When the Universe Shrank

Serial in Two Parts—Part One

By J. LEWIS BURTT

The author is a favorite with our readers, as well as with the Editors, and here he has contrived to introduce an atmosphere of suspense and excitement into a story of interplanetary adventure. The first part appears in this issue and we are sure that it will leave our readers in a state of expectation, so that they will await with great interest the concluding portion which will appear in the November issue.

Illustrated by MOREY

THE change began to be observable about the year 2930 (old reckoning). About that time it became patent to all that there was a rapid increase in size occurring in all forms of animal life. All living bodies seemed to be equally affected, even those which had already reached their normal maturity.

This phenomenon was inexplicable, especially as only living beings were affected, and the research bodies of the world were utterly at a loss either to account for or to check the development.

By 2945 the matter had become serious. The population of the earth had already increased almost to saturation point, and now the problem of world starvation faced us, for although our numbers had not increased, yet, in a period of fifteen years, the stature of man had nearly doubled and, consequently, his bulk had increased nearly eight fold. Where were we to get the extra food? Our reserves, which had been stored for generations, were fast being depleted and we could not look to the other planets for help, since they too were experiencing a similar growth.

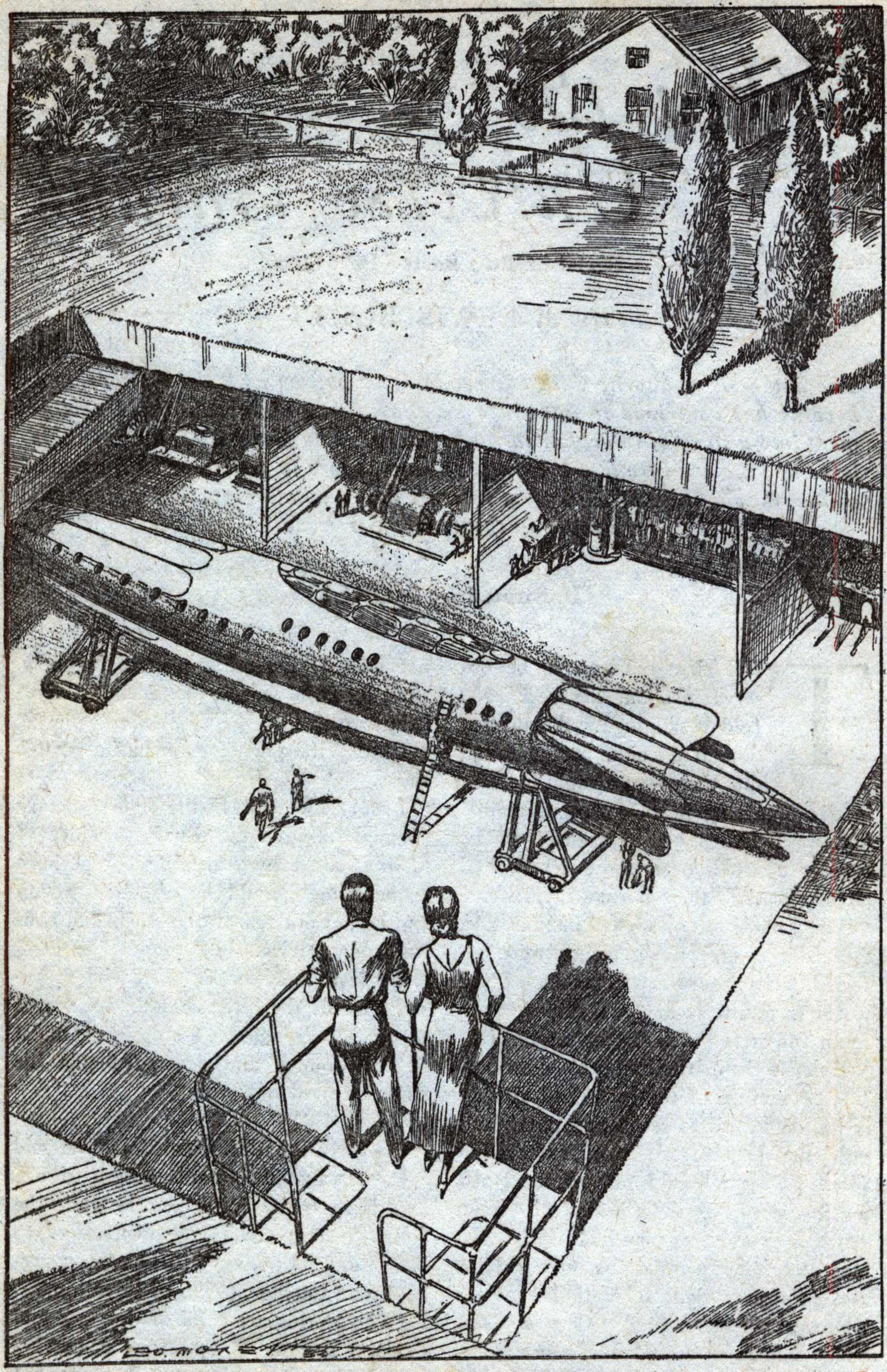
Clearly the phenomenon had a cosmic cause.

From 2935 to 2945 the Interplanetary Council followed the usual procedure of talking, suggesting, arguing (or perhaps "squabbling" would be a better word) and giving out reams of useless and contradictory advice.

At last, however, in 2945 the representative of the little satellite, Io, a man of powerful intellect, rose up in the midst of the Council and *demanded* that his plans be tried out.

"HONORABLE Councilors," he said in that memorable speech of his, "we have talked for a decade while the Solar System creeps steadily nearer to starvation, yet not one of us has even suggested an intelligent plan of salvation.

"The worlds are tired of our talk and demand action. I therefore demand—yes, ladies and gentlemen, I *demand*—



It sank for about twenty feet and then slid sideways under the ground, revealing a huge pit around which were a number of work-shops. The greatest surprise of all, however, was the beautiful chrome-plated, cigar-shaped space yacht which lay on her cradles in the middle.

that this Council call on the peoples of the worlds, that they make public the truth and let all, who have possible solutions to offer, be asked to submit their plans to their national councils who in turn will submit the best plans to us."

"Yes, young man," countered an old Venerian, "but do you want to start a panic that will wreck civilization?"

"There will be no panic," the young man replied calmly, "we shall only be telling them what they already know. And even if there is," he added seriously, "better that than years of slow and hopeless starvation."

"Oh, my friends," he pleaded, "let us trust our peoples, let us for once admit our impotence and open the way that the inevitable leader may come forward—for humanity's sake!"

The written words sound very ordinary, but the intensity of pleading behind them stirred that council beyond speech. Feeling the thrill of inspiration, the Speaker rose.

"Friend of Io, here from a little world comes wisdom, as so often in the past good has come from the little nations. I do not need to call for a vote. I know it is the unanimous will of this Council that your demands be complied with. Let this, then, be our proclamation, broadcast now to the worlds:

"We, the Supreme Interplanetary Council, authorized by His Highness Egbert, Hereditary President of the Solar Worlds, hereby notify the peoples of the Solar System that unless some means of checking this strange growth, or some means of multiplying our food supplies, can be found within a few years, we are doomed. Our worlds must perish.

"We therefore call on all the peoples of the Solar System to meet this crisis as men and women should. In addition, we call on all who have understanding enough to offer intelligent suggestions for the amelioration of our fate, to submit such to their National Councils for transmission to us."

The excitement caused by this proclamation did indeed come near to panic, but the danger was not immediate, there was still food for some years to come, and so the saner elements prevailed.

An astrophysicist was the first to throw light on the cause of the change. A young officer of the Terrestrial Interplanetary Navy, who was studying astrophysics, unearthed some old documents, among which was a pamphlet by that ancient wizard, Einstein, in which, backed by mathematical evidence, was the statement,

"Although the universe is at present steadily expanding and increasing in size, yet in the astronomically near future it will cease to expand and will enter upon a period of shrinkage."

Now the old astronomers had recognized this to be true, but they had calculated that this expansion and contraction was a matter of distances between stellar systems and of that only. They also assumed that in speaking of "the astronomically near future" Professor Einstein had meant a period of hundreds of thousands of years. In other words the accepted idea was that during millions of years the suns would gradually get nearer together, but at so slow a rate that no human agency would ever detect it, except through delicate instruments. At any rate it would not concern the ordinary life of mankind.

This young man, Neil Cameron, however, made a number of calculations, making use of the fact that the speed of light is invariable under all conditions in empty space, which showed that this contraction was already in progress, and that not only were the worlds rushing together at an appalling rate, but that they were also undergoing an actual shrinkage in themselves. This shrinkage he explained as being due to the alteration of inter-

atomic forces, causing planetary electrons to fall towards their nuclei to some extent as the universe contracted. For some unexplained reason the contraction did not affect living organisms, which consequently remained as large as before.

IN other words we were not growing at all, but our worlds were shrinking under us—we were only larger relatively.

This statement of Cameron's aroused the usual storm of controversy, disbelief and scepticism, especially among the older astronomers, but the arguments were so sound and the proofs so convincing that, finally, the theory had to be accepted as proven fact.

Here at least was a partial explanation, but it didn't seem to be of any help in solving the practical problem. It did, however, offer a ray of hope. Neil Cameron's figures, as finally accepted, showed that this shrinkage would continue until the worlds were about one thirty-fifth of their original volume (there was no very great diminution of mass so that gravitational pull on the inhabitants was not seriously altered). This meant that their surfaces would shrink to less than a tenth of their original productive capacity and new sources of supply must be found to balance this.

The reduction of the spaces between suns was, however, going on more rapidly, and when the contraction was completed, distances between solar systems would average less than thirty light-days instead of three or four light-years. What the consequences of this would be no one could foretell.

This dramatically rapid change seemed to be contrary to all astronomically known laws, for such changes usually take millions of years. Yet here it was happening in a space of less than forty years altogether—a mere instant in stellar time.

Again it was Cameron who gave the explanation. The universe, he had explained, had been in a form corresponding to that of a gas. Now if a gas is allowed to expand freely, it cools and with pressure will collapse suddenly to a liquid. This was exactly what was taking place in the universe. The solar systems, corresponding somewhat to the molecules of a gas, had expanded so rapidly (doubling the volume in a mere million years or so) that they had reached the point of condensation, and were now rushing together in a process corresponding to that of liquefaction.

He assured the peoples that there was no danger of actual collisions between systems, but he could not say what other forces might come into play. He felt confident, however, that after the instant of collapse (this little matter of forty years) things would adjust themselves on a new and different, but extremely stable basis.

However, this didn't solve the food question, and there the matter hung.

DIANE sat waiting in the ante-room of the great Council Chamber. After all it was rather a trying ordeal for a young graduate, even if she did belong to the finest college on the North American continent.

The door opened. An officer appeared.

"The Council will speak with you, Miss da Silva."

Nervously she followed the officer into the great hall and up to the great chair before the Speaker's throne.

"Miss da Silva," commenced the Speaker, "we have considered fully your suggestion that the oceans be drawn off into space and their beds be fertilized and made suitable for the production of foods. This Council at first thought that there was a suggestion of possiblity in your idea, and we have to tender you our thanks for offering it. The idea, however, was submitted to the leading astronomers and physicists and they have

definitely stated that it is an utter impossibility. We regret therefore that this Council can not act on the suggestion."

This dashing of her hopes was like a blow in the face to poor Diane, whose expression showed the keenness of her disappointment.

The Speaker, however, continued with a half-smile:

"Notwithstanding this, we have a request to make of you. One of our younger astrophysicists, Commander Neil Cameron, of whom you have doubtless heard, disagrees with his even more learned colleagues. In view of Commander Cameron's recent work in discovering the cause of our troubles, we are disposed to regard his clearly expressed opinions with very deep respect.

"Commander Cameron has requested this Council's permission to absent himself from all duty for an indefinite period so that he may further investigate your proposals. This request has been granted, and also his further request that you be invited to remain in the capital and collaborate with him in his work."

The sudden reaction from utter disappointment to encouragement was almost more than Diane could take in on the instant. Her face was a study in bewilderment.

She turned to the Speaker,

"May I have a little time to think this over?" she said. "These rapid alternations from 'impossible' to 'possible' are somewhat confusing."

She was conducted to a little sitting-room, where she was left for a while to straighten out all these contradictory opinions.

After some little time a knock came on the door and, at her bidding, a young officer entered. He came over to her and she looked up into a pair of deep brown eyes set in a handsome face and surmounted by a crop of dark, wavy hair. The concern in those eyes was genuine and unmistakable. It was real indeed.

"I'm terribly sorry that absurd Council bungled things so stupidly, Miss da Silva," said the owner of the eyes. "I'm Neil Cameron, you know."

"Oh!" she exclaimed, her pretty, oval face lighting up with surprised pleasure, "I'm so glad. It's good to meet the one man who apparently has some faith in my ideas, however impractical they may be."

"It's good of you to put it like that, Miss Diane," replied Neil. "It makes me feel even more certain that our work together is going to be a pleasure—of course you're going to accept the proposal, aren't you?" and, at her nod of agreement, he went on, "I surely do have faith in your idea, perhaps because it's the only possible one I've heard, perhaps because the 'old fogies' are so opposed to it, perhaps—may I say it?—because of the charm of its originator."

"Commander Cameron," came back the smiling reply, "these pretty speeches are very charming, but haven't we work to do?"

"OH! sure," was his ready return," "but need business be devoid of pleasure? I want us to be friends—real friends. And seriously," he went on, "I do think your idea holds possibilities—slim ones no doubt—possibilities overlaid by tremendous difficulties—yet ever since I read the outline of your scheme I've had a curious feeling that somehow you've found the only possible way."

"That, coming from you, is high encouragement. Shake!" She held out her hand impulsively to his warm and friendly clasp.

"These rooms," he went on to explain, "have been set aside for us and our assistants by the Council, but I think I should prefer to use my own laboratories and observatory at my home in England—that is, of course, if you are agreeable.

"By the way, my mother wishes me to

extend her welcome to you and to say that her home is at your disposal, if you will honor us by accepting our hospitality."

Diane's acceptance of this offer left no doubt as to her keenness. "But," she asked, "how about funds? Has the Council—"

"No, Miss Diane, the Council has *not*," was the rather disgusted reply, "but fortunately my mother also believes in your project and has placed at our disposal all we need for everything. No," he went on seeing her look of hesitance, "don't fear to use it. Remember it is for the worlds, not for ourselves."

"But how generous!" she exclaimed.

"Oh! I don't know—perhaps," countered Neil, "you see, mother and I have more funds than we can ever use, and setting aside a little matter of half-a-million eagles is really rather a relief."

"Half-a-million! Why—"

"Why, yes, it'll take all that and I fancy several more half-millions as well. To be perfectly candid that's all that's the matter with that Council. They know we've a chance, but they do hate to spend money on other people's ideas.

"Listen," he went on abruptly, "When we've won this battle with Nature we'll be powerful enough to get rid of that idiotic, doddering bunch of wind-bags. We'll set up a dictatorship—a good one, for the benefit of the people—a man like President Egbert, say. All this democratic nonsense has been proved a failure for the past thousand years. The peoples are no more free, under what they call democratic forms, than they were under the ancient Egyptian Pharaohs—they *think* they are, but—" he broke off suddenly. "Here, I mustn't start pestering you with my pet hobby."

"But," she pleaded eagerly, "that's just my idea, too, though an insignificant and impecunious girl like me never dared to talk such heresy."

He laughed, and she went on,

"But Neil—I may drop the formalities, mayn't I?—you thrilled me terribly then. Why did you say 'we'? Are you going to let me help you in that, too?"

"Would you like it?"

"I'd love it! But I suppose the other problem comes first, doesn't it?"

A COUPLE of days later they were settled down to work. The problem was immense. First of all there was the main problem of overcoming gravity sufficiently to draw off the oceans far out into space. Then there was the question of driving this mass of water—a little matter of some 55×10^{18} (thirty-five million, million, million tons)—into an orbit so that it would continue to revolve around the earth as a new satellite. In addition there was the problem of preventing it from freezing solid, so that it would be available for use as required. It was calculated that at least ten percent of the water must be left on the earth's surface in order to give sufficient evaporation area to provide a rainfall, as well as sufficient for the tremendous irrigation projects that would be necessary.

