

Stories of the Stars

NATURE SERIES

SELECTED AUTHORS

Stories of the Stars

Selected Authors

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Stories of the Stars

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Handbook of Nature Study

By Ann Botsford Comstock

For many reasons aside from the mere knowledge acquired, children should be taught to know something of the stars. It is an investment for future years; the stars are a constant reminder to us of the thousands of worlds outside our own, and looking at them intelligently lifts us out of ourselves in wonder and admiration for the infinity of the universe, and serves to make our own cares and trials seem trivial. The author has not a wide knowledge of the stars; a dozen constellations were taught to her as a little child by her mother, who loved the sky as well as the earth; but perhaps nothing she has ever learned has been to her such a constant source of satisfaction and pleasure as this ability to call a few stars by the names they have borne since the men of ancient times first mapped the heavens. It has given her a sense of friendliness with the night sky that can only be understood by those who have had a similar experience.

The Storyland of Stars

By Mara L. Pratt

The Storyland of Stars

What can be more in order, children, than that now, when the earth flowers are all gone, and the air, so clear and frosty, is bringing out the stars in all their brightness, we should turn to study them — the sky-flowers, as we may well call them?

But will they be as beautiful and as full of interest as were the earth flowers? Yes, — no, — yes, — indeed, who shall say? If you will try to tell me which season to you is the most beautiful, which flower you love best, perhaps I might find courage to try to say which of these, the earth-flowers or the sky-flowers, seem fullest of beauty and interest.

I am afraid we should all finish up as a little boy did, of whom I once read. In the winter he rushed into the house, his eyes sparkling, his cheeks red with the pinches and bites of playful old Jack Frost, and said, "Oh, mamma, is there anything so beautiful as winter? The sleighing! the coasting and the skating! O, and the sun! See, see the sun! see how pink it makes the snow! I wish it would always be winter!"

Spring came. The soft rains, the warm showers, brought out the clean new buds and the grasses. "O, the beautiful spring!" said the boy. "It's as if the world were

waking up after a long nap. I can almost see the grasses grow! How glad the birds seem! And the air is so full of flowers. Mamma, you never saw anything like the woods today. I wish it would stay spring forever!"

Then summer came. The little fellow went far up among the hills to play until vacation was over. O the great, broad fields, the dark, shady trees, the soft, warm air! "Just hark, mamma," the boy would say, "you can hear the stillness! How big the world looks! I wish the summer would never go!"

Autumn came. "Mamma," cried the boy, "I believe I could paint a picture. Just see the red leaves, and the flowers — I like those dark, rich colors! And the air — what makes the dim, hazy light? So different from the clear, hot air of the summer. What could grand-mamma have meant by saying this was a sad season? — the saddest of all the year? Why, it's the brightest of them all! Wouldn't it be grand if the world would look like this always? I wish it would never change!"

And so it is, I think, with any of these studies that have to do with Nature. Each is of itself so beautiful, so full of its own interests, that it is hard to say which is the best. Like the little boy's seasons, the one before us seems for the time better than all the rest.

And aren't you glad that it is so? How dismal it would be if only one of the seasons were beautiful and we had to

wait and wait, and long for its return during all the other three!

But dear old Mother Nature is not so stingy as that. There seems no end to her bounty. She takes away one beautiful gift only to give us another.

And now, right here, she has given us the stars, brighter and clearer than they ever are in the summer time, just because she has had to put the flowers away for their winter's rest, I think.

Good-Night Pretty Sun, Good-Night!

Good-night, pretty sun, good-night!
I've watched your purple and golden light
While you were sinking away.
And someone has just been telling me
You're making over the shining way
Another beautiful day.
That just at the time I am going to sleep,
The children there at your face take a peep,
Beginning to say good-morning just when I'm saying
good-night.
Now, beautiful sun, if they have told me right,
I wish you would say good-morning for me,
To all the little ones over the sea.

Astronomy

This is the name given to the science of the stars. It comes from a Greek word astron, which means star. Can you not think of a certain bright-faced, star-like flower whose name, now that you come to think of it, must have come from this same Greek word, astron?

You see then that somebody, long, long ago even, must have thought of the likeness between the stars and the flowers; so have we not as good a right to call the stars sky-flowers, as they had, so long ago, to call the flowers earth-stars?

You have no idea of the wonderful discoveries that have been made about these far-off dots of light.

By long years of hard study, astronomers have learned how far away these stars are from us, how far they are from each other, how large they are, how old they are, how much they weigh, what they have been doing, — yes, and even what they are going to do in the ages to come.

It was strange enough to know what botanists had learned about the families, the ways, the lives and the deaths of all the plants of the great plant world; but to think of learning all about the star-world, away up there in the sky beyond reach, beyond hearing, and almost beyond sight, seems almost incredible. It is enough to take away

one's breath, isn't it? But aren't we glad we haven't all this searching to do for ourselves? Isn't it good to be alive in these days of books and study, when people have already learned so much and are so eager to learn more?

Astronomy is such an old science! That is, people have been studying it, in one way or another, for so many, many years.

The Chinese, it is said, have books four thousand years old, in which are written reports of eclipses; and in one of these books, is told a story of a certain ruler in that country who was so angry with two astronomers, Hi and Ho, for not foretelling an eclipse of the sun that he had them put to death.

The Chaldeans, too, knew something about the sky. Lying out on the hillsides through the long nights as these Chaldean shepherds did, they could not fail to notice some of the wonderful changes among the stars. They learned to know and recognize the stars as they did their sheep.

They learned that certain stars seemed traveling on, night after night, towards the setting sun; and that by and by they, too, seemed to "set," as we say the sun "sets;" they learned that after a few weeks, or months, these stars came back again, traveled across the sky, and again were lost to sight.

They noticed that the moon came just so often, stayed just so long, then, like the stars, went down and out of sight.

Wonderful stories these shepherds used to tell of the star-world, — some of them wise, some of them so foolish you would wonder that anyone could believe them.

Early Astronomers

It is to the Grecians that we owe the first discoveries that have proved to be of any real worth.

Seven hundred years B.C., a wise man named Thales declared that he no longer believed that the earth was flat, or that it was held on an elephant's back, or on the shoulders of a giant. "This earth," said Thales, "is a great ball swinging in mid-air. The moon, too, is a great ball, and it receives its light from the sun just as our earth does."

He also understood something about eclipses, and could tell when they were going to come.

At one time, when two nations were going to fight against each other, Thales made use of his knowledge by telling the enemy that the gods were going to give sign of their displeasure by taking from them, in the midst of the battle, the light of the sun.

Of course, the enemy were not going to believe any such story as that from Thales. They sneered at it and prepared for battle. The battle raged high; men were falling on either side; blood was flowing, men were dying — when lo! darkness began to creep over the field.

Thales had been right! the gods were angry. Awe-struck, the fierce soldiers gave up the battle, threw down

their weapons, and, trembling with fear, gladly made terms of peace with the army of Thales.

In later days, when Christopher Columbus had to deal with the ignorant people of America, the same kind of story was repeated.

He found himself reduced to famine by the inhabitants of the country, who kept him and his companions prisoners; and being aware of the approach of the eclipse, he threatened them with bringing upon them great misfortunes, and depriving them of the light of the moon, if they did not instantly bring him provisions.

They cared little for his threats at first; but as soon as they saw the moon disappear, they ran to him with abundance of victuals, and implored pardon.

This was on the 1st of March, 1504, a date which may be tested by the modern tables of the moon, and Columbus's account proved to be correct. The eclipse was indeed recorded in other places by various observers.

Thales had two pupils who were greatly interested in astronomy. They not only eagerly listened to all that Thales could tell them, but studied into the mystery for themselves.

One of them said he believed that the stars were suns, and that the planets (those stars which change their places in relation to the other stars) had people living upon them.

The other declared he believed that the heavens were controlled by one God, and that the Grecian religion of many gods and goddesses, was all foolishness. He explained the causes of eclipses, and said they were not signs of the wrath of the gods at all.

The people were out of all patience with a man who could be so wicked as to say there were no gods and goddesses. "Why," said they, "he will bring down the wrath of the gods on our city by such irreverence. Away with him! Away with him!" and so this wise man and all his family were driven from the city.

These two men were Anaximander and Anaxagoras. Not beautiful names to our ears, are they? Nor very easy to learn, you will say. Still I want you to know them; for they are as familiar in astronomy as George Washington and Bunker Hill are in American History.

Next came Pythagoras. He made many really important discoveries — important because they were correct; but he could not prove they were true, and so they were unnoticed by the scholars of the time.

Among the incorrect theories he sets forth is this: that the planets are set at regular intervals as are tones of the musical scale; and that these planets, therefore, move along in harmony, making the "music of the spheres," as he called it. This heavenly music, however, could only be heard by the gods — the ear of man being far too coarse to catch such fine sounds.

The Ptolemaic System: The Copernican System and Kepler's Laws

Keep up your courage, little folks. These are the only hard words I am going to ask you to learn for a long time.

Ptolemaic System

Ptolemy, the originator of the "Ptolemaic System," taught that all the heavenly bodies revolve around the earth — the planets, the stars, the moon and all. The paths or orbits, as we call them, of all these were perfect circles.

From the earth a long bar extended far, far out into space. Hanging from this bar, like horse-chestnuts on a string, were the planets. The sun, they thought, was attached close to the bar, but the planets were dangling.

This bar then swung round and round the earth like a great weather vane. The sun being attached close upon the bar, kept steadily in its place always; but the planets dangling by their strings were kept dancing about in most irregular directions. In this way they accounted for the fact that planets do not seem to follow round and round in order as the stars do.

A comical system indeed, and a clumsy one, too. It is said that when a certain king heard of this wonderful system he cried, "It can't be true! or if it is, it is very clumsy.

Had I been present at the creation, I could have arranged the heavenly bodies better myself."

The Copernican System was not quite so bad. Copernicus taught that it was not about the earth that everything was revolving; but rather, that everything, earth included, was revolving around the sun.

"It is," said Copernicus, "as when we are riding rapidly. We think almost that the trees and the buildings are flying past us, when really it is ourselves that are flying past the trees and the buildings.

"So with our earth and the heavenly bodies. Instead of all the stars and planets revolving around this earth of ours, it is the earth itself that is turning around on its own axis and so making it seem to us here, on the earth, that the stars and planets are flying past."

Although Copernicus discovered this great truth, he still clung to the old idea that all the bodies moved in circles. For thirty years this astronomer worked, trying to make his reckonings "come out even" with the movements of the stars. But it was like a problem in long division where one little mistake had been in the beginning. Work as long as he might, it would never come right.

The trouble was the heavenly bodies weren't traveling in circles at all; and so when Copernicus drew his charts and planned when one planet in its circular path should reach a certain place — behold, the planet would get there

long before he expected it, or it would come lagging in too late.

But Copernicus was a wise man and a persevering man. He went through his problems over and over again for years. He didn't sulk and blame the planets for not coming in with the right answer, but said bravely enough, "I have made a mistake somewhere. I can't find the mistake, but I shall by and by."

And had he lived there is no doubt he would have discovered it. Certainly he deserved to.

After Copernicus died a Danish astronomer took up the work where the brave old Copernicus had left it. "I think Ptolemy was right about the earth's being the center around which every other body revolves," said he; "but I believe nothing in his bars and cranks. Let us see, Kepler," said he to his pupil, "how can we account for the movements of the planets?"

So, for years the Danish astronomer and his faithful pupil worked on; but for all his industry this teacher, too, died without having made any discovery that should help the world in knowledge of the heavens.

But Kepler himself during all these years had had theories of his own. He had seen the mistakes in his old teacher's work, and had all the time been secretly at work for himself.

Rejecting the Ptolemaic theory entirely, he came back to the idea which Copernicus had held — that the sun was

the center. "But," said he, "I more than half believe the trouble has been in trying to reckon the movements of these heavenly bodies in circles."

Over and over he tried his problems, just as in long division sometimes you will try figure after figure. But no matter what figure he tried, the answer would never agree with the planet.

"I am convinced," said Kepler, at last, "that the planets do not move in circles at all. I half believe they move in ellipses; and that the sun is in the center of the ellipse. I will try the ellipse."

Again for a whole year Kepler watched the planets in their course; but, alas, his reckonings came out in the end as badly as ever. This was discouraging indeed. He had felt so sure that at last he was on the right track.

Again he set to work, reckoning with the sun at one of the foci of the ellipse. Another year was spent in reckoning the planets, on an elliptical diagram.

The year was nearly at an end. No mistake had been discovered yet. So far Kepler's reckonings had agreed exactly with the actual movements. Would they agree to the very end? After seventeen years of hard work, and almost useless work, so it seemed to Kepler, was he to be rewarded at last?

Yes; in very truth he was to solve the problem which for years had puzzled and thwarted astronomers the world

over. The year was finished! the truth discovered! The planets do move in ellipses, the sun being at one foci!

This was Kepler's first great law. Now there was encouragement to work indeed. One great underlying law had been discovered. He had proved it and he knew it was right.

And now after months more of hard work two more laws were discovered by Kepler. When the moment came, bringing him proof that the truth of the third was brought to light, this great man bowed his head and said, "I have nothing more to live for. The book is written. It may be read now or in the years to come; I care not which. It well may wait a century for a reader, since God has waited six thousand years for an observer."

But isn't it odd, children, that even Kepler, wise as he was, full of such depth and reasoning, even he believed in the "music of the spheres?" He taught that Saturn and Jupiter sang the bass, Mars the tenor, Earth and Venus the alto, and Mercury the soprano.

There was one other quite noted astronomer at about this time, Tycho Brahe, who wrote a little book with a very long title, setting forth his ideas of astronomy. Little faith did this writer put either in Ptolemy or Copernicus.

"As to Ptolemy," he says in the little book, "his system is absurd. It is out of all nature; moreover it is by far too complicated.

"Then as to Copernicus," he goes on to say, "his theory, if not as absurd, surely is as impossible as that of Ptolemy. This heavy mass of earth, so little fit for motion, could not be displaced in this manner, and moved in three ways, like the celestial bodies, without a shock to the principles of physics.

"Besides, it is opposed to scripture! I think then," he adds, "that we must decidedly and without doubt place the earth immovable in the center of the world, according to the belief of the ancients and the testimony of Scripture.

"In my opinion the celestial motions are arranged in such a way that the moon, and the sphere of the fixed stars, which encloses all, have the sun for their orbit and accompany it in its annual motion round the earth."

"More than this," says Tycho Brahe in another page of his wise little book, "the earth is far too heavy to move about in this manner; and as to the idea of its turning: over and over as some would have us believe it does, it is plain that if that were so, we should one half of the time be standing upon our heads. Surely such things could not be."

You see astronomers in those days had not learned that the sun is 340,000 times heavier than this little earth which Tycho Brahe was so sure was far too heavy to be moved; neither had they yet learned about the law of gravitation, which keeps us all right in our relation to the

earth we stand upon, no matter whether we are on the "upper side," or on the "under side."

Soon as the evening shades prevail
The moon takes up the wondrous tale,
And nightly to the listening earth
Repeats the story of her birth;
Whilst all the stars that round her burn,
And all the planets in their turn.
Confirm the tidings as they roll,
And spread the truth from pole to pole.

Galileo

Living at the same time with Kepler was the great teacher Galileo. He was a wise man and a great scholar. He had been educated, however, in the theories of Ptolemy and had never thought to doubt them.

At last an astronomer who had been educated in the theories of Copernicus chanced to come to the city where Galileo lived. From him Galileo learned this simpler, more sensible theory. Always ready to be taught, great teacher though he was himself, he seized these new ideas eagerly and taught them to his own pupils.

At about the same time he learned that a certain optician in Holland had invented an instrument by which distant objects seemed to be brought near the eye.

And right here, before we go on, I want you to know just how the discovery of the instrument came about, for it was all due to the curiosity of one little boy — and you know some people sneer at children's curiosity and say it is all very foolish.

But here was a time when that same child curiosity proved of great use and benefit to the whole world.

The optician had several little children, who, like all little children, thought there was no greater happiness

than to play about their father's bench while he was at work.

It was great fun to play with the little smooth concave glasses that their father used in his work; to look through them, to hold them so that the sun would shine through them as through a sun-glass; and sometimes when the glass was held just right, such pretty colors — like rainbows — would fall upon the bench.

But one day, when the optician's little boy was at play with two of the glasses, he chanced to hold them in such a way that the face of the great cathedral clock, away out upon a distant square of the city, seemed to be very near.

For an instant the boy was startled. He stared hard at the clock and then at the glasses. He winked his eyes hard. But there was the clock so far away that the hands could hardly be seen — just as it had always been, ever since the child could remember.

"But it looked near — so near I could see the numbers on the face," said the boy to himself. "The glasses did it — it must have been the glasses."

Then of course, boy-fashion, he set to work to think it out. He sat down upon the steps to think. He turned the glasses over and over. He looked through first one, then the other — but the clock would not come near again.

"Strange," thought the boy, "I wonder"— but see! there's the clock again — close by — staring straight into the boy's face. "O, I know! I know!" cried the lad, "it is the

way I hold them — the two together — father! father!" screamed he, and the good old Dutchman came hurrying to the door to learn of his son's wonderful discovery.

This then was the way it came about that people learned that putting a concave and a convex glass together in the right position would make distant objects seem near.

It was a great and an important discovery; without it we should never have had the telescope, and without the telescope it is very little we should ever have learned about the stars or the sun or the moon.

"If only the planets could be made to seem near," thought Galileo, when he heard of this discovery in Holland, "what wonders they might show to us."

Galileo then set to work to make something like that which the optician had made.

After much labor he produced an instrument which magnified thirty times. This was the first telescope! Rough as it was — only a lead pipe with glasses in the end — it did more to throw over the foolish notions of the astronomers than years of study could have done.

With this telescope, Galileo examined the moon. After all these years of guessing and guessing, here was a little glass that showed the moon so plainly that Galileo could see even its mountains and valleys.

Next he turned his glass toward the planet Jupiter. Close to it he saw three little stars, as he supposed they

were, which were not visible at all to the naked eye. Here was something new! what could they be?

He could hardly wait for the following night to come that he might watch them again. Eagerly he turned his telescope upon Jupiter a second night. Another wonder! the little stars had changed their places! the next night they had changed more! the next night more still! and now another, a fourth star, appears.

At last Galileo knew beyond a doubt that these were four small planets running round and round Jupiter, while Jupiter was making his journey around the sun.

Here was a little Copernican system hanging in the sky for all to see.

Galileo, full of enthusiasm, told of his new discoveries, and invited his friends to come and look for themselves. He received, however, little else but scorn and ridicule. Many refused to look through the glass even, lest they should become bewitched.

Some said it was wicked to be digging out valleys on the fair face of the moon. Others said that there were only seven planets because there were seven metals and seven days in the week; and that it was absurd to say there were more than seven; it did not occur to these people that their own reasoning was a thousand times more absurd than anything Galileo had said.

But now that the telescope was invented and people could see what were in the heavens, all these absurd old notions gradually died away.

Knowledge of the sky grew very fast. Every year the telescope was improved and strengthened, and no longer was there any need for guess work. Astronomy began now to be a real science — that is, something that is actually true, based on real laws, everlasting and unchanging.

Among the Stars

By Agnes Giberne



Chapter I

The Star that Could not be Found

"Dormer! O Dormer!"

"Well, Master Ikon?"

"Dormer, I can't think where my star is gone."

"Your star!" repeated Dormer.

The two words came out with a jerk, and the work in her hands slid to the ground.

"My own beautiful star," said the child. "O Dormer, it was always there before I was ill every evening for a whole week. And I meant to go on watching it always. And now it is gone."

Dormer was a largely-built woman of middle age, with a cap and spectacles. She had a comfortable and motherly sort of face, and eyes which could look soft and gentle, or could grow large and round. At this moment her eyes were round as saucers.

"Every evening it was there over the poplars," repeated Ikon mournfully. "And you wouldn't let me go to look until today. And now it is quite gone."

"O well, I wouldn't mind," said Dormer, coming slowly to the conclusion that this was no relapse into fever,

but only "one of Master Ikon's queer ways." She picked up her work, and began threading the needle, which had become unthreaded in its fall. "I wouldn't mind, if I was you. There's hundreds of other stars just as good. One doesn't signify, more or less."

"Wouldn't anybody care if a star was lost?" asked Ikon wistfully.

"I shouldn't," Dormer replied.

"I think I should. I did love that star so," murmured the child. "I used to think …"

Ikon stopped short. Dormer was a most excellent and affectionate nurse, and he loved her dearly. She had cared for him with motherly tenderness from his earliest babyhood. Still, there was a certain something wanting between them. Ikon never found that his little innermost thoughts and feelings and fancies met with a response from Dormer. He was a delicate and dreamy child, and he often longed for somebody to whom he could speak freely, somebody by whom he would be understood.

Ikon's home was in the country, on a hillside, with wide views from the windows of earth and sky. He was an only child; and he had no mother; and his father was a grave man of few words, much occupied, and sometimes away for days together.

From very babyhood Ikon had been a delicate child, often ill, and still too frail to be sent to school. A lady came every morning from some distance, to give him a few

lessons; very few. For Ikon's father would not allow more. He said the child's brain was too busy, and must not be worked.

The little brain did work, nevertheless. Ikon was always wondering about this and that, wishing to ask questions of somebody. He was tired of trying Miss Mundy, his daily governess. She never would allow any break in her regular plan of teaching, and at the beginning and end of the time she was always in a hurry.

Yet, being a shy and timid boy, he dreaded greatly the time when his quiet little governess must be exchanged for a stern tutor. For of course tutors are always stern so thought Ikon.

It was a lonely life that he led. Few people were within easy distance of the house, and those few Ikon scarcely knew. He had no little sisters and no little friends. His chief pleasures were found in the companionship of his pet dog, and of the birds and plants and trees in the garden. All his leisure hours were spent among them, except when illness kept him indoors.

But Ikon had one pleasure greater than even these; and that was in the companionship of the stars.

This seems an odd word to use about the stars and a little boy; yet in a sense it is the right word. For Ikon loved the stars. He could not have told the time when first he began to love the stars. The feeling seemed to have grown upon him slowly, as he grew up out of babyhood.

Even as a tiny child he had delighted to gaze on the glittering sky, and had often clapped his little hands with joy at the sight.

And now that he was older, he hardly ever cared to go to bed, without stealing away first to his playroom window, for at least ten minutes of looking at the stars. A cloudy evening was always a sorrow to Ikon.

He had been ill lately, and for a month past the playroom had been forbidden ground. For it was in the top story, and even with a fire it was often chilly. But this day Dormer had at last granted leave.

Then it was, as Ikon knelt on the low window-seat, with eager eyes wandering over the broad reach of starry sky, that he found his own dear star to be gone.

He could not have told why he loved that star so much. It was only about a week or ten days before his illness, that he had first noticed it, shining over the distant line of poplar trees, low down near the horizon. And there had been a bout of fine weather then, so he had seen it every evening.

But now it was quite gone--a lost star. None other would do in its stead. There were many other stars over the far-off poplars, but not one so bright and soft and shining as this particular favorite.

Tears came into Ikon's eyes. He was really grieved, really distressed. For somehow that dear star had seemed to his little heart to smile upon him out of heaven, and had

made him think of the mother whom he had never known. And this was the fancy which he could not tell to Dormer; for Dormer would not have understood in the least what he meant.

So Ikon kept his little fancy to himself. But after a pause he asked:

"Dormer, do the stars ever die?"

Dormer stared at the child.

"Dear me, Master Ikon, you do have the oddest notions!"

"But do they die? Please tell me."

"I shouldn't think so," said Dormer. "Things can't die that ain't alive to begin with. It is time you should go to bed, Master Ikon."

"Just a minute," pleaded Ikon. "I want to know where the stars all go every day. They don't all die then, of course, because they are all right again next evening."

"Of course they don't," assented Dormer.

"And where do they go, Dormer?"

"They go why, they don't go anywhere," said Dormer.

"But they must, if they aren't here," said Ikon, wrinkling his brow.

"O well, you'll know about it all someday," said Dormer. "I wouldn't worry now. Time enough when you are grown up."

"Does everybody know that is grown up? Does papa?"

"Of course he does. What a question!" said Dormer.

Ikon looked brightened. He had a white little face, thin from recent illness, with a great forehead, and big anxious eyes.

"Do you think I might ask him about the stars someday? Wouldn't he mind?"

"I shouldn't think he would if you choose some time when he isn't bothered," said Dormer.

Ikon's face fell again. He felt that this might not be an easy choice.

"I do want to know what the stars are," he murmured. "What they really are."

"That's easy enough. They are stars," said Dormer.

"But, Dormer, don't you see? stars must be something" said Ikon, in rather a hesitating voice. "I want to know what they are. I want to know why they twinkle so; and why some of them don't. And I can't think why they should be so bright."

"They are bright because they shine, I suppose," said Dormer, folding her work.

"I wish I knew what makes them shine."

Dormer's answer this time was triumphant.

"Well, Master Ikon, that oughtn't to puzzle you, anyway. They shine because they are bright."

Ikon felt the matter to be hopeless. He could not even make Dormer understand him. It was in rather a peevish voice that he said:

"You don't see one bit what I mean. Nobody does. And I do want so much to know."

"Well, you must have a little patience," said Dormer, rising. "People can't learn everything in a day especially when they are ill."

"But I'm not ill now. I wish you wouldn't talk as if I was always ill," said Ikon fretfully. "Dormer, do you think the stars are bigger than they look?"

"It don't much matter if they are so long as get you to bed in good time," said Dormer.

"And I wonder if they are a hundred miles away," continued Ikon. "A whole hundred miles, Dormer!"

"As likely as not," said Dormer calmly.

Chapter II
What About the Stars?

Ikon lay long awake that night. The curtains were drawn, but he had pulled one a little aside before getting into bed. And through a single pane of glass bright starry eyes seemed to look down upon him lovingly.

"Twinkle, twinkle, little star,
How I wonder what you are!
Up above the world so high,
Like a diamond in the sky."

Ikon smiled as the old nursery rhyme came to him. He tried to remember how it went on, and could not.

Somebody else besides himself had plainly been thinking about the stars, and wishing to know more about them.

"How I wonder what you are!" he whispered two or three times.

The words seemed to soothe him, and presently he dropped asleep.

But even in sleep the thought of his dear lost star haunted him.

Ikon dreamt that he was taking a journey after this star —a strange journey, far away up in cloud-land, through the dark midnight sky. He wondered, as he floated along, whether he should find the lost star. He wondered if he should find out, too, what the stars really are.

But no; he could learn nothing new in his dream. Stars were around him everywhere; bright shining twinkling points of light. That was all. He did not seem to get any nearer to them. And he could not see his own soft star. He would have known it again at once, if he had seen it smiling over the distant poplars. How he was to know it again anywhere else was another question. There were plenty of stars in his dream; but they all seemed very much alike. The child sighed as he floated along, and murmured sadly:

"Is it quite quite gone? Do the poor stars die, after all?"

Ikon woke up next morning with a resolution in his mind. It seemed to have come to him in his sleep.

He would question his father about the stars. He would find out what they really were, and whether a star could ever die.

When his father was at home, Ikon generally went to him in the dining-room for a short time after the late dinner.

It was a very silent time commonly. Ikon's father was a particularly grave and silent man; very fond of his little

boy, no doubt, but, as a rule, extremely sparing in remarks to him or to anybody.

Ikon himself was generally much too shy to start any conversation. He answered if he were spoken to, and that was all. He used to have a little dessert, if Dormer had given him leave. Then he and his father generally sat in the library, each reading a book, till it was time for Ikon to go to bed.

But on the evening of this day Ikon went downstairs brimful of his new resolution. He was bent upon putting the question without delay.

It happened to be rather a fortunate evening for the purpose. Ikon's father seemed to be less wrapped up in his own thoughts than usual; and he actually asked the little boy what he had been doing all day.

"I began lessons again this morning, papa," Ikon answered, turning first hot and then cold with the effort to be brave. "Dormer wouldn't let me sooner."

"Ah, well Dormer is quite right. No use to overwork yourself. Dormer knows what is best for you. Have a fig, my boy?"

"No, thank you, papa. Dormer says I mustn't."

"Dormer knows best," murmured Ikon's father. "Do as she tells you, my dear. She is an excellent judge."

The voice sounded dreamy. Ikon felt that he had no time to lose. Once in the library, he would have no further chance of attention.

"Papa," and he faltered. "Please, would you mind telling me something?"

"Certainly, my boy. What is it?"

"Papa, what are the stars?"

"The stars, my dear! The stars!" said Ikon's father, in astonishment.

"Yes, papa. Please, what are the stars?" repeated Ikon, quite trembling.

Now it happened that Ikon's father, though a very clever and learned man, had never cared at all about the stars, had never troubled himself to read about them. Had Ikon questioned him about old buildings, old houses and castles, old pavements, old furniture, or old china, he would have had plenty to say. But with respect to the stars, he found himself quite at a loss. And odd as it may seem, this clever and learned gentleman said almost exactly the same as the untaught Dormer had done.

"Why, my dear boy, what an odd question! They are stars, of course."

"Yes, papa. Only I do want to know what they are for."

"They serve to light us up on a dark night," said Ikon's father.

"And are they meant only for that?" asked Ikon.

"That—ahem—no doubt—is their purpose," said his father.

"And, papa, are they bigger than they look?"

"No doubt, my dear boy, no doubt. Considerably larger."

"As big as this house, papa?"

"Well, yes, Ikon considerably bigger, I should say."

"And do the stars ever die?" asked Ikon.

"The stars die! The stars die, my dear boy!" repeated Ikon's father in a very puzzled manner. Then he looked at the child, and smiled, and finally burst out laughing. "I beg your pardon, Ikon but really the idea of a star dying so very droll! You must not be offended, my boy. Ha, ha, ha!"

Ikon was not offended, but his feelings were hurt, and tears sprang to his eyes.

"There, there never mind," his father said soothingly. "Here's a shilling for you to spend on anything you like. And if I were you I would leave the stars alone for the present. You are a little boy, and have plenty to learn in other ways."

"I should like best to learn about the stars," murmured Ikon.

"Perhaps so. Perhaps so. Astronomy is an interesting subject, doubtless. But reading and spelling are at present more important."

"Papa, I can read, of course," said Ikon rather injured. "And spelling has been quite easy for ever so long. And Miss Mundy is going to let me begin Latin declensions; only Dormer doesn't like it."

