MARVEL SCIENCE STORIES

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THIS MAGAZINE CONTAINS NEW STORIES ONLY

Vol. 1, No. 3 GREAT SUPER-SCIENCE NOVEL *February, 1939*

This Month's Cover:

S-f fans clamored for a cover by Paul, and we brought him back to science fiction, after several years' absence, to do the November MARVEL cover. More recantly wa've baen receiving insistent demands for a cover by s-f's favorite black-and-white artist—and we engaged the inimitable Wesso to depict a thrilling scena from Jack Williamson's book-length novel, "After World's End."

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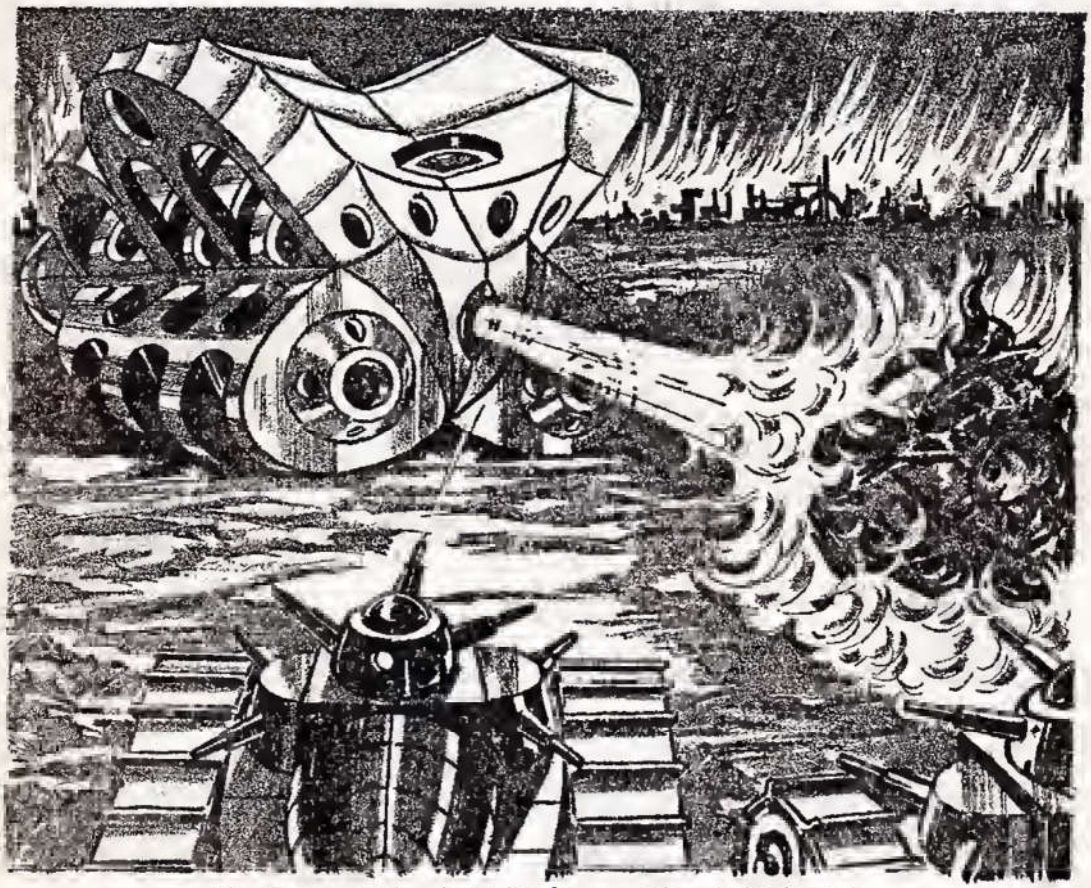
DID ORSON WELLES' RADIO PRESENTATION OF H. G. WELLS' "WAR OF THE WORLDS" TERRORIZE YOU? IT DIDN'T EVEN EXCITE US—FOR WE'D JUST READ THE ORIGINAL MS. OF THIS THRILLING, TIMELY NOVELETTE!

THE SECOND MOON

By R. R. WINTERBOTHAM

Had his questings into astro-physical space doomed mankind? Was Roger Sage to blame for this annihilating scourge of flaming meteors?



The flame scored a direct hit, leaving only a twisted wreck

CHAPTER I

STACCATO BARKS and crackles, rumbling booms and sharp bangs dinned through the day—July 4, 1976—as the United States celebrated her second century of independence.

There were fire laws, traffic laws, life guards and parachutes to protect the celebrators, yet the usual penalties were drawn from those who used fireworks, motor cars, bathing beaches and airplanes. One hundred and seventy-five million people in the fifty states of the Union—including the two new ones, big Alaska and little Hawaii—touched the fuse and let 'er buck, or cut the rope and let 'er explode, according to individual inclinations.

Europe, profoundly grave as nations stood heroically—in the estimation of each—amid an international crisis, tried to decide whether the time had arrived for another war. Inhabitants of European nations, poised for war, had time for a sidelong glance of non-comprehensive wonder at America's wanton bloodshed. Then, while Europe went to bed shaking its head, America settled down for an afternoon of popcorn, peanuts, baseball and firecrackers. Night fell in America and skyrockets swished to the heavens.

It was a gala Fourth of July.

Revelers from Parisian cafes, not knowing when the next war would start, had been making the best of it. It was shortly before dawn as these revelers were starting home in the traditional nondescript taxis of France when the heavens blazed forth with a display of fireworks *a la* American.

