SPRING, '30

Editor, AMAZING STORIES:

The August issue of AMAZING STORIES just to hand and much enjoyed indeed. I note my letter published in the same. As and If some of the readers object to reprints, why not publish reprints in book form only, so anyone desiring may purchase the same and no one will have any objections *re* reprints in current issue of the AMAZING STORIES.

Have you a complete list of all of Jules Verne's books? "The Fur Country," was a story of the Canadian North, was it not? One book told of a high tower built and a large gun to Fire on Paris, another told us of Movies and Radio long before they were a fact. I think I mentioned the names of the last two in a prior letter.

Do you think you are entirely correct *re* Internal Combustion prior to and external of the working cylinders? Heat is a question of temperature, therefore, can not any given degree be retained? Liquid air temperature is retained under Specific Conditions Pro Tem. What is impossible?

Yours truly,
Walker Hodgson,
Melville, Sask., Canada.

(You can get the complete list of Jules Verne's books in any good library. Your reference about internal combustion is not perfectly clear. You should tell us what particular article you refer to, giving us the number of the issue and the page. The temperature of liquid air is in a sense retained because the evaporation, especially that of the nitrogen, keeps the temperature low. Of course, any given degree of heat can be retained if proper methods are taken and if the substance in question is a permanent one and is not evaporating or otherwise changing its state or condition. —EDITOR.)

A LETTER OF MANY SUGGESTIONS FOR THE EDITORIAL STAFF

Editor, AMAZING STORIES:

Your recent efforts have earned another letter from me. The most notable feature of your work being bringing the illustrations back to the Paul standard. Wesso is very good. He is not so good at landscapes as Paul (take a look at the cover illustration for the story, "The Beetle Experiment"). In my opinion that was the best cover ever put on AMAZING STORIES either MONTHLY or QUARTERLY and I have had them all. To get to facts, Wesso is better than Paul at human beings, so they rank about the same. A totally different style, of course, takes a little time to get used to. Morey is good, too, but has not had enough work published to compare him with Wesso and Paul. Frankly I do not know what to think about Mackay, Dean, Briggs and Hynd and Wallitt. Mackay's cover picture for Verne's "Desert of Ice" was very good.

There is one point I would like you to consider when deciding whether a certain story is suitable for AMAZING STORIES. I never saw it or heard it expressed this way, so listen. We, the readers, want fiction with a scientific background. I think in the preceding sentence you will find why a great many stories with fine original thinking and ideas fail to go over big. Also, in that sentence you will see why Burroughs, Serviss, Cummings and others are so popular, while stories like "The City of Eric," some of Verne's stories, some of H. G. Wells' and E. A. Poe's stories are not so popular.

Regarding reprints, I want them.

Regarding serials, I want one to begin in the same issue the preceding one ends. The novels I believe get ten votes of popularity for every one that short stories get. I am not against the short story, but it is harder to write a science fiction short story than a long one so that it does not have more detail than plot.

Regarding illustrations, I would rather have two half-page illustrations than one whole-page one, any day. About one illustration for every ten pages of text is about right. Regarding stories, the last QUARTERLY was the best one yet. "The Bridge of Light" was easily Verrill's masterpiece. The MONTHLY continues to keep up its literary standard.

Regarding quality of paper, I would like to see the MONTHLY and QUARTERLY with cover paper like that used in August, September and October, 1928. At present the cover paper is too thin for the paper inside. The above-mentioned copies which I have are still in as good condition as the average magazine on a newsstand, while the thinner covered ones are frequently torn before they are all read.

I prefer serials and stories taking fifteen pages or more to the shorter stories. Also I think that a serial should begin in the same issue in which the preceding one ends. If this is done more long stories can be used. I am in favor of using Verne's stories as fast as possible, because they will get too old if not printed faster than lately. After Verne print Wells. Why do you not in the QUARTERLY alternate reprints with new novels? Print a new novel and a reprint short story in one issue and a reprint novel and new short stories in the next.

Another matter needs a few remarks. Many people write in and ask for sequels for this or that story. This they should not do, nor should editors ever ask an author to write a sequel to a story. I will tell you why. If an author is required by the publishers or urged to write a sequel to a story, either because the editors think it will go big or because the readers seem to want it, the chances are small that the sequel will be as good as the original story. On the other hand if the author (who should read readers' letters published in the magazine) sees that his or her story is praised, and if he gets another inspiration (for every good story which stands out comes from an inspiration) and decides himself or herself to write a sequel, that's O.K.

I have no inclination to criticize any of the authors or stories. That is all this time.

Donald Coveyou,
R. F. D., No. 3, Box 96,
Petrskey, Mich.

(This letter speaks for itself, and we are very glad indeed to get such correspondence from thinking readers. It is indirectly flattering even if it is of the scolding type, because it shows that interest is taken in our magazine. If you will look through our Discussions Columns, you will find many objections to the very things you wish. So you can imagine the condition of an editor who wants to please everybody and who begins to think that it is absolutely impossible to do so. We are

definitely sure that we have the best artists that AMAZING STORIES ever had. And when we try new people from time to time we feel a real satisfaction in coming back to the old. Bob Dean in his specialties was excellent, but his specialties were not ours. Some of Mackay's work was very fine. Most of our work is now being done by three artists, all of high type and of substantially equal merit. You will see our position about reprints stated several times in these columns. We cannot well give many of them in view of excellent original matter which we have awaiting publication.—Editor.)