"Well, well, my dear boy, do as Dormer wishes. She is an excellent caretaker," said Ikon's father, rising. "But you would find astronomy more tough than Latin. I advise you to leave it alone for the present."

And this was all that passed. Ikon was sorely disappointed. He could hardly keep back his tears, as he sat in the library over a book which he tried in vain to read.

"Dormer, it's no use," he said, when bedtime came, "I have asked papa, and he doesn't seem to care about the stars, and he says I'm too little."

"Just what I told you," Dormer answered.

But she could not bear to see her darling unhappy. After casting about in her mind what to say next, she suddenly put down her work, and went to a small bookcase in the corner.

"Look here, Master Ikon," she said. "Here's something about the stars, and something you ain't too little for either."

And coming back slowly, she began to read aloud in a sing-song voice

"Twinkle, twinkle, little star,
How I wonder…."

"Why, that's just what I was thinking about last night," cried Ikon; "and I couldn't remember how it went on."

He listened eagerly as Dormer proceeded

"what you are!
Up above the world so high,
Like a diamond in the sky.

"When the blazing sun is gone,
When he nothing shines upon,
Then you show your little light,
Twinkle, twinkle, all the night.

"Then the traveler in the dark,
Thanks you for your tiny spark;
He could not tell which way to go;
If you did not twinkle so.

"In the dark blue sky you keep,
And often through my curtains peep;
For you never shut your eye,
Till the sun is in the sky.

"As your bright and tiny spark
Lights the traveler in the dark,
Though I know not what you are,
Twinkle, twinkle, little star!"

"There!" said Dormer, with an air of great satisfaction.

"But, Dormer, that doesn't tell me anything," said Ikon. "It doesn't say why the stars twinkle, or why they go away in the daytime. I want to know *why*"

"If that's good enough to be put in a book, it's good enough for you and me," said Dormer, rather severely.

Chapter III
Folded Wings

The very next day Ikon's father said to him at breakfast, the only meal which the two regularly had together:

"I have just heard from an old friend of mine. He is coming to stay here for a short time, and he will be able to tell you anything you wish about the stars."

Ikon's heart bounded with pleasure, and he listened eagerly for more.

"Herr Lehrer," said Ikon's father in an absent tone.

"Papa, is that his name?" asked Ikon, afraid the information was coming very quickly to an end.

"Lehrer yes, Lehrer," said his father.

"But, papa, you called him…"

" Yes, my dear."

"Hair!" said Ikon, in a puzzled voice.

"Ah yes, just so. Herr Lehrer,—that means Mr. Lehrer. He is a German. 'Herr' means 'Mr.,' my boy. But he likes best to be called 'Herr' or, 'Professor.' Yes, 'Professor' does as well."

This was quite a long speech for Ikon's father. He went deep into his newspaper at once, as if afraid of having to say any more. Ikon dared not put further questions.

It was from Dormer, not from his father, that he learnt on what day to look out for the guest.

When that day came he did look out in good earnest. All the afternoon he scarcely stirred from the schoolroom window. Dormer brought her work and sat there with him, as she was always ready to do. Generally he spent his afternoons in the garden, unless it rained, and then he would be happy for hours in his favorite playroom. There were showers today, sufficient to keep him prisoner, but he would not go to his playroom, for the window there did not command a view of the drive to the front door.

"I wonder what Herr Lehrer will be like," he said again and again. "Papa says I am to call him Herr Lehrer, Dormer, and not Mr. Lehrer, because he is a German."

"It don't sound sensible," said Dormer. "Mr. is good enough for anybody."

"But I suppose German people think 'Herr' is prettier than 'Mr.,'" said Ikon. "Papa says he is something else too- 'Professor'- but I don't know what that means. I wonder whether he will talk to me."

"Not much good if he talks German gibberish," said Dormer.

Ikon was dismayed. This difficulty had not occurred to him before.

"I shall have to make haste and learn German," he said with a sigh. "But perhaps Herr Lehrer knows some English words. I think he must, because papa said he could tell me about the stars; and papa knows I haven't learnt to talk German."

After long waiting the Professor arrived, but by that time it had become so dark that Ikon could not see in the least what he was like. The utmost peering proved useless. Nothing remained but to muster up patience, and wait till evening.

Then, when late dinner was nearly over, and the little boy stole timidly into the dining-room, he found, as he expected, two gentlemen at the table instead of only one. This was quite an event, for Ikon's father rarely had a visitor.

Another unusual event was that Ikon's father should be talking; not only listening to the Herr, but actually talking too. The two gentlemen were deep in conversation; so deep that Ikon's entrance was at first quite unnoticed.

So Ikon had time to examine the newcomer at his leisure.

Herr Lehrer, though a German by birth, spoke English quite well and easily. This was a great relief to Ikon's mind. Now and then a German accent or a German expression came in, but otherwise his voice might almost have passed for that of an Englishman.

He had a square-shaped German head, though he was not generally stout in build. His face was quite beautiful, as even little Ikon could see, with a rather pale skin, and a full forehead, and soft shining benevolent eyes. Ikon thought those eyes very like stars. Then his features were regular, and might have belonged to almost a young man; yet, strange to say, his hair was grey, and he had a long silvery beard.

Ikon crept to the table, and sat down in his usual seat without a word. He did not in the least expect his father to notice him for some time, and he was quite content to sit and watch those soft starry eyes of the stranger. But suddenly they fell upon him, and their owner said quietly:

"Why, here is a little meteorite dropped suddenly out of space."

"My little son," said Ikon's father, and the Professor took the child's hand into a warm comfortable grasp.

"We shall be friends by-and-by," he said, smiling.

Ikon's father pushed some figs towards him, and the two gentlemen continued their conversation. It was all about old Roman pavements and ancient crockery—things which Ikon did not care for in the least and he could make nothing of it. They talked on, nevertheless, not only in the dining-room, but also later in the study. No silent reading took place as usual. Ikon alone had a book, and he could not give attention to it.

Presently Ikon's bedtime drew near, and all at once there came a break in the conversation. Herr Lehrer turned round towards Ikon and remarked:

"This is a very silent little boy."

"Ikon never has much to say for himself," his father remarked.

Dormer might perhaps have told a different tale.

"Fond of books?" said Herr Lehrer.

"Well, yes—too fond," said Ikon's father. "The doctor says he ought to read less and play more."

"He looks not robust," said Herr Lehrer, pausing for a word.

Ikon objected very much to being made the subject of discussion, and wriggled. The two gentlemen went back to ancient crockery, and not a word more passed with reference to Ikon, till Dormer's knock sounded at the door.

"Eh—what—bedtime?" said Ikon's father. "Why, I thought we had only just done dinner."

Then, as Ikon came slowly, book in hand, to say good-night, he observed:

"Herr Lehrer, here is a little boy who wants to know what the stars are made of."

Ikon hung his head, and felt much inclined to run away. But Herr Lehrer laid gentle hold on him, drew him

between his two knees, and looked at the child with extreme kindness.

"So!" he said, with his slightly foreign accent. That one syllable, "So!" pronounced in every variety of tone, was the most German thing about him "You want to know what the stars are made of?"

Ikon plucked up courage.

"I didn't say exactly that," he answered. "I wanted to know what the stars really are, and what they are for."

"So!" repeated the Professor, smiling more broadly. "You want to know what the stars really are? That is a pretty big question. And what they are for? That is a bigger."

"More in your line than mine, Professor," said Ikon's father, who seemed quite lively this evening.

"Just so," said Herr Lehrer. "This is pretty well for the knickerbocker age. Is there anything else that this little boy desires to know?"

Ikon crimsoned, but felt that it was now or never. Dormer's knock sounded again, and he grew desperate.

"Please," he said. "O yes, please."

"Speak calmly, my child. The world is probably not coming to an end this very instant," said Herr Lehrer in a gentle voice.

Ikon was far too eager for deliberate speech.

"Please, can you tell me?" he asked. "Oh, I do want to know where the stars are all gone every day, and what makes them shine. And I want to know why some twinkle, and why some don't. And I can't think where my own star went, and perhaps you could find out. And, please, do the stars ever die?"

The Professor sat still, looking at the child. Ikon's chest was quite heaving with excitement, and his great eyes shone, not like stars, but like fiery coals.

Dormer knocked again; this time impatiently.

"Is that the summons for the little knickerbockers to go to bed?" asked Herr Lehrer slowly. "I think we might be permitted one more five minutes, my friend."

"Certainly," said Ikon's father; and he went to the door, and spoke in a tone of apology.

Ikon overheard a little mutter, but Dormer went away.

The Professor still gazed at Ikon earnestly. Then, with his soft warm palm, he measured the width of the child's forehead.

"Yes, there are brains here," he said. "There is thought. There are folded Wings of Imagination."

But no answer had come to the questions, and Ikon's eyes grew beseeching.

"I cannot tell you everything in five minutes, my child," said the Professor. "These are large subjects that you have brought before me. What say you, little Ikon?

Shall you and I pay some visits to the stars, while I am here?"

Ikon's look was of eager response.

"Really truly?" he asked.

"On the Wings of Imagination," said the Professor. "Wonderful journeys may thus be taken."

"Children never understand," murmured Ikon's father. "He will claim a literal fulfilment of your proposal."

"Papa, I do understand," said Ikon, almost indignantly. "I know what imagination means. Dormer often says I've got 'such an imagination.' And of course I know we can't truly go to the stars. But I wanted to know if Mr. Herr really…"

"Herr Lehrer, my dear," said his father, for Ikon was growing confused.

"Really meant it," concluded Ikon.

"You and I will take those journeys in company," said the Professor.

"And will you tell me all about the stars?" asked Ikon.

"I will tell you some things."

"Whether they ever die?" asked Ikon.

"What makes you ask that question?" inquired the Professor.

"My star has gone," said Ikon, shyness vanishing under great eagerness. "I can't think where. And Dormer says

stars can't die because they are never alive. But I don't think Dormer really knows about it. And she says it wouldn't matter if a star did die, because there are plenty more. But I should be so sorry."

"I think it would matter," said the Professor. "It would matter to One above, Ikon."

Ikon gazed wistfully in the face of his new friend.

"You know who made the stars?" said Herr Lehrer.

"Dormer says God did."

"Dormer says! But look for yourself. Look in the first chapter of your Bible, before you go to bed HE cares for the stars, my child."

Ikon had grown very thoughtful.

"That will do now. It is growing late," the Professor said, softly patting Ikon's cheek. "Tomorrow you shall tell me about the star that is gone. Good-night."

"And will you come to my playroom?" asked Ikon anxiously. "It's the very best view of the stars in all the house."

"Then that shall be our observatory," said Herr Lehrer.

Ikon went straight upstairs, and hardly heard the complaint with which Dormer received him. He walked to a little side-table, and opened the Bible which lay there his mother's own Bible.

"What are you doing now, Master Ikon?" asked Dormer.

"I'm looking for something about the stars," said Ikon dreamily.

Dormer gave him a look. Then she sat down quietly, and waited.

Two or three minutes passed in silence, before Ikon exclaimed:

"I've got it!"

Dormer was silent still. He rushed across the room to her side, with the open Bible in his arms.

"Dormer, here it is. Look! Here it is!

"'HE MADE THE STARS ALSO.'"

"Didn't you know that before, Master Ikon?" asked Dormer gravely.

"I don't know. I didn't think," said Ikon. "Dormer, Herr Lehrer says it would matter if a star were to die. He says it would matter to God, because God made the stars and so He cares."

Dormer seemed to have no wish to defend her own view of the case. She only said:

"Hadn't you better go to bed now, Master Ikon, dear?"

Chapter IV
How Stars Rise and Set

"It was over there," said Ikon.

Evening had come round again, and Ikon was in his playroom; not alone, however, for the Professor was there also.

All day Herr Lehrer had been busy one way and another. Ikon almost thought that the promised talk about the stars was quite forgotten by him. But after Ikon's tea, and before the late dinner of the gentlemen, he suddenly appeared in Ikon's favorite room.

It was a clear bright night, and the sky was covered with twinkling stars.

In a very few minutes Ikon was talking quite easily and freely of his dear lost star. Herr Lehrer put out the candle, and drew up the blind. Then he sat down close to the window, with the child beside him.

"It was over there," repeated Ikon. "Over in that direction just where there are two little hills a great way off, and some trees between. You can't see now, but the trees are poplars; and the star always shone over those poplars."

"Always?" said Herr Lehrer in a gentle voice.

"I mean always for a whole week," said Ikon. "I used to look every evening before I went to bed, and it was always there."

"Exactly in the same spot, my boy?"

"It looked like the same," said Ikon. "Just over where the poplars are. And I liked that star so much. It twinkled and looked so bright. I used to think it was smiling. And then I was ill, and Dormer kept me in bed nearly a fortnight, and for a whole month she wouldn't let me come to my playroom, because she thought I might feel cold up here. It isn't really cold, but Dormer is always so frightened. It was so dull, having only the old nursery to play in, because I keep all my best things up here, and of course I am too old now for the nursery. And I did want to come and look at my star."

"You did not think of looking out of another window below this one?" said Herr Lehrer.

"No," Ikon answered, in a tone which showed that the idea had not occurred to him. "I never did. And when Dormer let me come here for a peep, because I begged her, the star was gone."

"You are sure?" the Professor said.

"O, quite sure! There were ever so many little stars, but not one like my beautiful big star."

Herr Lehrer seemed to be considering.

"A month ago or more," he murmured. "West—north-west—west—yes. The star may probably have been Arcturus."

"Arcturus!" repeated Ikon.

"That is the name of a beautiful star, which perhaps might have been thereabouts somewhere about a month ago, near the time of your going to bed," said Herr Lehrer. "But Arcturus is not dead."

"Is Arcturus the name of my star?" asked the child wonderingly.

"I cannot be absolutely sure, Ikon. Your descriptions are a little vague. But I think we may fairly conclude that it was in all probability Arcturus."

"And is that a big star?" asked Ikon.

"It is one of the brighter stars what I should call a star of the first magnitude."

"Doesn't magnitude mean bigness?" asked Ikon.

"It does, really. But in speaking of the stars we mean brightness more than bigness."

"And my star hasn't died," said Ikon in a satisfied tone.

"No," said the Professor. "When you missed your favorite star from over the poplars, it had only gone down below the horizon, out of sight. Did you not know that the stars rise and set just as the sun rises and sets?"

Ikon shook his head.

"I thought the stars were always exactly the same," he said. "Somebody once told me that the stars are called 'fixed stars,' and that is because they never move."

"Somebody explained himself rather badly," said the Professor. "Have you never missed any other stars from particular parts of the heavens? "

" No," said Ikon. "Only my own pet star."

"You must observe a little more closely in future. Now listen to me, my child. Of course you know that the sun rises and sets every day. That is to say, he seems to come up above the horizon in the morning, seems to pass over a portion of our sky, and seems to go down below the horizon in the evening."

"Yes—he does," said Ikon wonderingly. "The sun rises in the east and sets in the west. I know that."

"He seems to act thus," said Herr Lehrer. "Practically he so does—to us."

"But why do you call it 'seems'?" asked Ikon.

"The moon also rises and sets," said Herr Lehrer, passing over this question. "Her movements, however, are more perplexing, so we will let her alone just now. You quite understand that the sun rises every morning and sets every evening, rising in the east and setting in the west. The stars, too, seem to rise in the east and set in the west."

"Don't they really?" asked Ikon.

"As much as the sun does," said Herr Lehrer. "Stars are rising and setting through every hour of the night and the day. But it is only when the sun has set that we begin to see them rise and set."

"I never thought before about stars rising or setting," said Ikon.

"If you had watched your star long enough, you would have seen it slowly sink down behind the poplar trees," said Herr Lehrer.

"And wouldn't it ever have come up again?"

"Yes, next day. Not over the poplar trees, but in quite another part of the sky. Then it would have passed over the heavens and gone down again behind the poplar trees."

"But I don't understand why I can't see it there now in the evenings," said Ikon.

"This little brain must have patience," said Herr Lehrer. "I cannot explain everything all in a moment. The reason is that each day the stars seem slightly to shift their places, so to speak, and go down just a very few minutes sooner than the evening before. In one week the difference is not so great that you might not have seen your star each evening, somewhere not far over the poplars. Perhaps, without knowing it, you went a little earlier to look the last part of the week than the first part. But a whole month would make much difference. Your

star would have set some time before that hour, when at the month's end you looked anew."

"I wish I could quite understand," said Ikon.

"Believe that it is so, my boy; the how and the why must come later. I want you now to see clearly that the stars do truly seem to rise and to set every day, even as the sun seems to rise and to set."

"But why do you call it seems?" asked Ikon again. "Don't they really?"

"Yes, and no," Herr Lehrer answered. "This is puzzling, is it not? They do rise, and yet they do not. They do set, and yet they do not."

Ikon sighed.

"Let us consider the matter," said the Professor slowly. "The sun rises and sets. So do the stars,"

"But you said they didn't."

"They do rise, Ikon, to you and me. They rise upon you and me. It is no untruth to say that the sun rises and sets, for he does rise and set. So also with the stars. Yet at the same time, and with equal truth, we may say that the sun and the stars do not rise or set. For that which we rightly call their 'rising' and 'setting' is not caused by any movements of their own."

"Doesn't the sun go across the sky every day?" asked Ikon.

"He seems to travel thus," Herr Lehrer answered. "It is only in seeming. He does rise upon us; but that rising is brought about by the earth's movement, not by the sun's movement. The stars too rise upon us. But their rising is caused by the earth's movement, not by the stars' own movements."

"I don't think I know what you mean," said Ikon rather hopelessly.

"Did you ever spin round and round very fast, till it seemed to you as if the walls of the room and the pictures and furniture were all moving?"

"O yes," Ikon said, brightening. "It makes me feel quite giddy."

"Without the giddiness, that is what happens to us. Our world is ever spinning rapidly round and round, like a top. This spinning movement makes it seem to us as if the sun and the stars were always travelling round and round the earth. But the sun and stars have no such movements in reality. Therefore I say that they do not actually rise and set. The rising and the setting are entirely brought about by the quick whirl of our own earth."

"It is very funny," said Ikon. "I don't feel at all as if I was turning round and round."

"No; because everything on the earth around you is carried along at the same speed as yourself. Also, there are no jolts or noises to startle you. All the earth's movements are perfectly silent and perfectly even."

Neither spoke for a minute or two. Ikon seemed intent on his own thoughts.

"Now I must dress for dinner," the Professor said presently. "But come into my room for a minute; I wish to show you some stars which cannot be seen at this side of the house."

Ikon gladly obeyed. Herr Lehrer pulled up the blind, put out the two candles which stood ready lighted, and drew Ikon into the large bow-window.

"See," he said. "Has anybody ever pointed out to you the Great Bear?"

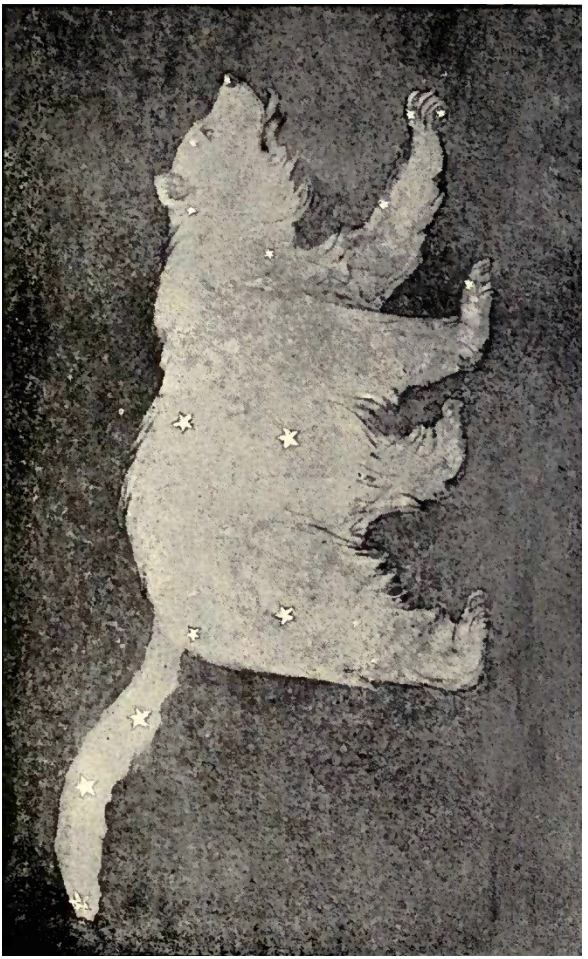
"The Great Bear! O yes," said Ikon. "Dormer shows me the Great Bear sometimes; but I don't think it is like a real bear. There's a picture of a bear in a book downstairs, and the stars are dotted over it. But I can't see it look like a bear in the sky. I can only see seven stars."

"Seven chief stars, and many fainter ones," said Herr Lehrer. "The outline of the bear in your picture is of course imaginary. It is rather curious that the ancients should have called this group by the name of 'Bear,' since the real bear has almost no tail, and those three stars make a long tail. Now can you show me the Little Bear?"

" No," said Ikon. "Dormer knew that there was a Little Bear, but she couldn't find it."

"Look first at the two bright stars in the body of the Great Bear, farthest away from his tail. Those two stars are called the Pointers, for they point in almost a straight line

to the pole-star, which forms the tip of the Little Bear's tail. Follow a straight line from the pointers in that direction and you come to the Little Bear. Seven chief stars again, four to the body, and three to the tail; but some of them are faint, and not so quickly seen as those of the Great Bear."



"Oh, but I see! Two—four—six—seven," said Ikon.

"The little star at the end of the tail is important. It is called, as I just now observed, the Pole-star. That star lies very nearly above the North Pole of our earth. If you were standing at the North Pole, you would look up and see the Pole-star just over your head. In old days, before the mariner's compass was invented, the Pole-star was most useful to sailors; for by it they could always tell where the north lay."

"But they couldn't tell when the Pole-star was set," said Ikon.

"The Pole-star never does set to people in the northern parts of the earth," said Herr Lehrer.

"Doesn't it? Then all the stars don't set," said Ikon thoughtfully.

"No; not all. Some stars never set to people living in England, and other stars never rise to them. The Pole-star is always above the horizon, to us. The Southern Cross is never above it, to us. Sailors in the northern parts of the earth always had the sun by day and the Pole-star by night to guide them except in cloudy weather; and then they were in a sad case. Don't you remember in the story of St. Paul's shipwreck, how this want was felt?"

" No," said Ikon, looking up in Herr Lehrer's face.

"I would read my Bible somewhat more, if I were you," said the Professor gently. "It is in the last chapters of Acts. You will find how he who described the event said: 'When

neither sun nor stars in many days appeared, and no small tempest lay on us, all hope that we should be saved was then taken away.'"

"But it isn't so bad for sailors now in cloudy weather," said Ikon.

"No; for they now have the guiding compass."

"Doesn't the Pole-star move at all?" asked Ikon. "I mean doesn't it seem to move?"

"Only round and round in a very tiny circle. Other stars go round the Pole-star in bigger circles. Those which lie nearest never set to us who are in England. The Great Bear, for instance, does not set. Stars placed farther off from the Pole-star, moving round in still larger circles, dip more and more below the horizon, for longer and longer portions of the twenty-four-hours and then it is that we speak of their rising and setting. But I must try to make this more clear to you another day."

Chapter V
Stars in Daylight

"Do you think you can manage a good walk this morning, Ikon?" asked the Professor next day.

"O yes. I should like it so much," Ikon replied.

"I want to take you to an old friend of mine living near here, and ask him to show you something."

Ikon thought it strange that Herr Lehrer should have an old friend just in that neighborhood; and he wondered greatly what the "something" might be.

He hoped that Herr Lehrer might begin again about the stars on the way. But instead of this they only talked of flowers and birds, till the house was reached where the Professor's friend lived.

Ikon had many times seen the house before, though he had never been inside it.

They did not go inside now. Herr Lehrer led Ikon through part of the garden, and soon they came upon what looked like a round wooden summer-house, having a dome-shaped roof.

"This is my friend's little observatory," said the Herr. "Have you ever seen a telescope, Ikon?"

"O yes," Ikon answered. "There's a sailor who has one, and he lets me look in it sometimes. And it makes the ships oh, so big!"

"My friend here has a telescope for looking at stars instead of ships," said Herr Lehrer.

"Is it inside there?" asked Ikon.

"It is inside there."

Ikon gazed wistfully up.

"But there are no stars now," he murmured. "It is all blue sky. Oh, I do wish it was night."

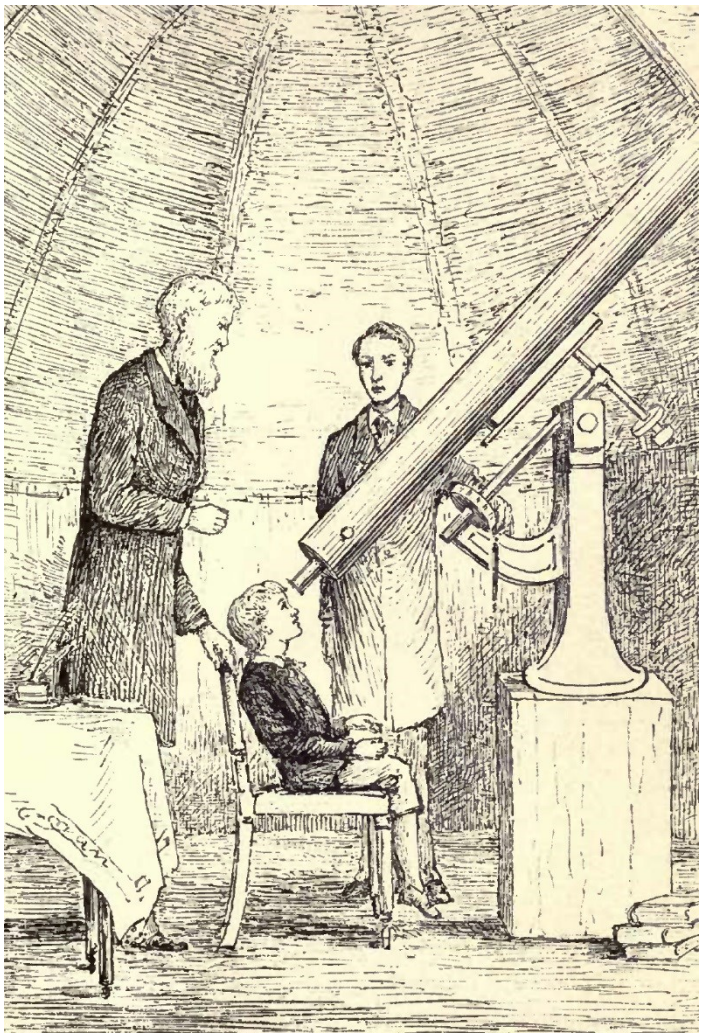
The Professor pushed open a little door and entered the dome-roofed observatory. There was not much space inside. A large telescope occupied the center, and many queer-shaped articles lay about, very puzzling to Ikon. Herr Lehrer's old friend proved to be a young-looking man, seated at a tiny table fixed against the wall. Ikon was quite startled to see him, he was so small and thin and pale. But at the sight of Herr Lehrer his face broke into a glowing smile.

"Ah, my friend!" he said joyously. "We did not half finish our talk yesterday."

"And I cannot stay to finish it today, Fritz," Herr Lehrer answered. "But I want this little boy to see something for five minutes, if we do not interrupt you."

The two spoke together softly, and Ikon's eyes wandered eagerly up and down the tube of the big

telescope. Then Fritz stepped forward, and began doing something to the telescope. He consulted a book, and he moved the tube, and he looked into it.



All this while he had not troubled himself to shake hands with Ikon. He seemed quite full of his other visitor.

"Are we going to look at the sun?" asked Ikon.

"No, my boy. We are going to look at the stars," said Herr Lehrer.

Ikon's surprise may be imagined. For bright sunshine lay outside, and a blue starless sky.

"But it isn't night, and the stars are all set," he said.

"Not all," said the Professor. "Some stars have set, and others have risen. Stars are rising and setting all day as well as all night."

Ikon stared hard through the opening in the roof.

"I can't see them," he said.

"Now will you look," said Fritz, rising. "Make haste."

Ikon obeyed in a great hurry. And there, sure enough, despite the daylight around, he saw quite plainly one tiny pale star.

"Oh! Oh! Oh!" he almost gasped. "But is that a real star up in the sky?"

"That is a real star in the sky," said Herr Lehrer.

"Oh, it's going it's going it's gone!" cried Ikon "What does make it run away so fast?"

Herr Lehrer put the little boy aside, peeped through the eye-piece, stirred the great tube slightly, and beckoned

Ikon back. There once more was the pale star; and again it quickly passed on and vanished.

"Why doesn't it stop in the telescope?" asked Ikon.

"Because," said the Professor, "it is not in the telescope but in the sky."

"But I mean" said Ikon. "I don't see why it goes on."

"The stars all go on," said the Professor. "Night and day alike. That seeming movement never stops, for it is caused by the whirl of our own earth. Have you forgotten what I told you yesterday evening?"

"O no," Ikon answered. "Only the stars in the real sky don't gallop away so fast."

"This is a star in the real sky," said the Professor, smiling. "But the field of view in the telescope is very small, and the star soon passes beyond it. And the same power which magnifies the star, bringing it as it were nearer to us, magnifies also the movement of the star, making it seem to go faster."

"I wish I could see the star without the telescope," said Ikon. "Why can't I? Are there any other stars beside this one?"

"Quite as many as at night," said Herr Lehrer.

"But why don't we see them?"

"Did you ever take a lighted candle into bright sunshine, and notice the appearance of the flame?"

"O yes," replied Ikon. "I did only a little while ago, and the flame was so pale and fady—hardly any light at all."

"Just so," the Professor said. "That candle flame would shine far on a dark night; but in the sunlight, you would not even see it at a very little distance. And the shining of the stars is very clear in hours of darkness; but when the sun is up their faint glimmer cannot be perceived. The stars are always there, Ikon; and but for the brighter light of the sun we might always see them."

"Is the Great Bear there now?" asked Ikon.

"Yes. It is only hidden by a veil of sunbeams," said Herr Lehrer.

"And the Pole-star. I wish I could see the Pole-star through the telescope," said Ikon.

"There is no difficulty," remarked Fritz.

The book was consulted again, and the telescope was adjusted anew. Very soon the young man said:

"Now!"

And Ikon speedily had his eye in the right place. This time the star was even paler and fainter than the last. Still it was quite plainly visible. Ikon watched steadily for some seconds.