Monsieur F. Billiones, astronomer of the Academy, was aroused from a sound slumber by the jangling of his telephone.

"Pardonez moi, M'sieur," came a voice, scented—even over the telephone, it seemed—strongly with *creme de menthe,* "your stars are behaving rather badly tonight. Or are we at war again?"

M. Billiones roundly upbraided the sleep disturber and hung up his telephone. Then, as he was about to return once more to bed, he glanced from his window.

"Mon Dieu!" he exclaimed, excitedly. "It was not *le liqueurs de Paris!* The meteors! The greatest shower since the Nineteenth Century!"

Balls of fire, trailing tails miles long were plaiding the heavens. Trembling with excitement, M. Billiones feverishly sat for forty-five minutes trying to plot the exact spot in the heavens from which the shooting stars came. In America they had machines that took pictures through a revolving fan that cut the trails of meteors twenty times per second, measuring their speed of flight. Several synchronized machines, placed miles apart, could give the exact location of the source of a meteor shower. But M. Billiones had no such machine. The wealth of France, invested in war machines, could contribute nothing for astronomical purposes.

Then the sun rose in the east to spoil the labors of the scientist.

"The source must be directly overhead. If there were only an hour or so more of night—" M. Billiones paused. "Why of course! America! *Mais oui!* It is still night there."

The scientist thumbed through his files. He had the address of a young American who lived somewhere in the Mississippi valley, who had caused a stir in astronomical circles with a new theory on the origin of the solar system, involving a new phase of energy. The theory was calculated to replace the insufficient nebular hypothesis and the unwieldly star-collision guesswork.

This young American—his name was Roger Sage—had discovered a constant of mechanics now termed the Sage constant. Its mathematical value was .00000537, which had certain relationships with the speed of light, 186,000 miles per second; the FitzGerald contraction, and gravitation.*

Sage considered the repellent force of the sun's light sufficient at certain times to throw off clouds of highly ionized vapor, such as exist in the photosphere of the sun. Similar action is observed in the formation of comet's tails. The thinner the gas, the greater distance the cloud will be thrown. Intricate calculations show tidal and energetic forces which cause condensation

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*Although only a few mathematicians are capable of wading through Sage's profound equations, Sage explained some of the simple phases of his discovery in a popular paper, published shortly after 1970 in *L'Apparitor Scientifique,* a Parisian mathematical journal. This paper probably first drew M. Billiones' attention to the young American. The paper compared the Sage constant of universal structure and other astrophysical constants. Sage pointed to the very close relationship of his own constant with the speed of light. Multiply the Sage constant, .00000537, by any given speed expressed in miles per second. The result will give the percentage of that speed to the speed of light. For instance, the percentage of ten miles per second to the speed of light will be 10 × .00000537 = .0000537.

of the gas to form planets and other solar satellites. The theory accounted for four planets of high density near the sun, and four other large planets of low density far from the sun. It did not account for Pluto, which was considered by Sage as an interstellar wanderer captured by the solar system and held as a planet. The high eccentricity of Pluto's orbit also bore out this explanation.

The theory, through quite involved methods of mathematics, also accounted for comets, asteroids, rings of Saturn and the moons of each planet, with the exception of the Earth. In the case of the Earth Sage showed that there should have been two moons, one comparable with the Earth in size and the other about the size of the existing satellite. This bothersome point tended to disprove the entire theory, because everyone knew the Earth had only one moon.

What had become of the other? Sage declared that there were two explanations: The first, that the second moon had been destroyed; the second, that the second moon was yet to be created. Like many men of science, Roger Sage had overlooked one point in his calculations. Neither explanation was correct, or entirely correct at that time.

M. Billiones was one of the scientists who had bitterly attacked young Sage's calculations. He had joined forces with other jealous European scientists who declared that nothing of scientific importance could come from savage America. It was in the form of a jealous hope that led Billiones to communicate with Sage regarding the meteors.

"How will the Sage constant deal with the meteors?" mused Billiones. "If it can account for a non-existent moon, surely it can account for meteors one can see."

BILLIONES grinned as he hoped that the simple little shooting stars would upset the theory that had caused this young upstart to steal the laurels of astrophysical philosophy from the whitened temples of the older men of science.

Without regard for cable tolls, M. Billiones wired Sage:

"We of France congratulate you of the United States. We hope the heavens may show an equal interest on July 14, 1989, the bicentennial of our nation's day of liberty. May it please you to fit the meteor shower, which now is celebrating your bicentennial, into your Sage constant hypothesis? F. Billiones, A. S."

It was not yet eleven o'clock at night when Sage received the message. There were six hours of time difference between his locale on Earth and that of Paris. He looked out of his window, to the west of his vine covered cottage. He saw the meteors flashing in the sky. He shook his head sadly. Meteors visible in Paris should not be visible in the United States, unless the Earth was plowing through a vast swarm. His calculations accounted for no such swarm at the present spot in which the Earth stood in its travel around the sun.

Something at last had been found that failed to hinge upon the elementary structure of Roger Sage's mathematical equations.

CHAPTER II

Science Under Fire

SUSAN THAYER spun her roadster up the cinder drive toward Roger Sage's cottage. It was unconventional for a young woman to call upon a young man—even her fiancé—at such a late hour. But she had observed the meteors. She sensed that

something was wrong with the universe; that something did not jibe with her sweetheart's theory. Roger would be deep in calculations, sweating over figures and arming himself to ward off the assault on his theory that was sure to greet him the following day. Too many scientists, especially that European clique led by Monsieur F. Billiones, would cheer at Roger's downfall.