To allow for seepage into the earth, diffusion out into space, etc., it would be necessary from time to time to replace loss with water from the new satellite, hence the necessity for keeping it from freezing.

A further problem was presented by the possibility of earthquake, volcanic and batholithic disturbances due to the alteration of the stresses imposed on the earth's crust when the weight of the oceans should be removed.

Altogether it was a neat little problem for anyone to tackle. No wonder the Council turned it down.

Both Neil and Diane were excellent mathematicians, but even so they spent a full three months calculating out the forces necessary, the strains to be allowed

for, etc. This task alone would have been impossible without a staff of a dozen assistants, who were kept constantly busy on their calculating machines or making practical observations of various sorts.

Meanwhile the shrinkage continued. The change from day to day was imperceptible, but over a period of months a distinct difference could be detected.

All seemed to be working out smoothly. Not a hitch occurred during this period of calculation, and at last it was over and the full immensity of the task lay before them.

The figures appalled them. Forces unbelievable would be required to hurl this stupendous mass of water out into space. Where were these forces to be found? How, when found, were they to be harnessed?

The two young scientists looked at one another in silence, their one thought "Impossible!" clearly expressed in both faces.

Slowly Neil stretched out his hands and clasped his partner's. No words could he find to express his disappointment, as he shook his head in a slow gesture of uselessness.

For a long time they stood thus, their eyes searching each other in a gaze of understanding friendship, a friendship that bade fair to be the basis of an even deeper feeling.

At last Neil spoke, almost in a whisper,

"I'm sorry, my dear."

AGAIN silence, deep, vibrant silence, held them. Then, with a half-despairing sob, Diane put her hands on Neil's shoulders, stared into his eyes with an intensity that was startling, and whispered,

"It *can't* be impossible! There *must* be a way!"

Then, as though the words had called the stupefied brain back into activity, she went on eagerly.

"How much money is there, Neil?"

He thought for a moment—hesitated—then said,

"I don't know. There's a great fortune, but only mother knows just how great it is. Everything rests with her."

"How much will she give us?" was the next demand.

As she spoke, a gentle voice from behind her asked,

"How much for what, child?"

Diane turned and threw herself into the arms of the dearest little old lady and held her close for a miinute, then,

"Dear Mother Cameron, just how big is that generous heart of yours? Our task looks impossible even to us, yet somehow we can't give up hope, can we, Neil?" she appealed to him, "but the half-million you've already given us won't go anywhere. We'll need far, far more. How much can you give us, Mother dear?"

"Half-a-million!" exclaimed the little Lady Cameron in a tone of disgust. "Did that young scamp tell you I'd set aside that much?" Then as Diane nodded in further disappointment, for she feared the amount was altogether beyond the facts, "Don't take any notice of his nonsense. I distinctly told him he could have ten millions a *month*. Now cheer up, Diane, there's plenty after all."

"But—" she hesitated.

"Well?"

"But even that is useless. We'll need —oh! I daren't begin to figure *how* much—" she broke off.

"What's our limit, mother?" broke in Neil, "Don't keep the poor girl in suspense any longer."

"To tell the truth, son, I don't really know myself. Your father left an immense fortune, and we've not spent one-tenth of the interest on it. Let's go to my little room and do some counting."

AS they reached the old lady's sanctum Diane made as if to withdraw.

"Don't be absurd, child," was Lady Cameron's admonition. "This is no secret from you." Then in a whisper, "It'll all be yours some day—when you're really my daughter—No, don't tell *him* what *I* know, he'll find out in time." And deliberately ignoring the girl's flaming cheeks, she led her into the little room.

For an hour they figured. Then the old lady took the various totals and added them all together.

"Well, will six and a half billions be enough?"

Startled at the immensity of the sum, Diane gasped. Then she threw her arms around the old lady with, "You darling, and you'll give it *all* to us?"

"Well, of course. What good's it going to do any of us if we don't fix these foolish worlds up?"

But Neil looked grave.

"It's a lot of money, mother," he said after a moment. "We must be the richest folks in the whole Solar System, but even that may be too little."

"Well, start on that, and when that's gone we'll get some more," she replied.

For two months more they, and a small army of workers, continued to wrestle with the great problem. The rainfall and irrigation projects were comparatively easy. The problem of putting the oceanic mass into an orbit, after its elevation into space, was, theoretically at least, comparatively simple. But the main question, that of actually lifting the water, proved completely baffling.

There was not enough power available on the earth, neither was there means of concentrating that power in the necessary way. Only one possibility remained—to find some means of nullifying gravity. This, so far, had proved entirely impossible and, not only so, but there seemed nothing leading towards any possible method.

Meanwhile the worlds continued to rush together. The great star, Sirius, formerly several light-years away, was now within half a light-year. So close was it that careful observation of its movements showed conclusively that it was a complex system consisting of two suns, one brilliant, the other dark and extremely dense (this had, of course, been known for centuries), surrounded by a group of at least three planets.

What if these planets were inhabited! What if their inhabitants, in desperation, should attack our system!

The suggestion was laughed out of court. How could they? Even half a light-year is too immense a distance to cross with a navy.

But *was* it so impossible?

The new casts insisted on the absurdity of the suggestion, but after reading some of the reports, Neil said suddenly one day at breakfast,

"Diane, I don't like it."

"Don't like what, my cooking?"

But he was too serious for joking just then.

"Don't like the approach of Sirius. Somehow it's menacing." Then, after a minute or so, "I'm going to have a look-see. Want to come?"

"Come? Sure, but where?" These sudden impulses of his always gave her a thrill of surprise, even though she was used to them by now.

"Out into space, of course. Where else? Are you game to sneak off with me for a cruise half-way to Sirius if necessary?"

"Sure I'm game, but in what? There isn't a *spliner that can go that distance."

"Oh, yes there is! Come along and I'll show you my big secret."

LIKE a couple of mischievous kids they stole off through the grounds, coming at last to a clearing in the park

* Slang for "space liner."

where there was a smooth grass plot some three hundred yards square.

"Now watch," he said as they halted by a big elm tree, "See what you think of this for camouflage."

So saying he pulled on the bark of the tree, which swung open, revealing a cavity containing a tele-dial and a number of switch studs.

He clicked over the tele-dial switch and a man's face appeared.

"O. K. below, Fred?" he asked.

"Yes, sir, all starred."

"Right," and Neil switched off.

He waited a few seconds and then pulled over another switch. There was a faint, whining noise which rose until it became inaudible. Then, to Diane's astonishment, a section of the grass plot, some two hundred yards square began to sink.

It sank for about twenty feet and then slid sideways under the ground, revealing a huge pit around which were a number of workshops.

The greatest surprise of all, however, was the beautiful chrome-plated, cigar-shaped space-yacht, which lay on her cradles in the middle of the pit.

An elevator ran up to meet them. They entered and, as they descended, the roof swung back into place above them, leaving no trace at all outside.

A middle-aged man dressed in mechanic's overalls came up.

"Well, Jock, how is she?" was Neil's query. "You know Miss da Silva, don't you?"

"She's fine, sir," was the reply. "She's all ready to go to Mars with you any minute, sir."

Diane looked puzzled—a little annoyed—who was this mysterious "she" that was so anxious to go to Mars?

The next order solved the mystery.

"O. K. We'll need her tomorrow—but not for Mars. Fill her tanks, every one of them, with that new nitropicrite fuel. Better put in some extra tanks too. Fill every available space with fuel and provisions for a cruise to Sirius."

The old mechanic looked at him.

"Man, you're crazy. It's not possible."

"Can't help it, Jock. Crazy or not we've got to go—Don't say a word, though. No one must know about this."

Then, having fixed that, he took Diane's arm and led her across to the space-ship.

"Like her?" he asked.

"*Do* I? She's perfect. What's her name? You know I'm almost jealous of her, she's so beautiful."

"You needn't be Diane. She *is* beautiful, but at that she'd be jealous of you, if she were alive."

"Don't be silly! What's her name?" countered Diane, a little embarrassed. This paying of compliments was a new phase for Neil.

"Well—I hope you won't mind—but I thought of calling her the 'Lady Diane'. May I?"

"That really is a compliment. I'm afraid I can't refuse that. It really is sweet of you."

"O. K. then. Let's go aboard."

THE "Lady Diane" certainly was a marvel of designing, even though in general plan she followed the regular designs of ordinary space-yachts. From the tip of her needle-like nose-piece, right along the shimmering length of her polished chromium hull, to her after rocket tubes, she looked what she was, a veritable interstellar greyhound groomed for a long course.

Her tapered length of three hundred feet made her look slim and light, despite the fact that she had a forty-foot beam.

Diane looked at her namesake for a minute. Then,

"Why the elaborate streamlining, Neil? It's no advantage in space is it?"

"I'm not sure," he replied. "At the

speeds she can travel there may be some resistance even in what we call 'empty' space, and anyway it gives her more speed when she's in an atmosphere—not to mention the advantage in appearance," he added with a whimsical smile.

On board all was already ordered confusion. Jock had got the crews to work emptying the fuel tanks and refilling them with the new high-efficiency fuel. Another gang was busy overhauling and polishing the beautifully designed rocket-motors and all the auxiliary equipment.

After a glance at the engines, they went up to the control room, which was placed right forward in the transparent nose. From their seats before the control panel they had a direct view over more than a hemisphere, while by an elaboration of mirrors, vision in other directions was secured, so that they could see in every direction, either on direct or telescopic vision, without even turning their heads.

Neil motored Diane into one of the massive padded chairs set before the panels, and took the other himself.

"Think you can handle her?" he queried, "The two panels are exactly alike—every control is duplicated and this master switch"—indicating it—"throws in either or both. If both are coupled in, the starboard panel takes control over the port, so long as this pedal is pressed. That, of course, is to ensure a definite over-control in case of emergencies.

"All indicators, mirrors and telescopes are duplicated too, but the telescopes are capable of entirely independent action under all conditions."

Diane shook her head slowly.

"I can handle any 'spliner' the Interplanetary have in the system, but this—why there are at least a dozen new gadgets."

"Oh! you'll soon get on to it. Look, this is——" and he launched out into an explanation of the various controls and instruments.

Some time later a mechanic came up rather hesitantly.

"Excuse me, sir, but Her Ladyship has phoned three times to say that lunch is getting spoiled."

"Lunch is——? Goodness, look at the time!" exclaimed Diane, "I'd no idea!"

THEY left early next morning. Only two persons had any idea where they were headed for—Lady Cameron and Jock McBain—and very few others even knew they were away at all.

Lady, Cameron, old as she was, begged hard to be taken along, but withdrew her pleas, when Neil explained that taking food for a third person meant so much less fuel space, that the success of the expedition might be seriously endangered.

They expected to be away for ten or twelve months, but, in case of emergencies, they carried supplies for ten years, including sufficient air and water conditioners for double that period. The rest of the ship, with the exception of the engine and control rooms and two small cabins, had been converted into a series of fuel tanks, every cubic foot of which was filled.

Their rockets would give them an eccleration of eighty units (the ancient foot per second being still used as the unit) which was more than anyone except the most highly trained space veterans could stand for any appreciable time. At this acceleration their fuel was sufficient for four thousand hours (say five months) *continuous* firing, using two hundred gallons an hour. In addition sufficient was carried to last the automatic steering tubes for ten years average use (these tubes, of course, were used very little, since once a course was set, they were practically only operated for the automatic avoidance of meteorites).

Once well clear of the earth, they swung to their course, a huge elliptical arc, which would bring them into the vi-

cinity of Sirius in about five months. They figured on using an acceleration of about fifty till they had reached twenty thousand miles a second—above which speed the relativity factor becomes too large for satisfactory acceleration—then drifting for a period, and finally decelerating at the same rate as they approached the star.

At their maximum speed their meteor detectors would, of course, be almost useless, but out in free space the chances of their striking anything were very small, and even so their long, needle-like prow would probably deflect them. Still, that was a chance that always had to be taken in space.

At first, existence to them was almost unbearable. The high acceleration nearly doubled their weight, and the drag on their internal organs was very close to the danger limit. Neither of them was susceptible to space sickness, but at such acceleration even the strongest suffer. The worst feature was, as always, the illusion of infinite time, which invariably makes these periods so much more terrible.

After the first few hours, Neil, seeing how the strain was telling on his companion, eased the rockets to thirty-six, which was comfortable.

"Why?" asked Diane rather testily.

"Don't think it's wise to carry so much strain," he replied, "We're more use alive than dead."

"But," she objected, "we'll never get there at this rate."

"Oh, yes we shall. We're not going to keep this rate. We'll increase the acceleration half a unit every hour till we get back to fifty—that way we'll get used to it more easily. It's going to be bad at that, and——" he hesitated.

"Well, what?" she asked, still very curtly.

"Well, there's one thing we *must* watch. The effect of the apparent time drag is to make us irritable, and unless we guard ourselves very closely we'll be murdering each other before the week's out."

"Oh, I'd forgotten that," she responded, "I suppose that's why I was so annoyed when you slowed down just now."

"Exactly. I felt my own temper rising for no reason at all, and remembered the danger."

"Well, thirty-six certainly feels better than fifty," she sighed out. Then with a swift return to gaiety, "Let's eat. I'm hungry, and besides I just *have* to look over the stores."

"Stores are O. K.," he replied, "We've plenty of everything to take us to the Great Nebula if necessary."

"So *you* say, young man. Fixed 'em your own self, of course!"

"Sure I did. That's why I know."

"Hmph! Sounds like a man," she scoffed. "Can we 'run automatic' for a while?"

"Think so. We've been out seven hours—speed 240 miles a second—distance about three million—R A. 75—Dec. 216—Yes, I guess we might as well."

A half hour's inspection and investigation of the stores changed Diane's scepticism into openly acknowledged approval. There seemed to be such vast amounts of everything from salt and pepper to canned oranges and turkey.

After Diane had made a thorough examination, Neil opened a small door in one of the storerooms. Behind it were two cupboards, one marked "Diane" and the other "Neil."

"What's all this?" she asked.

"Just a last minute idea of mine," he grinned. "Here's a key—opens both doors."

FILLED with curiosity Diane inserted the key in the lock marked with her own name, and opened the door.

"S-a-y, but——!" she began, "How *did* you know all the things I specially like? Look at that! And m-m-m—Martian mat-berries. I'm crazy about them. You're a real dear."

"Was rather an idea, wasn't it? Just a small supply of the things we each like best?"

"But how'd you find out exactly all my favorites?"

"Tell you some day—maybe," was the cryptic reply. And that was all the satisfaction she could get.

For some five days they accelerated, most of the time running 'automatic.' Their speed by this time was approaching four thousand miles a second.

That afternoon (they kept Greenwich Mean Time, of course) Diane suddenly turned to Nell with,

"Something wrong?"

"No, Di, Why?" he replied puzzled.

"I don't know, but I'm scared, there's danger ahead."

"That's funny," he answered back, "I've been feeling like that too. Anyway," he went on, "there's nothing to be done about it, is there?"

"I suppose it wouldn't be any use keeping a watch, would it?" she ventured.

"N-no. I don't think so—Well, maybe at that we'll feel better if we do. At least it'll break the monotony."

"I'll put some form of a detector screen out ahead as far as I can, and—Yes, I will—I'll try to fix up some sort of an odd weapon. Foolish of me not to have thought of that, wasn't it?"

"All right, then, Neil. I'll take first watch—three hour shifts?—while you get dinner and fix the gadgets."

About five or six hours later—Neil had forgotten all about either time or dinner, and Diane was still at the panel—Neil called out,

"I've got a beauty, can you come here a minute?" Then, seeing how cramped she was after such a long spell at the controls, he realized all and exclaimed,

"Oh, my dear. I'm so sorry. I quite lost track of time."

"That's O. K., Neil," she replied, "But what's the big idea?"

"Look!" he said indicating a dial, which he had just connected up to the panels.

As he spoke he threw over the control of a rheostat and, as he did so the needle moved over the dial, stopping eventually at the figure 1200.