"Is that really the Pole-star?" he asked. "I can't see the rest of the Little Bear."

"The other stars are too distant from it to be seen at the same time," said Herr Lehrer. "Yes, that is the Pole-star, Ikon."

"But I don't see how you could find it," said Ikon anxiously to the young man.

Fritz bit a pencil, and then answered:

"I know where to look for it."

"Now, Ikon," said Herr Lehrer, "we must not hinder our friend any longer. Say Good-bye."

Ikon obeyed at once, and said "Thank you" also, with a very grateful look.

Fritz looked at Herr Lehrer and said: "The little boy may come again."

"Thanks," Herr Lehrer answered. "He will be very pleased, I am sure."

"May I come here someday at night?" asked Ikon earnestly.

"What would the good Dormer say?" enquired Herr Lehrer, smiling. "We shall see, my boy."

For some time after leaving the garden the two walked in silence. Ikon seemed very thoughtful, and not inclined to chatter about what he had seen, as some children might have done. He kept gazing at the sky so hard that once or twice he caught his foot and would have fallen, but for his friend's hand.

"The stars are there, my child," Herr Lehrer at length said softly.

"I do wish I could see them," sighed Ikon.

"But you know the fact. The stars are there, ever shining on, only hidden from our eyes by brighter sunlight filling the air. Ikon, are you over-tired? I should like to turn aside for a few minutes on the beach, as we go home."

"I'm not the very least tired," protested Ikon.

"Dormer bade me be careful of you; but the wind is not so cold today. I do not think you will get any harm."

The sea lay not far from Ikon's home, and he often found his way thither. He loved to roam about on the shore, in search of shells and sea-weeds.

The Professor and the child were soon standing side by side upon the yellow sand. Small waves rolled in cheerily, sparkling in the sunshine.

"What a difference sunshine makes!" said Herr Lehrer. "What should we do without it?"

"Everything would be so cold," Ikon said, with almost a shiver. "I do like to feel warm."

"And all the warmth that we enjoy comes from the bright sun," said Herr Lehrer.

"Does the sun make the stars warm too?" asked Ikon.

"No, my boy. The stars are bright and warm in themselves, just like the sun. But our earth and the moon

would be quite cold and quite dark, if it were not for the sun's rays."

Then he stood looking at the sea.

Chapter VI
The Round Earth

"Ikon," said Herr Lehrer, "I want you to observe those two ships on the horizon. How much can you see of them?"

"I can see them both," said Ikon.

"The whole of both?"

Ikon gazed hard.

"They are big ships, and they've both got three masts," he said. "No, I can't see quite the whole of one. I can only see the masts. It is such a great way off."

"Such a great way off that the ship is too small for you to see it?"

"Not too small" said Ikon. "I can see the masts quite plainly; only not the other part."

"Not the hull."

"No. O yes, that is the word—hull. The sailors call that being 'hull-down.'"

"Which means—"

"Why, it means—" said Ikon. "It only means that one ship is gone down partly into the horizon."

"You would say that it has set," the Professor said, smiling.

"But ships don't set like stars," said Ikon.

"Not precisely, perhaps. I wish you to tell me what you mean by 'going down into the horizon.'"

Ikon seemed puzzled.

"What do you understand by the horizon?"

"It's just as far as I can see," said Ikon. "It's where the sea and the sky join."

"Seem to join," corrected Herr Lehrer. "If you were out there, where our horizon is now, do you think you would find the sky really down on the sea?"

"No," said Ikon, laughing. "Of course I shouldn't. The horizon would have gone on ever so much farther."

"Then the horizon is the distant line where either sky and sea or sky and land seem to meet. As you say, it is just as far as we are able to see. But why cannot you see farther? Is it because your eyes are too weak."

"I suppose so," said Ikon. "I didn't know my eyes were weak."

"And I do not think they are. If you and I were to climb that cliff, should we still be able to see only the same distance?"

"No," Ikon said at once. "I know we should see a great way farther out to sea, because I have so often noticed

that. The horizon seems to go away, and sometimes there are more ships."

"So, plainly, my boy, it is not weak sight which prevents your having a wider view. Being on the top of the cliff would not strengthen your eyesight. Now, Ikon, look again steadily at the ship that is hull-down. You are quite sure you only see the masts not the hull."

"No," Ikon answered. "I can't see the hull at all. But couldn't I if we were up on the cliff?"

"Yes; you could. We will try another plan, however. Instead of going up the hill, we will use a help to our sight, standing here."

The Professor drew a neat leathern case from his pocket, and pulled something out of it.

"Is that a telescope?" asked Ikon. "Why, it's two little twin-telescopes joined together."

"It is called a bi-no-cu-lar," said Herr Lehrer.

"Am I to open one eye and screw up the other?" asked Ikon.

"No; you may keep both eyes open, and use both. Now, Ikon, stand very still, and move the binocular gently, following the line of the horizon, till you find a ship. Not too fast. You will come first upon the nearer ship, which is not hull-down."

"Oh yes, I see. It's lovely," said Ikon. "The ship has grown big ever so big. It looks a great great deal closer than it was."

"Now move the glass on to the right for the ship that is hull-down. See if the glass will enable you to see the body of the ship."

"I should think it would" said Ikon confidently. "There! There it is! I've found it."

"And the hull?" said Herr Lehrer.

"Why, it is hull-down still," cried Ikon.

"You are quite sure? Examine carefully."

"I can only see the masts. But they are ever so much bigger and nearer. How funny!" said Ikon.

Herr Lehrer allowed Ikon to look a minute or two longer; then, taking back the glass, he put it into the case, and dropped both into his pocket. After which he turned from the beach, and began walking homewards.

"I do like that big something," said Ikon. "May I look in it again someday? "

"Certainly," Herr Lehrer replied. "But do not now forget the question which we have not yet answered."

Ikon had to consider.

"I know," he said. "It's why the sky and sea get together, I mean seem to get together."

"Seem to meet, at the horizon," said the Professor.

"Yes, seem to meet and why we can't see farther out to sea, when our sight is good enough?"

"That is better expressed. Can you tell me what shape the earth is, Ikon?"

"What shape?" repeated Ikon thoughtfully. "Oh, it's round."

"A plate is round," said the Professor. "Is our earth the same shape as a plate?"

"No. It's round like an orange. Miss Mundy taught me that. And it has got a flat North Pole, and a flat South Pole."

"The shape of the earth is that of a sphere," said Herr Lehrer.

Ikon said the word "sphere" twice, as if half recognizing it.

"Miss Mundy said that a hemisphere meant half, a sphere. And I know we are in the northern hemisphere, because that comes into my geography. But I don't think Miss Mundy ever told me that the whole world was a whole sphere."

"Come that shows attention," said the Professor, well pleased. "I see you are really trying to understand what I say to you. Your idea is quite right, Ikon. The earth is a sphere; and half the earth is a hemisphere, or half a sphere."

"Is a sphere like an orange?" asked Ikon.

"An orange is not a perfect sphere, because it is rather flat at the two ends, instead of being perfectly round every way. In the same manner the earth itself is not a perfect sphere, having poles very slightly flattened. Still, roughly speaking, an orange and the earth are spheres or balls. You may as well get it at once into your head that the moon and the sun and the planets are all spheres or balls. None of them are flat like plates."

"The moon looks flat," said Ikon.

"The moon is not flat," said the Professor.

"Are planets stars?" asked the little boy.

"No planets and stars are quite different. I must teach you the difference soon."

"I don't know yet why the sky and the water seem to come together at the horizon," said Ikon, after a pause.

"Because the world is a sphere, Ikon."

Ikon could not understand, and he was afraid the Professor would think him dreadfully stupid. He asked no more, and Herr Lehrer waited, smiling. Ikon presently murmured:

"I don't see one bit why."

He thought Herr Lehrer did not hear, and a fit of shyness seized him, so that he could ask no more. They were now quite near home, and Ikon was beginning to feel very tired. So he trudged along in silence, rather mournfully.

Reaching the house, Herr Lehrer placed a hand on the child's shoulder, and led him into the schoolroom.

"We have done nearly enough for this morning," he said. "But I must make this one matter clear. Where is you school-globe? "

"It isn't a very big one," said Ikon.

"Quite large enough for our purpose. If a little fly were standing here, Ikon, just where England is, and another little fly were standing there, at the south of Africa would these two little flies see one another?"

"No," said Ikon. "They couldn't."

"Why not? Because of weak sight?"

"Because the globe would come between. It would hide one from the other."

"Suppose these countries were not marked on a globe, but on a flat map. Have you an atlas?"

Ikon sprang across the room, and brought a slim red volume. Herr Lehrer turned to the map of the world.

"See a fly standing on England, and a fly standing at the south of Africa, might quite well see each other, had they good enough sight."

"Yes," said Ikon. "But if the earth isn't flat, I don't see why the map is made flat."

"For convenience only. This globe is a truer picture of our world. Now look at it once more, and leave the flat

map. Suppose these two little flies to be one in England, one at the Cape of Good Hope. Suppose they begin to travel slowly one to the south, one to the north. Could they see each other yet?"

"Not yet," said Ikon, watching the Professor's two finger-tips with great interest.

"Put your face here, and look with the eye of the English fly; not moving. Now the other fly comes nearer slowly. Say; could the one perceive the other?"

"Just," Ikon said. "I think this fly would have just a glimpse of your fly."

"Of his head or his legs?"

"Oh, the head first, because that would be highest," said Ikon,

"And a little nearer."

"Then they would see the whole of one another quite plainly."

The Professor withdrew his hand, smiling.

"You have learnt your lesson, my boy. It is even so that we see a ship approaching over the sea. First the masts, because they are highest while the hull of the ship is yet hidden. Then the whole of the vessel."

"But," Ikon said "but the fly wouldn't see the other fly, because the globe bulges up between."

"Precisely so," the Professor answered. "And we could not see the ship's hull today, because the waters of the ocean bulged up between."

"Does the water bulge up?"asked Ikon.

"The sea does as a whole. This earth being a sphere, the ocean is folded round that sphere, following its shape," said Herr Lehrer. "Your little globe is a small sphere, and the earth is a very large one. Therefore, the bulging of the earth's surface is very gradual and gentle. On your globe, a fly would be hidden from another fly at a few inches distance. On the earth, a ship can be seen by another ship when very many miles apart. Still, when one is hidden from the other, the reason is in both cases the same."

"Yes of course the earth is a great great deal bigger," said Ikon.

"The higher we are placed, the wider is our view," said Herr Lehrer. "On a hill we can see farther than on the shore. On a mountain we can see farther than on a hill. But in every case, nearer or farther, the gently-bulging surface of sea or land rises up, and seems to meet the sky, and shuts off from us what lies beyond."

"I should like to know how big the earth is," said Ikon.

"Another time," the Professor answered. "I have given you enough to think about this morning for a holiday."

Chapter VII
Things Big and Beautiful

"It is two whole days since I have had one single talk about the stars," said Ikon.

"Did you expect a lesson on Sunday?" asked Herr Lehrer.

"O no," the little boy answered. "Of course I didn't. And you told me a great deal on my Saturday holiday. Dormer says she is sure I ought to be satisfied. And she says she can't think why you take such a lot of trouble. And I told her it was because you were so good."

"I like to teach people who love to learn," said the Professor.

"I love to learn," responded Ikon, nestling close to his friend with a confiding air. "And I didn't mean to grumble about the two days, only it did seem long."

The Professor smiled at this, and asked:

"What do you want to hear about today?"

"If it was dark, I wanted to know more about the stars all moving," said Ikon. "Seeming to move, I mean. Dormer says the stars are all fixed quite fast, and never move at all, really."

"Dormer's assertion is not quite correct. But let that alone for the present. What do you wish explained?"

"About the earth turning round, and making all the stars seem to move over the sky," said Ikon, with knitted brows. "I've been looking and looking every evening when it is fine, and I can't make it out a bit. The stars all go walking on, on, over the sky. I've looked out as soon as it was quite dark, and once or twice again before I went to bed. And I could see the stars had gone walking on. But I don't believe they all come up in the east and go down in the west at least, I couldn't see that they do. It seems as if they just come up anywhere and go down anywhere."

"Rather puzzling for a little boy," said the Professor. "Wiser heads than yours have felt the difficulty. I do not mean to say much more to you now about these apparent motions of the stars. Some other matters had better come first. But perhaps I can help you a little."

"Please," Ikon said.

"Then notice this. Watch as you may, each evening, you will see no stars rise anywhere near the western horizon. Watch as you may, you will see no stars set anywhere near the eastern horizon. The general movement is all from an easterly direction to a westerly direction."

Ikon nodded. "I'll look," he said. "I think I'll look out both sides of the house."

"Do so," said Herr Lehrer. "Be quite clear in your little head which really is the east, and which the west. And remember also something else. When we speak of stars rising in the east and setting in the west, we do not mean merely the east and the west of this house. We mean that the stars, as a whole, rise to the east of the whole earth, and set to the west of the whole earth. This makes a very wide east and a very wide west, reaching in fact from the North Pole to the South Pole."

"I think I understand," said Ikon slowly.

"You asked me two questions lately which ought to be answered," said Herr Lehrer after a pause. "One was about the size of the earth. The other was about the distinction between stars and planets."

"O yes, please," said Ikon. "Are you going to tell me now?"

Herr Lehrer pulled a rosy-cheeked apple out of his pocket, and said:

"Describe to me how large this apple is, Ikon."

"It is big a beautiful big apple."

"But I want to know its exact size."

Ikon seemed quite at a loss.

"There are two or three ways in which you may answer me. You might say precisely how large it is, measured straight through from one side to the other. Or you might say how large it is, measured once round the outside."

The Professor produced a slender sharp stiletto, much like what ladies carry in their work-boxes; and also a small ruler, marked with inches. A yard-measure appeared next and was laid on the table. Herr Lehrer thrust the stiletto carefully through the center of the apple, till its point just reached the other side. Then, withdrawing it, he measured with the little ruler how much of the stiletto had gone into the apple.

"It's three inches," said Ikon eagerly.

"That is to say, the size of the apple from one side to the other, straight through its center, is three inches," remarked the Professor. "Or, as I should rather say, the apple is three inches in diameter. The word 'diameter' means 'the measure through.'"

Ikon repeated "diameter" two or three times, as if to learn it by heart.

"Again, we may take this yard-measure, and may see how much of it is needed to go around the apple at its largest part. See—"

"Nine inches," cried Ikon.

"So we may say that the apple is three inches in diameter, and nine inches in circumference."

"Cir-cum-fer-ence," repeated Ikon, "O yes, I know that word. Doesn't it mean round—right round the outside? The apple is three inches through, and nine inches round."

"That is a more exact description than merely to state that the apple is big and beautiful," said Herr Lehrer. "You must try to remember these two words, however diameter and circumference."

"Are you going to tell me how large the world is through and round?" asked Ikon. "I mean how big its diameter is, and the other too."

"The earth is a great deal larger than this apple," Herr Lehrer remarked. "Instead of being three inches only, it is nearly EIGHT THOUSAND MILES in diameter."

"Eight thousand miles!" said Ikon in amazement.

"Nearly," said the Professor. "Now I want you to tell me what the circumference of the earth is. A ball or globe is rather more than three times as much round the outside as through the center. Did you notice this with the apple?"

"No," Ikon answered. "It was three inches, and nine inches. Of course three times three is nine."

"Then, if the diameter of the earth is eight thousand miles, what is the circumference of the earth?"

"Three times eight thousand! O dear!" said Ikon.

"That is not so difficult, my boy. Three times eight is…"

" Twenty-four," Ikon promptly replied.

"Then three times eight thousand is twenty-four thousand. The earth is nearly eight thousand miles in

diameter, and she is about twenty-five thousand miles round at the equator."

"It's an enormous earth," said Ikon very seriously. "How long would it take me to walk eight thousand miles? Or to go by train! How long would that take?"

"Without stopping?" asked Herr Lehrer.

"I shouldn't want to stop. It would be so dark inside the world," said Ikon, smiling. "Of course, I couldn't really take that journey, because trains don't go straight down into the ground. And I couldn't breathe either could I? Only, people do make tunnels."

"Not through the center of the earth, Ikon."

"No only just a little way down. But if I were to go," said Ikon, smiling still "Oh, wouldn't it be a wonderful journey! Where should I come out at the other side?"

"Probably in New Zealand," said Herr Lehrer.

"It is nice to fancy things," said Ikon. "I like to fancy going down, down deep into the ground, and then coming out suddenly in New Zealand. How frightened people would be to see me! Would it take me a great while to get there?"

"If your train went steadily at the rate of forty miles an hour, continuing night and day alike, never stopping, and never going more slowly, you would accomplish your journey in eight days and a half."

"Do trains go forty miles an hour?"

"Some do," said the Professor. "That is a good medium speed. Some are faster, and some are slower."

"Only of course they do stop sometimes," said Ikon.

"Yes; passengers need food and rest; and engines need coal and water. Such fast travelling in real life is quite impossible."

"It seems such a great tremendous world," Ikon remarked again.

"Not nearly so large as the sun," said Herr Lehrer. "The sun is so very much more enormous, that our earth beside him looks quite tiny."

"I shouldn't think such a great big world could look tiny," said Ikon.

"Is a loaf of bread a large thing or a small thing?" asked the Professor.

"Why; I don't know. It's—isn't it pretty big?" said Ikon hesitatingly.

"Suppose you asked a little ant what he thought of a loaf?"

"Oh, he would say it was enormous," said Ikon, his face lighting up with fun. "He would think it a tremendous mountain."

"And suppose you asked an elephant what he thought of that same loaf?"

"Why, of course he would think it quite tiny," said Ikon laughing. "Not even a mouthful only a sort of scrap."

"You see, then, that size is a matter of comparison. The same loaf is enormous to an ant, and a mere scrap to an elephant. Now, the earth is very large indeed to you and me. But seen beside the sun, the earth is quite small."

"I didn't know the sun was so very very large," said Ikon.

"Other people did not know it either, once upon a time. The Greeks, long ago, were quite angry because somebody ventured to think that the sun might be as large as their little country, Greece."

"But it is bigger, really and truly," said Ikon, in a half questioning tone.

"Very much bigger. People believed, however, then and long afterwards, that our earth was the most important place—was the center, in fact, of everything. They supposed themselves to be living on a mighty world which never moved, round which the sun and moon and planets and comets and stars were perpetually travelling, just for the good of mankind."

"Don't any of the stars go round and round the earth?" asked Ikon.

"Not one of the stars. And not one of the planets either —unless—"

"Doesn't anything? Doesn't the sun, or the moon?"

"Yes, one thing does. The moon travels round the earth, and only the moon. None of the stars do; and none

of the planets unless, as I was about to say, we call the moon a planet. The sun does not. It is the earth which travels round the sun, not the sun round the earth."

"The sun seems to go round us," said Ikon.

"True; but you already know that this movement of the sun is only apparent, and is caused by the earth's own motion."

"Yes; I remember it is because the earth goes spinning round like a top."

"That is one movement. There is also another. The earth not only spins constantly like a top, but travels always in a wide pathway round and round the sun. She spins once in every twenty-four hours: but to journey once round the sun takes her a whole year."

"I think it's a very whirligig sort of world," said Ikon.

"People for a long while did not know this, Ikon. And when it was first talked about, they were greatly offended. For it did not seem half so grand, to be merely one among a great many planets circling round a mighty central sun, as to count our own earth that mighty center herself, with all the heavenly bodies circling round her."

"Do all the stars travel round the sun?" asked Ikon.

"No; not the stars. The sun himself is a star; one among many stars. Our own world and many other worlds travel round the sun, and we call them 'planets.' The sun is very much like a father, with a large family clustering

about him. Other stars may have their families of worlds also."

"It seems so very funny to think of our sun being only a star," said Ikon. "But you haven't told me about planets yet."

"I have not forgotten," said Herr Lehrer. "Now it has grown dark, I should like to show you through my telescope the difference between a star and a planet."

"Oh, have you got a telescope?" cried Ikon, with widely-opened eyes.

"Yes," said Herr Lehrer. "It is a clear night, and mild for the time of year. Do you think Dormer would give you leave to come out on the terrace for a short time? You must wrap up warmly. Tell her it is not windy, and that side of the house is sheltered."

Ikon rushed away, breathless and eager. Whether Dormer would have given her consent to anybody except Herr Lehrer may be doubted. But she liked the Professor for his pleasant ways: and she was grateful to him for all the trouble he took with the child. So Ikon soon came running back, muffled up to the ears, and beaming with delight.

"That will do," the Professor said. "Now come."

Chapter VIII
Ikon's New "Little Moon."

Herr Lehrer's telescope was not nearly so large as that of his friend "Fritz." It could be packed away in a sort of long narrow box. Ikon had seen this box often, and had wondered what might be inside it.

Now he saw the box lying empty on the terrace; and out of it had come a telescope, much larger than that belonging to the sailor, yet a great deal smaller than the one through which Ikon had seen stars in broad daylight. The tube was mounted on a three-legged stand; and a three-legged stool stood beside it, ready for use.

"Now, Ikon," said the Professor. "Are you ready for a little journey towards the stars?"

Ikon clapped his hands, almost too happy for speech.

"Mind, I only say towards the stars not to them. You and I can go in imagination, just so far as this telescope has power to carry us."

"But of course it will make the stars look ever so much nearer and bigger," said Ikon joyously. "I do want to see what they are really and truly alike."

Herr Lehrer silently arranged the telescope in a certain position.

"Are you going to let me look at that splendid bright star up there?" asked Ikon, extending his arm in the same direction as the tube. "Oh isn't it a beauty? Bigger than my star was!"

"There is no brighter star in all the heavens than Sirius," said Herr Lehrer.

"Is that star called Sirius?"

"Yes. It has an older name- the Dog-star. But I am not going to show you Sirius first. There is a tolerably bright star near. Take a good look with your own eyes, and then come here."

Ikon obeyed. He gazed hard for a moment at the star indicated by the Professor, and then sprang joyfully to the stool.

"Well?" the Professor said.

For Ikon sat in silence, with his eye still at the tube, direfully disappointed. He murmured at length, in a depressed voice:

"It isn't one bit bigger or nearer."

"No?" said the Professor. "Look again at the star, and then again through the telescope."

"It has gone away," said Ikon.

The Professor put his eye to the tube, and adjusted it afresh.

"Well?" he said once more.

"It isn't bigger much," said Ikon sadly. "I don't see that it is at all. It's only just a little more shining."

"We will try Sirius," said Herr Lehrer. "Sirius is a magnificent sun, Ikon, much larger than our own sun, we believe."

Ikon looked hard at the brilliant twinkling point of light, and then peered anxiously through the telescope. But the result was much the same.

"It's brighter," he said, sighing. "It is a good deal brighter in the telescope. But I didn't want only that. I wanted to see what the stars are like!"

"You did not see any more in my friend's telescope," said Herr Lehrer.

"No. But that was day-time," said Ikon. "I thought I was going to see ever so much tonight. And it isn't anything at all. It's only just the same as always. I don't see how anybody can know that that little star is bigger than our sun."

The voice sounded just the least degree injured.

"Our journey to the stars is a failure," said the Professor, falling into Ikon's mournful tone. "We have tried, and we cannot reach them. Shall we give up from this day thinking any more about the stars?"

"O no," Ikon said at once, looking up in the Professor's face. "I do want to learn more."

"But people cannot learn when they feel cross," said Herr Lehrer. "It makes their brains stupid."

"Then I won't be cross," said Ikon cheerfully. "Perhaps Mr. Fritz's telescope could show me the stars better."

"Not much better, Ikon. The most powerful telescope ever yet made can do little more than increase their brightness."

"I don't see why," said Ikon.

"Because they are so very very far distant."

"I thought telescopes were meant for that," said Ikon.

"Were meant to magnify distant objects, you mean. Yes; it is so. But the power of a telescope is limited. So enormous are the distances of the stars, that telescopes can help us but a little."

"I don't see that the stars are like the sun," said Ikon.

"No, my boy, you do not. Many things are true which you and I cannot see."

"But you know," said Ikon timidly, hearing rebuke in the tone.

"I know some facts about the stars which you do not yet know and which, as a little boy, you cannot possibly understand. There are further depths of knowledge beyond me also, where I find myself ignorant as a child. You and I have in different matters to learn the same lesson that often we must believe where we cannot see or understand."

"But you do know about that star being bigger than the sun," said Ikon.

"We know about how far distant Sirius is. We know that our sun, removed to the distance of Sirius, would not shine as Sirius does, but would be one of the fainter stars. We conclude, therefore, that Sirius, giving out very much more light than our sun gives out, must probably be much larger than our sun. Another day I will tell you more about the distances of the stars."

"If our sun was as far off as Sirius, wouldn't a telescope make it look any bigger than a common star?" asked Ikon.

"No, not at all, Ikon."

The Professor sat down again on the stool, and moved the telescope. Ikon, following this movement with his eyes, and searching over the sky, suddenly exclaimed:

"Oh, I can see another star, and it's brighter than Sirius. "Oh, ever so much bigger and brighter. And it doesn't twinkle at all. And you said you would tell me why some stars don't twinkle, and some do."

"The twinkling is merely in appearance," said Herr Lehrer. "It is caused by the layers of air through which the rays of light have to pass. In parts of the earth, where the air is clearer, the twinkling is much lessened. In our country, however, you may generally know a planet from a star, by the fact that stars do twinkle, and planets as a rule do not."

"That star isn't twinkling," said Ikon. "Is it a planet?"

"Yes. I am going to show it to you through the telescope. Ha!" the Professor added, in a pleased tone. "You are fortunate. Look quickly, Ikon, and look steadily."

This time no disappointment was in store for the boy.

"Oh! Oh!" he cried rapturously. "Oh, it's a dear little moon a real moon such a beauty. And it has got streaks all across it only not like the face on the big moon. Oh! And there are three little tiny stars quite near! Oh, it's going!"

The Professor responded to this, and once more Ikon's "moon" shone softly on him through the telescope.

"Now, Ikon, make the best use of your sight," said Herr Lehrer. "Are you quite sure there are only three little 'stars?'"

"One two three. Only three," said Ikon.

"Don't you see something on the edge of your 'moon' a little bright hump?"

"O yes—why, of course I do. What can it be?" cried Ikon. "And it's moving moving. I'm sure it is! There it isn't sticking to the moon any longer. O dear me, they are all running away again. Thank you now they are all right. And there are four little stars."

"But they are not stars. They are moons," said Herr Lehrer.

"Are those moons?" said Ikon in astonishment "Then there are five moons."

"No, only four. The larger body is a planet—a world like our own. The name of the planet is Jupiter. It is a very large planet indeed: much larger than our earth."

"Is it as big as the sun?" asked Ikon.

"No, not nearly. Jupiter is the largest of all the planets; but still he is only a planet. He travels round the sun, with his four moons; just as our earth travels round the sun with her one moon."

"I do wish we had four moons," said Ikon. "I should like to be on Jupiter. Are any people living there?"

"Ah, that I cannot tell you," said Herr Lehrer. "I think it is, to say the least, extremely doubtful. Now, my boy, I must not keep you here any longer, or you will take cold. You have had a capital view of Jupiter. Run indoors, and take off your wraps."

Ikon obeyed, and soon after the Professor followed him.

"Well," he said smilingly to the little boy, "I hope you are carrying away some clear ideas this evening, Ikon."

"I've been trying to remember all you told me," said Ikon. "And I think I haven't forgotten much."

"Try to tell me some of the chief points," said the Professor.

Ikon stood in front of him, with a very intent face.

"The sun is a star," he said. "And stars and planets are quite different. And our world is a planet."

"Good," said the Professor. "Go on."

"And the sun is in the middle of all the planets," said Ikon. "And they go round and round the sun-- our world and Jupiter and all of them. And the stars don't go round the sun, but perhaps they have planets going round them."

"Quite right," said the Professor.

"And the moon goes round the earth; and we have only got one moon," continued Ikon. "And Jupiter has got four moons. And the stars are such a very great way off that the telescope can't make them look bigger, but only brighter."

"Are the planets as far off as the stars?" asked Herr Lehrer.

"I don't know. Are they, please?"

"No; not nearly. You saw that the telescope could make Jupiter look larger."

"O yes I forgot. And there's a beautiful star called Sirius, and it's a sun, and it is most likely a great great deal bigger than our sun."

"Well remembered, my boy," said the Professor.

Chapter IX
Shine and Shadow

"Please, will you tell me more about Jupiter?" asked Ikon, next day.

It was a rainy afternoon, and he had been amusing himself in the schoolroom for a change. A lamp had been lighted early, and placed on the center table. Dormer came in and out, till Herr Lehrer appeared, and then she vanished.

"Jupiter is one of the planets," said Herr Lehrer, "There are many others, however."

"What does 'planet' mean?" Ikon wanted to know.

"A 'planet' means a 'wanderer.' They were so named at first because of their movements in the sky. The stars, as I think you know, remain fixed in the same positions, century after century. The movement of the earth makes them seem to sweep over the sky every night in company; but they do not change places among themselves. The Great Bear always keeps his own shape, unchanged; four chief stars to the body, and three to the tail. So too with the Little Bear, and with all other groups of stars."

"Is that what Dormer meant by calling them 'fixed'?" asked Ikon.

"That is doubtless what Dormer had in her mind. When you look out at night, and see the constellations of the Great Bear, or the little Bear, or Orion; you may be sure that Abraham and Noah and Job, looking at the sky thousands of years ago, might have seen those very constellations, just the same in shape as you see them now."

"I wonder if Abraham and Noah and Job ever looked at the stars," said Ikon thoughtfully.

"Abraham did," said Herr Lehrer. "God led him forth one night, and told him to look at the sky. And Job did, for he speaks of the stars in his book. No doubt Noah did also."

"I don't know exactly what constel—constel—"

"Constellations? A constellation is a group of stars."

"And haven't they changed the very least since Abraham was alive?"

"Since Abraham lived on earth? I do not say there has been no change. But I do say that if you had looked upon them then, and could look upon them again now, with your unassisted sight and common attention, you would not see the slightest alteration."

"It is such an immense time," said Ikon.

"We were going to talk about the planets," said Herr Lehrer. "The stars remain fixed, each having its own particular place in a particular group or constellation, from

which it never stirs. But the planets are always wandering on among the stars. That is why they are called Wanderers."

"Does Jupiter move about?" asked Ikon.