Susan found Roger standing in his garden, looking upward into the heavens. He was not studying figures, only looking, seeing and sighing. His shoulders drooped in dejection. At the sound of her car he turned and watched her step from the machine.

"Hello, Susan," he said, with a wan smile.

"You've noticed them, I see," she answered. "Have you accounted for them? Do you know what they are?"

Roger sadly shook his head. "There's no use trying to fit them into the theory, Susan," he replied. "This is something unaccountable. They might come from outside space, but they would have been noticed before this. I'm afraid there will be one attack tomorrow I can't answer. Already I have received a cable from Monsieur Billiones in Paris. I've communicated with him and found that his calculations show the source to be a point directly over Paris. They appear to be coming from a similar point here. Ninety degrees of longitude should make some difference in the point of origin, should it not? Yet, there are the facts."

"But, Roger, your theory must account for them, somewhere. Have you taken up the energy phases? The meteors may not be solid. They may be manifestations of condensed solar energy."

Roger started. Susan had touched upon a delicate point in his theory, for, as yet, the world had not been fully informed of the power in hyperga, the new energy type discovered by Roger Sage. He had developed it from experiments in radio. But Hyperga was different from radio. Radio beams of different wave lengths do not interfere with one another, except when the wave lengths are nearly the same, in which case a "beat" can be heard in a receiver. In the case of Hyperga waves, beats occur in many phases. Two widely separated wave lengths can produce beats, and in these beats Roger Sage discovered power that could shake mountains. By multiplying the beats he could build up a tremendous vibratory force. This force could be used to destroy matter. Then, by using a process of cutting down—dividing the beats—he could create energy far in excess of that used to produce the waves.

Roger at this point felt himself on the verge of a great discovery. Was it possible to *create* energy? If it were, the discovery would shake the foundations of science. Energy might be obtained at the cost of other forms of energy; or through the destruction of matter. But creation from nothing was against laws of physics.

"If my energy calculations are the explanation of the meteors, Susan," spoke Roger, "I prefer to be discredited. Hyperga is too powerful a weapon in war to be placed at the disposal of mankind."

"Perhaps the meteors are an optical illusion. The aurora, perhaps?"

Sage shook his head. "It is all perhaps, but hardly true. They are something not of the world that are striking the Earth. That M. Billiones and myself should see the phenomena directly overhead at two widely separated points on Earth is a clue. From this I must work toward a solution. But there may be things that cannot be explained without publicizing my hyperga discovery."

ROGER turned and went to his cottage. For several minutes he sat at his teletypewriter notifying observatories throughout the nation. In a few minutes came the replies.

The Harvard observatory scientists had been among the first to be notified. They had sat for two hours with eyes glued to their instruments. Their meteor tracing equipment placed the source directly overhead at Cambridge. At Mt. Palamar in California, scientists also reported the shower directly overhead.

Morning newspapers were going to press over the nation with headlines, eclipsing the tabulations of the Fourth of July death toll and the pending war scare in Europe, reporting:

FIREBALLS BAFFLE SCIENCE.

Across the seas came reports from Japanese astronomers in Tokyo. There too the meteors had been seen, but there was a slight divergence in the usual manifestation. While the meteors had appeared from directly overhead they all seemed now to be moving in one direction, toward the west.

At Vladivostok one Russian scientist observed them and wired Moscow:

"Meteors arising overhead are converging, like inverted funnel, toward the west."

Across Siberia the fiery trail was followed. It drew more to a point. It passed over the Russian steppes then suddenly vanished over the border of barren Estarkia, the militaristic, dictator ridden monarchy of the Balkans. When last seen by Soviet astronomers the train seemingly was converging on a single point within the borders of Estarkia.

Science sometimes is cautious and other times incautious with its beliefs. There are too many horrible examples of public ridicule and even martyrdom of scientists who have believed without reserve and who spoke without tact. Pasteur was ridiculed by medical men of his day. Bruno was burned at the stake and Galileo escaped a similar fate only by denouncing his discoveries. The Wright brothers were forced to carry on their experiments in flying in secret at Kitty Hawk because of public ridicule of the idea that a machine could fly. Learned men scoffed at Columbus when the navigator said the world was round.

On the other hand, established science is too likely to consider its theories unshakable. The men who ridiculed Pasteur, Bruno, Galileo, the Wright brothers and Columbus lived to be ridiculed because they had been too incautious.

Monsieur Billiones, while he placed himself in the position of the scoffers when he assailed young Sage, was unwilling to become one of the scoffed by advancing his own theory.

"We don't know the explanation of the meteors as yet," he announced to a horde of Parisian journalists who stormed his door soon after he had cabled his last message to Roger Sage. "Speaking for myself, I am quite sure there is a logical explanation concerning the meteors and I am positive the explanation will discredit that young American, M. Sage, to the credit of European scientists. But until the facts are assembled there can be no definite announcement. Science must be cautious and exact, you know."

As cautious as M. Billiones asserted he was, Parisian newspapers were cocksure that the laurels of science would go to Europe and not to America when the explanation came. Monsieur Roger Sage in America was sadly befuddled, said the Parisian gazettes. M. Billiones felt he was on the right track and expected to announce his discoveries shortly.

In America, Sage locked himself in his laboratory, built near his cottage.

He was not at home to reporters until late in the afternoon. Then Susan unlocked the door and invited the journalists inside.