"What's it mean, Neil?"

"Each unit on the scale is one hundredth of an astronomical unit—say about a million miles—which means that our detector is focussed about 1200 million miles ahead of us."

"But how? Surely that's not possible!" she exclaimed incredulously.

"Does seem rather a tall yarn, doesn't it? Fact is I'm kind of tickled with it myself. I'm using two etheric waves of slightly different frequencies. Where the vibrations are in phase, or nearly so, any material body passing through the wave causes interference which deflects the galvanometer. An alteration of current-flow of less than a millionth of an amp. will cause a deflection, so we should be able to detect any body whose mass is more than a thousand tons, so long as it is within the range of the instrument."

"We get the speed by timing the oscillations, which occur every half wave period, which is about every 10,000 miles of approach."

"But how d'you get the distance, once you're within range?" she queried.

"Approximately only. Just reduce power till there's no kick, and then step it up again till the needle begins to oscillate. Then read the distance directly on the dial. It's only very rough on account of the speed of the wave travel.

"This other dial, which is connected to the chronometer circuit, gives the speed

directly in number of miles per second."

"But how'd you get your wave to come back?" she persisted, determined to understand the thing properly.

"Well, that's a bit of a mystery to me too. It's a thing I stumbled on by accident. Oh, no! I didn't think all this out just now. It's been seething around in my head for months, but I never could see any practical use for it."

"Let's try it out right away," Diana went on enthusiastically.

"O. K.," but let's eat first—supper's been overdue some time."

After testing the "detectograph," as they called it, on a few known objects such as asteroids, they set it for maximum distance straight ahead and spread over a cone of ten degree angle. At the same time they reduced acceleration, both on account of their premonition and also to give them a rest from the strain.

There was no need to watch the detectograph for four hours or so. It would take time for the wave to travel out and the return impulses to get back.

Diane was on watch next morning when she noticed a flickering of the indicator needle and called Neil over for confirmation. He swung the ray off its direction for a while and returned it to its original direction. After a couple of hours the needle became stationary and remained so for a period corresponding to that during which the ray was deflected. Then it becan to oscillate again.

A FEW hours feeling around with the ray established the course and position of the strange body fairly accurately. They estimated it to be a body of from five to ten thousand tons mass, approaching the Solar System at about two thousand miles a second and about nine hundred million miles from them.

"If it weren't for this hunch, I'd say it was just a meteorite, in spite of its great velocity, but as it is, a body of that mass on a course between Sirius and the Sun looks mighty suspicious," was Neil's viewpoint.

"Let's watch him a while," suggested Diane, "If he's a meteorite his course and velocity will not vary. If he's a spaceship he'll show acceleration, unless he's just coasting."

"Brainy idea, Di. Let's do that," agreed Neil. "Meanwhile no acceleration for us. If we coast for a day we'll get better readings. Shove over the artificial gravity switch, will you?"

By midday they had pretty well decided that the stranger was just a wandering meteor, but after dinner the readings began to show a little variation, and by five o'clock that night it had become obvious that the stranger was approaching with diminished velocity. Diane, who was using the calculator, looked up.

"He *was* coasting. Now he's decelerating at about forty, which proves him a 'spaship,' and I'd say he's spotted us too."

"Looks like it," agreed Neil. "Sirian probably. Wonder if he's friendly or not. May be looking for new worlds to colonize, if they're overcrowded like we are. In which case——"

"What'll we do, skipper?"

"Say, any more of that skipper stuff and you go out the space-lock. This is a partnership, isn't it?"

"Yes, I know," agreed the girl, "But you've had so much more experience in things like this."

The result of their conference on the matter was that they should decelerate at a rate sufficient to stop them about the time they got close to the stranger, who apparently had the same idea.

Of course at such speeds it would be quite impossible for them to see each other when they got near, and until then, they were too small to be visually detectable anyway.

On the morning of the fifth day after spotting the stranger they had practically

come to a standstill, their speed (relative to the Solar System) being less than a thousand miles an hour. The stranger was now definitely visible in their twelve-inch reflector as a tiny sphere from which projected forward streaks of flaming gases. Obviously he too used rocket propulsion and was still decelerating.

Suddenly Diane turned to Neil and said,

"Suppose he's hostile, shouldn't we try to warn the planets of their danger?"

"Uh?" he exclaimed in surprise, "How in space can we! Over a million miles to transmit it! Have a heart!"

"Well, maybe we can't, but, my dear, we can at least try. Of course no wave we can send could possibly penetrate the heavyside layers of the planets, but some patrol cruiser *might* pick it up."

"It's an idea all right, Di," he agreed, "we've got to try. Our batteries are up to full charge after using the tubes so long, so we've lots of power to send with."

NEIL'S ship was one of the first to be equipped with the "anstromag" batteries. These were charged by means of a thermocouple arrangement from the waste heat of the rockets, a device that not only provided plenty of power for the auxiliaries such as lighting, heating and etherograph, but used up the heat radiated from the rockets, which sometimes became too hot on long runs and damaged their firing nozzles.

"Let's see," he muttered, "Work the calculator for me, will you, Di?"

For four or five minutes he shot figures at her in a bewildering gaze, his fingers flying from page to page of his book of tables. Then he sat back with a sigh of relief.

With scarcely a pause Diane ripped off a slip of paper from the machine and handed it to him with—

"Guess we can do it after all. What'll we send?"

"Quick work, Di," he approved.

"How's this?" she asked after a few minutes.

"H M H M—Neil Cameron and Diane da Silva, Space Yacht 'Lady Diane,' Position 16.3 . R. A. + 73 . Dec 216° . Course + 0.26 same direction. We are coming in touch with spherical space-ship from direction of Sirius. Believe it to be scout heralding possible attack on Solar System. Advise immediate preparation of maximum defence fleet. H M H M."*

"Too long?" she queried.

"No, that'll be short enough in Universal Code. Take control, will you, while I transmit?"

The stranger was by this time within twenty thousand miles of them and, like themselves, practically stationary.

After a few minutes Diane called.

"Visitor seems to be stationary. Please get me his size and distance on the mass-range-finder."

This was a complex device designed by Neil's old commander—almost his foster-father—Captain Freeman. It was not yet in general use, Neil having this one really for testing purposes.

"O. K.," he responded to Diane's request. Then after a few seconds,

"I make him about five thousand tons mass, diameter say fifteen hundred feet and distance about eighteen thousand."

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* The ancient SOS ...———...) was still used as the distress call for individuals and ships. For a general warning of danger to shipping or to the system generally, the signal HM HM (....——....——) was used

Declination and Right Ascension correspond to latitude and longitude and are set by arbitrary lines in space drawn from the sun as centre, Radial distance is distance measured radially outward from the sun in microparsecs—the old Terrestrial astronomical unit, the parsec, is Interplanetary standard.

Course is given as follows: the first figure relates to travel compared to the ecliptic (in non-technical language the plane of the Solar System) measured in degrees, plus and minus directions being arbitrarily determined. The second figure gives the direction corresponding to the declination.

Acceleration is given in the ancient British feet per second, the metric system having finally gone out of use.

Velocities are given in Interplanetary miles (1830 yards) per second.

"Good enough," she replied. Then, suddenly, she reached up and pulled the master switch, plunging them instantly into unutterable darkness and cutting off their artificial gravity, so that they floated slowly towards the centre of the ship.

"What's wrong?" asked Neil anxiously, as they drifted together and clung to each other.

"Just a hunch. Sort of felt his observation on us and thought we'd hide a bit. He'll not see us now, nor will he be able to detect us electrically with everything shut off. Give us a few minutes to think things out."

HOWEVER, a few minutes later they had decided to go on as before and let the first move come from the other ship.

Their heaters and lights on again, Neil went behind the control panels and made a number of connections.

"There," he said as he finished, "that ought to help a little. If he shoots any ray stuff at us now we ought to know about it before we get burned up."

"But you can't etherograph through it," objected Diane.

"No, that's the trouble. When I'm sending you'll have to cut the screen out with this switch. If he shoots at us there's an automatic trip on it, but I don't know if it will work or not. It should throw on the screen in time to catch any rays—provided he doesn't get us too hard on the first jolt," he finished rather soberly.

For another three hours there was no alteration of conditions, each ship seeming to be wanting the other to make the first move. During this interval of waiting, Diane handed over the controls to Neil and, to cheer them up a bit, got a meal consisting chiefly of "specials" from their little locked cupboards. Then she came and sat by him while he ate his; right at the panel.

While they were eating they discussed their plans of campaign, finally deciding that, since their enemy might be any sort of a being, they would do best by waiting for him to move first. That way they hoped to get some sort of idea as to his capabilities before they got into battle. By this time they had definitely concluded that he was hostile, and so they decided to keep on sending out their warning message.

After supper Neil said to his companion,

"I'm afraid you'll have to navigate for several hours now, Di, if you can. I want to get that weapon fixed up. I'm sure getting careless in my old age," he went on, "I should have had all these things done before we started, but somehow I never thought of meeting any enemies out here.

"You know, Di, it's lucky you know so much about space-navigating, and doubly lucky you've learned so much about this boat in such a short time. Now I feel I can leave her to you in any emergency."

"That being so," countered Diane, rather pleased at his praise, "do you think you could leave her entirely to me for a bit now?"

"Why, of course, Di. But what scheme are you hatching now?" he answered, suspecting from her mischievous manner that she had something she was going to spring on him.

"Well, only that I'm going to set a few alarms, so that our friend can't start anything without giving us a hint. Then I'm going to run an 'automatic' for a couple of hours and give the motors and controls a thorough overhauling. Then we'll *know* we'll be all right if we have to use all our power."

"But *can* you, Di," he asked, "It's a pretty tough job for a girl, you know."

"Sure I can," was her confident reply,

"Haven't I watched you do plenty of overhauls of one thing or another. "Besides," she went on, "I can always call you if there's anything I can't manage."

"It sure would be a good thing, and——" he paused for the right words. Then failing to find them, ended with, "Gee, Di, you're a *real* pal!" Which, after all, in Diane's opinion, were exactly the best words he could have said.

DIANE had nearly finished checking over the motors when Neil called to her,

"Come and see what you think of this."

"This" was a contrivance something like those ancient bullet projectors still to be seen in museums, and known to our ancestors as "machine guns!" That is, it was like them in outward appearance, except for a heavy cable attaching it to the batteries.

"Now watch!" he continued, "And for goodness sake, don't get in front of the thing."

As he spoke he aimed the gun at a sheet of high-resistance magna-metal, and slowly drew back the release. There was a brilliant flash. A hole appeared melted clear through the tough metal and nearly through the heavy fire-proof plate behind it!"

"Gee!" she exclaimed, "That's some weapon!"

"Wait awhile, my dear," was the rejoinder, "You haven't seen anything yet. I only used one notch of powder—about half of one percent! If I let that gun out it should be as effective at fifty miles as it was just then at twenty feet."

"How're your motors coming along?"

"Be through in about half an hour, everything, 'double starred' and ready for heavy duty."

"O. K.," he commented, smiling up into her grimy face, "I'll get breakfast while you finish. Then I'll need help in rigging up these three guns outside."

"Breakfast!" she exclaimed in surprise.

"Yes, breakfast. Do you realize that our couple of hours has grown into twelve. Time we ate, isn't it?"

A few hours later they were back on regular watches, still waiting for the enemy to make a move. Neil continued sending his warning call every five minutes, as they slowly drifted nearer and nearer to the other ship.

Suddenly they looked at each other. Diane shot out the ray-screen with all the power they had.

"Did you get it too?" they exclaimed simultaneously.

"Yes, but the ray-screen has checked it," was Diane's comment.

Both had felt in that moment a definite, worldless, mental command to "Stop sending that message!"

The surprise of it had, of course, resulted in their obeying it. They had to figure out how to handle this new development.

After a moment or two Neil said thoughtfully, "My dear, I think we can handle that all right. It's a form of mental domination that our forefathers called hypnotism, an evil practise long since fallen into disuse. I learned from the old writings that it is powerless to dominate those who resist it, who refuse to allow its suggestions to control them.

"I'd keep that ray-screen out to help, but I can't send through it. I must cut off the screen and keep on sending until we're forced to fight, so we'll have to keep our thoughts constantly alert to *refuse to listen* to his suggested orders."

"O. K. Neil. We'd better watch each other too. We may be able to help if one or other weakens—if the mental battle becomes too fierce," was Diane's wise addition.

Off went the screen.

Out again went the message of warning.

Again, with still more force, came the order, "Stop that!"

They continued unheeding.

"STOP THAT!" came the command with almost overwhelming force.

Neil's hand hesitated on the signal key, but only for a fraction of a second as Diane's clear voice rang out, with all her thought behind it.

"Keep on going Neil. *Keep on sending!*"

For interminable minutes the battle continued, but eventually their combined efforts began to win and the strain of resisting that mental attack gradually lessened, until they found that they could keep control without difficulty.

At the same time the strain was great and they felt the point of exhaustion coming nearer.

Then the message changed.

"Stop that message or we cut you to pieces!"

With all the power he could concentrate Neil sent back the mental challenge,

"Try and make us!"

However they knew they must soon stop sending, for the enemy was now drawing close. He was within a few hundred miles, and they knew that they would soon need their screen to prevent annihilation.

"I'll send twice more and then close the screen," was Neil's decision.

Diane, unable to speak, nodded her agreement, and Neil continued his sending, only now he began and ended his message with the personal cry for help—S O S.

But could there be any help? What chance was there that help was near? Not one in millions!

Just as he was finishing the last message, Diane suddenly leaned over and threw the switch controlling the ray-screen.

"What is it?" asked Neil.

"He shot a ray at us. I saw it just as it hit us and threw out the screen. That automatic never worked at all."

"Quick work, kiddo, you saved us that time!"

"Look!" she exclaimed, "It's terrible, but isn't it marvelous?"

There about two miles away, between their ship and the enemy sphere, was a most wonderfully beautiful, transparent, orange glow, shading away to dull red at its edges.

"Yes, my dear," Neil agreed, "It *is* beautiful. I'm thankful to see it that color too. He's got to heat it a lot more than that before there's any danger. It'll go to blue-white or even violet before it burns out the activators."

"I'm going to try our heat gun on him. Wonder what *his* screens are like!"

AS he spoke he trained a gun on the enemy ship and pulled back the control to its limit. There was a flash of sparks from the condensers as they took up the load. Then, close to the enemy, appeared a dull-red glow, which gradually brightened and glowed through yellow to a brilliant white.

"Gosh!" he exclaimed, "Got his screens into the white already, and at this distance too! He's either holding out on us, or else our armament is better than his. Wonder what sort of a screen that it. It's different from ours, not so transparent."

"Don't take any risks, Neil," was his companion's caution.

"You'd better figure on a few surprises. I fancy, though, that our resistance to his mental efforts surprised him more.

"Can you get through his screens?"

"Not from here, but if he comes closer I think I can, and before he gets through ours I hope."

Hour after hour this silent battle of forces raged. It seemed that neither side

was gaining anything. Our friends could not coax the enemy into effective range. Neither could they get away from him. His control was perfect. Diane tried everything she could think of, she threw on full acceleration, he backed away instantly—she shot around in as close a curve as they could stand, he followed them as if chained to them—she jerked from side to side, he copied every movement.

Then she had a new idea.

"Neil," she called, "We've only one way left to get closer. Let your gun-ray begin to lose its intensity. Let it appear as though our power is failing. I'll let the rockets miss fire a little at the same time. Maybe he'll fall for it."

For a short time their ruse seemed to be ineffective. Then they found their screen beginning to creep up the spectrum into the bright yellows and whites, indicating that their enemies were either using more power or getting closer.

They drew him on gradually until their screen had reached a definite violet, indicating a temperature sufficiently high to be near the limit of the screen's resistance. Then, with a warning "Now!" Neil threw back his release and the gun shot out its limit of power.

For an instant the enemy's screen flashed through blue-white to violet. Then it went dark.

With the swiftest movement they had yet seen, he flashed away from them to safety.

Neil turned with a grin, "Burned him some, I guess! Got through his ray-screen anyhow. Didn't he hop back though!—Wonder what sort of motors he uses and what sort of folks they are, who can stand that acceleration."