"Yes. If you watched him carefully for a long while, you would find his position slowly changing. Some of the smaller and nearer planets move much faster. A planet, instead of being fixed in one constellation, may be seen now in one group of stars, then in a second, and then in a third. That is one great distinction between stars and planets."

"I know another difference," said Ikon. "Stars twinkle, and planets don't."

"As a general rule they do not; but some among them may be seen to twinkle. I wish now to tell you of a more important distinction. What causes the stars to shine, Ikon?"

"Dormer says it is because they are bright."

Herr Lehrer turned to the table, smiling.

"Does this lamp shine because it is bright?"

"Why, no," said Ikon. "It shines because because it burns. It can't help shining. It shines because there is a flame of fire."

"That is precisely how the sun and the stars shine," said Herr Lehrer. "The sun shines, and the stars shine, because they are great fiery furnaces of heat and light."

"Are there flames in the sun?" asked Ikon.

"Yes. The sun is wrapped round with a tremendous envelope of furious flames."

"I shouldn't think it would be nice to live there."

"I should not think it would be possible," said Herr Lehrer. "Now the planets do not shine so—neither does the earth."

"Why, the earth doesn't shine!" said Ikon in surprise.

"Certainly it does, my boy—quite as much as some other planets. If you were on Venus, you would see our earth looking much more brilliant and beautiful than Jupiter did last night."

"Is Venus a planet?"

"Venus is one of the planet-wanderers—the nearest to ourselves in size."

"I never thought of the earth shining," said Ikon.

Herr Lehrer took up a little glass ball with which Ikon had been playing, and held it in the full light of the lamp.

"What makes this little ball shine?" he asked.

"Why because it's in the lamplight," said Ikon.

"Would it still look bright, if I put out the lamp?"

"O no; it wouldn't shine at all. It could not shine in the dark."

"You see, then, the difference between the stars and the planets. A star shines as this lamp shines, by its own

actual brightness. A planet shines, as this glass ball shines, by light falling upon it from something else. Our sun is a star, and he shines by his own burning light. Our earth is a planet, and she shines only because the sun's light falls upon her."

"And the moon?" said Ikon.

"The moon shines as the planets shine by reflected or borrowed light. The moon is bright, simply because the sunbeams falling on her make her bright. The moon can only shine on that side which is turned towards the sun. Her other side is in darkness. The sun, on the contrary, is always equally bright all round."

Herr Lehrer walked to the window, and beckoned Ikon to follow him.

"Do you think this part of the earth is shining now?" he asked.

"It doesn't look as if it was," said Ikon.

"And it is not. This side of the world is now turned away from the sun; therefore no bright sunbeams fall on it, and it cannot shine. The other side of the earth is now coming into daylight, just as we are now passing away from it. That side could be seen to shine, by somebody looking at it from another world."

"But our earth isn't up in the sky?" said Ikon, in a puzzled voice.

"Our earth is just as much up in the sky to another planet, as another planet is up in the sky to us."

"It seems funny," said Ikon. "And it is very funny to think of daylight being somewhere else on the world, while we are in the dark."

"There is always daylight somewhere on earth," said Herr Lehrer.

He rose from the table, and brought the little school-globe from another part of the room. Ikon jumped up, and then paused, not knowing what the Professor wanted. Herr Lehrer placed the globe on the table, raising it by means of a small desk to about the height of the lamp.

"Now, Ikon," he said, "you are to suppose this lamp to be the sun, and this globe to be our earth. How much of the earth is in daylight, and how much is in darkness? "

"The side near the lamp is in daylight—bright daylight," said Ikon. "And this side away from the lamp hasn't got daylight, I suppose. But it isn't dark."

"No; for there is sufficient light through the room to prevent any part of the globe being quite dark. But you can see that this side is in shadow; and with the real earth, the shadow is blackness. Now get up on a chair, and look carefully. Tell me is it day or night in England at this moment?"

"Why, we are in England, and it is nearly night," said Ikon. "Oh—do you mean on the globe? It is dark where little England is—quite night."

The Professor began to turn the globe very gently from left to right.

"Now watch," he said. "You see I am moving England towards the east. That is the way the earth turns. Can England see the sun rising yet?"

"Just a peep," said Ikon.

"Then that is the dawn. As the earth turns, England is travelling towards the east; and this makes it seem to her as if the sun were rising in the east. See England is passing on to broad daylight. Now she is exactly under the full lamp-light, and it is mid-day. Now she is moving onward, and it is afternoon with her. Other countries are, you perceive, having their mid-day; and others their morning dawn; all at the same time. Now England has reached her evening twilight. She is passing away from the sunlight and America is in broad daylight, while the inhabitants of China are plunged in darkness. Now England has passed into night once more yet none the less does the lamp shine."

Ikon was intensely interested. He asked to turn the globe himself, and sat on the table, scanning its surface eagerly, and calling out:

"It's night! It's morning! It's mid-day! It's evening! Now the people are going to bed! But over on the other

side of the world they are just getting up. How funny why, some are having breakfast and some are having tea, just at the very same time."

Ikon turned once or twice in silence, and then looked smilingly in the Professor's face to say:

"What tiny tiny wee little people they would have to be on this globe!"

"Much too small to be visible even with a microscope," said Herr Lehrer.

"I shouldn't like to be so small as that," said Ikon.

"Well, have you turned it enough?" asked the Professor at length.

"I suppose so," said Ikon, as if unwilling still to leave off. "I never did know before that it was day in one place, and night in another place, at the very same time."

"I hope you know it now," said Herr Lehrer. "There is always broad daylight exactly under the sun. There is always complete night exactly away from the sun. There is always morning dawn on one side, between the two. There is always evening twilight on the other side, between the two. As the earth turns on her axis, each country passes in turn through these different conditions."

"What is 'axis'?" asked Ikon.

"The axis of this globe is the slender rod upon which it turns. The axis of the earth is the straight line from her north pole to her south pole, round which she spins."

"I wonder why the globe is made all tilted over on one side," said Ikon. "It would be ever so much nicer straight."

"Would it? But the earth is not straight," said Herr Lehrer. "The axis of the globe is tilted to one side, just because the axis of the earth is tilted to one side. I will tell you more about this some other day."

Chapter X
The Size of the Sun

"I want to have a few words with you about the sun," Herr Lehrer remarked next morning after breakfast. "Miss Mundy does not come directly, does she?"

"O no—not till ten o'clock," said Ikon. "But we can't see the stars now, and I thought you were always too busy after breakfast."

"Not today; but I shall be busy all the afternoon and evening."

"The sun isn't shining now," said Ikon, coming to the Professor's side.

"Yes, it is shining very brightly indeed," said Herr Lehrer.

Ikon looked at him in astonishment. For certainly it was an extremely dull and beclouded morning.

"The sun shines up in the heavens, just as usual," said Herr Lehrer. "Only it happens that a few masses of vapor have come between his rays and this part of England."

"Is that all?" asked Ikon. "But ever so many people say the sun doesn't shine sometimes."

"The sun always shines," said Herr Lehrer. "Now and then his beams do not fall directly on you and me. Yet his light and warmth reach us through the clouds."

"Yes it isn't dark" said Ikon. "I didn't think of that. Please, I do want so very much to know how big the sun really is. Oh, and I want to know the names of all the other planets besides Jupiter."

"The planets shall come tomorrow. The sun today," said the Professor, "Which do you suppose to be the largest, my boy sun or moon?"

"Why, you said the sun was. It doesn't look the biggest," said Ikon, "It's only a great deal the brightest. But the sun and the moon look just the same size."

"Yet one is enormously larger than the other. How come they to appear alike?"

Ikon thought for some seconds, and shook his head hopelessly.

Herr Lehrer drew a ring off his little finger, and held it between Ikon's eyes and the window.

"Now observe and tell me which looks to your sight the larger, this ring, or yonder red house on the hillside?"

"The house, of course," said Ikon.

"You are speaking hastily. Observe for yourself. I do not ask which is in very truth the largest, but which appears so to your eyes at this moment. In your sight, does

the house or the ring fill the biggest space? See—you can behold the entire house within the circle of the ring."

"I suppose the ring looks the biggest really," said Ikon. "I didn't think it would."

"You jumped at a conclusion, and did not notice for yourself. Why does the ring look larger to you than the house? "

"Because—because—" said Ikon. "Oh, because it is close to me, and the house isn't."

"The case is the same with the sun and moon, my boy. The sun is like the house very large and very distant. The moon is like the ring very small and very near. Therefore, as we look at the two, they appear to be about the same size. The moon can even hide the face of the sun from us, as she floats between; exactly as this little ring can encircle the large house."

"How big is the moon really?" asked Ikon.

"Much smaller than the earth. Instead of being eight thousand miles straight through, the moon's diameter is only two thousand miles. If I were to take a good-sized marble as a picture of the earth, I should have to take a pea as a picture of the moon."

"Eight thousand miles, and two thousand miles! Why, two thousand is only one quarter of eight thousand," said Ikon. "And how big is the sun, please?"

"Tell me once more the diameter of the moon," said Herr Lehrer.

"Two thousand miles."

"And of the earth?"

"Nearly eight thousand miles," said Ikon.

"Good child. Now the diameter of the planet Jupiter, which you have seen, is a good deal more than ten times as much. Ten times eight thousand is eighty thousand. So Jupiter's measure, straight through the center, is more than eighty thousand miles."

"Oh, what a size!" said Ikon. "And the sun?"

" The sun's diameter is again more than ten times that of Jupiter. Ten times eighty thousand is eight hundred thousand."

Ikon's eyes opened widely.

"So," continued the Professor "you may remember these round numbers as somewhat near the mark:

"The moon: about two thousand miles.

"The earth: more than eight thousand miles.

"Jupiter: more than eighty thousand miles.

"The sun: more than eight hundred thousand miles."

"What a tremendous enormous great sun he must be," said Ikon. "Ten times as big as Jupiter."

"Much more than ten times as big" said the Professor. "We are speaking now simply about the diameter or

through-measure; not about the size of these globes as a whole."

"But I thought you said it was ten times as big," replied Ikon.

"No, my boy. I said that the diameter of Jupiter was about ten times the diameter of the earth; and that the diameter of the sun was about ten times that of Jupiter. To say that the size of one planet is ten times the size of another, is quite a different matter."

Ikon was plainly puzzled.

"See here," said the Professor "this globe of yours is, roughly speaking, about ten inches in diameter. Have you at hand the little glass ball which we used yesterday?—Ah, thanks, I did not see. Now this small glass globe is about one inch in diameter. Therefore, your globe is just so much bigger than the glass ball, as Jupiter is bigger than the earth. The diameter of one is about ten times the diameter of the other."

"Yes oh yes, I understand," said Ikon. "One inch, and ten inches."

"The diameter of the globe is ten times the diameter of the glass ball," repeated Herr Lehrer. "But the globe is very much more than ten times the size of the glass ball as a whole. Ten glass balls of this size would not make a ball as large as the globe."

"O no; not nearly" said Ikon.

"So it is quite a different matter to speak of the diameters of two balls, and to speak of their general size or volume. But now I wish to help you to a clearer idea of the sun's size, compared with the earth's size. Talking of thousands of miles is very puzzling to a little boy. Suppose we try to fancy the earth and Jupiter and the sun all grown small together."

"All grown to the same size?" asked Ikon.

"No; the same size would not do at all. You must picture them all to yourself as shrinking smaller and smaller; yet one not shrinking faster than the others."

"Yes. I'm fancying them," said Ikon.

"Whatever sizes we bring them to, Jupiter's diameter must always be about ten times that of earth; and the sun's diameter must always be about ten times that of Jupiter. If the earth's diameter is supposed to be one mile, Jupiter's will be ten miles, and the sun's will be a hundred miles. If the earth's diameter is supposed to be an inch, Jupiter's will be ten inches, and the sun's a hundred inches. In this manner you may gain a good notion, not of their actual sizes, but of how large each one is, compared with the others."

Ikon nodded and looked very intent.

"This little glass ball may do for the earth," said the Professor. "And your globe shall serve for Jupiter. The glass ball is an inch, and the globe is ten inches, in diameter. In proportion to these sizes, we shall require for

the sun a globe of about one hundred inches, or eight and a half feet, in diameter."

"Eight and a half feet!" repeated Ikon.

"This room is not high: but it is over eight feet and a half," said Herr Lehrer. "Your playroom would, however, be about right. A ball to represent the sun should just be able to stand in your playroom, Ikon, with perhaps two or three inches to spare."

"It would be a great huge ball," said Ikon. "And only this little tiny glass ball for the earth."

"And perhaps a large pea for the moon," said Herr Lehrer, smiling. "Did I not rightly say, child, that the earth was small beside the great sun?"

Chapter XI
Many Worlds

"May I learn the names of all the planets today?" asked Ikon.

"You may hear them, some of the number at least. The learning must depend upon yourself."

"I should like to write them down, and then I'll say them over and over to Dormer."

"Not a bad notion. What is a planet, Ikon?"

"It's a world," said Ikon. "And it goes round and round the sun."

"Do all planets go round the sun?"

Ikon said "Yes;" and then hesitated.

"All planets belonging to our sun's own family do," said Herr Lehrer. "But there may be thousands of other planets, travelling round other suns."

"O yes, I forget," said Ikon. "And a planet isn't a star. A star shines of itself; but a planet shines because the sun makes it shine. And a planet is a place for people to live on."

"Our own planet is a place for people to live on," said Herr Lehrer. "Other planets may be so also, or they may not be."

"Aren't some of them any use at all?" asked Ikon.

"Yes," Herr Lehrer answered. "God made them all, and when the work was done He saw that it was good. So you may be quite sure they have their uses, past or present or future. But I cannot at all say whether other planets are of use precisely in the same way as our earth."

Ikon was in the schoolroom again with the Professor. Herr Lehrer did not always seem inclined for the long climb upstairs to Ikon's playroom, except at night, when a good view of the stars could be had.

"All the planets of our system, so far as we know, spin round like the earth," said Herr Lehrer. "All of them travel round the sun, like the earth. So, like the earth, other planets have their days and nights and years. The great sun is in the center, pouring out light and heat; and the planets roll round and round him perpetually; each at its own distance, and each in its own pathway or orbit. Some are near, and some are very far away."

"How many planets are there?" asked Ikon.

"Eight principal planets, and many smaller ones. You shall get your slate presently, and write down all the chief names."

"Only eight!" said Ikon.

"Eight principal planets. That is not nearly all."

"No," said Ikon.

"We may divide them into three groups. First: the four smaller planets, nearest to the sun. Some think there are five, but this is not certain. Second: a great many very little planets, all travelling round the sun in company. Third: the four great outer planets, farthest away from the sun. In addition, there are the moons, belonging to some of the planets. Many of these moons are larger than many very small planets. They really are planets or worlds; though we call them moons, because they seem to belong to other planets, as our moon seems to belong to us."

"May I learn their names now?" begged Ikon.

"Yes, you may get your slate. That is right. Now put down first—

"'THE SUN.' For he is the center and head."

Ikon wrote quickly, as directed. He had a good clear hand for his age.

"Tell me now what comes next."

"Four or five not very big planets," said Ikon.

"If there are five, the name of the first and nearest to the sun is—

"VULCAN.

"But we are by no means sure that there is such a planet. The nearest of which we are sure is—

"MERCURY.

"That is a busy little planet, hurrying round the sun at a great pace. Outside the path of Mercury, lies next that of—

"VENUS.

"You may often see Venus in the evening or morning, soon after sunset or before sunrise. She is even brighter and more beautiful than Jupiter. Beyond Venus follows the planet—

"EARTH.

"These two, Venus and Earth, are much the same in size. Next comes the red-tinted planet—

"MARS travelling in a pathway or orbit outside that of Earth.

"Have you written down these five names, Ikon?"

Some little help in the spelling proved needful.

"Is that our own earth?" Ikon wanted to know.

"That is our own earth, lying between Venus and Mars. More correctly, the pathway of Earth lies between the pathways of Venus and Mars. All these planets are called worlds, but 'Earth' is the name of our particular world or planet."

Herr Lehrer took a piece of paper and a pen. He made a little black dot in the center, and said:

"That is the sun. Now we will draw the orbits of the four planets Mercury first Venus, outside Mercury Earth, outside Venus Mars, outside Earth."

"Four rounds," said Ikon.

"Four circles, I suppose you mean. But the paths of the planets are not circles. They are all slightly oval: and the sun is not exactly in the center of any one of these orbits. I am not attempting to show you their respective distances here. This is merely to make you understand their positions."

"May I keep that paper?" said Ikon.

"If you like. Next come the PLANETOIDS, or Little Planets. They were first named ASTEROIDS, or Little Stars. But they are not stars; they are planets, only very small ones. In number they amount to between two and three hundred; and their orbits all lie between the pathways of Mars and Jupiter. I will tell you more about distances another day."

"And then there are the big planets," said Ikon, having written down with some assistance the word "Planetoids."

"Yes. Outside the belt of little planets, we come suddenly on the monster planet—

"JUPITER.

"You have seen Jupiter already, and will not forget him, I think. Outside Jupiter lies—

"SATURN.

"I have not told you anything yet about this planet, with his strange and beautiful rings. Saturn is next in size to Jupiter. Then follows—

"URANUS.

"And after Uranus we reach the lonely far-off wanderer—

"NEPTUNE.

"If any more planets exist beyond these, they have not yet been discovered. Uranus and Neptune are a great deal smaller than Jupiter, but a great deal larger than Earth."

"May I know about the moons?" asked Ikon. "You said they really were planets too."

"Well, yes you may as well. Write 'Moon' above, and opposite the name Earth write 'One' Mercury and Venus have, we believe, no moons."

"We're better off than Mercury and Venus," said Ikon. Hasn't poor Mars a moon?"

"Mars has two exceedingly small moons, lately discovered."

"Oh, I'm glad of that. It would be nice if we had two," said Ikon.

"Jupiter has four moons," continued the Professor. "Saturn has eight. Uranus has four. Neptune has one."

"Only one and such a great way off from the sun!" said Ikon.

"Only one of which we know as yet. There may be others," said Herr Lehrer.

"May I read the names through?" asked Ikon. "I want to be quite sure I've got them all exactly right, and then I mean to learn them off by heart- perfectly."

The Professor made a sign of assent, and Ikon read:

"THE SUN.

"Mercury;

"Venus;

"Earth; with one moon.

"Mars; with two moons.

"The Planetoids.

"Jupiter; with four moons.

"Saturn; with eight moons.

"Uranus; with four moons.

"Neptune; with one moon."

"Right," the Professor said, when Ikon paused.

Chapter XII
Many Distances

"Suppose," said the Professor, "suppose that the sun were only one twenty-fifth of an inch in diameter."

"Are you going to tell me more about the sun today?" asked Ikon.

"I am speaking of the sun at this moment. I wish you to picture the Solar System on a very small scale."

"Is the Solar System something new for me to learn?"

"No. By the 'Solar System' I mean the sun and his family of planets, moons, and other bodies."

"O yes," assented Ikon.

"Sol is the Latin for sun; and by a 'system' we mean a 'plan' or a 'scheme.' The Solar System is that 'plan' of heavenly bodies of which the great sun is the center."

Then the Professor began again: "Suppose that the sun were only one twenty-fifth of an inch in diameter."

"That is less than an inch," said Ikon.

"Considerably less. You must divide an inch into twenty-five equal lengths, and take one of these tiny lengths for the diameter of your sun."

"But why?" asked Ikon.

The Professor produced an ivory foot-rule, with inches and tenths of inches marked. He made Ikon count the ten little divisions of one inch.

"And it wouldn't even be one of those tens." said Ikon.

"Tenths," corrected Herr Lehrer.

"Tenths," repeated Ikon. "It wouldn't even be half one of those. The inch is only in ten bits, and you want it to be in twenty-five bits. I shouldn't think the sun would be bigger than a pin's head."

"No larger than the head of a small pin," said Herr Lehrer. "So now we have the size of the sun. What must be the size of the planets in proportion? You know what I mean by 'in proportion '?"

"Yes. Jupiter's diameter has got to be ten times less, I mean, only one-tenth as much," said Ikon. "O dear me, Jupiter would be only a dot, and I am sure the earth wouldn't be anything at all."

"Would not be anything visible to our eyes, you mean. Earth and other small planets would be only as specks of finest dust. Still, you have now to picture them thus to yourself. I wish to show you what their proper distances from one another would be, if the sun were as small as I have described."

"O, I shall like that," said Ikon.

"Let us go to the large empty room behind the study," said the Professor.

Ikon followed gladly. It was a room seldom used, barely furnished, and not even carpeted. The Professor pushed aside a table, knelt down, and stuck upright in the boards a pin with a very small red head.

"That is our sun, Ikon. For the planets we will place other pins, though probably they should be too small to be seen by us. You understand that we are now picturing to ourselves the sun and his planets, all shrunken to a very minute size. Not only the sun and the planets are shrunken, but distances and movements are lessened also, exactly in the same degree. The whole thing, instead of being magnified, is diminished."

Herr Lehrer pulled out his "binocular" from a deep pocket, and bade Ikon look through it out of the window.

"Everything is so delightfully big," Ikon said. "Trees and all. Everything looks so much nearer."

"Nearer to you but not nearer, one thing to another," said Herr Lehrer.

"No," said Ikon, peering outside the glass and again through it. "No, things don't look nearer together. Those clumps of trees seem bigger, and closer to me, but they seem farther apart from each other."

"Then the glass magnifies distances as well as sizes," said Herr Lehrer. "Look at the cart and horse on the road yonder. Does the glass make them seem to move faster or more slowly?"

"Faster, I think," said Ikon, after a pause. "Yes, faster. I wonder why?"

"If they were nearer you would see them go faster," said Herr Lehrer. "The glass makes them seem nearer, and therefore makes them also seem to go faster."

Herr Lehrer put his hand on the binocular, turned it round, and desired Ikon to look through the opposite end.

"Oh! oh!" cried Ikon. "How funny! Why, everything has grown quite tiny oh, it does look pretty! I do like such a dear little wee view.

"Such little bits of trees, and the fence, and the clouds too, and the horse and cart are just like toys."

"Notice carefully, and then tell me," said the Professor. "Are the clumps of trees now farther apart from each other or closer together, than when seen by your own unaided sight?"

"Closer together. Farther off from me, and nearer to one another!" said Ikon. "It's all shrunk up small."

"Notice again," said the Professor. "Do the horse and cart move faster or more slowly?"

"Slower," said Ikon. "Not nearly so fast as when I saw them looking big through the other way of the glass. The horse is like a toy horse, and he just creeps along."

"Then you perceive, Ikon, that movements and distances, as well as sizes, may be lessened, or may be magnified. Objects which are more near to us, or which

are made to appear more near by a telescope, seem farther apart one from another and move faster. Objects which are far removed from us, or which are made by this binocular to appear far, seem nearer to one another and move more slowly."

Herr Lehrer took the glass from Ikon's hands, and put it away in his pocket.

"This is what we are in imagination doing for the sun and the planets," he said. "We are causing the whole to lessen the sun, the planets, the distances, the movements. The large bulk becomes small bulk; the great distance between one world and another becomes little distance; the fast movement becomes slow movement. But all the while, the true proportions remain unchanged. The biggest is still the biggest; the farthest is still the farthest; the fastest is still the fastest. It is as if we were viewing the Solar System, not through a telescope with magnifying power, but through the wrong end of my binocular. By this means, we have diminished the sun to the size of a small pin's head."

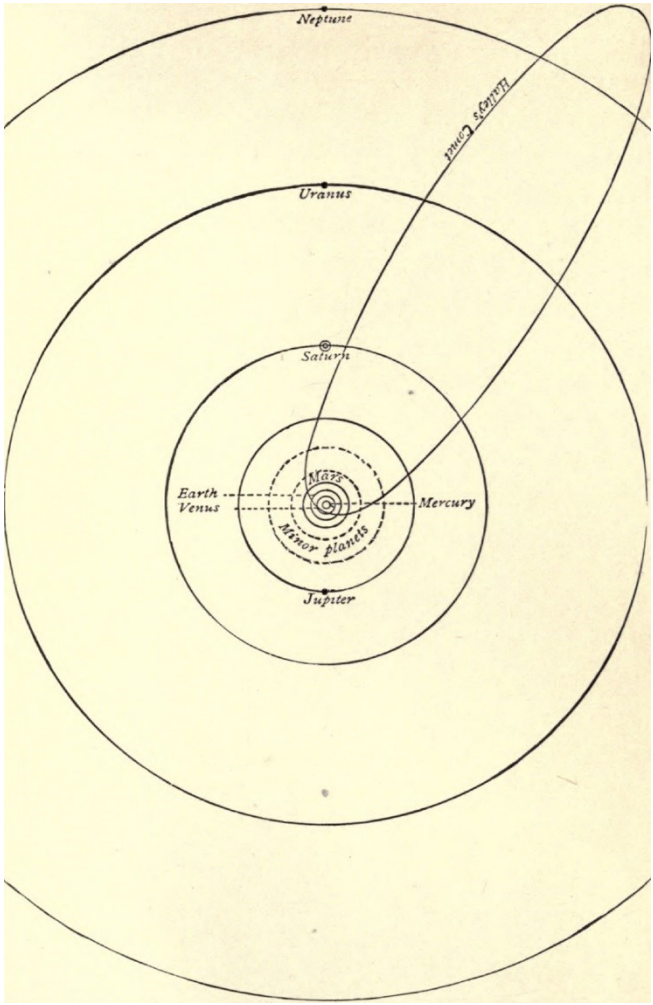
Ikon gave a little jump of glee.

"I quite understand now," he said. "And I do like it."

"Here then is our sun," said Herr Lehrer, pointing to the red head of the pin. "Which planet comes nearest to the sun?"

"Vulcan perhaps," said Ikon. "Or else Mercury."

"Vulcan being doubtful, we will take Mercury as the nearest. This little pin must stand for Mercury, at somewhat less than two inches' distance from our sun. Measure with the ruler, my boy. About one inch and two thirds."



Ikon obeyed eagerly, and the pin was placed. Herr Lehrer, with a piece of white chalk, marked a light line on the floor around the central pin.

"This is the pathway or orbit of Mercury," he said. "You see that I have made it somewhat oval; and the sun is not exactly in the center. That is more or less the case with all the orbits. Now the next planet."

"Venus," said Ikon promptly.

"Venus must be at a distance from the sun of three inches. I will mark this orbit also, outside that of Mercury. It would take me too long to chalk them all. Perhaps someday you may be able to do it yourself. Properly, the planets should be scattered round the sun in different parts of their pathways; not all be placed on one side. Now the next."

"Earth," said Ikon.

"Good. Measure your distance from the sun slightly over four inches."

"Mars," said Ikon.

"Six inches and a quarter from the sun," said Herr Lehrer.

"The Planetoids," said Ikon.

"These are in reality scattered widely over millions and millions of miles," said Herr Lehrer. "But on this tiny scale, those nearest to the sun will be about eight and a half inches distant; those farthest will be about twelve and a

half inches distant. Thus we have a clear gap of about four inches between Mars and the Planetoids. We have also another clear gap of about nine inches between the Planetoids and the next large world, called—"

"Jupiter," cried Ikon.

"You have learnt your lesson well," said the Professor, in a pleased tone. "Jupiter's orbit should be about one foot and three-quarters from the sun. You must imagine four tiny moons travelling with him. Then—"

" Saturn," said Ikon.

"Saturn's distance from the sun is not far from twice that of Jupiter. Three feet, two and a half inches, from the red pin."

"It's a great deal farther away from the sun than we are," said Ikon, with some pity for Saturn. "Uranus is next."

"Uranus is quite twice as far from the sun as Saturn. Six feet and nearly seven inches from the red pin, my boy."

"O dear me Uranus must be cold," said Ikon. "And Neptune?"

"Neptune must be at a distance of ten feet and about three inches. There!" said the Professor. "Now you have them all."

"And that's the Solar System!" said Ikon, gazing at the pins.

"That is a little picture of the Solar System," said Herr Lehrer. "But you must fancy these pin-heads to be minute

balls floating round the central sun, with no floor to support them. It is quite correct their being all placed on the same level, for this is very much the case with the orbits of the real planets. You must also picture the sun as so intensely brilliant that, in spite of its small size, it can light up this whole room with a certain measure of light."

"Must I fancy the little balls to be moving?" asked Ikon, with his most intent look.

"Yes; all," said Herr Lehrer. "The sun spins slowly round in his place; and the specks of dust not only spin, but also travel, slowly round and round him on their different orbits."

"Slowly; not fast?" said Ikon.

"The real planets go very fast. But this small Solar System would not have rapid movements," said Herr Lehrer. "The real earth has a very long journey indeed to perform in her year of twelve months. But a speck of dust floating round this tiny sun, must go slowly indeed to make the journey last twelve months."

"Is Jupiter twelve months doing his journey?" asked Ikon. "And Mercury?"

"Mercury's year is only about three of our months," said Herr Lehrer. "And Jupiter's year is about twelve of our years. Now, Ikon, here we have on a very small plan, the positions and distances of the planets or worlds belonging to our sun. What of the fixed stars?"

"I suppose they are farther away than even Neptune."

"Much farther. If our sun were only the size of this pin's head; if our earth were a speck of dust about four inches off, and Neptune a larger speck about ten feet off, where should we have to place the nearest fixed star? Not the farther stars, but the very nearest about which we know anything certain."

"Perhaps it would be as far as the fireplace," said Ikon.

"Farther."

"What—would it be out of the room? At the front door?" suggested Ikon.

Herr Lehrer shook his head.

"On the scale of sizes and distances which we are supposing," he said, "the very nearest fixed star, the distance of which is known to us, would be a little object, about the size of a pin's head and dazzlingly brilliant, placed fourteen miles away."

Ikon could only say:

"Oh!"

"It is astounding—utterly astounding," said Herr Lehrer. "A little more than four inches of distance between earth and sun. About fourteen miles of distance between earth and the nearest fixed star."

"But we shouldn't see it at all," said Ikon.

"That depends upon the intensity of the light," said Herr Lehrer.

"Fourteen miles," repeated Ikon.

"About twenty minutes or more of journey by rail," said Herr Lehrer. "Fourteen miles, as against four inches. Yet this little space of four inches," the Professor stooped to touch the red-headed pin and the pin which stood for earth "even this little space of four inches, Ikon, stands for about ninety-one millions of miles. Think then what the actual distance of the stars must be."

Chapter XIII
"Far, Far Away"

"Is the sun really and truly ninety-one millions of miles away?" asked Ikon.

"Quite that. Rather more," said Herr Lehrer.