"Gentlemen," said Roger, "I am taking a responsibility on my shoulders that may destroy my career as a scientist. I am about to make a public assertion that will challenge my standing as an astrophysicist. I have prepared a written statement to prevent my being misquoted. If there is anything you wish to know, call me at any time, day or night, and I will gladly elucidate what I have written. Beyond that I can tell you nothing. There are things I dare not reveal."

EAGERLY the reporters accepted the slips of paper passed out by Susan. Then Sage slowly read his statement aloud:

"I am making this public announcement because I feel that the world of science is faced with an emergency. Upon science rests the responsibility of warning the world of an ominous threat to the peace of that world. Nations must prepare for the greatest crisis in history. Europe must forego its petty squabbles and unite with America to repel a menace.

"I believed, last night, when I first saw the streaks of fire in the heavens, that I was witnessing a spectacular meteoric display. The fireballs, as you called them, looked like meteors and there the analogy ended. They did not act like meteors. Reports from other parts of the world convinced me that no meteor shower could have hit the Earth from a spot directly overhead at any point on the Earth.

"Every observer who saw the shower, in Europe, Africa, North and South America, reported that it originated apparently from a point *directly overhead.* In Japan, however, reliable observers noticed that the meteors drifted to the westward. In Siberia the drift was more pronounced and in Russia there was no doubt.

"In Europe a few scientists, headed by Monsieur F. Billiones, are attempting to use the phenomena to discredit my Sage constant theory. I will not admit defeat, although to explain the shower as a natural occurrence cannot be done.

"As you perhaps know my theory has failed once. It has forecast a second moon for the Earth. I worked over equations dealing with the second satellite in hopes of finding a clue to the meteor shower. But to my surprise, from the midst of my formulating came an explanation as to why the second moon has been lost. The second moon, according to my figures, should occupy the same space in the heavens that is occupied by the Earth. Naturally two objects cannot occupy the same place. One object, therefore, was thrust into hyperspace. This was the second moon.

"Gentlemen, we have a second moon, but it exists in another dimension. It is possible that the second moon, being about the same size as our Earth, may support living, intelligent creatures. The meteors witnessed last night and early this morning in all parts of the world came from hyperspace. But as I said their behavior was such that they could not be explained as natural phenomena. The behavior showed tampering with natural laws. The meteors were driven by creatures of intelligence and the flight was directed.

"Observers thought the meteors came from overhead, simply because they were witnessing a materialization from hyperspace. Billions of atoms coming from one dimension into another would appear to come from all directions. The billions of meteors observed over the Earth may have been but one materializing from another space. And last of all, gentlemen, it was not a meteor we saw, but a space ship."

CHAPTER III

The Invader

THE EYES of the reporters as they glanced at Sage were incredulous. One young man coughed, as if to conceal laughter.

"But, professor," said another, who maintained a serious face, "a day has passed since the meteor shower disappeared in the Balkans. No word has been received of the landing of invaders from another space."

"It would be nearly impossible for anything to happen in America that you young gentlemen would not hear about in a few hours," smiled Sage. "But Estarkia, a sparsely inhabited country filled with uneducated people, is different. It might take several days, even a week or two, for the proper investigation of such an occurrence in Estarkia. If the invader is hostile it is logical that his first step would be to shut off means of communication with other parts of the world. I would suggest that your editors get in touch with Estarkian correspondents at once and learn if there is anything unusual going on within the borders of that nation. Then, too, I would urge you to notify correspondents in Russia, Bohemia and other surrounding nations to keep their eyes open for refugees."

"Boloney!" blurted a reporter. "I don't believe a word of your statement, Dr. Sage. It's more like the fiction of H. G. Wells or Stanley Weinbaum."

"That's what the whole nation will be saying tomorrow," said Sage sadly. "But both those science fiction authors have been proven to be prophets of the future. And such a thing as I suggest *could* happen, you know. Anyhow, I felt it my duty to issue a warning."

A signal corps operator in Nugtaz, Estarkia, sat dreamily at his post. The Estarkian war games had been completed for this year and there was little activity in the military, save the constant preparations for the war that was about to break out in Europe.

Suddenly a small red light blinked on the panel before him. The radio operator touched a switch and an automatic tuner brought in a voice. "Nugtaz! Nugtaz! Calling Nugtaz!"

The operator tensed, then spoke into an instrument on the table before him.

"This is Nugtaz. Go ahead!"

"Get your commandant!" said the voice. "This is the operator at Ilota. We have urgent need of troops!"

"The commandant is in bed," replied the Nugtaz operator. "He left orders to disturb him only in case of a war. If it is a war, perhaps I can disturb him, but he will be very angry."

"It is not a war exactly, but it is worse. A race of devils has dropped from the sky. The devils are killing people in the village and driving the peasants from their farms and homes. To the west they are advancing toward us in a huge armored car!"

"My friend at Ilota, you are drunk! Very drunk! Go to bed and sleep it off!"

The little red light blinked off. The carrier wave stopped suddenly. It was strange. The operator had not expected his suggestion to be heeded so readily. Perhaps he had better call Ilota back to make sure.

The operator touched a switch. For several minutes he tried to raise the operator at Ilota. But no answer came.

"Perhaps something is wrong. Perhaps it is an invasion—a new weapon, perhaps. I shall call the commandant!"

The operator summoned an orderly. Within a few minutes the officer of the day had arrived and was receiving the operators report.