"No good wondering, my heroic child," commented Diane from the control chair, "We're likely to find out quite soon if we're not mighty careful—Oh look!" she broke off.

OUT from the side of the sphere there flashed a spinning ball of golden radiance. Slowly it seemed to approach them, yet they knew that actually it was travelling at terrific speed.

For a second they both gazed in wonderment, then—

"For God's sake dodge it!" came Neil's voice, harsh with excitement.

But even as he called, Diane realized the danger and flung the ship to one side. Now the menacing ball would pass to one side of them. But——

"Neil, oh Neil! look!" she almost screamed, "Look! it's *following us!*"

Frantically she dodged, turned, twisted, in an effort to avoid this new terror and to give Neil a chance to use his guns on it.

It was useless. The ray-gun made no impression on it. Steadily it approached. Now it reached the ray-screen—passed through it unharmed!

Diane, her wonderful courage strained to breaking point, locked the controls and got up from her seat. They could not avoid it, so they might as well meet it.

Neil slipped an arm round her, while with the other he still played his gun on the thing.

"It's finish, I guess, my dear," she whispered.

"Yes, I'm afraid so," he replied, "I don't know that I mind so very much going out, as we're going together. You know I love you, don't you dear?"

"Why of course, dearest," she whispered back, "Hold me close when the end comes, won't you?"

For a minute they held each other very close. Then, with a sigh, Neil muttered, "It would have been nice to know that the worlds had got our message, wouldn't it, dear?"

"Yes, Neil," she answered, "but somehow I feel they have."

Helplessly they stood awaiting the end. Together they did not really fear the

passing, but the uncertainty as to the fate of their message was the one thing that seemed to torture them. Had they failed, or had their message done its work and saved their worlds?

Gently the glowing ball touched the side of the ship. They braced themselves for instant annihilation, but—*nothing happened!*

Amazed, they waited. Then——

"Surrender, or we'll disintegrate you and scatter you through space," came the thought wave, "This ball can be exploded from our ship and will utterly annihilate you and your vessel. Make up your minds quickly."

What must they do? The question was in their eyes as they looked at each other. Was it not better to die defiant than to surrender and perhaps be forced to give information to their enemies?

The word of defiance was on Neil's lips, when Diane's exclamation checked it.

"My dear, we're wrong. We must surrender."

Uncomprehending, he stared at her.

"Don't you see. If we surrender we've still a chance—a possible chance to learn something of their armament and plans—a barely possible chance of getting information to our peoples. If we're killed we've *no* chance."

"But suppose they *force* us to give *them* information?" he queried.

"They can't dear, I'm sure of it. We know we can resist their mental forces, and if it comes to—" she hesitated with a little shudder—"if it comes to physical torture, we can endure that too. But there's a way out of that too," she continued with a sudden brightening of her voice.

"O. K., dear," was Neil's agreement. Then out to the enemy he sent the thought, "All right, we surrender."

Back came the order,

"Get into space-suits and leave your ship. We will give you an hour."

At least they took it to mean an hour, the time interval impressed on their thought giving them that impression, and, too, it was a reasonable interval.

Sadly they commenced their preparations.

"What did you mean, Di, by a way out of torture?" asked Neil suddenly.

"THIS," she replied talking a little compact from a pocket of her handbag, "Dad always insisted that I carry there, ever since the Venerian pirates captured the old "Marventer."

Opening the little box she shook out two tiny silver balls scarcely a twentieth of an inch in diameter.

"Put one of these in your mouth," she instructed, "Work it gently in between two teeth so that it will look like a poorly set filling. Make sure it won't be noticed if they should open our mouths, but arrange it so that an ordinary bite will not break it—it's fairly tough—strong enough to stand ordinary strains.

A little careful manœuvring and adjustment, and they each had one of the tiny pellets securely imbedded in their teeth.

"Now," Diane continued her instruction, "If the worst happens and we can endure no more, all we have to do is to bite down suddenly and *hard* on them to break them. The death they contain is instantaneous."

"Shall we set a time bomb to blow up the ship after we leave?" asked Neil next.

"They discussed this for a few minutes but finally concluded not to do it, feeling that the enemy could not possibly get any valuable information from the ship, and that so long as it remained, there might still be a bare chance of their escaping in it, just how, they couldn't say—but while they had it, something *might* turn up.

So they finished their preparation, indulged in one long embrace, locked on their space-suits and floated out into the void.

Slowly they drifted towards their conqueror, directing their movements by means of tiny reaction pistols.

After what seemed an age they reached the space-lock of the great sphere and pulled themselves inside.

The great valve swung closed and, after a while, an inner valve opened, admitting them to the interior of the ship.

"Do not remove your space-armor," came a warning—a warning that was totally unnecessary as they had no intention of doing such a thing until they had ascertained the conditions prevailing in their new abode.

"Come straight forward to the centre of the sphere," was the next order.

Carefully they made their way along the corridor into which they had emerged from the space-lock. The gravity on board was very light, even with their heavy space-armor, they weighed less than on earth.

There was no sign of any living thing in the corridors, but whether this was favorable or unfavorable neither dared surmise.

By allowing their helmets to touch they were able to talk to each other although their voices were somewhat distorted.

"What do you make of it, my dear?" came Diane's voice through the helmets.

"Haven't the faintest idea, sweetheart," came back the reply, "I suppose we'll come to some of them presently. Wonder what they're like."

The corridor extended for some four hundred feet. Then, as they reached its far end, a door slid open in front of them and they entered a big spherical chamber, obviously the centre of the vessel.

The space around the circumference of this chamber was filled with controls and machines, whose purposes were completely unfathomable. A narrow alleyway let through the maze of machines towards the centre, and along this they carefully made their way.

As they emerged from the forest of mechanism, they stopped, dumbfounded.

JUST what they had expected to find neither could have said, but they certainly were not prepared for what they did see. Geologists have always told us that the chance of two different systems producing life forms that are similar, is only one in countless billions, yet here before them was a definite refutation of all the thousands of years of theorizing.

The creatures who stood in the centre of this vast machine were *men*—men like ourselves! There were differences, truly, but minor ones only. In size they were very little smaller than Earthmen, perhaps a little larger than Martians, but broad and massive. Their color was a most peculiar greenish purple, a color strange to our eyes yet, curiously enough, not at all unpleasant.

But it was their eyes that fascinated the two earthlings. They were a peculiar luminescent yellow, seeming to glow with shifting lights—something, yet not quite, like the eyes of a cat seen in the near darkness.

Whether they were fortunate or not in finding beings of their own form neither could say. They were relieved to find beings whose form they could comprehend, but on the other hand, they remembered just how inhuman men of our own form could be on occasion.

In front of the commander's seat they stopped. A Sirian came forward. As he did so the commander sent the thought:

"Allow my officer to take a sample of your air. If it is suitable we can converse much better with those clumsy space-suits opened."

A few minutes determined that the at-

mosphere of the Sirian ship was breathable by Earthmen, and so they removed their helmets. They found the Sirian air unpleasant at first, but it was endurable, and after a while they became accustomed to it. Later they found that it was very similar to our own atmosphere but contained only about fifteen percent of oxygen and very little nitrogen, the deficit being made up chiefly of argon. The temperature was also higher than that of earth and the air was extremely humid. Still, as we said, they could breathe it without actual discomfort or danger.

When the prisoners had removed their helmets, the Sirian commander demanded, speaking unintelligible words but conveying the thoughts mentally.

"Who are you and from what world do you come?"

Quick as a light ray came back Neil's reply, "Why should we give *you* any information?"

"Because we can compel you to," was the answering thought.

"Compel *us?*" Neil threw every bit of derision and contempt of which he was capable into that defiance.

"Diane, standing close beside him, whispered, "Oh good boy!" Then directing her thought to the Sirians, "Fools! Don't think you can *scare* us!"

"There are other ways!" came back the malignant suggestion.

"What other ways?" returned Neil contemptuously, "Don't think anything you can do will make us tell anything we don't want to!"

At this defiance the Sirian's eyes seemed to redouble their luminosity. From him there emanated a series of thought waves of terrific power, waves intended to break down their resistance, waves which suggested horrors unthinkable, tortures unimaginable.

For what seemed hours the silent battle raged. Diane and Neil, standing as close to each other as possible, fought grimly and determinedly. Now and then doubt and hesitation would shake one or the other of them as the mental pressure was concentrated in that direction, but each time the increased attack on the one partly relieved the other. Each time, therefore, that other was able to give support with the reminder, "We beat him before, we can beat him again."

Once when the Sirian concentrated his supremest efforts to break down Neil's resistance, Diane saved him with the plea, "*Hold on,* Neil dear, remember that Right is Might!"

FROM this time on, the awful pressure relaxed. The Sirian apparently accepted his defeat. Ceasing his cruel efforts, he sent out a new thought, a thought of compromise which seemed to say, "I cannot break you, so I am reluctantly compelled to yield you my respect. Let us exchange ideas and give information for information."

The sudden release from strain came as a dazing shock. For a moment they seemed to be in a whirl of confusion. Then Neil's mind cleared.

"Look out, Di!" he warned, "It's a trick! There'll be another attack!"

Sure enough there was. Scarcely had the treacherous thought of compromise been put forward, scarcely had they time to react to it, when, following it, there came a thought so hideous, so terrifying, so crushing in its force that for a moment both of them were shaken.

Then, as an answer to their unvoiced prayers, there came to them the inspiration, "Good cannot be conquered by evil. Right is *invincible!*"

As one they hurled this thought, with all their strength at their tormentor. Instantly they felt his attack grow confused, weakened, out of focus.

Realizing their opportunity, they held firmly to that thought that neither

doubted came from the infinite Source of all Power.

For a full minute they held their ground, every instant growing stronger. Then, finally, the enemy, his power broken, his efforts exhausted, surrendered.

This time they knew it was no trick. They could feel the surprised dread that the Sirian was experiencing, and they knew that justice had indeed conquered, that malice had again been proved powerless against honor.

Afterwards, in recalling that struggle, they wondered why all those others had not added their efforts to their leader's attack, why only the commander himself fought the battle. For a long time they puzzled over it, until one day an old Martian philosopher solved the problem for them.

"Why, of course," he told them, "the explanation is simplicity itself. These people are undoubtedly able to concentrate and unite their mentalities, so that what you actually fought was the combined attack of all the beings in the vessel, directed and focussed through the commander."

The old Martian paused—thought for a while, "It must have been a wonderful fight," he commented rather wistfully, "I don't believe any but those who were truly united in mind, united in a great love, could have won it."

Now that the enemy's attack was broken, the opportunity for negotiation lay with the Earthlings. Without hesitation, Neil sent out a thought,

"You know now that you cannot break us to your will, but since for the moment we are in your power physically, we will consent to negotiate with you. *But we* agree to no *demands*—understand that," the substance of the message. The time for that was over.

As he delivered it, he realized that, in some strange way, he was voicing Diane's thought as well. In fact from that time on, in all their dealings with their enemies, these two invariably thought as one being, so close were they in understanding and friendship. All through this period their unity of thought was intensified, yet for some reason they could not explain, their thoughts were invariably transmitted to the enemy by Neil, never by Diane. Her idea was that it was the result of his masculine instinct to protect her from any harmful contacts—a sort of shielding her from the nauseousness of the attacks.

For some time the Sirian remained silent, sending out no thoughts, although they could sense that he was turning the matter over in his consciousness.

At length he seemed to come to a decision.

"We agree," was the thought that came, "Let us first, as a basis for negotiation, exchange thoughts telling each other what we are, whence we come and what are our life-purposes."

"We agree," was Neil's response. "After ten of our hours we will again meet you here," a stroke of genius this keeping the initiative. "At the moment we desire rest and food. We will accept your assurance that you will not interfere with us mentally or otherwise during this period, which we shall, of course, spend in our own vessel."

Assurance was given without hesitation and both felt that, despite the fact that their enemies were so peculiarly constituted mentally, they could trust that assurance.

THE two tired people were not long in returning to their "home" and in divesting themselves of their clumsy armor.

Once again cuddled down in her lover's arms, Diane's overstrained fortitude gave way. With a sob like that of a tired child, she burst out, "Oh Neil, darling!

I'm so frightened. It's all so terrible. I'm sure it'll send me crazy. We're so utterly hopeless."

Tenderly he kissed away the tears, whispered soothing words of comfort into her ear, until after a while her sobs ceased.

Exhausted now, but reassured, she looked up at him—saw for the first time the unutterably wearied, drawn expression of his face.

"Oh you poor old thing!" she whispered, "Here am I being a baby, when all the time you need comforting as badly as I do. I *am* a selfish little beast!"

"Hush, dear," he whispered back, "You know that's not true. You needed the comfort and help more urgently than I did. You just *had* to break down or else go mad. I was able to hold on by reason of my years of disciplinary training. But——" he broke off with a shudder that racked his whole frame, "I guess I'm all-in too," he ended feebly. He too had reached the limit of human endurance.

For a long time they just lay and tried to rest. The strain on them had been almost more than man could endure. They were completely exhausted mentally and physically as the result of the battle. They seemed to be in a daze, as though the power of coherent thought had gone from them. After a while, however, they began to recover and, in an hour or so, dropped off into a sleep from which they awoke feeling once again able to cope with the circumstances.

Their next interview with their captors was of a more interesting nature. They still felt the mental antagonism against their foe, but it must be admitted that the Sirians kept their bargain, and in exchange for an outline — carefully worded so as not to divulge vital information—one of the conditions of human life, they gave a fairly comprehensive idea of their own worlds.

As our astrophysicists had figured, their system consisted of a double sun with a system of planets, four altogether. They were suffering from the same calamity that had brought about the difficulties on earth. Their already overcrowded planets, shrinking under them, had left them desperate for food.

Their planets were similar to those of the Solar System, although, since Sirius is a much hotter and bigger star, its inner planets are hotter and have denser atmospheres. The world from which these particular beings came was somewhat larger than the earth, but, being less dense, the gravity was less. Being used to traveling to the other planets, however, they had become accustomed to considerable variation of conditions and so were able to stand much greater differences than were Earthmen. This, of course, accounted for the remarkable way in which they were able to manœuvre their vessel; they could stand accelerations that would have killed Neil and Diane.

They admitted that they were scouting in the direction of our Solar System in order to find more worlds to live on, and feeling certain that the prisoners could not get away, were not at all hesitant about giving away information—though Neil noticed that they carefully avoided any direct information about their armament, except to keep putting forward the suggestion of its invincibility.

At the close of the interview the Sirian commander gave them a thought that jolted them rather badly. Unintentionally Neil had convinced him that our system included worlds suitable to their constitution.

The result bade fair to be calamitous. He gathered the impression that they were going to turn back to their own star immediately and bring up their forces in a massed attack. He also gained the impression that this force was already in

space, cruising slowly in our direction ready to advance at the call of the scout.

This meant a very short interval of peace for the Solar System, as their ships were capable of extremely rapid travel. Neil put their maximum at something like 20,000 miles a second. If his impression as to their position at the time was correct then they could be brought up to the Solar System within a very few months.

This conference seems to have been extremely exhausting to both sides, for at its close, the Sirians requested a twenty-four hour interval for recuperation, an interval that suited Diane and Niel very well indeed.

This time, as they started to buckle on their helmets preparatory to going out into space, the Sirian commander called over a young officer and said, "I am sending this officer, whose name is Kan Atra, with you to see that you do not make any attempt to escape. I could, of course, ask your parole, but I am certain that you would not give it, so I am taking this precaution instead."

AS soon as they were back in their own ship, Diane turned to Neil and said, quietly, "It's our chance! Those men are intelligent, but they aren't quite clever enough. Fancy letting us get that thought that they needn't keep a watch on us, as we are too exhausted to try to escape.

"Did you get that too?" he asked, "I *thought* I did, but couldn't credit it. I guess they didn't realize that we got it as it wasn't sent to us.'"

"Yes, Neil, and do you realize that we can mask our thought from them and that they can only get our thoughts as far as we choose to let them?"

"Yes, dear," he agreed, "I discovered that, and have been wondering just how we can take advantage of it."