"I don't think I know exactly how much a 'million' means."

"You know what a hundred means, Ikon a hundred miles?"

"O yes," Ikon answered.

"Ten hundreds make one thousand." So, ten times a hundred miles is…"

"A thousand miles," said Ikon.

"But ten thousands do not make a million; and a hundred thousands do not make a million. For a million you must have one thousand thousands."

"What a great number!" Ikon said.

"So to fancy a million miles, you must think first of a hundred, then of ten times a hundred, making a thousand, then of a thousand times a thousand making a million. And when you have reached the thought of one million,

you have to remember that the sun is ninety-one times as much as one million miles distant."

"And yet the sun looks so near with the pins," said Ikon. "Neptune must be—oh, what a lot of millions away!"

"Every four inches of this distance between the pin-sun and the pin-Neptune means nearly ninety-one millions of miles," said the Professor.

"But I don't see how anybody can really know about the sun being such a way off, or about the number of miles," said Ikon.

Herr Lehrer smiled.

"Suppose I were standing on the brink of a broad river, Ikon, and wished to measure the width of the river. How should I do it?"

"Why," said Ikon slowly "why, I should think wouldn't you go across in a boat, and take a rope with you, and tie one end to the side you left, and see how long a piece of rope was wanted to go right over?"

"That plan might do. But suppose I had no boat, and no means of crossing the river. How then should I measure its breadth?"

"You couldn't," said Ikon.

"Certainly I could. The thing is done every day. To discover the width of a river without crossing it, to

measure the distance or height of a hill far off, these are things which do not offer the slightest difficulty."

"I don't see how anybody can," said Ikon.

"No, you do not see how. Even so small an affair as this is not known to you. Then is it surprising that you cannot tell how men measure the great distances of sun and stars?"

"Do they really?" said Ikon.

"They do really of the sun, and also of a few stars. Not of many stars, I grant. I do not think you will be able to understand till you are a little older exactly how this measuring is accomplished, though it really is a simple matter. We will now leave the pins alone, and will look upon the question of distances in a different light."

Ikon was all attention.

"Do you remember our speaking about the diameter of the earth, and about how long it would take to journey through the earth's center from England to New Zealand?"

"Yes!" Ikon said. "The diameter was more than eight thousand miles, you said. And the train was to go forty miles an hour, and wasn't ever to get faster or slower. And the journey would take eight days and a half."

"Suppose," said the Professor, "that you wished to travel away from earth, straight to the moon. Suppose a line of rails were laid, leading up into the sky."

"But it couldn't be," said Ikon.

"That is another matter. You are to suppose that it could be, and that you would travel upwards in a train which should go always at the rate of forty miles an hour, never hastening and never slackening its speed."

"How long would it take me to get to the moon?" asked Ikon.

"Not eight days and a half, my boy, but eight months and a half."

"What a great way!" Ikon said in surprise. "But I thought you said the moon was quite little and near."

"Little, compared with the sun's size; near, compared with the sun's distance. That is all I meant to say. Now imagine that you are going to take that same journey from the earth to the sun travelling straight there by train, always at the rate of forty miles an hour, never pausing for an instant on the way."

"Yes," Ikon said eagerly.

"You might hope to reach the sun in two hundred and sixty years."

"Why, I shouldn't be alive at the end," cried Ikon.

"Suppose again," continued the Professor softly and slowly, "that having performed this great journey of two hundred and sixty years, from earth to sun, you then wished to travel from the sun direct to Jupiter and Saturn, still keeping up the same speed of forty miles an hour

continually. How long would it take you to reach Jupiter, after leaving the sun?"

"How long?" asked Ikon.

"About thirteen hundred and fifty years."

"Oh!" said Ikon, with a gasp. "But it wouldn't take me so long to get to Saturn. Yes, it would, though because Saturn is farther away than Jupiter."

"On Jupiter you would not be much more than halfway to the orbit or pathway of Saturn," said Herr Lehrer. "It might happen that Saturn would be far away on some other part of his orbit, perhaps quite the other side of the sun, at an enormous distance. But we will suppose that Saturn is at his nearest point, just on the part of his orbit which lies exactly outside where Jupiter is. Even so the journey from Jupiter to Saturn would take another eleven hundred years and more."

"It's dreadful," said Ikon gravely. "Please, how long is that straight all the way from the sun to Saturn? "

"Nearly two thousand five hundred years of traveling. The orbit of Uranus lies about twice as far from the sun as the orbit of Saturn. So we may say that this railway journey from the sun to Uranus would occupy about five thousand years."

"And Neptune is ever so much farther still," said Ikon. "Would it take ten thousand years to get to Neptune from the sun?"

"Perhaps between seven and eight thousand. Now recall these figures, Ikon. A train, going always at the rate of forty miles an hour, would pass exactly through the earth in…"

"Eight days and a half," said Ikon.

"From the earth to the moon?"

"Eight months and a half."

"From the earth to the sun? "

"Two hundred and sixty years," said Ikon quickly.

"Well answered. From the sun to Saturn?"

"Two thousand five hundred years," Ikon said, not without hesitation.

"From the sun to Uranus? Twice as much as to Saturn—"

"O yes!—five thousand years."

"Good! Remember the last figure—five thousand. A train travelling from earth to the nearest fixed star, going always at the same speed, would arrive there in—not five thousand years, Ikon but—about—FIFTY MILLIONS OF YEARS."

"O dear!" sighed the child. "I think I like best the little pin-sun, and the star only fourteen miles off."

"The proportions are the same. Fourteen miles compared with four inches means no less a distance, than fifty million years of travelling beside two hundred and

sixty years. And you ought to like best," added the Professor gently "whatever helps you to see most clearly the wonderful power of God."

Ikon looked earnestly at the Professor.

"His power is shown in His works," added Herr Lehrer.

"Are the stars His works?" asked Ikon.

"HE made the stars, child."

"Yes, I know that is in the Bible," said Ikon. "'HE MADE THE STARS ALSO.' I found that text, and I learnt it. Does the Bible say anything else about God making the stars?"

"Bring me the Bible from that table," said Herr Lehrer. "Thanks. Now see if you can find the thirty-third Psalm, and read aloud the sixth verse.

Ikon obeyed, and read slowly:

"'By the Word of the LORD were the heavens made; and all the host of them by the Breath of His mouth.'"

"The Word of the Lord is Christ and the Breath of God is the Holy Spirit," said Herr Lehrer. "So God made the host of heaven, Ikon."

"What is 'host'?" asked Ikon.

"A host commonly means an army. You have seen often enough the glittering host of stars. Find the eighth Psalm, and read the third verse."

Ikon obeyed again:

"'When I consider Thy heavens, the work of Thy fingers; the moon and the stars, which Thou hast ordained…'"

The child looked up with intent eyes, repeating:

"'The work of God's fingers'!"

"To be sure, Ikon. What else would you have? Our Father speaks to us in our own language," said Herr Lehrer musingly.

"Does 'ordained' mean the same as 'made'?" asked Ikon.

"It means more. God made them; also He gave to each its proper weight, motion, speed; He placed each in its right position; He orders and controls each, continually. The nineteenth Psalm, Ikon, and the first verse."

Ikon read aloud:

"'The heavens declare the glory of God; and the firmament showeth His handiwork.'"

"'His handiwork' means the work of His hands, 'the work of Thy fingers' again."

"And 'firmament'?" said Ikon.

"That is explained in the first chapter of Genesis, seventh verse see: 'God made the firmament, and divided the waters which were under the firmament from the

waters which were above the firmament; and it was so; and God called the firmament Heaven.'"

"The waters below?" questioned Ikon.

"Seas and oceans; the waters above, clouds and vapors. 'Firmament' and 'heaven' are words both used for the space between clouds and earth. But the heavens which hold God's host of countless stars reach far far beyond, into distances which we cannot even fancy. And this wonderful 'heaven', these vast distances, those splendid suns of light, Ikon, one and all 'DECLARE THE GLORY OF GOD.'"

"I wonder what He made them all for," the little boy said thoughtfully.

"That was one of the first questions which you put to me, Ikon," said Herr Lehrer.

Ikon smiled, and asked:

"Did I?"

"Yes; but I did not answer it then."

"Will you now?" inquired the child.

"It is answered here," the Professor said, touching the open Bible. "Find the fourth chapter of Revelation, and the eleventh verse."

Ikon read aloud with eagerness:

"'Thou art worthy, O Lord, to receive glory and honor and power: for Thou hast created all things, and for Thy pleasure they are and were created.'"

"'FOR THY PLEASURE,'" repeated Herr Lehrer. "Don't forget this, Ikon. Whatever in creation seems to us puzzling, or needless, or lacking in beauty remember still 'Thou hast created ALL things for Thy pleasure.' That is enough for us. For His pleasure they were made; for His pleasure they now exist."

Ikon thought for some seconds with a dreamy look.

"Perhaps there are people living on some of those other worlds," he said.

"It may be so," the Professor answered.

"Perhaps little boys doing lessons, and playing perhaps on Jupiter," said Ikon.

"It is, I think, on the whole more likely that little boys might be living on Mars than on Jupiter," said Herr Lehrer.

"Why?" asked Ikon.

"From what we know of the present state of the two worlds, it seems rather the more probable of the two."

"Won't you tell me all you know about Mars and Jupiter?" asked Ikon.

"Today, child?"

"No; someday," said Ikon.

"Someday I hope to tell you more," said Herr Lehrer. "'All I know' might be rather too much for your little brain

as yet. Tomorrow I think we will leave the planets alone, and have a lesson about the seasons on earth."

"What seasons?" asked Ikon.

"Spring, summer, autumn, and winter," said Herr Lehrer.

Chapter XIV
Summer and Winter

"We will go into the schoolroom, Ikon. I want the lamp and your little globe."

They soon sat together at the schoolroom table, the lamplight falling on Herr Lehrer's silvery beard and star-like eyes; while Ikon's little pale face was uplifted, full of eager readiness.

"You were going to teach me about the seasons today," he said. "And that means spring and summer and autumn and winter."

Herr Lehrer touched the school-globe which stood before them, and said:

"Show me here how we on earth have day and night."

Ikon turned the globe slowly on its axis.

"Like that," he said. "The earth goes round and round and round, and the countries on the earth go round; and that makes the sun seem to rise and set every day."

"Does the sun seem to rise all over the earth at once? "

"O no!" Ikon replied. "It is sunrise in one place and noonday in another place, and sunset and midnight in other places, all at the very same moment."

"How long is a 'day'?" asked the Professor.

"Twelve hours," said Ikon.

"No. A 'day' in the language of astronomers means the whole day of twenty-four hours, including morning, noon, evening and midnight. By a 'day' of twelve hours you mean simply the time of daylight."

Ikon nodded.

"But daylight does not with us last always exactly twelve hours. In spring and autumn for a short time we have, it is true, a day of twelve hours and a night of twelve hours. This soon changes. In winter the sun does not rise till seven or eight, and goes down about four in the afternoon; so daylight is only eight or nine hours long, and darkness lasts fifteen or sixteen hours. In summer we have just the opposite a very short night, and very long daylight."

"Yes; the sun gets up quite early in summer," said Ikon.

"This difference is more and more marked, the farther we go from the equator," said Herr Lehrer.

"Show me the equator on the globe. Right. On the equator, days and nights are always equal, all the year round, just twelve hours each. But passing away from the equator, either north or south, the days become longer

and longer in summer, the nights longer and longer in winter, till, at the North and South Poles, there is only one day of six months and one night of six months in the year."



"I shouldn't like that. I shouldn't like it at all," said Ikon. "I should be so dreadfully tired before I went to bed."

"Yes if you sat up all through the six months. But you would have to go to bed in daylight," said Herr Lehrer. "That is what people do in northern countries, when summer comes round in Greenland, for instance, and the north of Norway. Show me Greenland on the globe and Norway."

"Here and here," said Ikon.

"Quite right. Now watch, while I spin it slowly, and tell me, has England on the globe a short or a long night now?"

"Short," Ikon said. "Quite short. The top of the globe is turned so much towards the lamp, that the light shines on England most of the time."

"We usually call 'the top of the globe' the North Pole," said Herr Lehrer. "You have answered truly. As the globe now stands, with the North Pole pointing towards the lamp, or sun, England has long daylight and short darkness. That is England's summer."

"I like summer," said Ikon.

"But in another part of England's year, as you know well, Ikon, it must come about that she has long darkness and short daylight."

"Yes; we have had that lately," said Ikon; "be—because it is winter."

"The full 'day' of twenty-four hours never changes in length," said Herr Lehrer. "The divisions of that day into darkness and light do change, however, very much. Now, how is this?"

Ikon could give no answer.

"Why does not summer last always? A few months ago we had in reality what England on this little globe has now, long light and short darkness. What has caused our days to shorten and our nights to lengthen, since last summer?"

"Winter has come," said Ikon.

"But why has winter come? Why should not summer continue?"

"I suppose because because we have had frost and snow," said Ikon.

Herr Lehrer smiled.

"Frost and snow come with winter," he said. "But they do not cause winter, my boy. Did it ever strike you that the sun seemed at all different in summer and winter?"

"The sun isn't so hot in winter," said Ikon.

"No; he has not so much power. And the reason of the sun having less power is that he is lower down in winter—nearer the horizon. He does not come up high over our heads, but only rises a little way and soon goes down again. The sun's rays come slanting through the air, instead of beating straight upon us from above."

"But why?" asked Ikon. "What makes the sun go away?"

"Did I say the sun went away?"

"No. You said," began Ikon. "You said—I thought you meant that."

"It is a curious fact," said the Professor, looking at Ikon "that we really are nearer to the sun in winter than we are in summer."

"Nearer in winter," said astonished Ikon.

"Only about three millions of miles," said the Professor carelessly.

"But that is a heap nearer," said Ikon. "It ought to make us—oh, ever so much hotter."

"It does not," said the Professor. "Look here, Ikon suppose a fly were standing on my knee, would he feel the heat of the fire?"

"Why—no—yes," Ikon said. "I suppose the fire would make him warm."

"No doubt; for if there were no fire, he would be colder. Now, suppose he walked one quarter of an inch nearer to the fire, still remaining on my knee. Would he feel a great increase of heat? "

Ikon laughed, and said:

"He wouldn't feel the least bit of difference. He wouldn't even know he was nearer."

"You have answered yourself," said the Professor quietly. "We ourselves do not feel 'the least bit of difference'; and by feeling we should not know that we are nearer. It can only be known by careful measurement. The three millions of miles, in our great distance from the sun, are much the same as one quarter of an inch on my knee would be in the distance of a fly, standing here, from the fire.

After a moment, the Professor added:

"At the same time, it probably does make some difference. In the northern hemisphere, we are nearer the sun in winter and farther in summer. This probably causes our winters to be just a little milder, and our summers just a little less hot. For in the southern hemisphere, where they are nearer to the sun in summer and farther away from the sun in winter, both summer and winter are more severe."

"What does really make summer and winter?" asked Ikon.

Herr Lehrer stood up, and said:

"Now look once more carefully upon the globe as it stands. The North Pole is, you see, towards the lamp pointing towards the fireplace end of the room."

"Yes," said Ikon.

"We are going to let the globe take a journey round the lamp; just as the earth takes her yearly journey round the

sun. But as it moves, we must take care that the North Pole always points in that same direction. For this is the case with our earth. The North Pole of the earth points always to the Pole-star."

"I remember the Pole-star quite well," said Ikon. "I saw it in daylight through Mr. Fritz's telescope."

"The earth never turns so as to point with its North Pole just the other way," said Herr Lehrer. "We must not allow this globe to veer about as it journeys, so that the South Pole, instead of the North, should point towards the fireplace end of the room."

"But the earth does turn round and round," said Ikon, in a puzzled tone.

"The earth spins upon her axis, as I now make this globe spin. Notice, however, that the axis itself does not move about. It remains steady. The North and South Poles do not sway to and fro. See; I may spin as fast as I like, and the countries rush round; but still the North Pole points in the same direction, never changing."

Ikon said "Yes," in an earnest tone.

"As the globe spins, and as the North Pole points ever to the north, you may see that England now has short nights and long days. So too have France, Germany, and other parts of Europe. For it is SUMMER to the northern half of the world, that half being bent or turned towards the sun. How about the south? Look at New Zealand."

"New Zealand is right away from the lamp I mean, the sun," said Ikon. "And it has short days and long nights."

"You see, then, that summer for the north means winter for the south. Do you remember asking me once why your little globe was set thus slanting instead of straight?"

"Yes; and you said my globe was made so because the real earth does slant," replied Ikon.

"Suppose the axis did not slant," said Herr Lehrer. "See—If I hold it thus, with the North Pole pointing to the ceiling and the South Pole to the floor which part of the earth would have summer, and which would have winter?"

"I don't see any part more like summer than another," Ikon said, after some thought.

"Right. There would be no summer in one part more than another. Nights and days would be exactly equal all over the earth. And as I carry the globe round the lamp with the axis still upright, see, the same state of things continues. There are no changes of season, no summer and winter, no spring and autumn."

"Wouldn't that be nice?" asked the little boy.

"It may seem 'nice' to us," Herr Lehrer answered, smiling. "We should, however, lose many advantages as well as some disadvantages. I do not think we are well able to judge which is really the nicer; and I am quite sure that God knows what is best for us. Now we will come back to

where we were before, and I will once more place the globe in its right position, with the axis slanting, and with the North Pole pointing towards the fireplace end of the room. Which season have we now?"

"Summer," said Ikon.

"Summer for the northern hemisphere; and winter for the southern."

Herr Lehrer walked round the table a little way, bearing the globe, and keeping its North Pole still pointing steadily towards the same wall as before.

"Now, Ikon, we have a change. The North Pole no longer is directed towards the sun; but the lamp-light falls on North and South Poles in equal measure. This is what we call the equinox, or the time of equal nights. Twice in the year for a short time, days and nights are of equal length twelve hours each all over the world."

"Just as if the axis was upright," said Ikon.

"Yes; only they do not remain equal. Since the summer, England's days have been shortening and her nights lengthening, till each are exactly twelve hours long. In New Zealand, on the contrary, days have been lengthening and nights shortening, till there also both are just twelve hours in length. So now we have the AUTUMN equinox for England, and the SPRING equinox for New Zealand, at the same time."

The Professor moved on a little farther, making the north pole of the globe point steadily still towards the

fireplace end of the room. Exactly opposite his first position, he stood still.

"Now, Ikon, you may see a marked change. The South Pole is turned towards the lamp; the North Pole is turned away. England now has winter; long nights and short days; the sun not rising high, and having little power. But New Zealand is enjoying full summer, with long days and short nights."

The Professor again moved on, till opposite his second halting-place, where he had shown the "autumn equinox" of England.

"Notice, Ikon," he said "how once more neither North Pole nor South Pole points to the lamp, but both receive the same amount of light. All over the world, days and nights are equal England's day having grown longer, and New Zealand's shorter, till each again is exactly twelve hours long. This is England's SPRING equinox, and New Zealand's AUTUMN equinox."

Herr Lehrer moved on once more, and reached his first position.

"Here we are, at the point from which we started. England is in the blaze of summer, with lengthened days and shortened nights; while New Zealand has passed into winter cold and darkness."

Ikon was delighted. He could not be content till he had carried the globe himself round the table. Two or three attempts were failures; for the North Pole had an

awkward trick of pointing about anywhere and everywhere in his hands; and also he could not quickly learn that troublesome word "equinox." But at length a successful tour of the lamp was made, each season having its right name given at the right moment.

"That is the way the earth travels round the sun," said Herr Lehrer.

Then he seemed to be thinking.

"Ikon, I have something to say that will make you sorry."

Ikon looked up with a face of alarm.

"I am going away early tomorrow morning; so this will be our last lesson for the present."

"Going away!" said Ikon, in dismay.

"I did not expect to leave so soon, but unexpected news has made it needful."

Ikon's eyes were full, and he could not speak.

"I quite hope to come back again someday: perhaps very soon," said Herr Lehrer.

"I did want—to learn—such—such lots more," half-sobbed Ikon.

"So you will; so you may," said the Professor. "Keep in mind all I have taught you; and someday I hope to come again and teach you more. I have quite enjoyed our little chats together. And, Ikon don't look so sad, for I have something to say. If you have any questions to ask, or if

you think of anything which puzzles you, then you may write to me."

"May I really write by post?" asked Ikon.

"Yes; certainly you may. I will give you some envelopes, ready directed. So now do not be unhappy anymore. Remember, I really mean to come again, perhaps very soon."

Ikon dried his eyes, and tried to be cheerful. But he found it hard work next morning to say good-bye; and the house afterwards felt strangely desolate, without the kind Professor in and out.

Still Ikon had the envelopes, all directed and stamped and ready for little notes to be put inside. That was one comfort.

Chapter XV

Letters to and Fro

About one week after Herr Lehrer's departure, Ikon's first letter was sent off. It cost him much time and trouble.

Letter I

"DEAR HERR LEHRER,

"Please, I do not think you ever told me about whether the stars can die. I am afraid it is a silly question, but I do want to know so much. And I want to know the name of my star that I could not find at least, the name that you thought might be the one. Is that star of mine really a big sun?

"I am, your affectionate

"IKON"

Answer to Letter I

"MY DEAR IKON,

"The name which I supposed to belong to 'your star' was ARCTURUS.

"Arcturus is a large beautiful sun, very very far away. If Arcturus were where our sun is now, it would look to us at least as large and bright as the sun does.

"Arcturus is one of the 'fixed stars.' But that does not mean that this star really never moves. We know of no star with more rapid movement than Arcturus. To men he does indeed seem to remain almost in the same place in the sky among other stars. Yet all the while Arcturus is rushing through space at the great speed of about fifty-four miles each second. Not forty miles an hour, like the train we have talked of, but fifty-four miles a second. Think of this!

"So you want to know whether a star can ever die.

"I wonder what you mean by 'dying.' A star has not life like a little boy. The light of a star might die out, if God so willed, leaving a cold and dark body just as a furnace-fire may die out, leaving cold cinders behind. One or two stars have been known to vanish; and we suppose that their light may have died out, or have grown too faint for us to see.

"Once upon a time our own earth was most likely a little star, all aflame and brilliant. But the fires of earth have died out long ago; and after being through long ages a very hot ball, earth has slowly cooled down to her present state. The little star has turned into a little planet.

"If the earth now shines as we know she does she shines only with borrowed sunlight. Yet I do not think you would call ours a dead world, Ikon. There is much more of

life on earth now, than in the days when she was a little star, blazing, and shining with her own radiance.

"Your affectionate friend,

"A. LEHRER"

Letter II

"DEAR HERR LEHRER,

"I do like to think of our earth being a dear little star! But I am glad it is not now, because then I suppose we couldn't live on it.

"Were all the planets stars once upon a time? And please, will all the stars be worlds by-and-by, if they get cold enough?

"Oh, and there is something else. Do all the planets lean over like our earth; so as to have summer and winter and all that?

"Thank you so very much for your kind letter. I have read it six times, and I am your affectionate

"IKON"

Answer to Letter II

"MY DEAR IKON,

"I am pleased to see you exercising your little brain on these matters. Only remember that we cannot always give the answers to such questions. Our Father in Heaven knows; but often we do not.

"It seems likely that all the planets were once, long long ago, globes of heat and flame and light, much like the sun, only a great deal smaller.

"Some of them are now quite cooled down, like our earth. Some perhaps are even more thoroughly cooled; since a goodly amount of heat still remains in the earth, deep underground. Some are probably much less cooled than the earth. Jupiter, for instance, being so enormous in size, would take much longer than our little earth to become cool. And certain signs make us believe that both Jupiter and Saturn are still in a very heated state, not covered with great flames, like the sun, yet far too hot for any human beings to live there.

"As for the stars, I cannot say what purposes God may have for them, in the far far distance. The mighty furnace-fires of sun and stars will last, I suspect, much longer than you or I are well able to imagine. But it is possible that some of the smaller fainter stars are parting with their heat more quickly. We know very little as to all this.

"The planets do slant, my boy, each one more or less, like our earth. Jupiter is placed almost upright; so there are days and nights of nearly equal length, all over Jupiter, all his year round. Venus again seems to lie over very much indeed, far more than our earth does; and this, one would fancy, must cause rather unpleasant changes of season.

"Believe me,

"Your affectionate friend, "A. LEHRER"

Letter III

"DEAR HERR LEHRER,

"I hope you won't think me a great trouble. You said once that people are more likely to be living on Mars than on Jupiter. And I should like so much to know why. Is it because Jupiter is so hot still? Would you mind telling me, please?

"Your affectionate,

"IKON"

Answer to Letter III

"MY DEAR IKON,

"If Jupiter is in such a state of heat as some believe, he would make a very uncomfortable home for men.

"Do you remember seeing Jupiter with his four moons through the telescope? Do you remember the curious markings or belts on Jupiter?

"Those belts of color are believed to be enormous masses of cloud. Jupiter seems to be quite enwrapped in clouds.

"It is a rather puzzling question, what causes these clouds to remain always floating above Jupiter. The sun can have little power at that great distance five times as great as his distance from us. It seems quite out of the question that the heat of the sun alone can draw up such enormous quantities of vapor, and keep them floating as clouds above Jupiter.

"But if Jupiter himself is very hot still, so hot that water on him would all boil away into steam, then the puzzle is at an end.

"This vast cloudland above Jupiter must be a very stormy and wild cloudland. Such tremendous storms are seen to sweep along, through the telescope, that the worst hurricanes of earth are nothing beside them.

"You know what a 'hurricane' is, I hope. If not, ask Miss Mundy.

"There are other reasons which make us believe Jupiter to be still in a very hot state. One reason is that he seems to shine more brilliantly than the sun alone would make him shine at that distance.

"Mars is in quite a different state from Jupiter.

"We really know more of Mars than of any other planet. Mercury and Venus seem to be much covered with white clouds owing most likely to the heat of the sun. Mercury and Venus are nearer to the sun, you know, than we are. But Mars is farther away.

"Clouds are seen to drift over Mars, just as they drift over earth. But the surface or ground of Mars is plainly to be seen. And there are very odd markings, with red and green tints, which seem to show land and water. But Mars has less sea than we have. If people really do live on Mars—and about this we know nothing—they never need be sea-sick. Every journey might just as well be taken by land as by sea.

"Something else on Mars is very interesting. We can see round white caps at the North and South Poles.

"You know, I dare say, that we always have snow at our North and South Poles. It lasts the whole year; but in the northern summer, there is less snow at the North Pole, and more snow at the South Pole; and in the southern summer, there is less snow at the South Pole, and more snow at the North Pole.

"Now, the very same thing seems to happen on Mars. We see plainly these little white caps at the two poles. When the North Pole of Mars is turned towards the sun, then the northern white cap grows less, and the southern white cap which is turned away from the sun grows bigger. But when the South Pole of Mars is turned towards the sun, then the southern white cap grows less, and the northern white cap which is turned away from the sun grows bigger.

"Is not this strange? So Mars seems to have, not only clouds and rain, and land and water, but also frost and snow, and summer and winter, very much like our own.

"And is it not wonderful that men should be able to find out all this about a world so many many millions of miles away?

"Your affectionate friend,

"A LEHRER"

Letter IV

"DEAR HERR LEHRER,

"May I ask you about the moon? I want to know what the man is, with the bundle of sticks. And is there anybody perhaps living there? And does the moon seem as much like our earth as Mars does?

"I have not forgotten that the moon is 2,000 miles in di—I don't know how to spell that word—I mean, straight through the middle. And if the world was as big as a marble, the moon would be as little as a pea. And you said the moon was a moon, but it really was a little planet too.

"Papa took me out in the garden last night quite late, to see a balloon. And I ran to the end of the terrace, and saw the moon shining down on the sea, and on a big rock. There was a man trying to fish; and it did look so pretty.

"I liked your last letter so very very much, and I read it lots of times, and I am,

"Your affectionate

"IKON"

Answer to Letter IV

"MY DEAR IKON,

"I am very busy and can only write a hurried letter today. But I am sending you a little book, which tells you about the moon. Much of the book is too hard for you; but I have marked certain parts.

"The moon is of great interest to all of us, because she is our near companion, and in a sense our servant.

"Yes the moon, though a moon, is also a little planet. And while the moon travels round and round the earth, she also travels round and round the sun.

"You are quite right about the size of the moon about 2,000 miles in diameter. With regard to her distance, you already know that a railway train, going always at the rate of forty miles an hour, might reach her in eight months and a half.

"The moon appears to us much more like a dead world than any other which we know.

"All over the moon there are great numbers of curious round hollows. Some of these are very big, as much as one hundred miles across and more. Some are quite small. The whole face of the moon seems to be quite pitted with them, like the face of a man badly marked with small-pox. A picture of part of the moon in the little book I am sending you, will show what I mean.

"These round hollows, or at any rate, the larger ones, are believed to be craters of volcanoes. Only the volcanoes in the moon seem to be all now dead and silent—not active, like the volcanoes on earth.

"We can also see mountains on the moon, and shadows cast by the mountains; and there are light parts and grey parts. These are the markings which look to you like a man with a bundle of sticks.

"So far as we can tell, there is no water on the moon. There are no seas, no rivers, no lakes, no streams, no brooks. There is little or no air, certainly not enough for a man to breathe. No animals can live there; no plants or trees can grow there.

"You must try to fancy a bleak and barren land, with harsh rocks, and rugged mountains, and deep hollows. Nothing soft or green or smiling about it.

"The sunlight there falls with intense brightness, and casts black shadows. Overhead there is a black instead of a blue sky; with stars shining at the same time as the sun; and a splendid earth in the sky, instead of a moon. You will find all this and more, in the little book.

"The moon's day lasts about fourteen of our days, and her night is the same length. Such a day of glaring fearful heat and such a night of awful cold as we cannot even picture to ourselves.

"The want of air and water in the moon causes all this great difference between her and our earth. And now I have not another minute.

"Your affectionate friend,

"A. LEHRER."

Chapter XVI
A Dream Without an Ending

It was long before Ikon could write again. The exchange of letters came suddenly to an end, for Ikon fell ill.

During some days he read eagerly the little book about the moon, hardly ever content to let it out of his hands. All marked parts, and some parts that were not marked, he read and re-read, going over them again and again, till they were quite fixed in his memory.

Dormer was uneasy about all this reading, and she would fain have made him spend his time in play. But perhaps the beginning of the illness was already on Ikon; for he seemed fretful, and would not do as Dormer wished. And Dormer could not bear to oppose him.