The officer scratched his head. "The troops are getting too soft," he said. "Perhaps some night work would help them. I'll send men to Ilota to arrest

that drunken radio operator. No need to disturb the commandant. This is mere police work. Sergeant!"

A small man bearing stripes on his arm entered the headquarters and saluted.

"Yes, sir!"

"Call out a cavalry detail—four armored cars. You take charge. Advance to Ilota and arrest a drunken radio operator who professes to have seen a race of devils invading the town."

"Yes, sir!" said the sergeant, saluting again and turning to go.

"And—sergeant—see that you take along plenty of ammunition!"

The sergeant raised his eyebrows and left.

Within thirty minutes, four pieces of motorized cavalry wheeled rapidly westward toward Ilota. Each armored car carried a driver, two machine gunners and a man to operate a one-pounder. In addition, Sergeant Ivan Icza sat in the fourth car with his eyes glued to the slit that ran across the front of the machine. His hand rested on a two-way radio unit.

Sleepy-eyed, the soldiers peered through observation ports at the starlighted hills. To the west was a greenish glow. The men grew uneasy at the sight. The Ilota lights had never burned green before.

Sergeant Icza nudged the driver of his car.

"Radio operator at Ilota claimed he was attacked by a race of devils," smiled the non-com. "Damned if I don't think the old goat of a captain half believed it."

THE driver smiled. One of the machine gunners behind the sergeant cackled loudly.

"Wipe it off!" growled Sergeant Icza. He could call the captain an old goat, but no buck private could laugh.

The cars approached a hill that separated them from Ilota. The sergeant picked up the short wave microphone.

"Deploy!" he ordered. "No. 1 car form the point. Advance No. 1 close as possible to Ilota. If attacked, return fire and hold ground. The others will follow to your support. Report by radio whatever you see out of the ordinary."

"Yes, sir!" came a rasping voice from the loud speaker.

No. 1 car shot ahead while the other three machines formed a parallel line behind it.

The first car disappeared over the hilltop toward Ilota. The sergeant looked uneasily at the green glare above the hilltop.

"The city is burning!" snapped the voice from the radio. "Burning with green flames. Something—maybe devils, sir—has attacked the town."

"Hear that!" whispered the sergeant. "Just what I thought—devils!" He raised the microphone. "Continue toward the town. Report what you see."

"I see people on the road. They're not troops, but men and women fleeing from the city. Refugees!"

Sergeant Icza flipped a switch on his radio. Tersely he notified headquarters at Nugtaz. "Get the commandant out of bed!" roared the sergeant to headquarters. "This is war!"

The first refugees met the three tanks as they moved over the hilltop. Ahead waved the green flames that were consuming the city of Ilota. Limned before the flames were thousands of men and women, rushing like mad from the city. They were not all from Ilota. There were peasants from the country beyond. Devils? Sergeant Icza's lips curled disdainfully. Devils would not fight like this. This was the work of man. It was an invasion, war! There would be famine, bloody fighting, pestilence, corpses in the streets. Europe would be gloriously mad with bloodshed.

"Sergeant!" called the operator in car No. 1. "There's something advancing toward us. Looks like an egg-shaped tank—can't make out the nationality. It's a huge affair, probably fifty feet long. Sergeant! This is too big for us, what shall we do!"

"Stand your ground. Open fire if it comes closer!" ordered the sergeant. He wished that the old goat at Nugtaz had believed more than half what the Ilota operator reported. The sergeant wished the old goat had sent an army.

Once more the radio blared. The rasping voice of the operator broke into a shrill cry of terror. "Tune to 8.6 meters! They're trying to communicate!"

The sergeant flipped the tuner. A piping voice cackled into the loud speaker. It was a language strange to the sergeant who had heard many tongues spoken in his years of service. But there was no mistaking its meaning. Insistent, deadly, the voice demanded no resistance.

Feverishly the sergeant contacted headquarters.

"General alarm!" he shouted. "Invader advancing past Ilota. Refugees fleeing eastward."

As the sergeant spoke, the huge, egg-shaped tank spouted flame. It was a greenish flash that swept toward the No. 1 car. Dirt geysered skyward as an explosion rocked the armored vehicle. Then there was another spout of flame and a second terrific explosion as the flame scored a direct hit, hurling the car into a twisted wreck beside the road.

The three remaining cars opened fire as they wheeled about for a slow retreat. The sergeant had had enough. There was a third flash from the invader and No. 2 car was shattered.

"Hold 'em as long as we can!" muttered the sergeant into the microphone to the remaining No. 3 car. In his own machine the gunners were firing at the enemy and the one pounder was banging fifteen times per minute. "Retreat slowly—"

Sergeant Icza never finished. Another flare of green flame swept over No. 4 machine. The sergeant, driver and gunners screamed as the entire world seemed to explode about them.

In No. 3 car, four men jumped from the door and ran to join the throng of retreating refugees. Behind them the egg-shaped tank slowly swung back toward the city of Ilota.

CHAPTER IV

Oscillation Geometry

EUROPE was soon to suspect that something was rotten in Estarkia. But the source of the putrefaction remained a mystery. Refugees streamed across borders, into Russia, Germany, Bohemia and Roumania. They told wild tales of a race of devils that annihilated entire cities with a burst of green flame. But the stories were too wild for general credence. Surrounding nations moved troops close to the Estarkian border and issued bulletins that a civil war was raging in the small Balkan state.