"Why, don't you see?" she persisted, "That Sirian officer can't get our thoughts, so we ought to be able to find some way to get rid of him so that we can try to escape."

"Hm-m," thought Neil, "Guess that's so. Well, much as I hate to do it, even to an enemy, since he seems a decent sort of chap, I guess I'll have to—— Get his attention for a minute can you, Di?"

"Oh, Neil, you don't have to——"

"No, dear, only just give him enough to put him to sleep while we tie him up."

When a few minutes later the Sirian woke up, he found himself securely bound and gagged. Seeing that he was awake, Neil went over to him and said,

"Sorry we had to be so inhospitable, but you can see why."

"I understand," said back the officer, but could you allow me freedom to breathe in comfort?"

"Why, yes," consented Neil, knowing that Diane was thinking the same thing, "We'll give you complete freedom if you'll give us your word that you won't interfere with anything we do."

The prisoner hesitated. Sensing his thought, they assured him, "No, we are not planning any action to injure your people just now."

This satisfied him and he gave his word, which they felt quite safe in accepting, since they had realized that these people had a very definite code of honor of their own.

Having freed their jailor, they prepared a meal and when it was ready they invited him to join them.

His face lighted up with pleasure at this fair treatment, but he shook his head doubtfully.

"Your foods may not be suitable for me," was his expressed thought. Then with a sudden change of idea, he thought, "I believe I will try some."

He found our foods moderately to his taste, though there were a number of things that he refused after very careful

investigation. His attitude seemed to be that the chemistry of his body might be sufficiently different from that of ours to make the eating of certain foods dangerous to him. However, nothing that he did eat seemed to do him any harm, either then or at any other time.

WHEN they had finished and had had a couple of hours rest, they started to plan their escape.

Their ship was attached to their captor only by a slender cable, since both vessels were merely drifting without power. To unhitch this cable required only a few minutes work, although it meant going out into space to do it, and, in order to minimize the risk of detection, Neil had to work without his pocket projectors, pulling himself along the cable till he reached the couplings close to the enemy ship.

Carefully he unfastened this coupling, but left it holding so that a slight jar would separate the two vessels. Then, taking infinite care not to let go of the guiding wire for an instant, he slowly made his way back to his ship.

These were moments of intense anxiety to Diane. Neil was forced to work without light so that he should not be seen, and this meant that he was also invisible to her.

"Suppose he let's go of the cable and drifts away!" she thought, "He'll never get back, and I'll never, never find him again!"

With a half-sob she pulled herself together—forced herself to be busy. Neil would need a hot drink when he got back. At least she could have one ready.

After an interminable time Neil reappeared in the space-lock. He entered the ship, slipped open the face-plate of his helmet, and most thankfully drank his coffee.

"O. K. so far, dear lady," he reassured her, "But now comes the ticklish part. Somehow we've to start this crate away from the enemy without letting him see us go. That means we can't use our rockets—far too conspicuous."

"But how *can* we?" Diane looked puzpled, "When we planned to drift away I never thought about that. Shan't we rather tend to drift towards him?"

"It was a bit of a problem I must admit, and I'm not so very sure even yet that it will work. Just in case it doesn't, my dear, you'll have to do something very hard indeed. When I go outside to try my plan, I shall tie a light rope to my belt and take a flashlight with me. If I give three short flashes followed by two long ones it will mean that I've failed. Then you must start the rockets pointing towards the enemy and, using all the acceleration you dare, must drive the ship away from him."

"But, Neil," she stared at him horror-struck, "Oh! I couldn't possibly—and risk leaving you behind?"

"There's very little risk of that, little lady mine, I'll take a good, stout rope," he assured her.

"But, Neil," she persisted, "You may get caught in the *rocket blast!*"

"We must risk that. For the sake of our worlds we have to take that chance. One of us at least must escape.

"I don't think there's much risk, though," he added quietly. "I'm taking a couple of powerful pistols. If you have to use the rockets and tow me, I shall use the gun to drive me sideways out of the stream of fire. I think—I'm sure they're powerful enough."

A few more explanations, a long kiss, and out again into the void he went, knowing full well that, if his plan failed, his chances of life were very slim indeed.

At high velocities the factors of apparent increase of mass and of the slowing down of time have to be allowed for. A ship's chronometer and its other instruments will show variations from the Terrestrial standards if great velocities are used. The variation is, however, negligible unless a speed of more than two hundred miles a second is used.

Corrections are based on the simple formula.

$$T_m = T_s \frac{1}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}}$$

Where T_m is time registered by moving clock, T_s is time registered by stationary clock. v is velocity of object; s is velocity of light.

END OF PART ONE

To Our Readers:

IN our announcement in the August-September issue of *Amazing Stories* we promised this issue would be worth-while waiting for. And, we have done everything in our power to live up to our promise!

Most noticeable, of course, is the change of size. We have, at considerable expense, changed *Amazing Stories* to this new, convenient library size—with 50% more pages than the former *Amazing Stories*. And, we have obtained for our readers the cream of the present day science-fiction—the first group of these stories appear in the surrent issue.

Remember, although the physical dimensions of *Amazing Stories* have been changed, there will be no alteration in our editorial policy—the same number of stories as heretofore will appear in each issue and we shall endeavor to gradually increase the contents in coming issues. Only the best science-fiction stories will be used.

We sincerely hope that our readers will find the new *Amazing Stories* of greater value then ever before. You may rest assured that we will do everything in our power to make *Amazing Stories* bigger and better than ever!

The Editor

When the Universe Shrank

By J. LEWIS BURTT

This is the final installment of this story. It holds the reader's attention to the end and in places is quite exciting. It is distinctively an interplanetary tale and the attention is held in suspense while the great opposing fleets meet in line of battle out in open space. The hero of the story is very interestingly described.

Illustrated by MOREY

PART II

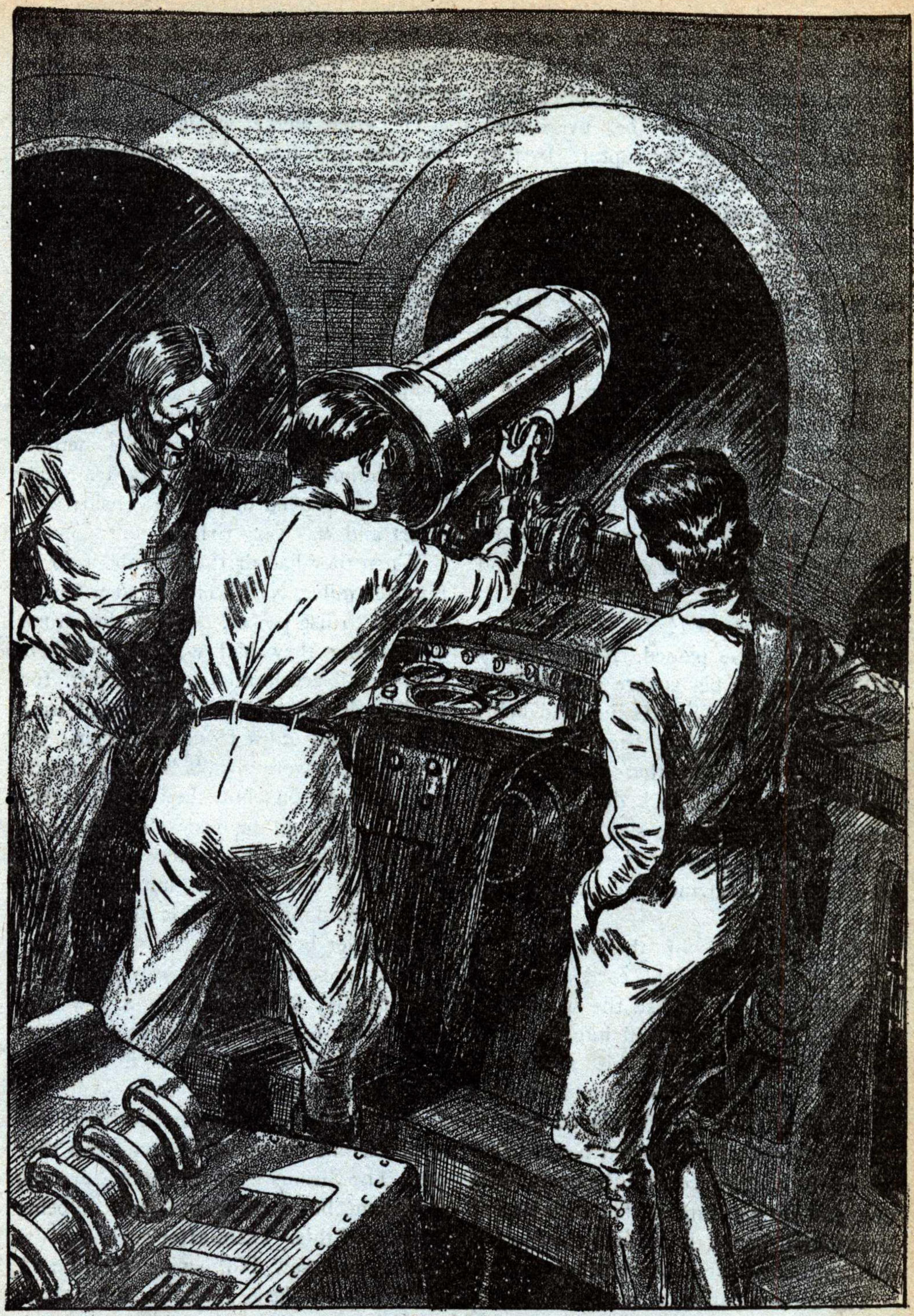
What Went Before

People of the earth observed or thought they observed an amazing change; all animals, including mankind, seemed to be increasing in size. The population of the earth had nearly reached saturation point, and the increase in size made the condition far worse than ever. The solar system had for long been united. A visitor from the Jovian satellite, Io, demands that warning shall go to all. Neil Cameron and Diane da Silva, both scientists, hold that there is no increase of size and that the world is shrinking. Many seismic disturbances were to be expected. Water would probably begin to leave the earth and would have to be replaced by a supply from some other planet. An enormous sum of money is needed for the project and Diane's mother offers all that is needed, as she is incalculably rich. Cameron shows Diane a beautiful rocket-powered space-ship—he names it the "Lady Diane," and they start off into space. A description of their novel appliances is given by Cameron, who tells Diane about the operation of the ship, and a wonderful projector that can throw a projectile fifty miles. Far out in space they encounter an enemy ship. Both Cameron and Diane are captured and taken into the enemy ship. They are sent back with a guardian to the "Lady Diane" and manage to escape taking the guardian with them. The enemy is from the orbit of the Sirian system. They communicate with thought waves. The Sirians were in search of new worlds to live on. The guardian turns out to be a very decent fellow. The "Lady Diane" is tethered to the Sirian ship, but Cameron, at the risk of being left out in space, detaches his ship secretly and they start away with the Sirian guardian.

CAUTIOUSLY he let himself out of the space-lock, leaving the great valve open behind him. With infinite care he began to haul in on the cable, pulling very gently so as not to break the coupling apart. Slowly the "Lady Diane" drew nearer to her captor. Taking care not to let the movement become at all rapid, he hauled in the slack of the cable until but a dozen feet separated the two vessels. Then, with a long, thin, flexible rod, he reached out and touched the big sphere.

Carefully he checked his vessel with this rod, as a boatman fends off a boat from a wharf. Infinite caution was required, as the ship only weighed an infinitesimal fraction of an ounce, the gravitational pull between the two vessels being almost negligible.

Just as the ships were about to touch, he jerked loose the coupling and, pushing smoothly and steadily, yet with every ounce of power he could command, he forced the "Lady Diane" away from the sphere.



Rapidly Neil adjusted the instrument to his own sight and took a long look. Then he called Diane over for a look also.

Without the slightest jar, the feather-weight ship (on earth it would have weighed some six-thousand tons; here inertia alone had to be overcome) bounded away from her captor. In that few seconds she had been given a speed of nearly fifty miles an hour away from the other ship.

The sudden movement was too much for Neil. His hold slipped. His long pole went drifting away from him, and for an instant he felt a deathly fear as he floated helplessly off into space.

The moment of panic passed as he remembered his life-line, but—the vessel was drifting away at a good speed; was already invisible in the darkness of space.

Would his line stand the strain when it suddenly jerked him along at the end of it?

Suppose it snapped!

A second or so passed. Neil suddenly realized that the big sphere was drifting away from him. The life-line had held!

Of course there had been no violent jerk, his weight, like that of the ships, was negligible. The jerk due to the inertia of his body as he suddenly started after the "Lady Diane" was only a slight one, and in his momentary panic it had gone unnoticed.

With a prayer of thanksgiving he pulled himself along the cord and, in a few minutes, had reached the space-lock, had passed through it and into the ship.

Quickly he unlocked his space-suit, stepped out of it and—collapsed into his sweetheart's arms, utterly played out.

There were still about ten hours to go before the conference with the enemy was due, and they estimated that they had at least eight hours in which they could drift without their absence being noticed.

The Sirians had no way of knowing in which direction they had gone, while they had the advantage of being able to keep them in view. They felt certain that they would not be seen unless they used their rockets, but even so, they decided to keep watch in case of unexpected developments.

The great mental strain was over for the time and they soon recovered their normal cheerfulness.

They found that the young Sirian officer, Kan Atra, was really a very decent sort. It turned out that he, like themselves, saw the folly of war between worlds, but, of course, being an officer of the Sirian Space Forces, he had had to comply with orders.

Before long they began to teach him a few words of English, since the method of communication by thought transference alone proved to require considerable effort and was very tiring.

When they had drifted for about four-hundred miles, Neil decided that it would be safe to use power. During their time of drifting they had worked out their course and accelerations, and a plan for eluding detection until they were at least ten thousand miles from the Sirian. Of course there were always his detectors to be reckoned on, but they figured that these would not be very efficient, since they were exactly in line between him and the Solar System, the impulses from which would make detection of the nearer, but smaller body difficult.

They started by using their rockets intermittently, firing only for a few seconds every few minutes and at each burst altering their course so that it would be a difficult matter to spot them.

For a while they watched their ex-captors, but no sign of pursuit did they see. The Sirians were no doubt searching for them, but there was no way of being certain of this. Then, after several hours more, they saw him swing round and, with terrific blasts from his tubes, head straight away from them in the direction of his own world.

Once certain that there was going to be no pursuit, they accelerated steadily at

their cruising maximum, which they had found to be not more than forty-five units. Observation showed them to be some fourteen-hundred million miles from home, which meant that it would take them some ten days to get back, accelerating till they reached the half-way point and then decelerating till they entered the Solar System at a speed slow enough to navigate among the many worlds and meteorites there.

At the same time Neil began again to make signals, this time using a directional beam which was almost entirely safe against detection from astern. He stuck to the same type of message, only saying that they had escaped and warning the worlds that they must prepare for a certain attack.

During this journey home they became very friendly with their prisoner, who had accepted the inevitable very philosophically. After a few days, when he had learned sufficient English, they took him into their confidence with regard to their idea of shifting the oceans. At first he was inclined to be incredulous, but soon his attitude changed, and one day at dinner he suddenly put down his knife and fork with the exclamation,

"I've got it!"

"Got what?" came the simultaneous query.

"The solution of that ocean problem."

They stared at him for a moment. Then Neil jumped up, caught Diane round the waist and began to execute a war-dance with her.

"I believe he has too!" was his jubilant comment.

But Kan Atra would not commit himself any further just then.

"Perhaps I spoke too soon," he said, "I just had a flash of inspiration then. Please don't ask me any more about it until I've worked it out. It may prove a disappointment after all."

"Oh! but it mustn't," encouraged Diane, "it means the salvation of both our systems—and maybe others as well," she added thoughtfully.

On the afternoon of the ninth day—they had been decelerating for over four days and were within fifty million miles of home—Kan Atra, who was taking a turn at look-out, called Neil over to the telescopes.

"Look!" he said, "can you see anything within a degree or so of that setting?"

Rapidly Neil adjusted the instrument to his own sight and took a long look. Then he called Diane over for a look also.