There was, as Herr Lehrer had said, much in the little book that Ikon could not understand. Still, many facts were clear, and as soon as Ikon grasped them, his quick imagination found fresh food to work upon.

The moon grew to be a real though strange world to him, almost what fairyland is to many children.

He used to sit over the fire in his playroom, pondering the subject in long half-waking dreams. And at night,

when Dormer had taken away the candle, he would steal out of bed, and draw aside the window-curtain, and lie watching the soft round face with its silvery smile.



There was a very pretty view out of this window of a cottage some little way off, outside the garden. Tall poplar trees grew beside the cottage, and a piece of water lay near, crossed by a bridge.

Ikon delighted in the shining of the moon upon this pond, with the dark tree-shadows lying beside the bright path of moonbeams.

He had often noticed how stars in the neighborhood of the moon disappeared, their little glimmer quite put out by her brilliance. But one evening he was much interested to see a bright star quite near the moon. It must have been a very bright star to shine on still, through the moon's radiance. Ikon wondered if perhaps that was his own dear lost star, come back again.

Sometimes, in these moods, he would try to picture a journey to the moon; a ceaseless upward rush by train for eight long months and a half.

Or better still suppose he had wings and could fly there! How delightful that would be; Ikon never forgot what the Professor had once said about "Wings of Imagination." He used to get a little confused now and then, and could not feel quite sure whether he wished for real wings or imaginary wings. But he had no doubt at all that he would have liked a real journey to the moon.

In the midst of all this Ikon fell suddenly ill.

He was not in danger. It proved, however, to be a tedious sort of attack, and Ikon was greatly pulled down

by it. He had to spend nearly a fortnight in bed; and he grew very weary of imprisonment.

Part of the time his mind wandered slightly, and he had many strange fancies. But it was not till he was much better, and Dormer had ceased to be anxious, that he had one day an odd and disappointing dream about a visit to the moon. That he should dream thus was hardly surprising. His little head had been so full of the subject, that a dream might have come quite naturally.

For the first time Dormer had lifted the child out of bed to the sofa, for an hour or two. While there, after having early tea, he fell fast asleep. It was just about the time that Herr Lehrer had often given him a lesson about the stars; and perhaps this was Ikon's last waking thought.

He fancied himself in his little playroom, lying on the rug before the fire, watching for Herr Lehrer's coming.

It seemed to him in his dream that he had waited long; and he was growing impatient. Still, he felt sure that his friend would not fail to arrive.

His certainty proved well founded. All at once a voice said cheerily:

"Get up, Ikon, get up. Make haste. We have no time to lose."

Ikon rose slowly, feeling dazed. Herr Lehrer stood near, looking both like and unlike himself. The silvery beard and starry eyes were unchanged; but the Professor

wore flowing robes; and, to Ikon's amazement, a pair of strong yet shadowy wings were folded behind his shoulders.

"Get up, Ikon. Get up," repeated Herr Lehrer. "We have a long journey before us."

Ikon rubbed his eyes, and said:

"I must have been asleep. I didn't know I was going on a journey. O what beautiful wings! I wish I had wings too."

"See!" Herr Lehrer said, pointing to a large looking-glass, which somehow occupied one wall of the playroom.

Ikon felt no surprise at seeing the glass; but it did astonish him to perceive a reflection of himself, with just such another pair of wings behind the shoulders.

"How funny!" Ikon said, laughing with joy. "I never had wings before."

"Really! But everybody has wings," said Herr Lehrer.

"Everybody!" repeated Ikon.

"Certainly," the Professor said. "Or else the stumps of them."

"Mine are not only stumps," said Ikon, with a sense of satisfaction.

"Decidedly not," said Herr Lehrer. "Very well grown wings indeed."

"Herr Lehrer said I had Wings of Imagination," murmured Ikon.

"Of course he did," was the answer; and Ikon wondered vaguely whether this winged visitor really were the Professor after all. The other did not seem to notice his perplexity.

"Are these Wings of Imagination?" Ikon inquired.

"Certainly," his companion said.

"And can I fly away with them?" asked Ikon.

"Undoubtedly," Herr Lehrer said.

"And where are we going, please?" was Ikon's next question.

"Where! You ask where, child!" Herr Lehrer drew nearer, and gazed hard into Ikon's face.

"Have you forgotten your wish so soon? A visit to the moon, Ikon the moon!"

"Can we really and truly go?" asked Ikon.

"Certainly," answered the Professor, nodding his head. "Certainly."

"And the sun too!" cried Ikon. "May we pay a visit to the sun? And Mars, and Jupiter? Oh, and Sirius and Arcturus and lots of stars!"

"The moon tonight!" Herr Lehrer said solemnly.

"But it will take a great while to go," said Ikon. Then he found himself saying something confusedly about "forty miles an hour," and "eight months and a half."

"Just so," the Professor answered.

"Forty miles an hour—forty miles—forty miles," muttered Ikon, as if learning a lesson.

"Exactly so," said the Professor.

"Eight months and a half! Eight months and a half!" Ikon said the words over and over, without power to stop.

"Precisely so," said the Professor.

Ikon was troubled with an indistinct feeling that food would be wanted on the way. He tried to explain to Herr Lehrer, and could not speak. Then he wandered about, hunting vaguely for something in the shape of provisions. Cupboards and sideboards seemed to be all around him. He pulled out drawer after drawer, saying to himself:

"Buns and sponge-cakes."

"Ah, yes," Herr Lehrer said. "Come; shall we be off?"

The room was growing misty, and Ikon had a nightmare sense of trying to get something done which lay out of his power. Then the cupboards and sideboards, the walls and floor, faded quietly away; and Ikon forgot all about buns, sponge-cakes, and the eight months' journey. Herr Lehrer spread his wings, and Ikon did the same. The two rose swiftly and easily upward. To Ikon's surprise, he found flying to be no trouble at all.

How happy he was! To be at last really going to the moon! In his dream Ikon remembered quite clearly how often he had fancied himself taking this journey. But such fancies had been only fancies.

He laughed softly to himself with the thought that now all this was real.

It was a clear evening, and the stars overhead shone brightly, except where their radiance was dimmed by the brighter light of the half-moon.

As Ikon and his friend shot up, with arrow-like flight, the earth seemed to drop away beneath them, and the rows of lamps in a neighboring town shrank together, fading into rows of bead-like specks, then into mere blurred lines.

Ikon had read lately a very good description of how things looked to a man going up at night in a balloon. It was quite curious how clearly that which he had read and pondered over was now pictured in his dream.

As lamps and houses faded and shrank, the sky overhead seemed to grow each moment deeper and broader. Few clouds floated in cloudland this evening; and no haziness shut off the faint glimmer of human cities below, or the shining of suns and worlds above.

"What makes the stars so bright?" asked Ikon. But his companion gave no answer.

Then Ikon's wings seemed to be failing him, and he could no longer rise with ease. Herr Lehrer was leaving him behind, and Ikon cried in distress:

"Oh, stop, stop don't go away!"

So the Professor came back, and grasped his hand, and said:

"Cheer up, child don't tire so soon. We are not far now from the moon."

And all at once a bright silvery dazzle of light enfolded them on every side. Ikon saw above an enormous moon, filling up a great space in the sky. Each instant as they drew nearer, the great round moon grew yet more enormous. He caught sight too of the well-known markings the man with his bundle of sticks grown unnaturally big.

"We are almost there! we are almost there!" cried the child, clapping his hands in glee.

Then suddenly other sounds stole into his ears. The Professor faded away; the splendid huge moon vanished; the dazzling light was gone. Ikon found himself lying again on the sofa, a wingless little boy under a warm shawl. And Dormer stood by his side.

"Come, Master Ikon," she said. "You are having a comfortable sleep; but I mustn't leave you here any longer, or you won't get a wink tonight."

Dormer was very much astonished to be answered by a burst of tears.

"Why, Master Ikon! Now, Master Ikon!" she said, with mingled pity and reproach.

"O Dormer, why did you awake me?" sobbed Ikon. "I was having such a lovely beautiful dream."

"Well, dear, I'll get you quick into bed, and you can go on with your dream," said Dormer.

"But I never do go on with dreams. Of course I don't," said Ikon fretfully. "And Herr Lehrer was here, and we both had got wings. And we were flying away to the moon, and we had almost just got there. And I wanted to see everything so much. And you woke me up, and spoilt it all."

Dormer had much ado to keep from laughing at the notion of wings. She managed, however, to look pretty grave, and persuaded Ikon to tell her all about his dream, in hopes that his mind would be relieved.

"That's the queerest child I ever did see in all my life," she said to herself, when Ikon was safely tucked up in his bed for the night.

Chapter XVII
Unfolded Wings

Ikon did not "go on" with his dream. Wish as he might, the Professor with wings came to him no more.

Somebody else came, however, quite unexpectedly.

One day, nearly a week later, when Ikon was lying back in an easy-chair, too tired even for play, Dormer entered, saying:

"Here's a visitor, Master Ikon."

Ikon lifted his eyes eagerly. Could it be Herr Lehrer? He saw his father always twice a day; but not at this hour: and Ikon had no other callers.

No, it was not the Professor. A young man followed Dormer into the room, small and pale and sickly-looking, with a shy and awkward manner. Ikon knew him again in a moment. It was the Professor's friend; the owner of the big telescope.

"Mr. Fritz!" he cried, with a bright smile.

Fritz reached the couch, and said,

"How do you do?"—seeming terribly bashful and ashamed of himself.

"Are you really come to see me?" asked Ikon wonderingly.

"Herr Lehrer asked me," said Fritz.

"I'm so glad. It is so kind," said Ikon.

Then there was silence. Dormer placed a chair, and Fritz sat down. He stared at Ikon, and seemed at a loss what to do next.

"I'm so glad you have come," repeated Ikon, feeling less shy than usual, just because he saw Mr. Fritz to be more shy than himself. "I have been wanting and wanting somebody dreadfully,—I mean, somebody who knows all about the stars."

"Nobody does," said Fritz.

"O yes," cried Ikon. "Herr Lehrer does."

"No, he doesn't. He knows some things. Nobody knows everything about them."

"O no, of course not. I didn't mean that, of course," said Ikon. "But he knows a great great deal. And so do you, because you have a telescope."

"That does not follow at all," said Fritz.

"Won't you talk to me about the stars—just as Herr Lehrer does?" asked Ikon.

"But you ain't to tire yourself, Master Ikon," said Dormer.

And with that she went away, leaving the two alone together. Fritz seemed relieved at her departure.

"Herr Lehrer told me you had been ill," he said. "In fact, he desired me to call, and see how you were, and tell you stories."

"I don't want stories," said Ikon sadly. "Dormer reads me lots. I'd a great deal rather know more about the stars."

"No doubt," said Fritz.

Then another pause took place.

"I had such a funny dream the other day," Ikon said softly at length.

"Yes, I know you had—about the moon," said Fritz.

"Why, how could you know?" asked Ikon; and unfortunate Fritz grew very red, as if he knew himself to have made a mistake.

The truth was, Dormer had told Ikon's father about the child's dream; and Ikon's father had been so much amused as to mention it in a letter to the Professor, and the Professor had passed on a few words about the dream to Fritz. But of course nobody meant Ikon to know all this.

"Oh, it doesn't matter," said Fritz. "People often dream. I dream myself, sometimes."

Ikon could not exactly see Fritz's answer to be an explanation; but he only asked,

"Do you ever dream about the moon?"

" I am not sure that I ever did," said Fritz. "So you may as well tell me your dream."

Ikon liked that. He launched out eagerly, and gave full particulars, warming and flushing with his tale. Fritz listened with an odd solemn face of attention, now and then breaking into a short laugh.

"It was so dreadfully disappointing to stop there," Ikon said, at the end. "If only Dormer hadn't woke me up!"

"She could not guess what you were dreaming," said Fritz. "And you have never dreamt a conclusion?"

"O no; I wish I could. I never do go on another time with a dream," said Ikon. "Do you?"

"Sometimes," said Fritz.

"I wish I could. But I can't make myself," sighed Ikon.

"Perhaps you had better not try," said Fritz. "Perhaps I might manage to carry on your dream for you."

"Will you? Oh, will you?" cried Ikon. "Can you make yourself dream the rest of it, and then tell it all to me?"

"Well, not exactly that," said Fritz. "But Herr Lehrer has desired me to tell you a story, and I always do what Herr Lehrer wishes."

"Because he is so good?" asked Ikon.

"Yes; I dare say that is the reason partly."

"And you will tell me a story?" asked Ikon, rather soberly.

"I must because Herr Lehrer says so. But suppose it is a story of a little boy's journey to the moon, in a dream?"

"Oh, that will be splendid," said Ikon, with sparkling eyes. "And you'll make him see everything that a real little boy would see, if he really went to the moon."

"So far as I know what a real little boy would see," said Fritz; "and of course supposing such a little boy could stay long enough in the moon to see anything at all."

"Couldn't a little boy stay if he got there?" asked Ikon.

"Why, no not very well," said Fritz. "There is no air in the moon at least, not enough to be worth mentioning. And people can't possibly live without breathing."

"I suppose I forgot that in my dream," said Ikon. "I ought to have choked, oughtn't I?"

Fritz gave one of his little short laughs.

"No, that was not necessary. You went with Wings of Imagination. People can go anywhere on Wings of Imagination if their wings are strong enough to carry them."

"I think it was very conceited of me to dream about my wings being so strong," said Ikon, blushing.

"Perhaps you had had the thought in your mind before," suggested Fritz, and Ikon blushed still more. "But your notion about stumps was not bad."

"There's a boy in a cottage who has only got stumps instead of arms," said Ikon.

"No doubt that put the idea into your head," said Fritz.

"But of course he hasn't got wing-stumps," pursued Ikon. "Won't you please tell me the story now this minute?"

"I—I—no, I think not," said Fritz slowly. "The fact is, I am not a good hand at extemporizing."

"Ex temper what?" asked Ikon.

"Making up a tale at the moment," explained Fritz. "I think I will write it out, and then come and read it to you."

"Tomorrow?" asked Ikon.

"Not tomorrow, but very soon."

"But are you sure you aren't too busy?" asked Ikon.

"Quite sure," Fritz said.

"And will the little boy in the story be me?"

"Perhaps not," said Fritz thoughtfully. "We will leave that uncertain. I shall call him Eikōn."

"My name is Ikon, not Ikone" said the child.

"Ikon is derived—that is to say, it has grown from a Greek word, Eikōn."

"I wonder what Eikōn means?"

"It means an image or a similitude. Something that is like something else."

"I wish my name was Eikōn."

"Better not wish that," said Fritz. "I want the word for my story."

"And will there be a Herr Lehrer with wings?"

"I rather think on the whole not," said Fritz slowly. "I think it would be more respectful, perhaps, not to give the Professor wings."

"I couldn't help doing it in my dream," said Ikon rather ashamed. "I didn't mean to be rude to him."

"Of course not. But to give him wings in my story would be another matter. I propose to have a little girl with wings, instead of a Professor."

"A fancy little girl?" asked Ikon.

"No a real little girl. Her name is Stella. She is a very nice little girl indeed. Perhaps someday you will see her. 'Stella' means 'a star,' and she is fond of hearing about the stars."

"Why, she must be like me!" cried Ikon.

"Not like you in face," said Fritz.

"And shall I—I mean, will the boy, Eikōn, go with Stella to the moon?"

"Probably he will," replied Fritz.

Then Mr. Fritz stood up to say good-bye.

"I will bring something soon to read to you," he said. And three days later he kept his word.

Chapter XVIII
Mr. Fritz's Story

"It is called 'Eikōn's Visit to the Moon,'" said Fritz, in a shy voice, as he unrolled some papers, written over-closely in a small and not very distinct handwriting. "You are to shut your eyes while I read, and to imagine that you see exactly what Eikōn saw. In fact, for the time you are to believe yourself Eikōn, not Ikon. And you must not interrupt me."

"Mayn't I ask questions?"

"Not by the way. When I have done, you may if you like."

Fritz paused a moment, and looked at Ikon.

"I think you kept up your own character pretty well in that dream," he said.

"My character," said Ikon, in a puzzled voice.

"Yes. You like to talk, don't you? and to ask a great many questions."

"O yes," Ikon said, rather bashfully. "At least, I like to talk to some people."

"To Herr Lehrer?"

"Yes and to Dormer and to you, Mr. Fritz."

"You kept that up in your dream," repeated Fritz.

Then he went back to his papers. They were rather in confusion, and had to be arranged.

"Will the real little girl, Stella, read your story?" asked Ikon.

"I am not sure. Perhaps someday. Now shut your eyes, and listen."

Ikon obeyed; but very soon he forgot, and his eyes were opened widely. Fritz began to read in a particularly shy voice, stopping often to clear his throat. Soon, however, he too forgot to be shy; and thenceforward the story went easily and well.

Eikōn's Visit to the Moon

Part I

"The child, Eikōn, stood gazing into the midnight sky, a sky richly sprinkled with stars. Who would have thought, to look at those mere points of light, that each one was a sun or a world in itself?

"To the east the moon had lately risen; a silver crescent, sending soft light upon earth.

"If I could but visit the stars!" sighed the child, as he had often sighed before.

"He stood watching long with upraised eyes, till weariness overpowered him. Then he sat down, leaning his head against a grassy bank, and gazing skyward still.

But presently his eyes closed, and he sank into heavy sleep."

"Was he out of doors? Wouldn't he catch cold?" asked Ikon.

"You must ask no questions," responded Fritz. "I have written down all I have to say."

"It seemed to Eikōn that he had not forgotten himself more than three seconds, before a clear flute-like voice said:

"Eikōn!"

"Eikōn sprang to his feet. To his surprise a blue-eyed girl stood beside him."

"Oh, has Stella got blue eyes?" cried Ikon.

"A blue-eyed girl stood beside him; not much taller than himself, and dressed in white. She was fair and gentle-looking, with long hair in curls. Two gauzy silvery wings of strange texture were folded together behind her shoulders."

"What's 'texture'?" asked Ikon. "I should like to know that little girl. Only of course the real Stella wouldn't have wings."

Fritz put down his paper with a grave face.

"Ikon, if you go on interrupting me, I shall read no more."

"I won't; please do read I won't interrupt again!" cried Ikon, in a great fright; and Fritz went on:

"'Are your wings strong tonight?' asked the little girl.

"Eikōn felt no surprise at seeing the little girl with wings; but it did surprise him to hear of his own wings. He peeped over one shoulder, and there undoubtedly they were; soft gauzy wings, all ready for use.

"'Will you go with me yonder?' asked the child, lifting her hands towards the starry sky.

"'To the stars! O yes! Which shall it be?' asked Eikōn earnestly. 'Sirius? The Pleiades?'

"'I think we will try an easier flight first. Your wings are not practiced,' she said. 'The Pleiades and Sirius are so very very far away. Our near neighbors, moon and sun, should have our first attention.'

"'Oh, certainly the moon and the sun. I quite forgot our own sun and moon,' said Eikōn. 'And I have so often longed to visit the moon. What a beautiful place we shall find! How soon shall we start?"

"'Now. There is no need for delay!' 'But shall we not need food with us?' 'Food! O no,' the child answered. 'The want of food is not felt by those who soar on the Wings of Imagination. We shall travel rapidly, far more rapidly than the fastest express train.'"

"She talks most dreadfully like a grown-up person," whispered Ikon very softly to himself. Fritz paid no

attention to the remark, but possibly he took a hint from it for the future.

"'Is this your first visit to the moon?' asked Eikōn.

"'No,' she answered. 'I have been many times. But it will be your first trip. Come!'

"'Will you not tell me your name?'

"'My name is Stella; and yours I know is Eikōn. So now we are friends. Come!' she repeated.

"The two young creatures spread their wings, and sprang joyously aloft.

"How delicious it is to float upward away from earth, borne upon the powerful Wings of Imagination! Those who possess only the stumps of these wings, or who have rendered them useless through want of practice, can crawl but heavily along the roads of learning.

"Side by side Stella and Eikōn rose through the darkness towards the glittering sky. Beneath, all seemed to shrink and dwindle and fade. Above, all seemed to stretch and widen and glow.

"'What makes the stars so strangely brilliant?' Eikōn asked in subdued tones. 'I never saw them shine like this before.'

"'You have never been so high, perhaps,' Stella answered.

"'Is it because we are much nearer to them?' inquired Eikōn.



"'No, that is not the reason. The fixed stars are so enormously far away, that this slight difference counts for nothing. They shine more brightly to our eyes, because of the thinness of the atmosphere. There is so little air up

here, that if we had come as men commonly journey we could not breathe. But these wings will bear us safely where by any other mode of travelling we should die.'

"'I have not noticed any difference in the air,' said Eikōn, in surprise. 'Will it grow thinner still as we ascend?'

"'Yes; rapidly,' replied Stella. 'At a height of fifty or a hundred miles there is practically no air. But do not be anxious. You will not suffer.'

"'I suppose we are now at a great height,' said Eikōn.

"'Far above the topmost peak of earth's loftiest mountain,' Stella answered.

"As the two rose, they soon left darkness behind, and emerged into dazzling light. Eikōn was delighted with the change. Stella bade him look back, and mark the dark shadow out of which they had come.

"'See,' she said, 'we have left behind us, not only earth, but also earth's shade. Just as every tree casts its shadow on the ground, so every planet casts its shadow into space. That is the meaning of night. Earth throws a perpetual shadow, always in the direction away from the sun; and in that shadow is man's night. Now we are travelling through space; and in these vast reaches of space around our sun, there is never any night, except just where a rushing planet casts its shadow. We are now in a region of perpetual day.'

"'I do not quite understand what you mean by "space," said Eikōn.

"'The sun and moon, the planets and stars, are all set or placed in space,' replied Stella. 'At your home, the tables, chairs, and stools are all set or placed in a room. Only, the pieces of furniture are at rest; whereas the stars and planets are always moving. Besides, there are no walls, or floor, or ceiling to space.'

"'How far does space reach?' asked Eikōn. 'And what lies beyond space?'

"'I do not know,' the child answered, with a serious look in her blue eyes. 'HE who created space alone knows how far space reaches. And if space has bounds—if there is any beyond to space—we only know, Eikōn, that God is there.'

"This seemed to Eikōn a wonderful and beautiful thought.

"'How gloriously the sun shines,' he said, falling into Stella's gentle and reverent tone. 'What a blaze of light! And how black the sky has grown.'

"'The air has become so thin,' she said. 'Without air there cannot be a blue sky!'

"'And are we really in space now?' asked Eikōn.

"'You have been in space all your life, Eikōn, for the world itself is in space. But we are passing now into regions of space away from earth.'

"'Oh, what is that?' cried Eikōn, as a small dark body rushed past them earthward, with lightning speed, flashed into a blaze of flame, and vanished.

"'Only a shooting-star,' Stella answered. 'Have you never watched for shooting-stars at night?'"

"O yes," whispered Ikon eagerly. "I didn't know they were that sort of thing though."

"'Yes,' Eikōn replied. 'I imagined, however, that the shooting-stars were suns, like other stars; not little bodies like this!'

"'The real stars are suns: but a shooting-star is not a real star. It is only a meteorite,' said Stella. 'We may expect to meet many of them on our way to the moon.'

"'I hope they will not strike us,' said Eikōn, with a shudder.

"'No fear,' Stella said, smiling. 'We are here on Wings of Imagination, remember. But for that, there would indeed be danger.'

"'Will not that shooting-star fall down on earth and kill somebody?' asked the boy.

"'O no; it will probably have burnt out long before it reaches the ground. A little dust may fall, and that is all. Now, Eikōn, shut your eyes, and take my hand. Come where I lead, and do not open your eyes again until I give you leave.'

"Eikōn obeyed, though not willingly. He was conscious of swift and steady motion, his own weaker wings being helped on by Stella's more practiced pinions. Once he said,

"'We are going so fast; and yet I feel no wind.'

"'There cannot be wind where there is no air, said Stella. 'Wind is moving air.'

"'Then is there nothing here?' asked Eikōn, almost opening his eyes in surprise at the thought.

"'Nothing that we can see or feel. But there is believed to be a something everywhere through space, very much lighter and thinner than the thinnest air which we can possibly imagine. This something we call 'ether.'"

"Then the two swept onward in silence; and suddenly Eikōn found himself standing upon his feet.

"'Open your eyes,' said Stella softly.

Part II

"'Why, we are back on earth again!' exclaimed Eikōn, in disappointment.

"Stella smiled and said,

"'Are we? Look around.'

"'It's only earth,' repeated the boy.

"If so, it was a strange earth. Eikōn rubbed his eyes, and gazed about, with a sense of bewilderment.

"In front, far away, extended a bare and barren plain, upon which the sun's rays poured down with a dazzling and sweltering heat. The glare was so intense that Eikōn could not face it.

"He turned to the right, and saw a range of mountains, jagged and rocky, casting shadows of inky blackness. No rivulets poured down these mountain sides; no grass or plants or trees were anywhere to be seen.

"To his left, rose an enormous rocky parapet, extending for miles, but gradually curving away as if around some unseen center. Here, too, were the harsh and rugged outlines; the utter want of softness; the fierce glare of sunlight; the deep blackness of shadow.

"The plain in front was dotted at greater and smaller intervals with sharply-cut circular hollows, some small, some large, usually surrounded by ridges of hard rock.

"Stella waited patiently, while Eikōn's eyes wandered around.

"'Look up,' she said softly at length.

"Eikōn obeyed. He beheld a sky of midnight blackness, bespangled with brilliant untwinkling stars. Strange to say, the stars shone thus although it was full day, and the sun beat down in unutterable splendor.

"The sun! Was that indeed the very same sun, which Eikōn was used to see from his earth-home? A crown of golden and many-colored light encircled the dazzling orb;

and a glorious fringe of radiance, ever changing in hue and quivering with motion, streamed outward far into space on all sides.

"'Is that our sun?' asked Eikōn in amaze.

"'That is our sun, Eikōn, only seen without the veil of air to soften his glory,' replied Stella. 'See yonder.'

"Eikōn again looked, and his eyes fell upon a splendid sight in the heavens, a shining body, not so very unlike the moon he had often watched from earth, when at her third quarter, but about sixteen times as large, exceedingly radiant, and bordered all round the outer edge by a hazy band. On this beautiful moon-like orb were many curious markings, which reminded Eikōn of his large school-map of the world, hanging on the wall at home.

"'And that is—' he said wonderingly.

"'That is THE EARTH,' Stella said.

"'How magnificent! I never knew we had such a perfectly radiant world to live in,' the boy said, deeply stirred at the sight.

"'We may dwell in the very midst of God's glorious things, and yet not see them,' Stella said gently.

"'And this—this really is the moon?' said Eikōn, as if hardly able to believe it.

"'This is the moon. Have you any doubt? Yonder is our earth which we have left. No other world lies so near.'

"'And we have come all this great distance!' mused Eikōn.

"'About two hundred and forty thousand miles,' said Stella, smiling. 'A mere nothing in astronomy.'

"'Shall we ever get back?'

"'Have no fear,' Stella answered cheerfully. 'But you have more to see here, before we return. Look again at the sun. Is he not a dazzling object?'

"'Why do we not see from earth that crown of gorgeous light?' asked Eikōn.

"'On earth we look through a thick atmosphere, and all those delicate tints and lines of light are lost. Not that they can never be seen from earth but it is only possible under certain conditions. You may see earth's atmosphere now, the hazy band which is folded around her. See, too, you can almost make out the different continents on her surface. The part which lies in darkness includes your home, Eikōn; for you know that, when we left, night had begun.'

"'We have been so long in coming, that it must be at least next day at home,' said Eikōn.

"'Not so long as you would suppose. How do you like this heat?'

"'It is fearful,' Eikōn answered. 'I wonder at myself for being able to stay here.'

"'Wings of Imagination,' Stella said softly. 'Had you come in any other way, you could not stand the heat for three seconds. If I could conjure into existence a pond of water on this spot, it would boil away almost instantly into steam.'

"'Do you not think we might find some water in one of those round holes?' asked Eikōn.

"'In the craters? See for yourself.'

"'Are these volcanic craters?' inquired Eikōn. 'I have seen pictures of volcanoes at home; but they were quite different.'

"'Earth's volcanoes are often active still. The moon's volcanoes are dead. That makes a great difference,' said Stella. 'Yes, it is believed that these are volcanic craters, the larger ones at all events. Yonder wall of rock surrounds a great crater, about a hundred miles or more across. But no fire or smoke or lava is ever seen to come from them. Everything upon the moon seems dead.'

"Eikōn exclaimed, 'Oh!' as a round hard body came rushing downward out of the sky, and struck the ground close to where they stood, with a seemingly tremendous blow. The very ground shook beneath it; yet there was no sound. Eikōn stared.

"'I did not hear it,' he said.

"'There are no noises in the moon, Eikōn, for there is no air to carry sound,' replied Stella. 'If you and I were here in any other way except on Wings of Imagination, we

could not hear each other speak. That was only another meteorite.'

"'A shooting-star. But it did not blaze into flame and burn away, as it came,' said Eikōn.

"'No; there is nothing to make it do so. Meteorites that fall to earth, catch fire in their rush through our atmosphere. But here there is no air. If you watch, you will see many such meteorites fall while we are here.'

"'I wonder where they come from,' said Eikōn.

"'Millions and millions of them are always rushing round the sun, in all parts of his system; and many fall upon the earth and other planets.'

"'And the moon,' added Eikōn.

"'Yes and the moon,' repeated Stella. 'Some believe that the smaller hollows on the moon are not craters at all. It is supposed that they were made long ago by large meteorites falling, at a time when the surface of the moon was soft. But I do not think anybody is quite sure about this yet.'

PART III.

"Eikōn looked wistfully at the rocky parapet of the great crater.

"'Perhaps we could find some water over there,' he said.

"'We will explore, by all means. However, I may as well tell you at once that there is no water on the moon.'

"'No water at all!' said Eikōn.

"'Apparently not—at all events on this side. I cannot speak as to the other side, never having been there.'

"'Why not go now?' Eikōn desired to know.

"'The moon only turns one side towards earth; always the same side,' said Stella. 'No one knows anything about the further side. My Wings of Imagination cannot carry me there; for I have no knowledge of what exists on the other side. Come, shall we mount the rocks? Spring, Eikōn!'

"Eikōn had rarely in his life been more astonished. Instead of alighting at a distance of three or four feet, he cleared with ease a space of thirty or forty feet.