"INTO THE GREEN PRISM" COMMENTED ON

Editor, AMAZING STORIES:

I have never written before, although I am a constant reader of AMAZING STORIES. I am writing now because I noticed in the "Discussions" column the suggestion that you have a "Science Correspondence Club" and I wish to second that motion. There are many questions about science that I would like to ask some one. The letter that Robt. F. Oliver wrote about the story "Into the Green Prism" and your answer, started me thinking. He suggested people of such gigantic size that we couldn't see them. You did not understand why the telescope did not bring them in view. The way I understand Mr. Verrill's story was that those little people were on an atom, and as atoms and electrons are in a molecule, they seem to constitute a tiny universe of their own. The full-size human walking over them would walk on millions of molecules besides their own. Also, as the molecule is their universe, their atom is their world. The ordinary human would be walking over millions of universes. The best of our microscopes do not show people on the atoms. So can you expect our telescopes to show people walking on millions of our universes? When we are only a tiny spot on our earth our atom-in only one of those universes?

I did not care for the "English at the North Pole"; too stale, nothing different in it. "The Flying Fool" I did not care for; many people have queer dreams. Nor did I like the "Secret Kingdom." I can't say just why I didn't like it. Perhaps I was too dense to understand.

I liked "The Baby on Neptune," though I couldn't quite understand why they couldn't describe their bodies if they had developed an interplanetary code to the perfection they had it. AMAZING STORIES is about the only magazine I read. The only fault is that one issue lasts me only an evening.

Marshall N. Robbins,
Box 1309, Rochester, N. H.

(Your letter is indirectly flattering because it shows that you are reading our magazine in a critical spirit and such letters as yours, we think, may have a good effect on our authors. Mr. Verrill is a very distinguished archeologist and will find [illegible] of his stories, Moon," by H. G. Wells; "The Mad Planet" and "The Red Dust," by Murray Leinster; "Beyond the Pole," by A. Hyatt Verrill; "Explorers of Callisto" and "Callisto at War," by Harl Vincent; "The Green Girl," by Jack Williamson; "When the Atoms Failed," by John W. Campbell, Jr.; "Vampires of the Desert," by A. Hyatt Verrill; "The Sixth Glacier," by Marius; "War of the Planets," by Harl Vincent; "The World at Bay," by B. and Geo. C. Wallis; "The Menace of Mars," by Clare W. Harris, "The Skylark of Space," by Edward Elmer Smith; "Armageddon 2419," by Philip Francis Nowlan; "The Sunken World," by Stanley A. Coblentz; "Vandals from the Moon," by Marius; "The Golden Girl of Munan," by Harl Vincent; "The Comet Doom," by Edmond Hamilton.

There are, of course, many other fine stories but I believe these are the cream of the crop.

I have been saving my copies since I first started reading AMAZING STORIES and although some copies have been lost I know that many AMAZING STORIES readers would be glad of the chance of reading these stories. Anyone who is interested can write me.

Rufus E. Bowland, Jr.,
1208 Overton St.,
Old Hickory, Tenn.

(It is interesting for us to look over the list of authors which you give with the titles of their stories, as we find so many of them are still with us and we have every reason to believe will remain with the magazine. Garrett P. Serviss, however, is dead.—EDITOR.)

"THE ICE MAN" APPROVED OF AND A GOOD WORD FOR THE RISING GENERATION

Editor, AMAZING STORIES:

On reading Mr. Bridgeford's very curious letter in the June issue, I was rather surprised. As a father of two daughters, whose P. H. S. ratings are 98.7 and 100+, scholarship averages .93 and .88, I feel fairly fit to answer his challenge to fathers.

My answer is: I would far sooner have my daughters read stories like "The Ice Man" than half the stories in say, *Cosmopolitan* or *Saturday Evening Post.* And as to these, they are decent on the whole. Moreover, I cannot see why the candid statement of normal Old Roman reaction to modern conditions is in any sense offensive to a sane person of modern viewpoint. It might prove so to a mind of psychopathic, prurient type.

But to a modern youth, fully in harmony with the vastly cleaner ideals of the rising generation, the truly scientific candor of the Old Roman's reactions would not and could not be corrupting. The clean, candid "teensters" of today would only note the differing viewpoints. It takes the prudish mind of the "nineties" to see immorality [illegible] Mr. Bridge-

A LETTER OF FRIENDLY CRITICISM

Editor, AMAZING STORIES:

Sometimes you ask for some criticism. Well, here it comes.

First of all your illustrators, you have only two who deserve the space they use; they are Wesso and Morey. The others need experience.

Second, some of your correspondents are beginning to think that "Discussions" is a reserved section for only a few. How do I know? I only need to ask some and here is what they say, "I have written many letters, but it seems as if only a few have a right in the 'Discussions' section."