Reports were wirelessed and cabled to America and published beside Roger Sage's warning of an invader from hyperspace. The reaction was curiously unexpected. A nation laughed at Roger Sage. The greatest scientist of the age was declared crazy. Reports of disorder in Estarkia was nothing to be alarmed about. Estarkia always was having revolution. No one believed that an invader had attacked the Earth.

But Susan Thayer and Roger Sage read the reports of the disorders in Estarkia with concern. Quietly the two set to work building a weapon that was to utilize that strange creating and

destroying force, hyperga.

Two broadcasters were built, capable of utilizing certain wave bands of the force. By bringing the wave bands into close relationship, a multiplication of beats resulted and the result was destruction of matter. By moving the wave bands apart the effect was one of division—a decreasing ratio—that created energy. In one way the weapon could be used as a disintegrator. In another it could be used to build immense stores of power.

Roger perfected a device that could narrow the destructive energy to a tight beam that could be directed on any one spot. When he tried it he found that the action was like a sweeping green flame that pounded atoms into nothing.

"The invaders of Estarkia use a green flame as their weapon, Susan," said Roger Sage. "I have a suspicion —nay, more than a suspicion—a fear, that the men of the second moon know the secret of hyperga."

"I think, too—" began Susan. Her words were interrupted by a roar and a crash. Roger rushed from his laboratory into his garden. Smoking amid the flowers of the garden was a large metal ball. It was fully ten feet in diameter and as the two stood dumbfounded at the object, a section of the wall slid back. From the opening protruded a hideous, twisted body.

The creature bore some resemblance to man, but it was a suggestion rather than actuality. It was short, almost a dwarf, with a humped back, twisted facial features that were hardly human, and long, triple-jointed fingers. In one of its gnarled hands was a metal tube which he held menacingly toward Roger and Susan.

"Stand quietly," said the creature in perfectly enunciated English. Then he addressed Roger. "You are Roger Sage, the scientist?"

Roger ceased his stare and nodded. "I am," he said. "And you?"

The creature laughed. "I am the invader from the second moon, which you so futilely warned against. I have come to repay an ancient debt."

"Debt?"

"Yes, a debt. You through your discovery of the Sage constant and the use of hyperga energy made our invasion of your space possible." The creature paused. He looked greedily at Susan. "The woman, who is she?"

"This is Miss Thayer, my assistant. She is quite essential to me and to my work. In fact," said Roger, "I could hardly have perfected my mathematical equations without her help."

The invader hesitated. "I should destroy her. But—" an oily, insinuating smile crept over his face. "—you like her, yes? Perhaps to save her from a very bad death you will do things for me? I am Exib, leader of the men from the second moon. I need your help, for my scientists do not understand all of the points of your theory. Unless you help them—" Exib looked at Susan in a way that conveyed his meaning.

The creature waved the tube toward the opening in the sphere. "Come!" he ordered.

Roger turned to Susan. "Shall we make a break for it?"

Susan shook her head. "It's not as bad as it seems, I think. I have faith in you, Roger. I know that you alone can do things that must be done right now."

Roger led her toward the door of the sphere.

The interior was barely furnished. Nearly all the inside was filled with machinery. Roger's eyes swept over bristling levers, control bars, dials and indicators. But in one corner was a human figure. A man, who stared at the two who entered.

"M. Billiones!" exclaimed Roger, recognizing the French scientist, whom

he had met on several international occasions.

Exib grinned. "Because he was so useful in discrediting you, Dr. Sage, we decided to save his life, too. You three of all mankind are to survive the destruction of the Earth." The moonman took his place beside the controls of the sphere. "This is the form of transportation used on Irti, which you have chosen to call the Earth's second moon. It can fly in the air or float on water."

EXIB touched a black-handled S-bar. There was a sudden jerk then the ball seemed to float through the air. Looking downward through the transparent floor, the prisoners could see the Earth pass beneath them in one continuous blur. A sob came from Billiones.

"To think, Dr. Sage, I was your enemy! I laughed at your ideas, while all the time you alone could have warned the world of this invasion! Now they will kill all men and colonize the Earth—"

"We don't w a n t your Earth!" sneered Exib. "We are going to destroy it. We like our planet, but we are tired of conditions which make us exist in a weird space with sunshine, but without a sun; with strange forces that cannot be understood. We hope to move our own planet out of the hyperspace into your place in the solar system. To do this we must wipe out the Earth. Roger Sage's invention—hyperga—will make this possible."

"How did you know of hyperga?" asked Sage.

"Long ago the instability of our world led to certain scientific experiments that showed us our true position in the universe. We determined that our position was approaching a point at which no degree of stability can exist, even with our great machines, for a much longer time. Certain tensions that created our position in hyperspace were increasing and had to be removed, but we could find no way to remove them.

"Then, about fifty years ago, we succeeded in tapping radio communications from the Earth. The radio waves pierced the barriers of hyperspace and once we had records of them, we learned your language and habits. We studied your science and found that the stability which besets us does not exist on your planet and that your planet occupies the place which ours rightly reserves to occupy."

"That is a matter of opinion," said Roger.

"It is the truth," snapped Exib. "Nevertheless, one day we heard Roger Sage's story of the Sage constant expounded by radio. We set our scientists to work on the problem. They succeeded in formulating the entire equation, even the points which Sage has never made public—the new phase of energy, hyperga, which is quite common in our own world. We use it in place of electricity."

"That! That's the answer! Hyperga is a manifestation of hyperspacial energy!" exclaimed Roger. "Why didn't I suspect it before?"