"'Why, how is this?' he exclaimed. 'I never made such a leap in my life before.' Yet his exultation was a little damped by seeing that Stella had done the same as himself.

"'Ah,' Stella said, with a smile; 'you have not been used to leaping on the moon. Weight here is less than on earth.'

"'I can believe that. I never knew what it was to feel so light and agile. But what can be the reason?'

"'Merely the smaller size of the moon,' replied Stella.

"A few more such springs, and some swift climbing and running, brought them soon to the summit of the grim parapet, which now could be seen extending far in one huge unbroken circle. Within was enclosed a deep

hollow. At the center of this hollow a group of three or four high hills could be seen, all sharp and jagged and shaped like cones. Inky shadows fell from them upon the floor of the crater. The whole scene was intensely dreary. No water; no grass; no blue and green tints; nothing to soften the harsh outlines. Only black shadows and a black sky, contrasting with the fierce white glare of sunshine.

"'Oh, this is terrible,' said Eikōn, shuddering. 'I could not bear to live here.'

"'I have not shown you the worst yet,' Stella said in a low voice, as if she too felt the oppression of the sight. 'You know now something of what the moon is in her day-time. You have yet to learn the bleak horrors of her night.'

"'Surely no living creatures can possibly exist on such a world?' said Eikōn.

"'One would suppose not,' Stella replied dreamily. 'Sit down, Eikōn, and let us wait. The sun will set in less than a week, and then night will come.'

"'A week!' gasped the boy.

"'Less than a week. Three or four days, I should have said. The moon's day lasts a fortnight of our earthly days, and her night another fortnight. But her day is now a good deal more than half over; for the sun has long passed his highest position in the heavens. We will wait here three or four days, and see him set. Time will go very quickly. Remember, our waiting will be only on the Wings of

Imagination.' Stella spread her gauzy wings, with a smile, as she spoke, and gently waved them to and fro.

"Eikōn readily agreed. Together they watched the sun, as slowly, very slowly, he crept across the black sky. The stars moved in like manner, much as the stars are seen from earth to move; only here they could be watched in daylight, and from earth they can only be watched at night. Moreover, here they appeared to move with exceeding slowness, like the sun. For the changes which on earth can be seen to take place in twenty-four hours, on the moon can only be seen to take place in twenty-eight days of earth-time.

"While the sun and stars thus lazily advanced towards their setting, the radiant earth never stirred from her place, seeming always to hang like a glorious fixed globe at one spot in the sky. Changes of another kind were visible, however. For earth could be seen to wax and wane, going through her month of phases, even as we on earth see the moon wax and wane.

"'If we were here twenty-eight days, we should see earth pass through all her quarters in turn, from new-earth to full-earth, and back again to new-earth,' said Stella.

"'Like new-moon and full-moon, I suppose,' Eikōn replied. 'How wonderful it all is.'

"By-and-by the radiant sun went down. Then, with startling suddenness, night was upon them.

"It was not, indeed, a night of darkness. On this side of the moon there is at all times the beautiful shining of earth; equal at her full to more than a dozen full-moons, and equal at her crescent to more than a dozen crescent-moons.

"But the cold was fearful intense; past words to describe. If in the moon's day, water would pass instantly into steam; in the moon's night, water would change no less rapidly into the hardest ice.

"Except on Wings of Imagination, no human being could have endured the awful chill. Stella and Eikōn drew closer together, shivering at the desolation of the scene. The harsh mountain ranges showed plainly still in earth's cold light; and countless stars shone overhead with steady radiance; and the deep silence was unbroken by any sound of movement or of life.

"'Eikōn, have you had enough?' Stella asked at length.

"'Yes oh, yes. Let us go home,' entreated Eikōn.

"'Then take my hand,' she said, 'and spread your wings. Shut your eyes, and have no fear.'

"Again with swift flight they rose upward, this time leaving behind the dreary wastes of moonland, and passing earthward. Soon they came out of moon's shadow, and once more found themselves in the full blaze of perpetual sunlight.

"Before Eikōn could have thought it possible, he was back in the garden he had left.

"How fair and sweet seemed the coloring and shades of earth, even by night, after the terrible scenes he had quitted!

"'Oh, I would not live on the moon,' Eikōn cried. 'Earth, dear old earth, is better of the two.'

"And as Eikōn said these words, Stella faded from his sight, and he awoke."

CHAPTER XIX
Things Light and Heavy

"I'm glad he finished his dream properly before he woke up," said Ikon, in a deeply-interested voice. "He managed much better than me, didn't he?"

"Better than?" suggested Fritz.

"O yes—Miss Mundy always tells me that. I wish I could go to the moon too, Mr. Fritz. But oh dear, I do like that story so very very much. Only I wish Eikōn had seen lots and lots of things more before he came back."

"Giants and griffins?" asked Fritz.

"No, real things, I mean. Oh, and why didn't he and Stella go round to the other side of the moon? I do wish you had made them, Mr. Fritz."

"Couldn't," said Mr. Fritz.

"Couldn't you really?" asked Ikon.

"I didn't know what to make them see there."

"Don't you really know?"

Fritz shook his head.

"Not much, at all events," he said. "There would be the sun, of course—and the black sky, and the stars shining by daylight, probably. And most likely, the same sort of

scenery. But nobody really knows, for no human being has ever looked on that side of the moon."

"Nobody ever?" inquired Ikon seriously.

"Nobody, ever," repeated Fritz. "The moon always turns the same side to us, and the opposite side is always turned away."

"But I suppose it's most likely just the same as this side," said Ikon.

"Can't say. Very possibly," responded Fritz. "I know one difference. At night there is no earth-light."

"Don't they see the big earth shining like a great moon?"

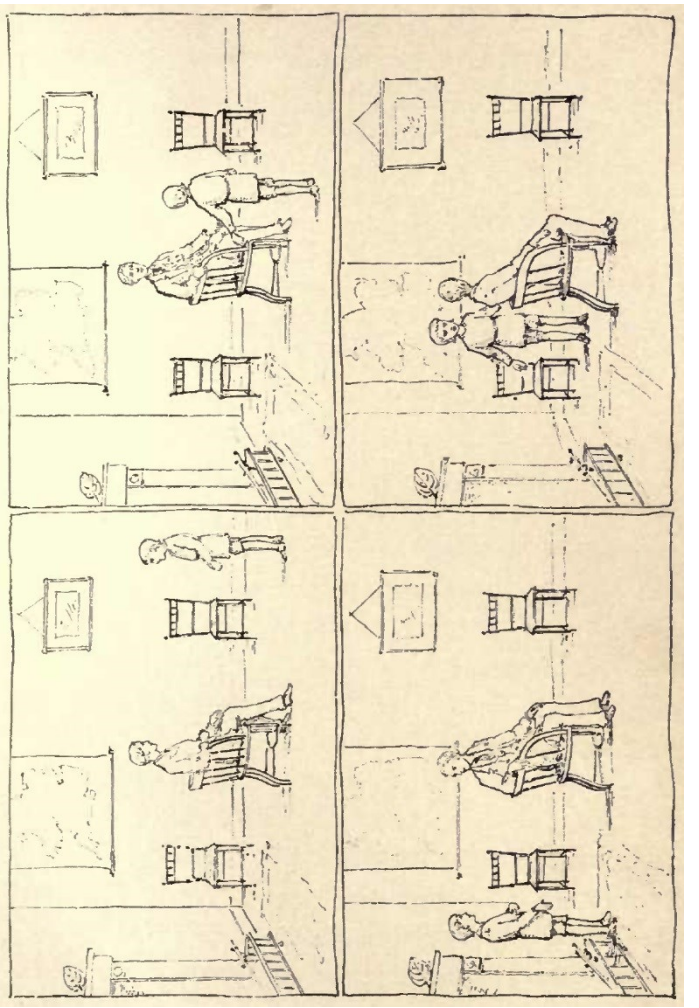
"No, never. There are only the stars at night. I don't know who you mean by 'they,'" added Fritz drily.

"Oh, I meant people—but of course there are not any people on the moon," said Ikon.

"Probably not," said Fritz.

"Well, I know one thing," remarked Ikon, nodding his head with an air of confidence,—"I know one thing, Mr. Fritz. The moon doesn't spin round and round on its axis, like the earth and the planets. Because if it did, of course the other side would come round sometimes, so that we could see it."

"The moon does spin on her axis," said Fritz. "That is what caused the sun and stars to appear to set, when Eikōn and Stella watched them."



"O yes—I forgot about the sun setting. But how very funny and extraordinary it was that the earth shouldn't have gone on and set too," remarked Ikon, puckering up his forehead.

"It does seem odd at first sight," said Fritz, trying not to laugh. "But look here, Ikon. You know, don't you, that the moon goes round and round the earth?"

Ikon nodded.

"As the moon goes round the earth, if she did not spin on her axis we should see every part of her in turn."

"Should we?"

"Certainly. If you were to move slowly round me, never turning on your feet, but keeping your face steadily fixed in one direction, I should see first your back, then your side, then your face, then your other side."

"O yes, of course you would," said Ikon, his face brightening.

"And if you were to move slowly round me, spinning fast on your feet as you went, I should still have views of you all round."

Ikon looked assent.

"But if you were to move round me, starting with your face turned towards mine, and if as you went you were to spin very slowly on your feet so slowly that one spin would take just the same time as once going round me—"

"Yes" said Ikon.

"Then I should only see your face all the while, and never your back."

Ikon was greatly interested. He could not be content without trying the three modes. Fritz had to move his

chair to the middle of the room. Then Ikon walked round him; first, keeping his face always in one direction; next, spinning so fast that he became giddy and nearly fell down; lastly, having his face steadily turned in towards Fritz all the while.

"But I didn't seem to spin on my feet a bit this time," he protested at the close.

"You did spin, Ikon, whether it seemed so or not. As you moved round me, your face pointed to each part of the room in turn. That shows that you were in reality turning slowly on your feet."

"Is that just how the moon goes?" asked Ikon.

"That is how the moon goes. The time that the moon takes to spin once round upon her axis, is exactly the same as the time that she takes to journey once round the earth. Both are twenty-eight days. This is how it happens that one side of the moon is always turned towards us, and never the other side. And this is why our earth shines always upon one side of the moon, so that anybody living there could see the earth seemingly fixed to one place in the sky."

"But," Mr. Fritz, said Ikon slowly,—"couldn't you have made Eikōn go to the other side of the moon, and fancied something for them to see?"

"Certainly I could," said Fritz drily. "I might have made them find Jack and the Beanstalk there, or

Cinderella and her glass slipper. But I thought you wanted sense in my story, instead of nonsense."

"O yes, that I do" cried Ikon. "I don't want nonsense."

"People have fancied a good many things about the other side of the moon," said Fritz. "Some have wondered whether there is perhaps air there, and perhaps water, and perhaps grass and trees and animals. But these are mere guesses."

"At any rate, I'm quite sure Jack and Cinderella aren't there," said Ikon, laughing. "Mr. Fritz, please don't go yet. I want to ask you something else. About Eikōn jumping so easily on the moon. I couldn't make out what you meant. Stella said it was because the moon was small."

"Do you know what causes weight, Ikon?"

"Things being big," said Ikon.

"You mean that a big thing is heavier than a small thing. But this is not always the case. A down pillow is larger than an iron door-scraper; yet the pillow would not weigh the heaviest."

"O no. Some sorts of things weigh more than other sorts," said Ikon.

"That brings us back to my question. What causes weight?"

Ikon thought, and thought in vain.

"Why doesn't this table float up in the air?" asked Fritz.

"Why, it can't, Mr. Fritz. It is too heavy—a great deal too heavy."

"Just so. And it is heavy because—"

Ikon said humbly,—

"I don't know."

"Because," said Fritz, "the earth drags it down."

"Is that why?" asked Ikon.

"That is why. The earth pulls down everything, trees and hills, and houses and people, and stones, everything, in fact."

"But what makes the earth pull?"

"Everything pulls everything else," said Fritz. "But the earth is so enormously bigger than any single thing upon the earth, that all lesser pullings are quite lost sight of in her great dragging of everything towards herself. We call this pull 'attraction.' And the downward pressure of all things toward the earth we call 'gravitation.'

"But what makes the earth pull?" repeated Ikon.

"God makes it do so," Fritz answered gravely.

Ikon was silent for some seconds.

"The amount of attraction or pulling in each instance depends on two things," said Fritz. "First, on the bulk of the earth; secondly, on the bulk of the thing attracted."

"But you said the biggest things weren't the heaviest," said Ikon.

"Not always. However, if I have two pieces of iron, one large and one small, the large piece will weigh the most."

Ikon responded by "Yes."

"If I have two pieces of oak, one large and one small, the biggest again will be the heaviest."

"Yes," repeated Ikon.

"But it will not do to try the iron against the wood. Iron is of a closer make than wood, it has more substance pressed into a smaller space. So a piece of iron is heavier than a piece of wood the same in size."

"But you haven't told me about the moon, Mr. Fritz."

"We are coming to that. I said just now that the weight of any one thing depended partly on its own size, partly on the size of the earth. Now, of course, the size of the earth does not change."

"It doesn't grow bigger," said Ikon, smiling at the thought.

"Suppose the earth were bigger," said Fritz. "Suppose our world were as large as Jupiter, her make being the same as it is now. Then her attraction would be very much greater than at present. Objects on her surface would be pulled towards the ground with tremendous force; and everything would be heavier. A man who can now walk easily upright, would then be dragged down with such power that he would have to lie flat on the ground."

"Couldn't he stand at all?" asked Ikon. "Couldn't you stand, if you were in a world as big as Jupiter?"

"No," replied Fritz. "Not unless I were differently made. I should want, for instance, much stronger muscles, before I could resist the great downward pull of such a world, and be able to stand upright."

"I'm glad we don't live on Jupiter," remarked Ikon.

"But on the other hand," said Fritz, "suppose our earth were much smaller than she is now! Suppose the earth were just the size of the moon!"

"Yes?" Ikon said.

"Then the downward pull would be so much slighter, that the weight of everything would be lessened. A block of stone which a man now is not able to stir, might then be lifted by a child."

"Is that why Eikōn could jump so high?" asked Ikon.

"That is why. Have you anything else to ask? For I must go."

"I don't think I know why the earth in the sky had halves and quarters like our moon," said Ikon.

"Do you understand why the moon has phases, Ikon?"

"Phases?" repeated Ikon, in a puzzled voice.

"Halves and quarters, I mean."

"No," said Ikon. "I don't know, Mr. Fritz."

"Someday you ought to have a lesson on that subject. I can't wait for it today."

"Will you write some more about Eikōn and Stella?" asked Ikon imploringly, as he rose.

"We shall see," said Fritz.

"Mayn't they fly off and visit the sun? O, do please let them! That would be beautiful!" said Ikon, with sparkling eyes.

"I'll consider the matter," Fritz answered.

Chapter XX
Another Story

A few days later Fritz came again, with a small roll of papers in his hand.

"It is done, Ikon," he said in his shyest tone. "The child Eikōn has had another dream."

"The sun! Has he been to the sun? And Stella too?" cried Ikon.

"Well, yes—something of the sort. They have paid a visit to the neighborhood of the sun. I could not well take them nearer."

"Oh, you dear dear kind Mr. Fritz!" cried Ikon rapturously. "Do please read it to me. Don't wait for anything. I do so want to know what they saw."

The story was as follows:

Eikōn's Journey Towards the Sun

Part I

"The child stood again in the garden, leaning idly against a small tree. Stars overhead could not be seen, because of the sunshine which flooded the air.

"Eikōn was not thinking about stars. He had been trying to look at the sun, till purple spots and blots were

before his eyes wherever he glanced. Eikōn did not know the danger of using his eyes thus."

"Why, is that dangerous?" asked Ikon. "I have tried ever so often to look at the sun."

"Don't try again," said Fritz. "People have lost their sight in time, by such attempts."

"Mayn't I ever look?"

"Yes, sometimes when the sun is setting; or when there is enough mist or fog to dim his brightness. A bit of smoked glass will make it safe at any time."

"I'll ask Dormer for some smoked glass this very day," said Ikon.

Then Fritz went on:

"He was wishing that it were only possible to pay a dream-visit to the sun, such as he had already paid to the moon.

"And while he thought, the heat of the day made him listless, so he sat down upon a grassy bank, and presently fell asleep.

"He did not know himself to be asleep. He fancied that he was only lying on the bank, thinking still about the sun, and wishing to fly away from earth.

"And suddenly a silver voice said, 'Eikōn!'

"Then he started up to find Stella beside him, blue-eyed, and fair-haired, and robed in white, with folded gauzy wings."

"Does the real live Stella always wear white frocks?" asked Ikon.

"I am not sure," replied Fritz doubtfully. "I have seen her in white. Ikon, I do not like these interruptions. You are too fond of hearing your own voice."

"I'll be good," whispered Ikon; and Fritz continued:

"'Eikōn!' she said.

"'O Stella, Stella, I am glad,' cried the boy. 'I have longed so much for you, that we might take another journey to the skies.'

"'What! Did you not have enough in your last?' she asked, softly smiling.

"'O no, no. I want to see the sun, dear Stella, said the boy beseechingly.

"'That is a much longer voyage than before,' said Stella. 'The moon is only two hundred and forty thousand miles away; but the sun is ninety-one millions of miles.'"

"Ninety-one millions of miles! What a lot!" murmured Ikon.

"'Ninety-one millions of miles! That does indeed sound enormous!' replied Eikōn. 'But on Wings of Imagination, Stella—'

"'If your wings are strong enough, let us go, by all means,' she answered. 'Come, shall we try? We can but turn back halfway.'

"Stella did not this time bid Eikōn close his eyes. He spread his wings, and sprang joyfully upward. Together they rose through the sunny air, till the highest flight of the lark was left far behind, and hills dwindled into flatness. No shadow of night lay behind them now; but green fields and the broad sparkling ocean.

"Yet, as they swept rapidly upwards, changes came to pass. They reached cloudland, and Eikōn was astonished at the curling wreaths of white mist, which from below had looked so firm and still against the blue sky. Leaving these light clouds they rose higher, and soon the earth beneath glowed in the sunlight with a strong white glare; and the sky overhead grew from blue to the darkest purple, then deepened into inky black.

"Stars came out one by one, as at night; only the sun still shone intensely. And the wreath of radiant light fringing the sun was once more visible, as seen from the moon.

"'We have left earth's atmosphere behind us now,' Stella remarked. 'There is no air here.'

"'Only what you call ether." said Eikōn.

"'Yes that we suppose.'

"'Shall we come across the moon on our way to the sky?' asked Eikōn.

"Stella shook her head. 'The moon, is at this moment, on the other side of the earth,' she said.

"'Or any of the planets?' asked Eikōn.

"'No,' she said. 'Not if we travel direct from earth towards the sun. Neither Venus nor Mercury lie at this moment anywhere near the straight line between earth and sun. And all the other planets, you know, have their pathways outside the pathway of our earth.'

"'I should have liked to land at Venus half-way,' observed Eikōn wistfully.

"'It would not be half-way,' Stella answered. 'Venus at one point in her orbit does certainly pass somewhere about half-way between the sun and ourselves. But at the present moment a journey to Venus would be quite as long as a journey to the sun himself. And a journey to Mercury would be even longer; since Mercury is on a part of his orbit quite beyond the sun.'

"'Then there is actually no planet at all just now between earth and sun,' said Eikōn.

"'None known to us. That is no uncommon state of things. However, if you keep a look-out you may see some passing meteorites here and there. Ha!' as a small body rushed past, glowing in the sunlight. 'There is one.'

"'Where is it going?' asked Eikōn wonderingly.

"'I do not know,' she said. 'Each meteorite has its own little pathway round the sun. But if it comes near enough to one of the planets, it will be drawn aside, and will fall

down upon the planet. Millions of meteorites are destroyed thus every hour.'

"'There is another!' exclaimed Eikōn.

"'Yes and here comes a third. But this is nothing. In parts of the Solar System they flow in a continuous stream, countless millions travelling in company.'

"'Ah! what is that?' cried Eikōn, when they had advanced a considerable distance through the glare of sunshine; whether thousands or millions of miles Eikōn could not tell, so swift and arrow-like was their flight. 'Look! what is that?'

"For at a little distance he saw a bright star-like object, with a tail of soft light curving away into space.

"'That is only a comet,' said Stella. 'Have you never seen a comet before?'

"'Once, I think,' Eikōn said, with some hesitation. 'How wonderful and beautiful! Is that comet another sun?'

"'O no,' Stella said, smiling. 'The body of a comet is much smaller and lighter than you would suppose; though some of them have enormous tails. But this is a very small one.'

"'Where is it going?' asked Eikōn.

"'Round and round the sun, I suppose,' she answered.

"'You suppose but you do not know, Stella?'

"'I have little doubt that it is so with this comet,' said Stella.

"'And the tail is what?' asked Eikōn.

"'No one can answer that question, Eikōn. There is hardly anything in nature more puzzling than the tail of a comet!'

"'I should like very much to go nearer,' murmured Eikōn.

"'Not now,' said Stella. 'We have enough to think about today. You had better leave alone thoughts of comets and meteorites, and fix your attention on the great sun. See how much nearer we are how large he has grown. Were we not here on Wings of Imagination, we could not for an instant face this tremendous heat.'

"'We shall not be blinded, I hope,' said Eikōn, amazed at the surpassing glare of light, as if from an enormous electric globe, which seemed to fill all space around them. So intense and overpowering was the radiance, that the brightest summer's day on earth would have been as dim twilight in comparison; and Eikōn found himself positively unable at such a moment to picture in his mind the meaning of the word 'darkness.'

"'No,' Stella answered. 'It will neither blind us nor drive us mad, as would certainly be the case if we were not here on Wings of Imagination only.'

"'Stella, do you think the glory of heaven itself can go beyond this?' asked the boy softly, as they floated side by side in the ocean of dazzling brilliance.

"'I think it must,' she said gently. 'For after all our sun is only one of the many lamps which were made by Him whose throne is in heaven. I think the glory of His throne and presence must surpass all other glory. But those who are in heaven are fitted to endure heaven's light, and to rejoice in it. Now, Eikōn, look steadily at the sun, and tell me what you see.'

Part II

"'I see a glorious sun of enormous size,' said Eikōn. 'A round body still, glowing with an extraordinary blaze of light, past the power of words to describe.'

"'Look attentively,' Stella said.

"'Stella, I see strange dark spots upon the sun, several of them, all different in shape. They are blackest in the center, and they have grey edges. Some are bridged over with grey streaks across the darkest part. Some seem to remain the same, but one is changing quickly. See!—the grey bridge has broken up and vanished.'

"'Those are sun-spots,' said Stella.

"'Are they stains upon the bright sun?' asked Eikōn.

"'No, not stains. They are believed to be great rents or holes in the outer burning envelope of the sun, letting us see through to lower depths.'

"'I suppose those black depths are quite cool and shady, compared with the outside,' said Eikōn.

"'No; probably not,' she answered. 'The blackness is perhaps only in comparison with the outside glare. Some believe that those black depths are the most intensely hot of all. These spots are supposed to be caused by tremendous storms and hurricanes on the sun. How large should you take them to be, Eikōn?'

'"It is difficult to judge,' the boy said. 'Certainly they are not really small. Perhaps they may equal in size the great craters on the moon.'

"Stella quite laughed. 'One of those bigger spots,' she said, 'is most likely from fifty thousand to a hundred thousand miles across. The whole moon might lie as a little boulder in one corner of it. Fifty such planets as our earth thrown in would not fill up that hole!'

"'You do not really mean it, Stella?'

"'I do indeed. Ah, if we could go close and look in! But even in imagination that is too much,' she said.

"'What are those other spots?' asked Eikōn suddenly. 'Not black, but most intensely bright—brighter even than the radiant surface of the sun.'

"'They are called faculæ Stella answered. 'I can give you no English word. But they too are doubtless caused by great stormy disturbances, and outbursts of tremendous flame.'

"'See—such a bright spot has appeared this instant,' said Eikōn. 'It grows brighter as I look.'

"'It may be of the nature of some volcanic outburst,' she answered.

"'And, Stella oh, Stella, I notice something else,' cried the boy. 'The whole face of the sun is strangely mottled all over. What extraordinary markings, almost like tiny slender leaves, lying closely side by side, or crossing each other in all directions. Thousands upon thousands of them.'

"'Those tiny leaves, as you call them, are each hundreds of miles probably in length,' said Stella. 'Some have described them as being shaped like grains of rice.'

"'But what are they, Stella?'

"'No one can yet answer that question,' said Stella quietly. 'Go on tell me more.'

"'Round the edge of the sun—O how marvelous!—round the edge of the sun it is as a sea of quivering fire; not water, but fire, Stella. I seem to see the very rising and falling of the billows, like the waves against the horizon, on a stormy day by the ocean. How grand!"

"'It is a sea, and a sea of fire,' said Stella. 'Those are indeed fiery billows of enormous size, ever rising and falling.'

"'All around the sun's edge,' said Eikōn.

"'All over the sun's surface, Eikōn. For the sun is perpetually turning round and round, just as the earth does; and every part of his surface is at the edge sooner or later. That which we see at the edge of the sun is merely a side-view of what really covers the whole globe. When you at home see waves against the horizon, on the ocean, you may be quite sure that there are like waves all over the surface between you and the horizon.'

"'There is something else,' cried Eikōn. 'Strange jagged crimson shapes, standing high out of that fiery sea some like jets and fountains of fire, and others like sharp-toothed mountains of fire, and others again like great flames darting upward.'

"'And they no doubt are flames,' said Stella. 'These are most likely a kind of volcanic outburst here and there.'

"'Like the white spots on the sun?' asked Eikōn.

"'Perhaps a side-view of the very same kind of thing,' she answered. 'What do you think, Eikōn, of flames ten or twenty thousand miles in length? Those strange red "prominences," as men call them, must be of the nature of flame.'

"'See, there is a fresh one bursting upward at this moment,' cried Eikōn. 'It is rising rising oh, what a height!'

"'Yes. Our earth might lie as a little ball at the foot of that fiery peak," said Stella.

"'There it has exploded, or broken,' Eikōn said presently. 'Now it is slowly dying down again. How perfectly wonderful.'

"'Wonderful, indeed! For these outbursts may be watched, not only from where you and I now are, Eikōn, but actually from earth itself through powerful telescopes,' said Stella. 'Think what the outburst of flame must be, which can be seen at a distance of ninety-one million miles.'

"'Could I see it through a telescope?' asked Eikōn.

"'Not at all times,' she answered. 'The thick air of earth, and the glare of sunlight in that air, hide from us these strange sights. But they may be seen in a total eclipse.'

"'A total eclipse!' repeated Eikōn. 'What is that?'

"'The moon sometimes passes exactly between earth and sun, so that for a few seconds she entirely hides the sun from us. Then, when the dark body of the moon just covers the bright surface of the sun, these strange red flames, together with the fiery sea, may be plainly seen. Now, Eikōn, look again, and notice what comes next, outside the peaks and fountains of flame.'

"'Ah, there is the beautiful fringe of light which we saw from the moon,' said Eikōn. 'What is it called?'

"'The corona, or crown,' Stella replied.

"'But it was many-colored then, with changing tints,' said Eikōn. 'Now it is silvery white, and the crown has violet rays. Some of the rays have a strange appearance, as if bent and twisted in bundles. And what a distance they reach!'

"'Some suppose these rays of light to be a constant outpouring from the sun, perhaps an enormous and ceaseless stream of meteorites,' said Stella.

"'Do you see also, Eikōn, a fainter radiance, outside the corona, and reaching far far away into space? This may be often seen from earth, before sunrise or after sunset; and it is called the Zodiacal Light.'

"'Stella, cannot we go nearer yet?' cried Eikōn.

"'Cannot we look into the dark spot, and stand beside the fiery mountains, and examine the crown of light?'

"'I fear not,' she said gently. 'We should not know what to see. We could not distinguish what is true from what is fancy. I cannot take you nearer to the sun, Eikōn!'"

Chapter XXI
Why The Story Was Not Ended

"Is that all?" asked Ikon, opening his eyes wide.

Fritz rubbed his head,

"I didn't know how to carry it on," he said.

"But couldn't you oh, couldn't you have taken them close to the sun? It seems so uncomfortable, their just floating about nowhere," said Ikon, in a dissatisfied tone.

"Somewhere, not nowhere," said Fritz.

"Well, but I mean—they weren't on anything," said Ikon. "They only just went floating about, millions of miles away from everything. Couldn't you have taken them right to the sun? Because of course they wouldn't be burnt, when they had Wings of Imagination."

"When they travelled on Wings of Imagination, you mean, I suppose," said Fritz. "I did think of that. But I found serious difficulties. We really know so little of the sun. If I had landed them there, I should only have landed myself in perplexity. Besides, there seems to be nothing to land them on. Even in imagination I could hardly make

them stand or sit on billows of fire and mountains of flame."

"But there are the spots," said Ikon. "Mightn't Eikōn and Stella have explored inside those black holes?"

"They are not holes, like holes in a rock," said Fritz. "It is so difficult to give a child of your age any true idea of these things. A hole on the surface of the sun may only mean a break in the fiery sea, where the outer envelope is torn open by a tremendous whirlwind."

"But couldn't Eikōn have peeped through?" persisted Ikon.

"You forget the size of the spots when you talk of 'peeping through,'" said Fritz, in rather a severe tone. "A dozen or fifteen worlds, such as ours, strung like beads on an enormous rope, and hung across the opening, would not reach from one side to the other of the biggest sun-spots which are sometimes seen."

Ikon said only, "O dear!" to this.

"Besides," added Fritz, "I cannot at all be sure what he ought to find within. So it was safer to keep at a distance."

"The grey edges and bridges, and the black middle," suggested Ikon.

"The umbra and penumbra—yes. But nobody knows what the grey edges and the black center would look like, if one were near. You are a rather unreasonable little boy, I think. You don't want a nonsense-story, and yet you are

vexed because I don't attempt to describe more than I know."

"I won't be vexed," said Ikon eagerly. "You are so kind to take such a lot of trouble. Only won't you please do one thing—won't you just tell me a little more about the sun now, in your own words?"

Fritz looked up to the ceiling, and down on the floor, and seemed to think it would be rather nice to run away. But Ikon's wistful black eyes held him captive.

"You know the size of the sun?" Fritz burst out abruptly at length.

"O yes," Ikon said. "It has got a diameter more than eight hundred and fifty thousand miles long."

"Don't say it has got!" said Fritz. "It 'has a diameter.' That is enough."