There was no mistake about it. There, heading toward them, was a fleet of cylindrical space-ships, ships of their own system. Within a very short time they would be rushing past these friends, these men who were obviously searching for them.

When Neil's first messages were picked up by an Interplanetary Patrol and relayed to the Council, there was a storm of debate. Many of the Councilors believed it to be a hoax and, after a long and stormy session, the Council voted to ignore the message, arguing that it was impossible for any space-ship to have reached the positions indicated.

The rumor spread, however, and finally reached the ears of Neil's old commander, "Daddy" Freeman, who immediately went direct to the President himself and asked an audience.

He had no difficulty in convincing the President of the genuineness of the message, and a call put through to Lady Cameron, soon confirmed the fact that Neil and Diane were somewhere out there in space.

Then the President took action such as no President had dared to do for centuries.

He showed the Solar System that, after all, he was no figurehead.

He did exactly what Neil had always

dreamed should be done. He dissolved the Interplanetary Council, dissolved it in a speech that, though short, left nothing of their condemnation unsaid. Then he called a personally selected council of his own, and, as Dictator, assumed direct command of the forces and governments of the whole system.

All worlds were placed under martial law, proclamations of warning were broadcast, and the navies of all the inner planets were ordered to prepare for war.

Then the messages, which were by this time being relayed in continuously, ceased suddenly.

What had happened? Were the two adventurers captured—killed?

The relief fleet which Commodore Freeman had all ready to rise, was held. It was useless to send out a fleet blindly into space without further information. They might search for a lifetime.

For two or three days "Daddy" Freeman roamed around in a state of uncontrollable anxiety. Then the messages began again.

Within an hour his fleet of eight fast scouts was on its way to meet the wanderers.

With a sudden movement Neil reached over and turned on all the deceleration he could get. At the same time he switched on all lights and threw into action the oxy-magnesium gun. This gun was set to fire a blast of brilliant white magnesium light every five seconds. He was taking no chances of being missed—they should see him somehow!

For a few minutes they continued to rush toward the fleet. Then from the nose of the leading vessel there flashed out a brilliant red flare, followed by two short green flashes—the signal of the Interplanetary Patrol.

They were safe at last! The fleet had seen them!

Almost like automatons Neil and Diane sat at the control panels, operating control, as though they had merely been out for a short "joy-fly". No sign did either of them give of the pent-up emotions within them.

Very soon they realized that, despite all their braking power, they must pass the rescue fleet at a speed of at least sixty miles a second. As though he were at the panel of a regular cruiser, Neil eased the deceleration to something more bearable, and flashed out four flares, two red, one green, one white. This was the regulation signal which meant, "I am approaching with extreme velocity. Scatter and give me passage."

Only just in time was the warning sent. Within half a minute the "Lady Diane" flashed between the ranks of the fleet like a streak of living fire.

The only sign of anxiety either showed was Diane's tight gripping of the controls as she held the little vessel, steady as a gyroscope, on her course. That and Neil's sharply indrawn breath were the only signs of the extremely narrow escape they had had, for they had missed the leading vessel by less than two miles—almost a graze at that velocity.

Even as they passed, the fleet began to wheel round in a ten-thousand mile circle to follow them.

Nine hours later the leading vessel caught up with the runaway and, within another hour, the wanderers were on board the great ship.

Greetings and reports over, the contingent set its course for earth.

They tried to keep their arrival as secret as possible, but somehow the newscasts had got wind of it, and the big landing-ground at the capital was thronged with people, while the atmosphere was thick with welcoming planes.

Neil looked at Diane with an expression of consternation, but she smiled back at him.

"Ghastly, isn't it?" she agreed, "but I guess we can endure it," then as they

neared their cradle, "oh, look! there's the President himself. Now we *are* in for it!"

The ordeal was soon over, however. The President, probably knowing from experience how it felt, cut short the ceremonials on the ground of urgency of defence. All he did was to greet the two friends and congratulate them on their escape.

Then, in a short speech of commendation for their gallantry and resourcefulness, he turned first to Diane, motioned her forward and said,

"Miss da Silva, in the name of the Solar Worlds we thank you, and as a small expression of the System's gratitude, we confer on you the title, never before given to a woman, of 'Lady Defender of the Worlds' and rank as Honorary Captain in the Interplanetary Navy."

Then, turning to Neil, "And to you, Commander Cameron, we extend equal honor, not knowing which of you two is deserving of the greater. You are therefore now 'Knight Defender of the Worlds' and have rank as Space Commodore in Our Navy, this promotion being, we feel, equal to the raising of your friend to the rank of Captain. These honors, of course," he went on, "carry the customary pensions, although I fancy that you, at least, Commodore, will not worry unduly over that."

A few congratulatory speeches from Ambassadors of the other planets followed, and then they were at last able to slip off home to Lady Cameron, whose greeting meant more to them than all their public honors.

But they were not allowed long to themselves. Scarcely had they reached home when the President summoned them to the capital again, this time with their Sirian friend, to attend the Defence Council. The Sirian, of course, would not divulge any information, but on Neil's guarantee, he was permitted his freedom and was allowed to return to Neil's laboratories, where he at once started to work on his ideas for the ocean removal.

No time was wasted. Most of Neil's suggestions for the campaign were adopted and within three days the Terrestrial fleet was ready to rise, the ships having been got ready before the arrival of the "Lady Diane."

Twelve more days were required for the arrival of the Venerian contingent, and then the great defence fleet was to sail for Mars to pick up the third section.

These twelve days were all too short. It was the only time Diane and Neil had in which to work on their big problem, and even that was broken into by official meetings, dinners, etc., which they could not avoid. They did, however, have time to go through all their former work with Kan Atra and to discuss his scheme with him.

Command of the expedition was given to Commodore — now Admiral — Freeman, the Terrestrial contingent being under the command of Commodore Neil Cameron.

Diane had told Neil that she was going as far as Mars on his flag-ship, and that her father would probably accompany the fleet in his private "patrol"—being an officer of the Atmosphere Patrol of the American Continent—and take her home from there. As a captain she was, of course, privileged to travel in naval fliers.

THE great fleet of ten-thousand huge armored fliers, with the accompanying "mosquito fleet" of fast scouts, left earth at dawn of the last day of May, 2946, rising and moving in absolutely perfect formation. The roar of their rocket-tubes was heard for over a hundred miles, and the thousands who had assembled near the great space-drome,

were treated to a pyrotechnic display such as the world had never seen.

During the ascent and acceleration, which occupied some four hours, Neil was fully occupied with handling his fleet and was unable to think of anything else. As soon, however, as they were set on the course and speed for Mars, he phoned up to the control room of the ship—he himself had a special control room from which he could give instructions to his Flock and Squadron Commodores—and requested that the captain be asked to come down.

A few minutes later a rap came on his door and, in reply to his invitation, an orderly stepped in, announced, "Captain to see you, sir," and retired.

A second later the young Commodore looked up to see before him, in captain's uniform, none other than Diane!

With a grin he got up and came round the panel.

"So you've decided to wear the uniform of your rank, dear?" he commented, "suits you, too."

"Well," she asked after being suitably admired, "didn't you send for me on official business, sir?"

"Send for *you* on official business!" he exclaimed, "no, dear, I sent for the captain of this ship."

"We-ll——?" she queried with a mischievous inflection of her musical voice.

"What!" Neil nearly jumped through the space-port. "But you're not——"

"You bet I am. *I'm* boss of this ship young feller! Haven't you just admired my uniform?"

"But, my dear——" he went on.

"Well, aren't you glad to have me?" was her mischievous reply.

"Glad! I'll say! But, my dear, you shouldn't have done this—you shouldn't have risked such danger. I really can't let you go past Mars, dear."

In reply she threw her arms round his neck and whispered,

"Don't send me away, Mr. Fleet Commodore, dear. I'm not afraid you know, and if you're—if you don't come back, then I don't want to either."

"But, how in the galaxy did you manage it?"

"Easily. I made love to your "Daddy" Freeman and then I smiled nicely at President Egbert, and you *heard* him say he'd do anything for me."

Then for a few minutes they discussed official matters, after which Diane said, "If we've finished all the business, I want to go and inspect my ship. I know a good many captains leave all that to their lieutenants, but I think I'd like to make my first inspection myself."

"O. K., my dear, I guess we'll both have to be pretty busy from now on."

Then assuming official status, she asked,

"May I dismiss, sir?"

"Certainly, Captain."

A half humorous smile at the incongruity of this necessary formality, and she was gone.

•

NEIL turned to his control board. Everything seemed in order. All ships were keeping station.

The formation was that of a huge complex cone, the flagship leading and the fleet following in squadrons of fifty-five ships, each squadron forming its own cone as a unit of a larger cone.

Squadron formation was peculiar, but very effective. In front was the leader. Next came a ring of eight ships (A Flight) in a circle of ten miles radius and five miles behind the leader. Five miles behind this again was a ring of sixteen ships (B and C Flights) in a circle of twenty miles radius, and the same distance behind this again, a third circle of twenty-four ships (D, E and F Flights) in a thirty mile circle. Fifty miles ahead of each squadron were six scouts, making the full strength of fifty-five ships.

Flock formation followed the same plan as the squadrons, fifty-five squadrons forming the flock, the circles in this case increasing in radius by two hundred miles, with a forward interval of two-hundred and fifty miles.

The total number of ships in a full flock, together with supply ships, additional scouts, etc., was something over three thousand, so the whole fleet was divided into three flocks traveling on parallel courses, with a clear space of a thousand miles between their outermost scouts (the latter with picked crews capable of standing an acceleration of eighty units for considerable periods).

Headquarters unit, consisting of a squadron of fifteen ships of the line and a fleet of these little ten-man fast scouts, had a position central to the three flocks, which were equally spaced around it.

The remainder of the fleet consisted of out-flying scouts, forming vanguard, rearguard, and circumguard.

The whole fleet in motion was a most marvelous spectacle, covering as it did a circle in space of three-thousand miles, with a total depth of nearly a thousand miles.

The Venerian contingent of one flock was parallelling them at ten thousand miles. This, with two flocks from Mars and possibly a few ships from the Outer Planets, would make the second fleet under a Martian Commodore.

Main Headquarters groups had gone ahead and were some two million miles away.

ON the second morning out, Neil called through to the control room for Diane. When she reached his office he told her that some of the ships in the Venerian contingent were giving trouble and were not able to keep station.

"Commodore Mansik has asked me to go over and see if I can locate the trouble. I shall be gone about ten hours, and I want you to take charge of my control panels during my absence."

"Right, sir," was the formal reply. Then dropping formalities, she added, "but get back as soon as you can, won't you? I want you here on this ship with me."

He reached over to a small drawer and took out two small boxes.

"These," he explained, "are personal radio sets—an idea of my own. They are intended for private and personal communications. Freeman and I have talked over a distance of ten miles, but we have had no chance to test them out in space.

"Now's our chance for a real test. You take this set and I'll keep the other."

"Gee! I'm all thrilled," was the girl's excited comment. Efficient captain though she was, she still had a good deal of the child about her. "How d'you fix it?"

"Put the main strap round under your arms with the power box and 'mike' between your shoulders. The 'mike' will pick up the sound vibrations from your lungs through the bones. Run the fine wire up along and under your helmet strap and over your head, letting the receiver pad rest *behind* your ear.

"With the present fashions in hairdressing this instrument should be quite invisible when worn by either a man or a woman. You'll notice that your set has its pads and leads tinted to match your own coloring."

It certainly was difficult to detect it, even without the helmet, and in full uniform it was entirely concealed.

Neil gave a short explanation of its controls, and then said, "switch it on and we'll talk."

She did so and began to speak.

"For planets' sakes!" Neil nearly jumped out of his skin, "You nearly burst my eardrums!"

"So you did mine!" came back Diane's

voice as she opened the switch, "I never thought they had that power!"

"Neither did I," agreed Neil rather ruefully as he rubbed his ringing ears. "The power is adjustable though. Set them to register a faint whisper now, and then, as I get away from the ship, keep changing the adjustment to suit the distance. I'll do the same, and then we'll be able to use them efficiently at any distance."

"What's their maximum range?" asked Diane.

"Dunno," was the reply, "but if that little effort is anything to go by, I'd say about a million light-years. Seriously though, I hope they'll be effective up to about twenty-thousand miles in clear space."

"How many sets have you?" was the next question.

"Only two so far, or rather three instruments. This one of mine will record from yours or Freeman's. The other two, yours and his, will only record to mine."

"But can't I talk to Paddy Freeman?" she coaxed.

"Not just at present. He's much too far away," was the discouraging reply. "But if it will please you, I can fit them all with triple cycles like this one. Then we'll be able to talk together as well as each having a private line to each of the others."

NEIL reached the Venerian flag-ship in a little under an hour, and soon got details of the trouble. It appeared that a dozen or so of the ships were unable to keep station, but would, for no apparent reason, swing in every now and then towards other ships.

On two occasions ships had actually touched before their side rockets could drive them back to their proper positions.

With the Venerian Commodore and a couple of staff mechanical experts, Neil went on board the most erratic vessel. A quick examination showed every mechanism apparently 'starred' and the ship was keeping station perfectly.

This continued for about an hour. Then, without the slightest warning, she lurched sideways and, before the side rockets could be brought into play, was drifting swiftly towards her neighbour.

As the jerk occurred, Neil took a sweeping glance over the control and instrument boards. Apparently all meters were showing normal readings.

He grabbed a phone and called.

"All operators and observers report readings of meters at moment of jerk."

One by one the readings came through, all seemingly normal. For a few minutes he studied the tabulated figures in front of him. Then, as though muttering to himself, he called Diane on the new instrument.

As soon as she answered, he whispered, "Get the readings of all meters on all control panels of your ship. I want normal readings as they stand under these conditions of velocity and formation."

As he sent the message he reached for a pad of tabulating forms and began to fill in the top sheet as though figuring out possible readings. He knew how a little of the mysterious always impressed Venerians.

In a few moments the reports began to come through from Diane. He tore off the scribbled sheet and began to fill in another with the figures she sent.

Before long he had the sheet filled and then he began to compare the two sets of readings—rocket temperatures, 'starred'—pressures, 'starred'—battery voltages, 'starred'—artificial gravity—h-m-m-m! Something funny here, figures far too high.

Abruptly he rose, signaled to the two mechanicians to accompany him, and led the way down to the after power-room.

Then things began to move somewhat rapidly! His first order rapped out. "Put all gravity into neutral." Then, "open up the gravity boxes."

This took some twenty minutes, during which time he strode around from meter to meter, testing, examining, checking.

When at last the boxes were opened, he stepped down into the nearest and walked slowly along, examining mechanism after mechanism.

Suddenly he stopped. "Look there!" he called to the Venerian officers.

One close look was sufficient. The two Venerians just 'blew-up'. The gravity balancing relays were almost red-hot, their 'mikite' insulation burned and fused!

"What's to be done, sir?" queried a Venerian officer, "We've only two spares, and the other relays will likely be as bad as these."

"Do?" Neil snapped out, "Why just float around without any gravity for the rest of the war, I guess. Wait a minute. I want to think this out."

Going back up to the power room he sat down at a desk and began whispering to Diane,

"See how many spare C. B. relays there are in the Terrestrial Fleet, also how much No. 18 insulation and No. 483 wire."

The answer was not long in coming.

"We've only four spare G. B. relays per ship and the regulation amounts of insulation and wire—What's up?"

"Oh, all the G. B. relays in the whole Venerian fleet are defective I guess. The ones in this boat are a *mess*."

HE looked up at the Venerian Commodore.

"I want your *fastest* scout boat at once, please, Commodore."

Mansik stared for a moment in surprise. Then he turned and gave the order.

A minute or so later Neil handed him a written form with the request, "If you think it advisable, will you have that dispatched at once please, Commodore? Don't radio it," he added. "Too much publicity!"

The message ran:

"Commander Venerian Fleet in Space, to Commandant of Supplies, Planetary Headquarters, Mars:

The Venerian Fleet is having trouble with defective gravity-balancer relays. It appears that the type fitted—G. B. K. Z.—is too small to carry the load under full formation conditions. Many of these have already broken down and it will be necessary to replace the relays of all ships with larger ones as soon as possible.