Third, please quit putting in unscientific stories. If I wanted that kind of a story I wouldn't buy "A. S." Stories like "The Feathered Detective," "The Secret Kingdom," "English at the North Pole," "A Twentieth Century Homunculus," etc., etc., are very much out of place in A. S. Please don't get me wrong. The stories are all right, but they don't belong in a scientific magazine. Stories like "The Moon Woman," "A Man from Space," "Rhythm," etc., need a little pep to make them interesting. On the other hand, we have stories such as "The Skylark of Space," "When the Atoms Failed," "The Metal Horde," etc., which are written up in such a manner that I have reread them many times. "The Skylark of Space," which is my favorite, I have read almost fifty times.

Now that I have gotten rid of the necessary criticism I can tell you what I think of A. S. as a whole. The issues are well balanced with both short and long stories and with different plots and settings. The "Magazine" is improving right along and keeping ahead of some of the others.

Herman Snyder,
410 5th St.,
Portland, Oregon

(If you will look over our recent issues, you will find that the two artists that you like have been doing the great majority of our work with a certain amount of assistance from Paul, who is a great favorite of many of our readers, and it is our readers whom we wish to please. There is no question of right in the "Discussions Columns." We use fine type, do not abbreviate letters except in very few cases, and squeeze in what we can, whether they express approval or disapproval of our work. Our stories are all scientific, although they vary naturally in the depth to which they penetrate. We certainly appreciate the kind expressions toward the end of your letter.—EDITOR.)

TRAVELING FASTER THAN LIGHT

Editor, AMAZING STORIES:

May I enter a few words of appreciation for your magazine? Thanks. From the title, we find that the contents are "amazing stories," therefore why should they not be what they were to be? I have yet to find one that was not amazing. If the text itself was not amazing, the fallacies contained supplied that need, so why [illegible] I would [illegible]

was fine—a better serial than "The Green Girl." I like those interplanetary tales. So much for commendatory criticism. Now for a bit of adverse criticism.

I believe that your illustrator made a mistake when he drew the picture of a steam yacht at the beginning of the story in the June issue, entitled, "The Non-Gravitational Vortex." At the beginning of Chapter 2, the following sentence appears: "To him, life began with the hour of his recovery aboard the Loch Lovern, Sir Esme's ocean-going yacht, a splendid five-masted bark, for Sir Esme was a true sailer, and had no use for steam," and yet on the cover of your magazine appears a picture of a fine steam-yacht, with the name of "Loch Lovern" on its bow!

I think that the "Feathered Detective" was out of place in AMAZING STORIES as there was little science contained in it.

In closing, let me offer my best wishes for the future success of your magazine.

Some of my chums say that you do not publish letters from "kids," but only from scientists or adults. They say that your magazine is not a "kid's magazine." Is that true?

Lawrence Hall,
286 Nelson Street,
Sarnia, Ont., Canada.

(What is a poor editor to do? Read the letter immediately preceding this and see how different people feel and see if you can find any way in which we can please all our readers. You are not the only correspondent who has brought up the blunder in the drawing of the steam yacht. We are very glad, indeed, to publish letters from our young readers.—EDITOR.)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUG. 24, 1912, OF AMAZING STORIES, published monthly at Jamaica, N. Y., for October 1st, 1930.

State of New York, } ss.
County of New York. }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. T. Van Zile, who, having been duly sworn according to law, deposes and says that he is the President of the AMAZING STORIES and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Radio-Science Publications, Inc., 381 Fourth Avenue, New York City; Editor, T. O'Conor Sloane, Ph.D., 381 Fourth Avenue, New York City; Managing Editor, Miriam Bourne, 381 Fourth Avenue, New York City; Business Managers, none.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent. or more of total amount [illegible]

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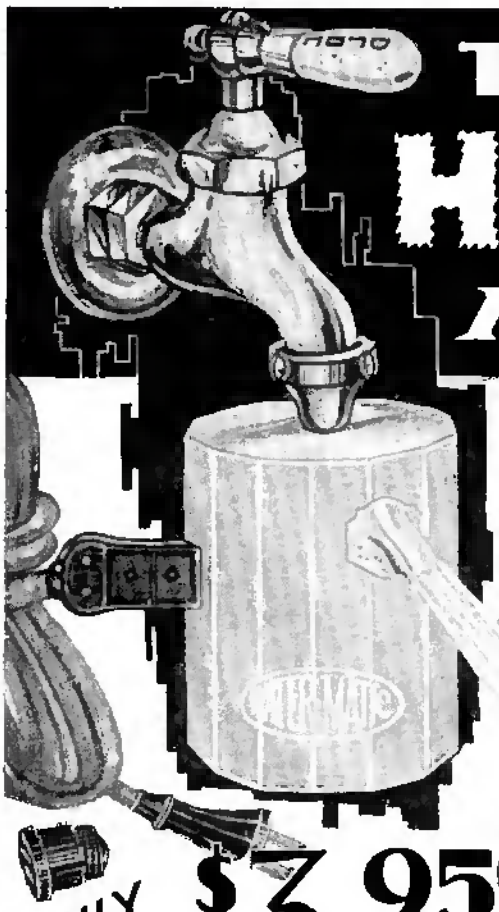

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