"Because, Mr. Sage, your science of oscillation geometry is very young. The idea of a three-dimensional object being given a fourth-dimension vibration probably has never occurred to you. However, I will give you credit for giving us the clue to interspacial travel. Your Sage constant permitted us to do that and it allowed us to formulate plans for the destruction of the world."

As Exib talked he directed the craft eastward. The craft was controlled by the long S-bar. The motor seemed to run on the principles of an electric motor, but Roger guessed that hyperga energy was used. The power came from a huge black box, undoubtedly

akin to a storage battery.

"We used only one machine to make the jump from Irti—our planet—to the Earth," Exib continued. "How we laughed at your consternation! You thought we were a meteor shower! Coming from our space to yours the craft appeared everywhere at once. Then it condensed over Estarkia. It was simple in explanation. It was like looking into ends of electric wires and seeing the generating plant."

Roger nodded. "I suspected it."

Exib went on: "At our place of refuge in Estarkia we have eleminated the population. A huge piece of machinery is being installed to rip the atoms of the Earth apart by hyperga destruction. But we cannot overcome a problem of wave length. That is why I need your help. If you aid me, I will spare your life, and that of your companions." Exib glanced at Susan.

"And if I refuse?" asked Roger.

"You will not refuse as long as the young woman is alive."

Roger left a reassuring squeeze of his hand from Susan. It told him more than words. As surely as if she had spoken she had communicated to him that she had faith in his ability as a scientist to outwit Exib and all of the super-brained hideosities of Irti.

"How can I help?" asked Roger quietly. In his mind existed a doubt.

CHARTER V

Equation of Destruction

EXIB brought the ship to the ground in a valley near the ruins of Ilota. The craft had traveled from America to Estarkia in less than an hour.

In the center of the valley was the huge machine which the moon-dwellers had used in traversing the dimensions. It was nearly five hundred yards in length, lined with ports and studded with small projecting spines, which Roger recognized as hyperga repulsators.

Near the craft were two egg-shaped vehicles, something like a tank used in warfare. Further away was a deep excavation over which a metal framework was rising.

"That will be the point from which the disintegrating force will be applied on the Earth," explained Exib. "We have one hundred men working the machines for its construction and we will have it finished as soon as you determine the proper wave lengths for the destructive oscillations."

Exib led his captives inside the dimension traveler. Susan and Billiones were taken to comfortable quarters while Roger was led to a laboratory. On the wall of the room into which Roger was taken was a huge chart, covered with mathematical symbols.

"There, Dr. Sage," said Exib, "is the mathematical calculations as far as we have been able to take them."

Roger scanned the chart. The equation carried the Sage constant, represented by the symbol *S*. Another well-known constant used was the *I* constant, known in mathematics as the square root of minus 1. This constant theoretically represents the differnce between time geometry and space geometry—a warning signal in any equation to look out for waves and oscillations. Two other abstractions in the equation, X and Y, represented the unknown wave lengths to be used in the destruction of the Earth.

The final summation on the chart was the equation:

$$S. \times. I^2. Y = Q.$$

"The only aid we can give you in solving the values for X and Y is the fact that we know that one of the values must represent one-half the distance between Irti and the Earth," ex-

plained Exib. "Since the two planets are in different dimensions we find it impossible to measure the distance."

"Why not try using the symbol .5," smiled Roger. "Then express the other unknown in terms of the distance between Irti and Earth?"

"Splendid, but try doing it," suggested Exib.

Roger smiled. He hoped to catch a slight error in the equation, something that had escaped the eyes of the scientists of Irti, but something which he hoped would save the Earth. Such an error did not appear, however.

"As you know," said Roger, "multiplication of wave forces of hyperga causes destruction of matter on the Earth, while division causes creation of energy. May I ask if this holds true on Irti?"

"Just the opposite," declared Exib. "On Irti multiplication causes creation of energy and division causes destruction. It has led us to believe that the creation of energy is simply the transformation of matter from the Earth's dimension, into energy on Irti's plane."

"I suspected as much," Roger nodded. "Therefore, if we wrote the equation: $S/X/I^2/Y$, it would mean not the destruction of Earth, but the destruction or Irti and all creatures of its spacial structure, including you on Earth?"

"Yes," agreed Exib, "for although we exist in your dimension our bodies are attuned to hyperspace and a reversing of the processes would destroy us, providing of course the correct wave lengths were used. But you need not plan our destruction, Dr. Sage. You will be watched carefully and your mathematics will be studied by our greatest minds."

During the days that followed the prisoners were allowed to see each other only at meal times. Susan, somehow, had managed to keep her spirits buoyant, while Billiones remained in the depths of despair.

"You are responsible for this, Roger Sage," said the French scientist. "Your dabbling with unknown spacial mathematics brought these monsters."

"If it had not been I, it probably would have been you or someone else who discovered the Sage constant, M'sieur," said Roger. "After all, how much credit should a man receive for discovering something? Columbus Discovered America and all Americans and the world are indebted to him. But the time was ripe for such a discovery. A score of others planned a similar voyage—Cabot of England made such a trip. So if it had not been Columbus who traversed the Atlantic it would have been someone else.

"The same might be said for Lindbergh. He was the first, but there were others who saw him off who were planning the same trip from New York to Paris. Had Lindbergh failed, another would have won the glory and the world would not have been changed greatly."

"You are depreciating their efforts!"

"Not at all. Such men deserve recognition, but it is manifestly unfair to others, tried and tested and found to be of similar greatness, that the single discoverer should receive all the glory. Every hero's success lies on a foundation of other men's work."