It is requested that you supply to our fleet on its arrival as many as possible of a larger relay. Type G. B. K. K.-9 or larger should be suitable.

We require up to a maximum of 20,000 relays and also 1000 units of insulation No. 48b. and 1000 units of wire No. 564.2

Please do your best for us, as our fleet will be unable to go into battle without the new equipment."

The Venerian read it over, thought for a moment, then signed and dispatched the message.

"Thank you, Commodore," he continued. "We are most grateful for your help. None of my own officers could locate the trouble, since the gravity boxes appeared to be functioning. You must be a wizard at spotting trouble," he added with a smile.

"Glad to have helped you, Commodore," was the reply," I think, if I were you, I would instruct your captains that any ship that gives trouble is to proceed with neutral gravity.

"It will be inconvenient for the crews, but it is essential that your whole fleet arrives.

"Perhaps it would be as well, also, if you increased your formation distances by ten or twenty times. That would relieve the boxes somewhat too."

Then, taking his leave, he entered his own flier and returned to his flag-ship.

The journey to Mars occupied sixteen days, during which the officers and crews of the ships were drilled in battle practise and formation, and were also given a course of lectures—by etherophone on the methods of resisting the hynoptic forces of the enemy and keeping their own mental control.

The experience of their two commanders in this matter was invaluable. There is little doubt that, had our fleets met the enemy without this mental preparation, they would have fallen under the spell and surrendered without a struggle.

The lectures were given by Neil and Diane, each one dealing with certain special phases of the problem, and at the conclusion of the course, they felt quite confident that humanity would be able to defend itself against any mental attack that could be launched.

A code of signals was devised so that flock and squadron commanders could be warned of such attacks and resist them as units.

Instructions were also given that, in battle, no orders were to be obeyed and no move made until confirmed by at least two officers. This was to prevent any unfortunate incidents arising through individual officers coming under enemy influence temporarily.

THE arrival at Mars was a sight such as few living could remember. The air seemed filled with great cigar-shaped vessels. The landing grounds, specially prepared for the great fleet, covered mile on mile of the dry, sandy wastes of the little red planet. As far as the eye could reach in every direction there lay rank on rank of shining metal ships.

Twenty-thousand there were in all, packed close together, yet still covering a full forty square miles of ground. The ten-thousand Terrestrial ships on the north occupied a whole county, while the seven-thousand Martians and three thousand Venerians filled an equal area.

Beside this, an area of at least sixty miles was packed with the thousands on thousands of little scouts. A hundred thousand of them at the least were gathered in this area, while from time to time still more groups arrived, until even this huge area was unable to accommodate them.

Around the Venerian fleet the bustle and rush was terrific. The Martians had procured more than half the required relays, and every vessel was being refitted with larger ones, or with extra numbers of the small ones taken from those ships which had the new ones installed.

Two days of preparation were followed by a similar period of rest and recreation for the overworked crews.

On the afternoon of the second rest day, shooting down the sky, came one of the fastest scouts in use. A tiny ship it was, bright blue, carrying the colours of the "Saturnian Federation of Satellites."

Straight to Admiral Freeman's headquarters it was taken. Its commander stepped out, saluted the Admiral and handed him a message.

"From Commander in Chief of the Satellite Forces of the Outer Planets, to the Admiral in Command of the Inter-Planetary Expedition.

Greetings. Following our messenger is the fleet of the Outer Planets.

We regret the delay in arrival, but have been awaiting the arrival of some of our forces from asteroids on the far side of the sun.

We are pleased, however, to be able to place at your disposal a total fleet of

about eight-thousand vessels, together with accompanying scouts.

We earnestly trust that this fleet will be of great assistance to you."

This was indeed glad news. The commanders from the inner planets had only expected a small contingent, certainly not more than half a flock, from the outer satellites. Now the Solar Fleet numbered nearly thirty-thousand ships of the line—a navy such as had never before been gathered together. Moreover, the new unit enabled the fleet to adopt its most efficient formation, that of three units equally spaced around its headquarters section.

Against such a fleet the enemy must needs be powerful.

The voyage outward from Mars did not commence at once. During a month of preparation, drills, battle-practise etc. were carried out almost continuously. This month was necessary both for the training of the combined fleets and also to allow the fast scouts to get sufficiently far ahead of the main fleet.

These scouts were sent out at regular intervals of two days, so that there was, in front of the fleet, a strong series of protective vessels, and also a definite line of communication.

The scouts accelerated up to twenty-thousand miles a second, so that when the main fleet sailed, the leaders were some two light-days ahead (say forty-thousand million miles). These were spread out over the area of a circle of nearly one-light day in diameter.

This incredibly gigantic fan of scouts was necessitated by the terrific velocity attained by the main fleets. They must be so far ahead that they could give the main body warning at least twenty days before it could come up with the foe—and, incidentally, give the foe equal warning, of course.

A surprise attack with fleets of this kind is utterly impossible, since such fleets require a tremendous time to decelerate to speeds at which they will not simply shoot right past each other and away into the void. In this case from fifteen to eighteen days must be allowed.

The scouts would, of course, ethero-graph back their messages from rank to rank, while themselves dashing right past the enemy's scouts, and then they would turn in a circle of uncounted millions of miles to rejoin the main fleet.

On July 20th, the main fleet moved off. It was a sight such as could be seen only by telescopic vision. The vastness of the formation was too much for the eye to take in at short range.

It took some ten hours to get formation, as the leading ships had to travel outward so far before decelerating to a stop, while the rest came up into position behind them.

For high velocity-traveling all intervals were increased by two hundred times, so that this incredibly great navy now occupied a circle of a quarter of a million miles in diameter, with a fore-and-aft depth of a hundred-thousand miles—little enough space at that for such tremendous velocities.

It is almost impossible, even in these days, to picture this colossal formation. The thirty-thousand ships of the line may perhaps be visualized, but when we try to picture this far-flung screen of scouts spread out so that no one of them is within a million miles of his nearest neighbor, then our very imagination fails us utterly and hopelessly.

THE scouts had no light job. They had to detect the enemy fleet at a range of at least five-million miles. Moreover, the enemy vessels would be dark bodies unilluminated by the rays of the sun, which at that distance was merely a fairly bright star. The only light radiating from the vessels would be the faint trails of their rockets—if they were

using motors of that type—and possibly a few rays from unguarded space lookouts.

Visual detection is impossible under such conditions, so they were forced to rely on directional vibration receivers tuned to the utmost sensitivity. (There had, of course, been no time to equip them with Neil's new detectograph). With these they should be able to detect the radiations—the corona loss—from the electrical machinery of the ships. But five-million miles is a long way even for the most delicate instruments.

A less extensive range would have been useless, since, with a relative speed of perhaps forty thousand miles a second, they would, even then, get only about four minutes of possible observation before the enemy would be passed and out of range again.

It was absolutely marvelous the way in which those scouts kept contact. Their formation, even at such terrific distance, was such that their detectors gave them almost complete coverage over their whole front. A few enemy vessels might slip past unnoticed, but long before the main body was reached some at least of their scouts must reveal their presence.

On August 10th, the first reports came from the scouts. On the eighth the first line of enemy outguards had been detected traveling directly towards the sun at a speed of about fifteen-thousand miles a second.

On the 25th, reports of contact with the main fleet began to come in, and as soon as this occurred the calculating machines were set to work to figure out the necessary course and deceleration to get the Solar navy in position to meet them.

As had been expected, the Sirian fleet had detected our scouts also and were themselves decelerating so that the two fleets would come into contact in about twenty days.

All scouts, except the immediate advanced guard, began at once their gigantic circling movement. Those whose position compelled them to pass through the enemy's lines, sprayed out behind them a fan of tiny steel balls—a million or so from each—so distributed as to occupy a space of some fifty million cubic miles.

These little pellets were few and far between it is true, but it only required one of them to strike an enemy vessel to cripple it badly. At the tremendous speed of approach these balls were as deadly as any natural meteorites.

The full effect could not be seen at the time, but when all the facts of the gigantic attack came to be known, it was estimated that some five thousand of the forty thousand enemy vessels were wrecked or disabled by them. The balls, although so scattered, were numerous enough to overtax the automatic meteor repellors and so do effective work.

As the speed decreased, the great cones began to contract until normal positions were reached, with vanguard scouts at twenty thousand miles.

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THE enemy formation was a huge hemisphere with the concave side forward. Their idea apparently was to envelope our fleets completely by completing the sphere.

As the fleets made contact the forward scouts shot out projectiles filled with uranium solutions, which were timed to burst on contact, or immediately in front of the enemy ships. The released fluids, in the moment before they froze solid, spread out over the hulls of the spheres forming slightly luminescent patches which, under the influence of rays from our ships rendered the spheres easily visible. This work was so well done that practically all the enemy vessels were thus identified.

At ten-thousand miles the first premonition of a mental attack was felt. From

a group of scouts came the first warning M. A. signal, and every man in the fleet braced himself to resistance.

Within a few seconds came the voice of Admiral Freeman,

"Mental attack developing. All ranks keep stations. All orders will be confirmed and reconfirmed." Then, immediately following,

"Terrestrials will attack outward from center. Allow enemy fleet to make complete envelopment. Mars-Venus attack from left flank and Outers from right.* Fleet Commodores use own judgment as to methods and formations."

Then in a different voice came,

"General Staff Commodore Hyachi confirms order of Admiral Freeman" and the order was repeated word for word. Then again

"General Staff Adjutant Taklata reconfirms order of Admiral Freeman and Commodore Hyachi" and again the exact words were repeated.

Clumsy? Yes, but very necessary. As we have already said, the fleet had to be protected against officers under enemy influence, and the exact repetition of the words was the only safeguard. Under, or partly under, enemy domination officers would almost certainly *not repeat the* exact *words* of an enemy-suggested order. They would express the *thought* each in his own words.

Swiftly the Terrestrial Fleet swung into its new formation. Each flock covered a sector of the sphere, with squadrons facing outward. Headquarters, of course, remained in the centre, directing by etherophone and telescopic vision. The enemy, thinking they had our fleet in a trap, closed in behind them.

It must be remembered that in the almost complete darkness of outer space, visibility must be extremely poor, and that, even though the battle was formed in close order, yet it still covered thousands of miles in all directions.

Arrived in position, the Earth Fleet halted and waited for the enemy's move. Almost at once it became evident that the full force of the mental attack was to be directed against this section. With every man in the fleet using all his powers of resistance, and with the support of the outside fleets too, they had all they could do to stand against this terrible menace.

At first, as had been the case when Neil and Diane had been attacked, it took the form of suggestions of terrifying fates.

In a few moments a sense of doubt and confusion began to make itself felt. Promptly Neil turned to his Staff Commander and Signal Lieutenant.

"Watch!" he orderered as he started to write out a message. "Has either of you had that thought suggested to you?"

"No, sir!" came the instant reply.

"O. K., then. It's an order. Please confirm."

Then calling on his phones, he read the message.

"Flag-Captain da Silva is hereby relieved of her command and appointed to the General Staff with rank of Fleet Commodore. She will hand over her present command to Commander Edwards, who takes rank as captain on assuming command.

"Fleet Commodore da Silva will report immediately to this control-room to take command of the mental defences of the fleet."

As soon as Diane reported, Neil called her into his private office.

WHEN they were alone she turned to him with,

"Neil, dear, why didn't you let me keep my ship. I *did* want to fight it through."

"I know, dear," was the quiet reply, "but you are the only one who can handle

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* The terms "left" and "right" could be used without confusion, since the fleet always worked from its own space-plane, which was set by the commander according to the direction of travel.

this command. *It's the most important job in the fleet.* I must keep clear for general control and you are the only other one who knows just what these fiends can do—You saved us before, you know!"

"But, Neil, you've given me equal rank with yourself." She protested, "Can you do that?"

"You bet I can, sweetheart. It's both right and necessary. Daddy Freeman will confirm it all right. Besides, you must have that rank so that your orders will supersede those of the Squadron and Flock Commodores."

"But see," he broke off, "the attack is developing. Better get at it. Good luck, dear."

Diane, with characteristic decision, immediately called two of her former staff to act as her "aides" and to confirm her orders. Then she got busy.

Idea after idea she sent out to the fleet. After a while the sense of confusion began to fade, as the men began to co-ordinate their thoughts with hers.

Neil's wisdom in making the appointment was now apparent. Every man in the fleet just worshipped their lady commodore, and responded to her as they would to no other. They knew too, that she had already met such attacks, and that knowledge gave them the added confidence that was so essential.

Time and again her voice rang over the wires and through the ether. Now it would be, "Hold on, boys, you can't be licked!" or again, "We are on the side of right, and Right is Might!"

Then again she would meet some definite order of the enemy. Once it was "Leave those controls *alone!*" as the mental order came "All controls in neutral."

For a full hour the struggle continued. Then like a ray of brightest cheer, came Admiral Freeman's voice on her private radio.

"Well done, Commodore Di! Stay with it, girl! Mars-Venus and Outers will strike within three minutes."

As though the enemy had heard the whisper the attacks redoubled. Diane could feel the suggestions almost like physical blows.

Her fleet began to break. Here and there a man or an officier would collapse and try to do the enemy's bidding. Time and time again did commanders and others have to force their own men back from some panel or other. Yes, even to shooting down their best friends did they come.

Within a minute confusion began to develop. *Could* they last out that other two? *Could* they? They MUST!

With the supreme effort of her life Diane shrieked into the phones,

"Hold on! Hold on, boys! Remember your wives, your sisters, your sweethearts! Hold on! Right is INVINCIBLE!"

It was her old appeal and again it won. Men, officers, commanders took a new grip on themselves. A few moments of appealingly intense struggle followed, and then—

"Our fleets are attacking," came Neil's voice.

A gasp of relief quivered throughout the fleet. Now the enemy must divide his attention.

LIKE the snapping of a switch the pressure ceased. The mental attack had *failed!*

With a sigh Diane sank back completely exhausted, utterly spent with the terrific strain. Without a second's hesitation Neil turned to his Staff Lieutenant. "See to her!" was his curt command, snapped out through clenched teeth.

He would have given everything to go to her just then, but—his world was at stake, his duty, his honor, and well he knew that she would never have him desert that even for her.

Quickly he turned back to his panel.

"Mental attack defeated!" he called, "Orders following this may be direct, without reconfirmation."

Never did a tired fleet go into battle with such steady determination. As soon as direct orders were again established Neil sent out,

"All squadrons, except No. 1 of 'A' Flock, will protect with full ray-screens and attack outward with rays 1, 2, and 5.

"Squadron 1A. will scatter, watch for attack by radiance balls and endeavor to devise some means of defence against them."

Then after a moment he added, "Good luck, One! Yours is the place of danger—and of honor!"

No. 1. Ray was merely an intensely brilliant ray of white light, to expose the enemy to view (Our ships had been painted a dull black before leaving Mars to counter any similar ray used by the enemy). Ray 2 was pure, concentrated heat, and Ray 5 was an ultra-violet which was to activate the luminous paint sprayed on the ships by the scouts.

In addition they had Rays 3, and 4, the former a short "gamma" ray, the latter a beam of magnetic force.

For extra armament each ship carried ten guns of twenty inch calibre, which fired projectiles containing a couple of tons of kryptonyl-nitro-pyridine (known as K. N. P.), one ounce of which was equal to more than ten pounds of the ancient, but similar, T. N. T.

These guns were only intended for special circumstances as the concussion of their firing was so hard on the crews.

The sudden blaze of sixty-thousand searchlights must have been distinctly disconcerting to the enemy, but they were evidently fighters. Their own rays flashed back within a second.

At first the battle seemed to be merely a sort of fantastic searchlight display. Then Neil ordered,

"Squadron Commanders will focus Ray 4 on any enemy ship that approaches within fifty miles. Focus *through* the hulls and try to freeze their electrical machinery."

As he finished speaking, a red light flashed on his panel. Quickly he threw a switch,

"Commander Squadron 1A., speaking, sir," came the voice, "Enemy are firing luminosity balls from some of their ships in sector 346/28. May I collect my squadron there, sir?"

"Certainly, Commodore, your squadron is entirely in your own hands. You are permanently connected without signal. Good luck."

The main battle was developing very slowly. The enemy seemed loath to use more than a few rays—although our fleets were certain that he had a much greater number. This slow development suited Neil exactly. The longer time he had the more chance there was of Squadron One finding out something about the balls of fire.

"Squadrons should concentrate their rays more," was his next instruction. "Concentrate the focussing until you break through their armor. Add Ray 3 at the focal points to help break down armor resistance."

As he gave the order, Neil felt an intense pity for these men who were fighting so gallantly. Well he knew that they were almost exhausted by that terrible mental battle. Yet not a man faltered, although it was like automata that they obeyed—spontaneity of thought and action could hardly be expected yet.

Then there came to him an understanding of the enemy's slowness. Of course, he too was played out! His unsuccessful attack must have been continued to the point of utter collapse. The enemy *could not think clearly* for a time!

As the full significance of this struck him, he turned to Diane, who, now nearly recovered, was sitting beside him.

"Now's our chance, kiddo!" he grinned. "Those beasts are still exhausted and can't think," and as a rather wan smile flashed over her face, he turned back to his phones.

"Squadron commanders give 'em everything you've got. Get 'em before they start thinking again!"

NOW things did begin to hum! With marvellous precision the many rays moved to and fro, combining and recombining. Ship after ship of the enemy's fleet flashed into white heat—drifted off her course—her crew burned alive. Thousands must have been destroyed within a few minutes.

But this was not to last. Aroused by the sudden intensity of the attack, the Sirians forced themselves back into activity. Now they let loose their great weapons —the balls of fiery radiance. Thousands on thousands of these horrors came rushing towards our fleets, directed by some force inexplicable to us. Hundreds of them struck before our ships could dodge them, and each time they struck, a ship went to its doom in a soundless crash of infinite brilliance.

How many enemy ships were destroyed we could not tell, but within an hour, over three thousand of ours had gone—and what was happening to the flanking fleets we could only guess!

In growing apprehension and alarm Neil and Diane watched the recording officers. How long could this last?

Frantically he called No. 1. "Can you get ANYTHING on them? We are being annihilated!"

"Nothing yet, sir," was the disheartening reply.

Fifteen more minutes—two thousand more ships dead!

Diane looked at her lover, saw the desperation in his face.

"Isn't it HELL!" she exclaimed. "If only we were out there on the circumference doing something, it wouldn't be so bad—but here, safe in the center——"

"Not so safe either," broke in the voice of the Staff Lieutenant. "Look at that!"

"That" was a group of fire-balls rushing towards them at terrific speed. It was their turn now—a few moments and their little squadron would be but a blaze of light!

"My God, *look!*" cried Diane suddenly. "Oh! the heroes!"

In amazement they stared, for right into the path of the fire-balls shot a full squadron of vessels—a Japanese squadson—deliberately throwing away their lives to save their leaders!

"What squadron is that?" asked Neil hoarsely.

"No. 37, 'A' Flock, sir."

"Record it. Never let that sacrifice go unhonored." Neil's voice broke on the words as the heroic squadron burst into brilliance.

For a moment headquarters stood in bareheaded silence. Then, suddenly, sounding harshly through the hush, came the voice of Commander 1A.

"We have it, sir. The balls can be stopped by Ray 3 if its wave-length is increased to .0004 micrometer. Concentration of ten or a dozen rays at this wave will explode them."

"Thank God!" was the fervent response.

Now the intensity of the fighting redoubled. The enemy, finding his weapons repulsed, endeavored to swamp our defence by sheer weight and rapidity of fire. Still our ships continued to go out in flame—still we seemed to lose two or three to their one!

With haggard face Neil muttered,

"Our last reserve!" and called again on general signal.

"All squadrons—rapid fire independently with K. N. P. guns."

By now there was no attempt as regular formation. Earthmen, Venerians, Saturnians were all in a general mêlée with the hostile spheres. Fortunately for Neil's headquarters, the general shape of the battle was a hollow sphere of which his group was the central point, so that they missed the greatest intensity of the attack.

FOR two hours more the struggle went on. Rays, projectiles, fire-balls—everything that they could hurl at each other was used. Squadron after squadron was annihilated. The whole remnant of the Solar force now numbered less than two thousand ships—*and still they died!*

The enemy was suffering, too, suffering terribly. Our K. N. P. guns were wreaking havoc. For every ship we lost, the Sirians were now losing five, but—could we last out? Or would all our ships be wiped out first?

All of a sudden, the enemy appeared to realize the rate at which his ships were dying. Panic seized him. He turned and *fled!*

Out into space he drove, himself now only three thousand strong, towards his own distant worlds.

For a few minutes the Solar Fleets were stunned. A moment ago annihilation stared them in the face. Now the enemy had quit, had showed a yellow streak!

Neil looked at his sweetheart. Diane stared at her lover.

"He's going!" she exclaimed almost in a whisper.

"But why?" came the Course Commander's puzzled voice. "He'd just about got us!"

"Don't you see, boys," Diane burst out suddenly, "That mental attack broke him! He's fought all the battle on the *remnant* of his nerve, and now it's cracked up."

Even as she said it, the voice of Admiral Freeman cut in: "Regular formation all ships. The fleets will pursue the enemy to his destination."

"Good stuff, Dad"—this over the private wire from Diane and Neil together.

The pursuit soon became a dull, monotonous routine. True, there were skirmishes between scouts, and twice there were minor battles between the big ships, but these were merely incidental.

Day after day the six hundred remaining earth ships with their allies, scarcely five hundred more altogether, drove on into space.

Admiral Freeman, worn out with the strain—he was over seventy years of age at this time—relinquished his command to Neil and returned with the messenger scouts to earth.

For a month the pursuit continued. Then one day the enemy turned at bay. He had evidently decided that this three thousand vessels were, after all, a match for the thousand or so Solar ships.

But no! Neil knew now how to handle him. Without waiting for any sort of mental attack to develop, he simply ordered his fleet to independent action with K. N. P. guns.

Fifteen minutes of this and friend enemy had had enough. Unhappily for him, however, his main fleet had become separated from his headquarters section—or so it appeared.

Seeing this, Diane, now acting as Chief Observation Officer, called Neil's attention to it with the suggestion,

"Why not send out a couple of squadrons and *pinch* 'em?"

"Gee! You hit the ball every time, don't you," was his only comment.

The capture was effected without difficulty and with the loss of only one ship.

As the captive vessels approached, Neil sent out the thought,

"Chief Sirian Commander will prepare to leave his ship. He will go out into space to be conducted to us. Safe conduct is guaranteed. The alternative is complete annihilation."

"I will come," was the answering thought, given with a terrible intensity of bitterness.

THE interview reminded Diane and Neil of their own appearance before their foes, only now the tables were turned.

The conference lasted a full hour, during which time Neil searched the Sirian's thoughts to its depth. The enemy had learned his lesson. He knew now that our Solar System was not for him.

Understanding this, and realizing that, although he was utterly ruthless in warfare, yet the foe still had his own very definite code of honor, Neil said to him at last,

"You are an enemy, yet we respect you as a fair-fighting foe. Therefore we wish to deal justly with you. I wish to confer with my staff and then we will advise you of our decision."

For some few minutes Neil and Diane discussed all sides of the question, their ideas, with a few suggestions from some of the other officers being finally written out and unanimously agreed to. As soon as this was done, the Sirian was sent for.

"What is your decision?" was the thought he sent them. In it was no trace of defiance, nor, on the other hand, was there any note of fear. It was the direct and courteous question of a defeated general who must accept the inevitable, and who decides to do so with the best grace possible.

Slowly and carefully Neil spoke, voicing his thoughts as he sent them out.

"We have decided to treat you as an honorable foe, to trust your word that there will be no treachery. Do you give it?"

"I give my word," was the simple and obviously sincere thought returned.

"We accept it. These are the terms we offer you, that in the name of your planets you shall agree to.

"You will take your fleet back to their own system and remain within its boundaries unless we sanction otherwise.

"For our benefit you will leave with us one each of every type of ship in your fleet, together with sufficient officers and men to navigate them. These officers to explain to us the mechanisms of such things as we do not ourselves understand. These officers and men to be allowed to return to their own worlds, should they so desire, after the final ratification of the peace terms.

"If you accept these terms, we will at once withdraw our fleet from pursuit and let you all go free, trusting in your honor to keep the pact until its ratification by the rulers of both systems.

"If you refuse, you will be given ten hours in which to rejoin your fleet. At the expiration of that time we shall proceed to annihilate your fleet systematically, mercilessly, and completely, leaving only one vessel to return to Sirius with news of your fate."

"Enemy beings," came back the thought, a thought so sadly expressed that no one of all those conquering officers could do other than pity the fallen foe. "Enemy beings, you have treated us honorably. The wrong was ours in the first place, but you too can understand our need, which is as desperate as your own. Our great fleet is broken. We must return to our worlds in defeat, to tell them that the chance for our race is lost to us, and that most of us must perish.

"We have no enmity against you. Think kindly of us if you can."

Deeply moved the men stood in silence.

Then, for nearly the first time addressing one of the enemy directly, Diane spoke.

"We greatly regret your fate, even though we ourselves may share it. We feel for you in your defeat, but at present we cannot help. All we can say is 'Go in peace' no longer our enemy."

The Sirian stood silent. The turmoil of his emotions could be felt.

After a few moments Diane spoke again.

"Friend of Sirius, there is one ray of hope for your world as well as for our own. Your officer, Kan Atra, whom we took back with us from your scout vessel, is working with us on a possible project, which we hope may solve our problem. Rest assured that, if we find it, you also shall share in its benefits." Then stepping forward she held out her hand and, as the Sirian grasped it, she said, "Go back to Sirius with that ray of hope—and go as a friend.

ONCE more did the two friends join hands as they drifted down to earth. Once more did they receive the plaudits of the Solar System. This time representatives from every planet and inhabited satellite in the system were present.

At the end of a week of celebration, Neil, alone with Diane at last, said gently,

"Di, darling, let us slip away and get on with the work. I've had enough of this fuss," and on her enthusiastic agreement, he continued, "and, Di, what do you say we run off and get married first?"

"I'd love to, dear," she answered, "but somehow I think we'd be happier if we waited till our work is done. Remember there's still the big problem to face. Really we're no better off than we were last year." Then, as he kissed her in agreement, the door opened.

"I'm so sorry to interrupt," came the voice of the president himself, "I know you two want to get away—to your work —but first I have a small request to make of you. Will you, before you go, speak a few words to the assembled worlds, who are now waiting at their etherphones. Give them a word of hope. Tell them, if you can, that there is hope of salvation. Will you?"

Of course they agreed. Each gave the worlds a message of encouragement, and then, to their infinitive embarrasment, the president stepped forward to the screen, took each by the hand and said,

"Peoples of the Solar System, you have heard from these two friends that there is hope for us. Now you will all rejoice to know that in their efforts to find safety for you, they have also found happiness for themselves. It is an honor for me to announce the betrothal of the Lady Diane da Silva to Commodore Sir Neil Cameron, the two whom we all may thank for our deliverance from a terrible conquest."

When they reached home, they found Kan Atra very busy. He had practically completed his work. The plan he had thought of in the "Lady Diane" had proved successful so far.

He took them out to the testing grounds where he had had a little lake constructed, and what was their astonishment to see, right in the middle of this lake, a huge aluminum ball at least three hundred feet in diameter, anchored with strong chains.

"Now watch," he said.

From various points around the lake there were trained on to the base of the ball a number of ray machines. Kan Atra threw over some switches and from these machines there leaped out rays of a soft golden hue, all focussed on to the ball.

Immediately it began to strain upward against its anchors. Then as it steadied, they saw that the level of the lake was beginning to drop.

"What's happening to the water?" asked Neil.

"Going into the ball," was Kan Atra's

explanation. "The ray, which is similar to the one used to project our luminosity-balls, will, at certain frequencies, counteract the influence of gravity on certain substances, among which are certain metals and a few simple compounds such as water. As the rays are focussed just now, they are nullifying the earth's pull on the ball and also on the water that is immediately below the opening in it.

"Since the ball is exhausted of air, the water will be forced into it by atmospheric pressure from without. In the ordinary way, of course, this only gets the inside water level up to about thirty-feet, when its own weight prevents any further rise—but that is the most elementary physics, of course.

"However, when the ray is in action the water inside becomes practically weightless and so the pressure outside can force it up until the sphere is filled. Then the cables can be released and, with a little adjustment and manœuvring, the ball full of water can be moved about at will."

"So you really have succeeded?" said Diane after a long pause. "I always knew my idea was real, but somehow, now that it really does work, I can't quite believe it."

AS a matter of fact neither she nod Neil seemed to take in the marvelous truth of it just then. Perhaps all their experiences had left them so mentally satiated that they were incapable of taking in any more ideas for a time. At any rate the realization of it only seemed to reach their comprehension slowly. But when it did——!

It was not long before the president was called to inspect the project and, when he saw their demonstration, he unhesitatingly pronounced it practicable. He ordered work to be started at once on the construction of a large number of aluminum balls, each twenty miles in diameter, ready for the reception of the ocean water.

It was estimated that it would require about eight thousand of these balls, since the mass of water was equivalent to a single sphere of over three hundred miles in diameter. To build larger balls was, however, not practicable so they had to use this large number. About a thousand were to be constructed, each being used several times.

The construction of these balls and of the necessary machines for operating them took nearly a year, but instead of waiting for the completion of the whole series, they commenced to draw off the water as soon as there were sufficient balls available.

It was soon found, as Neil had warned them, that too rapid a removal of the weight would cause serious disturbances, and so it was arranged that the lifting of the oceans should be spread over a period of years to avoid danger of earthquakes. Even as it was there were many destructive shiftings of the earth's crust, but, fortunately, Neil's calculations had been so well made that these were nearly all foreseen and little or no loss of life occurred through them.

The problem of the disposal of the water had been a difficult one, but eventually, at Kan Atra's suggestion, it was removed to an orbit some millions of miles inside that of Mercury, where it was near enough to the Sun to prevent it from freezing. In fact, after it was set in steady rotation, it was found that it kept a temperature high enough to give the little watery planet a considerable atmosphere of vapor.

As soon as the work was started on earth, the Venerians and the inhabitants of the outer satellites followed suit, their oceans being added to the same mass, so that eventually there was a planet formed whose diameter was nearly a thousand miles. Mars, of course, had no ocean to

remove, so arrangements were made to transfer her surplus population to some of the less populated satellites and even to one or two of the larger asteroids.

The removal of the first group of balls was an event in Interplanetary History. A hundred of the great spheres were lifted simultaneously by the throwing of a switch by the originator of the idea, Diane herself.

The event, at President Egbert's request, had been made coincident with her marriage to Neil, when immediately the last ball had disappeared into the sky, the president stepped forward and, in the presence of delegates from all over the Solar System, and of Kan Atra and a few other Sirians, who had chosen to remain on earth for a time, he joined their hands in marriage.

The ceremony was conducted without any elaboration, since both felt that it was too solemn an occasion.

As soon as the ceremony was completed, a guard of officers—the survivors of the great battle—formed around the newly-married pair and before the crowds realized what had happened, the bride and groom were away on the "Lady Diane."

Where they went for their honeymoon is the one secret they never told.

OUR story is ended. The history of the years that followed is well enough known, how the ocean beds were fertilized, how the hot planet Mercury was found unsuitable for any of the peoples of the Solar System and so became a Sirian colony, how each succeeding generation born into the world is smaller than its parents, so that as time goes on, the stature of men will again adjust itself to the lessened size of the worlds, is in fact doing so at such a pace that we have already started to bring back our oceans, making our earth once again the delightful world it used to be.

All this is history and does not really belong to our story. What we have tried to tell you is the story of the romance of our wonderful grandparents, of their great love for each other that made their life together, and with their friendship with the honored Kan Atra, such an example to the worlds.

"May we be found worthy to follow in their footsteps" is the great hope and prayer of us who write, their two grandchildren, Diane and Neil the Younger.

THE END