"Get us out of here," moaned Billiones, "and you can have the floral offerings."

BILLIONES was drawing figures on the tablecloth with his pencil as they talked. At first he drew triangles, then he drew squares, then a row of crosses. Finally he put a row of figures across the table and abstractly multiplied them. Roger watched him closely. Suddenly the American let out a whoop of joy. He seized the tablecloth and jerked it from beneath the dishes.

"There!" cried Roger. "That is an illustration of my point. Without even thinking, M'sieur Billiones, you have saved the world!"

"I? Wh-what have I done?"

"You have solved a difficult irreversible equation," smiled Roger. "We Americans call abstract scribbling such as you have been doing, 'doodling.' It is a common habit, but psychologists make a great deal of it, and have even gone so far as to classify various types of doodlers. You have solved the equation and you have saved the world, but you don't know what you have done."

Roger paused and lifted his hand for silence. Hastily he concealed the tablecloth. The sound of footsteps told them that Exib was coming.

CHAPTER VI

The Equation

EXIB led Roger back to the laboratory. "Our machines are perfected," he announced. "Now we need the translation of the unknown factor Y, or our equation, into a numerical value. For X, we have assigned .5, as you have suggested. You will go to work at once, but no tricks. Every figure will be examined carefully."

Roger smiled. "I have the value of Y," he said quietly. "The value of Y is two!"

"Let me see!" Exib motioned toward the chart. Roger quickly wrote down the following two equations:

$S \cdot X \cdot I^2 \cdot Y = Q$ (Where Q means the destruction of the Earth).

$.00000537 \cdot .5 \cdot -1 \cdot 2 = Q.$

"What is the numerical value of Q?" asked Exib.

"The value," smiled Roger, "is the negative Sage constant, —.00000537."

The moon-man nodded. "The two wave lengths modified by gravitational and wave constants result in destruction of the Earth if multiplied."

Roger's lips moved slightly as he muttered something about division. But Exib did not hear. He stepped to a panel and turned on a switch. The indicator on a dial crept upward. When it reached a stationary point, Exib turned to a dial and began twisting it nervously.

"The Sage constant," he hissed. "Value, .00000537!"

Roger interrupted. "Of course you have taken precautions for the safety of we three human beings?"

"The ship will act as a shield," said Exib. "It is impervious to everything but the oscilliatory geometrics that would destroy Irti." The motors in the room were screaming. Exib twisted the dial again. "Multiply the first wave length—value .5. Result, .000002685. Next the imaginary constant—the square root of minus one, squared—value, minus one. Multiplied by .000002685. Result, minus .000002685." The motors reached a higher note. The air seemed charged with tension. "The final step. The second wave length, Y, value 2, multiplied by the result of the last operation, minus .000002685. Result, minus—"

The thunder of a thousand storms shook the universe. There was a whirl of dust, a burning stench, screams of the Irti men. Roger closed his eyes. Then, suddenly as the noise arose, it quieted. The American opened his eyes. He was standing in a peaceful valley near a deep excavation. The dimension traveler, the disintegrating machinery, all of the machines of Irti had vanished.

"Roger!" came Susan's voice faintly. "Wh-what happened?"

The scientist turned. Nearby were his fellow captives, M. Billiones and Susan.

"M'sieur," smiled Roger. "Let me

congratulate you. You saved the world. It was not the method of calculating—multiplication or division—that counted. But the final result. In the case of that equation the final result would have been the same, whether the numbers were multiplied or divided."

"I do not understand." M. Billiones stared at the American.

"The tablecloth?" asked Roger. "Of course, it was destroyed. But never mind—" He wrote with a stick on the ground.

$.00000537 \times .5 \times (-1) \times 2 =$
$-.00000537$

"Now we divide:"

(A) $\frac{.00000537}{.5} = .00001074$

(B) $\frac{.00001074}{-1} = -.00001074$

(C) $\frac{-.00001074}{2} = -.00000537.$

"In both cases the answer is the same—the negative Sage constant. The negative sign indicated energy and I was certain energy would be created, not destruction of matter. In the creation of energy Irti and all dwellers of that planet were destroyed."

"But how—how did I solve that problem?" asked Billiones.

"Abstractly you wrote down the following four figures—3, 2, 1, ½. Then you multiplied the four, your answer was three; you divided the four, your answer still was three."

"Why?" asked Susan.

"Because two times one times one-half is the same as saying one times one. And two divided by one divided by one-half is the same as saying one divided by one is one. By substituting my Sage constant for the number 3, I had practically the same equation you had written on the tablecloth."

In the distance came the sound of a bugle. Then, over the hilltop, advanced a party of soldiers from Nugtaz.

Susan frantically waved her white handkerchief. The warlike maneuvers halted and the captain rode forward.

"Where is the enemy?" asked the captain in broken English.

Roger smiled and nodded toward M. Billiones. "Thanks to my friend's doodling—"

"What?"

"Doodling, a type of abstract mathematics. We have wiped out the enemy as a result."

"Ah! Signor Doodle! I am honored to meet such a hero!" said the captain with a bow.

M. Billiones looked toward Roger Sage. The French scientist smiled in his glory. No longer was he jealous of the American mathematician. Men of science are forgotten, but national and international heroes live forever.

"I love you like a brother, Roger Sage!" said M. Billiones.

But Roger was not interested then in the Frenchman's adoration. At that moment Roger was thinking of Susan and not by any means in a brotherly fashion.