Ikon nodded.

"Well!" Fritz said, rubbing his forehead, "if you had more than one million worlds, all the same size as our earth, and if you rolled them all together into one huge globe, that globe would be scarcely as large as the sun."

"Wouldn't it really?" asked Ikon.

"No. Of course I am talking now about the seeming size of the sun," said Fritz. "I don't know at all how large the solid part of the sun may be. We can only measure the sun as a whole, including his fiery surroundings, a sort of atmosphere of fire."

"And a sea of fire," said Ikon.

"You can call it a sea, if you like, but it is a sea where there is no water. The waves are waves of flame."

"Perhaps there is a real small sun inside, quite cool and comfortable," suggested Ikon.

"There may be a firm central body, very likely. I don't know what to say to the idea of coolness or comfort, under such an envelope of flames. However as to the weight of the sun, we know something about that. Suppose we had an enormous pair of scales."

"Cook has scales in the kitchen," said Ikon.

"These would be much bigger scales. They must be so tremendous that in one scale we can put the whole great sun."

"O dear me!" gasped Ikon. "They would have to be big!"

"The question would be, what to put in the other scale, so as to out-weigh the great weight of the sun," said Fritz.

"Wouldn't a star do?"

"Might!" said Fritz. "But we can't weigh the stars. The planets have been weighed, and the sun too."

"Have they really?" asked Ikon, with astonished eyes.

"Certainly. Not in scales, but by calculation. You cannot possibly understand all this, till you are older. Now suppose we have put the sun into one scale. We then bring

together in imagination all the planets, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and the Asteroids, rolling them into one huge ball."

"Will that ball be heavy enough to weigh down the other scale, Mr. Fritz?"

"No," said Fritz. "The other scale would scarcely stir under it. You would need about seven hundred and forty of such balls, each as heavy as all the planets put together, before the two scales would hang equal."

Then there was a pause.

"Mr. Fritz," said Ikon.

"Yes, Ikon."

"I don't think I can really quite understand that sort of enormous bigness."

"Of course you can't," said Fritz.

"And when you talk about millions and millions and millions of miles, I do try to make myself see them. But it seems as if they couldn't get inside my head."

"Quite true," assented Fritz.

"I liked it best when Herr Lehrer made the sun and planets all seem to get a little together."

"Well, yes, that is the best plan," said Fritz.

"Only I wish I could understand properly all about the great big real sizes."

"It's no use to worry yourself," said Fritz. "Man's mind is only made with a certain grasp. Your hand can't hold a larger thing than it is made to hold; and your mind cannot either."

Ikon looked at his little fingers curiously.

"But if I had a man's hand, I could hold something bigger," he said.

"And if you had a man's mind, you could grasp matters which you cannot grasp now. Nevertheless, there would always be very much beyond your grasp."

"Even if I were like Herr Lehrer?"

"Herr Lehrer has a great mind," replied Fritz. "But Herr Lehrer is always saying how little he knows and understands."

"Doesn't Herr Lehrer know all about a comet's tail?" asked Ikon, after a pause.

"Nobody does," said Fritz.

"Not what it is made of?"

"No," said Fritz.

"I should like to see a comet quite close a real big comet," said Ikon. "Have you seen a comet, Mr. Fritz?"

"More than one; but not quite close."

"Do tell me about a real big comet," said Ikon.

"I have seen several," replied Fritz. "Yesterday evening I was looking at the picture of a comet which appeared in 1861. That was a remarkable one."

"Had it got a tail, Mr. Fritz?"

"It had a tail. It also had a head. We call the head a nucleus. Most comets have a head and a tail."

"Was the picture pretty? Was it a very nice comet?"

"Sir John Herschel was particularly interested in that comet, so no doubt it was 'nice,'" said Fritz drily. "The picture gives the comet as he saw it."

"Who is Sir John Herschel?" inquired Ikon.

"He was a famous astronomer; and his father, Sir William Herschel, was still more famous."

"And he liked that comet?" pursued Ikon.

"Everybody liked to see that comet. It was large, and very bright. At one time it came so near our earth, that some thought we might even have passed through part of its tail. But no one could be sure."

"Wouldn't a comet's tail burn us?"

"Probably not. We cannot say much as to the nature of comets' tails; only we know them to be of the lightest and thinnest possible make."

"Mr. Fritz, are you going to tell me any more about the sun?" Ikon asked suddenly.

Fritz considered for some moments, and said "He always turns round and round upon his axis."

"Like the earth," said Ikon.

"Yes; only the sun takes twenty-six days, instead of twenty-four hours, to spin once."

"Two days less than the little moon," said Ikon.

"True. This spinning movement of the sun was first found out through the spots. Men saw the spots slowly travelling across the sun's face, taking nearly a fortnight to cross, disappearing for a fortnight on the other side, and then appearing again."

"Do the spots always keep the same? I thought Eikōn and Stella saw one changing and going to pieces."

"Some spots remain the same, with little or no change for many weeks. Others break up and vanish in a few days, or a few hours, or even in a few minutes. You must remember that the whole surface of the sun is in a state of tremendous turmoil all roaring flames, and fiery billows, and furious storms. In fact, we cannot possibly picture to ourselves the real condition of things there."

"Are Stella and Eikōn going to visit somewhere else?" asked Ikon, in a beseeching voice.

"I don't quite know," said Fritz. "Perhaps I will try. But this last attempt seems rather a failure."

"I should like Eikōn very much to go to Mars, and to travel about everywhere, without ever having to be sea-sick."

"But it would be rather awkward," Fritz remarked, "to take him to Mars, and make him walk about there, when I have not the least idea what he ought to see."

"I wish we did know a great deal more," sighed Ikon. "There seem to be such lots of things you can't tell me."

"I dare say we are none the worse, in the end, for being made to feel our own ignorance," said Fritz.

"Must you go?" asked Ikon, as he rose.

"I really must," said Fritz.

"Couldn't you just end that story, and let them come back and wake up."

"I'll consider," said Fritz. "Well, yes I have an idea. I will come again soon, and give you one more reading. And that will be the last before I leave home."

"Are you leaving too? O I am sorry!" said Ikon. "Everybody seems to go away."

"Never mind. Your turn will come sometime," said Fritz kindly.

Chapter XXII
A Sequel to the Story

Three or four days later Fritz appeared again, with the usual little bundle of papers; and after a few words of greeting, he read aloud as follows.

Journey Among the Planets

Part I

"'And you cannot take me any nearer, Stella?'

"'No,' she said; 'I find even my own wings not strong enough; and yours are less practiced than mine. The heat and glare would be too fearful. Even in imagination one cannot face such a sight.'

"'And must we go home now?'

"'Stella seemed lost in thought.' She said at length: 'I should like not to return immediately. Are your wings weary yet?'

"'O no!' he said, 'I am quite ready for a further flight. Where shall we go next?'

"'I should like much,' she replied, 'to give you a rapid view of the Solar System as a whole.'

"'May we visit all the planets?' asked Eikōn with delight.

"'I cannot promise to take you actually upon those other worlds. Wings of Imagination have their limits in what they can do. But I should like to take you nearer to give you a view of Mercury's speed, and Jupiter's great size, and Saturn's wonderful rings. It will be something of a bird's-eye view.'

"Then Stella paused again, and thought.

"'You know, perhaps,' she said, 'that all the planets travel in nearly the same plane?'

"Eikōn shook his head. He did not understand.

"'I mean this,' she said. 'Suppose there were stretched out in space a great transparent sheet, reaching through all the Solar System. Suppose that the sun were exactly at the center of this sheet, half his body being above, and half below it. You are supposing?'

"'Yes,' said Eikōn.

"'You must also suppose the sheet to be so made that the planets can pass with ease through it. Now, the sun being in the middle of this sheet, the planets will all have their pathways almost flat upon or level with the sheet. Not quite for each, more or less, will rise just a little above and sink a little below it, at different parts of their orbits. But all will keep nearly to that one level.'

"'I think I see your meaning, Stella.'

"'That sheet pictures what men call the plane of the ecliptic. You and I will now rise on our wings above this

plane or supposed flat surface in space, and will take a bird's-eye view of the Solar System.'

"'I am ready,' Eikōn said.

"'Only remember, Eikōn, there is no real sheet. There is nothing in space to mark the level which the planets so nearly keep. And when I speak of rising above it, I speak as men speak on our earth. Seen from Earth, this would be a northerly part of the heavens. But away from earth, so far as we know, there is no up or down.'

"'That seems very strange,' said Eikōn.

"'Well, we will call it "up," for convenience,' she answered. 'Now come. We will not venture too near the great sun. But that sun must be our center, from which to reckon all else.'

"Then it seemed to Eikōn, as they went, that his sight had a strange new power given to it. Hovering above the Solar System, he was able to view the wondrous sight more fully. Miles were miles and distances were distances still; yet the vastness of space appeared to shrink and to come within the grasp of his mind and thought.

"He could see the glowing central orb, apparently at rest, only turning steadily upon its axis. A blaze of splendor, past description, filled space around. The unutterable radiance of the globe as a whole; the surging ocean of stormy flame-billows in which it was enwrapped; the grey and black spots where this fiery envelope was rent open by fierce tempests; the tremendous mountains of

flame springing out of the fiery ocean; all these were clearly seen by Eikōn, yet without any sense of terror on his part.

"He could perceive the gorgeous crown of colored and silvery rays, reaching far away from the sun. He noted, also, what seemed to be countless millions of meteorites, speeding incessantly round the sun, and glittering in his light. Millions of these were each moment falling upon the sun, while millions more each moment rushed in from the distance to supply their place. He began to wonder whether, perhaps, those rays of light in the corona might really be caused by the sunshine falling on these countless multitudes of little whirling bodies, never for an instant at rest.

"As Eikōn looked, lost in admiration, he saw a great comet drawing near. This comet was much larger than the one he had seen before, with a magnificent tail, or train of light, curving away and branching into a forked ending, like two tails springing from one.

"'We will watch this,' Stella said quietly.

"The comet did not keep to the same plane or level as the planets, but approached the sun from that direction which Stella had called 'above.' As it came, it rushed ever faster and faster, the bright star-like head foremost, surrounded by a soft cap of radiance. Nearer and yet nearer it drew, till so close to the sun that Eikōn cried aloud, thinking it must surely fall in upon the raging flames

and perish. But no; the tremendous speed with which it now journeyed carried it safely round.

"For a little while—how long Eikōn could not tell—the comet was lost to sight, hidden by the radiant body of the sun. Then it came out on the other side, somewhat changed in shape by the tremendous heat through which it had passed.

"A strange sight was now visible, which made Eikōn again call out in excitement.

"He had noted, as the comet rushed round the sun, that the great tail, instead of simply trailing after the comet's head, had swung outwards in an enormous sweep, pointing always away from the sun. Now, more wonderfully yet, as the comet journeyed on its pathway, leaving the sun behind, it was the tail which went first, and the head which followed after.

"'Stella, how is that?' asked the boy breathlessly.

"'I do not know,' she answered. 'No one understands how it is. A comet's head always points towards the sun, and a comet's tail always points away from the sun. But I cannot tell you the reason.'

"'But what can the tail be made of?' asked Eikōn.

"'I do not know,' she said again. ' No one knows. Some have thought one thing and some another. It is a great perplexity. Now, Eikōn, we will look at the planets.'

"'How long do you suppose it took that comet to sweep round the sun, Stella?'

"'A few days, probably,' she replied.

"'Have we been days watching?'

"'Only on Wings of Imagination,' she answered, smiling.

Part II

"As Eikōn looked about, it seemed to him that he caught sight of a little planet-like globe, not very distant.

"'What is that!' he exclaimed.

"'I am not sure that it is anything,' replied Stella. 'We cannot be certain. But if that really is a planet its name is Vulcan.'

"Surrounded still by burning radiance of light and heat, the children hovered near a world which with great speed was hurrying round the sun a world small indeed, compared with the enormous globe in the center.

"'This is Mercury,' said Stella. 'Mercury is only about three thousand miles in diameter, not much bigger than the Moon.'

"'How intensely brilliant is the side of Mercury towards the sun!' said Eikōn. 'Yet Mercury is not so bright, seen from Earth, as some other planets.'

"'No; for Mercury is so near the sun, that we never can see him in hours of darkness. Mercury is only visible soon

after sunset or just before sunrise. But Mercury, too, has a dark side.'

"'Yes, so I see. Beautiful shining Mercury. But at what a speed he travels!'

"'That must be,' Stella observed. 'At this short distance, the sun attracts Mercury with such great force, that the planet going more slowly would fall down upon the sun, and be destroyed.'

"'Yet we do not seem so very near the sun,' said Eikōn.

"'Mercury is about 35 millions of miles away, scarcely more than one-third as far as our Earth.'

"'And Mercury is very much smaller than Earth.'

"'Nineteen Mercuries rolled into one would hardly make a world as large as Earth,' said Stella.

"'I see that Mercury turns upon his axis, and that the axis slants like that of Earth.'

"'Yes; Mercury's day is much the same in length as Earth's day. But Mercury's year is only about three of our months. That is to say, Mercury journeys once round the sun in three months, instead of twelve months. So Mercury's seasons must be short and quick indeed, spring, summer, autumn and winter, lasting only about three weeks each."

"'Hardly long enough for enjoyment,' said Icon. 'Stella, the heat on Mercury must be very great. The sun appears such a size seen from this distance.'

"'About seven times the size of the sun as seen from Earth,' replied Stella. 'Mercury's pathway is very much more oval than ours, and his distance from the sun varies more. At his nearest, Mercury has ten times as much light and heat as any part of Earth enjoys, and at his farthest, not seven times as much. But that must be more than enough for any such beings as man.'"

Part III

"The children spread their wings, and passed on for many millions of miles with the swift flight of light. Presently they came upon another world, larger than Mercury, not quite so rapid in movement, and having a pathway outside that of Mercury.

"'This is Venus!' Stella said. 'A far more beautiful sight to us on Earth than Mercury; yet, as you may now see, not really so brilliant. But Venus is nearer to earth and farther from the sun, and may therefore be seen in hours of darkness.'

"The soft luster of this beautiful world made Eikōn think of the evening star he had so often watched from Earth and no wonder, since Venus is that evening star.

"He could see that Venus, like Mercury, was placed in space with a sloping axis as regarded the sun; also that she turned steadily on her axis; also that she passed ever round the sun in an unmarked pathway. No moon travelled with Venus.

"'Some call Venus the twin-world of Earth,' said Stella; 'for the two are nearly the same in size. Venus is only a little the smaller. She has a day of about the same length as Earth's day; while her year is about seven and a half of our months. See how much her north pole is at this moment bent over towards the sun. Venus' axis slopes far more than Earth's axis. This must cause much more severe changes of seasons than we have on earth at least, so we should suppose.'

"Eikōn noted that with Venus, as with Mercury and Earth, the side towards the sun shone brightly, and the side away from the sun was in shadow. Here, too, as the globe kept spinning on her axis, each part in turn passed through light or day, and darkness or night.

"'There is believed to be an atmosphere on Venus,—perhaps much thicker than our atmosphere on Earth," said Stella. 'That might help to ward off some of the great sun-heat to which Venus is exposed, not so great as the heat which Mercury endures, certainly, but far beyond what we feel on Earth.'

"'Venus seems to draw sometimes very near to Earth,' said Eikōn.

"'Yes, when both happen to be on the same side of the sun together. The two worlds are then about 23 millions of miles apart. When Earth is on one side of the sun, and Venus on the other, they are divided by more than 160 millions of miles.'

"'No wonder Venus sometimes looks so bright,' said Eikōn.

"'Ah; we do not see Venus at her best when she is nearest. If we did, she would be a splendid sight indeed. Venus' path in the heavens lies between Earth's orbit and the sun. When Venus is nearest to us, her bright side is turned away, and only her dark side is towards us; so we cannot see her at all, except with a very powerful telescope. When she is at her farthest, her full face is visible, but the great distance makes her look smaller and less bright.'

"'What a pity,' said Eikōn.

"'Yes, it does seem a pity. Our best view of Venus is between these two extremes, when, seen from Earth, she is at the side of the sun, so to speak. We can then see only half of her bright side a half Venus, in fact, shaped like the half-moon, though this is not clear without a telescope. If anybody lives on Venus, he has the view of Earth which we can never have of Venus; a fine full Earth, at the time when the planets are nearest together.'

"'That must be very beautiful,' said Eikōn.

"'Note one thing more before we go,' said Stella. 'You see that Venus is a partly light and partly dark body, like other worlds. If you examine the line where light fades into darkness, you may see it to be jagged and broken. It can be seen thus from Earth through a good telescope.'

"'What does it mean?' asked Eikōn.

"'The jaggedness is believed to be caused by very high mountain ranges. Some suppose Venus to be perhaps quite covered over with mountains, far loftier than any on Earth. But this is hardly a settled fact. We will now pass on to the next planet.'

Part IV

"Again they sped through space in company, and soon they were hovering over another globe, much the same in size as the one they had just quitted.

"Like Venus, this globe turned incessantly upon her axis. Like Venus, this globe had a slanting axis, only less slanting. Like Venus, this globe journeyed steadily round the sun. Like Venus, this globe had its darkened side, and shone brilliantly on the part which faced the sun. Unlike Venus, this globe was accompanied by a second and much smaller world. The smaller world turned very slowly on its axis, and also journeyed round the great Sun. But in addition to this it travelled perpetually round and round the larger world not in loops, with that world in the center of each loop, but in gentle curves backwards and forwards, so that it was now before, now behind, now on either side of the larger world.

"'Venus is distant from the sun about 66 millions of miles, but these worlds are distant about 91 millions of miles,' said Stella. 'Venus travels at a rate of 21 miles each second. This larger world travels 18 miles each second.

See, Eikōn this world has a day of 24 hours, and a year of 12 months.'

"'Why, it must be our own Earth with the Moon,' exclaimed Eikōn joyously. 'I had no idea we were so near home. What a beautiful planet! I should not have known it again. Ah! there is the snowy cap at the North Pole. I see cloudy markings also here and there.'

Part V

"Moving further onward, the two came next upon a smaller world, travelling in an orbit which lay quite outside that of Earth just as a large hoop laid on the ground will surround a smaller hoop laid within it.

"The planet, which they had now reached, turned, like the others, upon its axis, and travelled always round the sun. Also, it had its bright and its dark side. The bright side shone with a red glow, and greenish tints might here and there be seen amid the redness. At the north and south poles, white patches, as of snow, were visible.

"'This little world is Mars,' said Stella. 'Its diameter is nearly five thousand miles—above half that of Earth. Mars has a day about as long as Earth's day, and a year almost as long as two of our years. It journeys at the pace of fourteen miles and a half each second.'

"'Scarcely half so fast as Mercury,' said Eikōn.

"'Well, no. But even 14½ miles a second means 870 miles a minute. That is not slow,' Stella said, smiling. 'We count 60 miles an hour extremely fast travelling on Earth.'

"'The years seem to grow longer, and the speed to become less, as we go farther and farther from the sun,' said Eikōn.

"'Naturally,' replied Stella. 'A planet's "year" means the time which it takes to journey once round the sun: and the farther each planet is from the sun, the longer must that planet's pathway be. Besides, the more distant a planet is, the more slowly it has to travel, since the sun's power of attraction becomes less, and therefore less speed is needed to overcome that attraction.'

"'It seems very wonderful how one thing fits exactly in with another,' said Eikōn.

"'God has willed it all,' she said simply. 'The wonder is great, certainly, but perhaps it would be greater if things did not so fit in. God's power is enough for much more than this.'

"'O surely I see a tiny moon near Mars!' Eikōn suddenly exclaimed.

"'Look carefully, and you will see two moons,' said Stella. 'They are so very small as to have been long undiscovered. We call them Deimos and Phobos.'

"'And as I look closely, what curious markings there are, all over the body of Mars!' continued Eikōn. 'Almost like the markings on a large map of our own world, seen in hazy light or at a distance; only here the outlines are differently arranged, and are greenish and reddish in tint. Can those be lands and seas?'

"'That is what we suppose,' said Stella.

Part VI

"'Now,' she continued, 'we have seen the four inner and smaller worlds, of which our own Earth is one. Follow me, and see what comes next. But first,' and she paused, 'I should tell you that the distance of Mars from the sun is about 140 millions of miles. The next planet of importance, Jupiter, is about 475 millions of miles distant. Between the two there is, as you see, an enormous gap. We will examine what this gap contains.'

"A wide space had first to be passed, entirely void of planets. Eikōn looked to right and left in vain. Of planets there were none to be seen. Nothing broke the great solitude, save here and there a little passing meteorite, shining in the rays of the sun rays, not so bright here as on earth, owing to increased distance.

"All at once Eikōn found himself hovering over a belt or family of small planets, journeying round the sun in company.

"This, however, by no means implies real nearness on the part of the small planets. Two or three hundred little worlds, scattered over a pathway about one hundred million miles wide and of enormous length, certainly does not mean that any two of them were close together.

"Stella led Eikōn in swift flight across the great breadth of the zone, and around some portion of the whole orbit. And as they went, they came upon here one little lonely world, and there another, and further on a third; the largest being small, and the smallest very small.

"These tiny worlds, scattered in space, seemed like a group of tiny islets in a great sea; while the larger planets were perhaps rather more like distant continents, separated by the broad ocean.

"'I have counted between one and two hundred,* Eikōn said presently, 'and each little world has, I see, like other planets, its bright and its dark side, and throws its shadow into space.'

"'More than two hundred and thirty are known to us now,' said Stella. 'But fresh Planetoids are still often discovered. There may, for aught we know, be many hundreds of them. See, this is Vesta, the brightest of the whole group as seen from Earth.'

"'A very small world!' Eikōn said musingly.

"'Vesta is about three hundred miles in diameter. You would need some eighteen thousand Vestas to make one ball as large as Earth. Yonder is Ceres. I cannot tell you the exact size of Ceres, but most likely it is about the same as Vesta. Ceres was the first found of all the Planetoids. Now, Eikōn, we will leave these little planets, and pass onward.'

Part VII

"Another wide and empty space had to be crossed, Stella, as usual, leading the way. After leaving the last Planetoid, some seventy-five millions of miles lay before them, unbroken by a single world. But on Wings of Imagination this great journey was quickly over.

"Then the little voyagers found themselves drawing near to a magnificent sight.

"A mighty planet became visible, spinning rapidly, and journeying in a wide sweep round the far distant sun. And travelling both around and with this great world were four small shining worlds. And on the body of the chief globe were beautiful tints, and bands or belts of many hues.

"'What a perfectly marvelous group!' murmured Eikōn.

"'This is the giant planet of our Sun's family,' said Stella. 'Twelve hundred Earths would make only one globe as large as Jupiter appears to us. Of the four moons, one is smaller than our moon: the other three are all larger.'

"'Marvelous!' repeated Eikōn. 'And this great Jupiter too, I see, turns upon his axis.'

"'Not only turns, but turns very rapidly,' said Stella. 'Jupiter's whole day lasts ten hours, instead of twenty-four. That means five hours of light, and five of darkness. A brief working day, according to our ideas.'

"'People would not be so tired by the evening,' said Eikōn. 'Stella, I don't think Jupiter seems to whirl along on his orbit so fast as even Mars.'

"'There is no need. Jupiter is not only much larger and heavier than Mars, but also much farther from the sun. At this distance eight miles a second is speed enough to balance the sun's attraction. However, eight miles a second still means nearly five hundred miles a minute not so very slow, after all!'

"'And Jupiter's year?' questioned Eikōn.

"'Jupiter's year is equal to twelve of our earthly years. Think what the length of his journey round the sun must be, Eikōn! A journey twelve years long, with a speed of five hundred miles a minute.'

"Eikōn shook his head. 'I cannot think it,' he said. 'Even on these wings, Stella, I can see but a little of that pathway. It is truly most wonderful.'

"'You may notice something else,' Stella said; 'and that is the position of Jupiter's axis. It does not slant like Earth's axis, but is placed nearly upright pointing, as we should say, almost exactly "north" and "south." That means nearly equal days and nights all over Jupiter and all through the year. Nights five hours long, and days five hours long, whether at the Poles or on the Equator.'

"'Has Jupiter also an Equator?' asked Eikōn.

"'Certainly. That line round the globe, which we call the Equator on Earth, may just as well be called the Equator on Jupiter.'

"'How very small and dim the sun looks from here,' said Eikōn, with a shiver. 'The inhabitants of Jupiter must be strangely cold.'

"'I am not so sure. If there were people on Jupiter, they would perhaps be a great deal too hot,' said Stella, smiling.

"'Really?' asked Eikōn, in surprise.

"'Come a little closer, and look more carefully,' said Stella.

"As they approached, Eikōn's attention was much drawn to the dark and light belts lying across the surface of Jupiter. Some were dull, some ruddy, others grey or bluish, pearly or yellowish-white. Gradually he saw that these bands of color were not fixed, but that slow movements were taking place in them. Shapes and tints changed; and bridges of grey were formed across one band from those on either side of it; and these bridges, once formed, presently vanished again.

"'Surely there must be a good deal of disturbance on Jupiter,' said Eikōn.

"'It seems so, indeed,' replied Stella. 'If those are, as we believe, vast cloud-belts, the storms which sweep over the planet must be tremendous. I do not suppose, Eikōn, that we ever obtain a glimpse of the actual planet. Jupiter

appears to be a world quite enwrapped in enormous masses of cloud or vapor.'

"'As the sun is enwrapped in an envelope of fire?' asked Eikōn.

"'Even so,' she answered. 'Jupiter was no doubt once upon a time folded in a sea of fiery flames. But Jupiter now is long past the flaming stage of star or planet life. Whether he has reached the same stage as Earth and other small planets, is another question.'

"'If those are really cloud-masses which we see, the actual size of the real planet may be smaller than one would suppose,' said Eikōn.

"'No doubt,' replied Stella. 'That is all the more likely, because we know the weight of Jupiter to be much less than we should expect from his seeming size.'

"'But what an extraordinary thing that such an enormous thickness of clouds should always cover the planet!' exclaimed Eikōn. 'What can be the cause?'

"'It is most extraordinary—especially when we think of the small power of the sun here. Some source of great heat there must certainly be, to draw or to drive up such tremendous masses of vapor, and to keep them floating above the planet.'

"Eikōn looked towards the small distant sun, and said, 'It cannot surely be sun-heat only.'

"'What if Jupiter is not yet cooled?' asked Stella softly. 'What if we are now looking upon a red-hot world, not indeed a world of flames, yet still far too heated for water to lie in seas and oceans on its surface? Then of course the waters must float above, in the form of clouds."

"'Certainly, in that case nobody could live upon Jupiter,' said Eikōn.

"'Nobody, at all events, like ourselves, and no animals like those on Earth. Perhaps, instead of being on Jupiter, there may be living creatures on Jupiter's little companion-worlds; his "moons" as we call them.'

"'Can that be?' inquired Eikōn.

"'I do not say that it is so. We cannot possibly know. The idea has, however, been put forward, and it does not seem quite impossible. A red-hot Jupiter, so large and near at hand, might well supply abundance of light and heat to living creatures on those "moons," in addition to what they would receive from the sun. This is of course only a guess; but it may be true.'

"'Then Jupiter would be a half-sun, half-planet,' said Eikōn.

"'A kind of secondary sun to his companion-worlds, yet a planet in himself,' said Stella. 'We must not remain here too long, Eikōn. Come, I have a yet more beautiful sight to show you.'

Part VIII

"Already they were five times as far away from the sun as when on Earth. But now a space almost as broad as the whole which they had already traversed lay before them.

"Jupiter is more than 450 millions of miles away from the sun. Another 400 millions of miles, unbroken by a single planet, had to be traversed before the nearest part of the orbit of Saturn could be reached. And Saturn lay by no means at that nearest point.

"Travelling was now no longer, as at first, through a flood of white and dazzling radiance. There was indeed still ample light for human eyes, and the sun still shone with an intense glow; but he had grown small in seeming size. And the surrounding brightness was but as twilight, when compared with the overpowering glare which had surrounded them in the neighborhood of Mercury.

"More than 850 millions of miles away from the sun, they came at last upon another great world. This fair planet was only a little smaller than Jupiter; and, like Jupiter, it had most beautiful tints and bands. It, too, whirled rapidly on its axis, in a full day of about ten hours. But unlike Jupiter it had a very sloping axis.

"The sun now looked extremely small, not more than one-hundredth part as large as the bright sun seen from Earth.

"About this delicately-colored orb, named Saturn, clustered no less than eight moons or small planets, at

different distances. These, travelling ever round the great planet, went always with him in his long journey round the sun, just as our moon goes always with Earth in her journey. But the length of Saturn's yearly tour is almost as much as thirty earthly years.

"In addition to these moons was something else, far more rare and lovely.

"Round the body of Saturn, and exactly over that part which we should call Saturn's Equator, was a wonderful ring of light.

"As Eikōn looked, in silent amazement, he gradually saw that not one ring only, but two distinct rings, divided by a gap, surrounded Saturn. One of these was very bright. Outside that was another of more greyish hue. Presently he perceived also an inner and third ring, within the brightest, dusky in color, and so slight in texture as to be transparent.

"These rings, seen one way, were very slender; not much more than a hundred miles in thickness. A man standing upon Saturn's Equator, exactly under the rings, and looking up, would be able to see only a narrow edge or line above him in the sky, if, indeed, he could see it at all.

"But while the thickness of the rings was so slight, their breadth between that inner edge and the far distant outer edge was something quite enormous. For, while the inside rim of the inside transparent ring was only about ten

thousand miles above the surface of Saturn, the outside rim of the outside greyish ring was nearly fifty thousand miles away.

"'What can these marvelous rings be?' Eikōn asked of Stella.

"'I cannot tell you, with certainty,' she answered. 'They are very likely formed of countless millions of meteorites, always whirling round the planet, and shining in the sun's light. So, at least, some suppose. Others think they may be immense numbers of very small satellites; "moons" we may call them.'

"'Extraordinary!' murmured Eikōn.

"'Come with me to a position exactly over the uppermost ring,' said Stella, spreading her wings. 'Now look down and see what a mere edge is visible. Yet if we pass towards the north or south of the planet, what a breadth of surface we see in the rings, reaching outwards from Saturn.'

"'What a lovely world Saturn must be to live on!' cried Eikōn.

"'I am not so sure,' replied Stella, with a half-smile. 'Those rings are wonderful, certainly. But note what a shadow they cast on the body of Saturn. That shadow of the rings must entirely hide the sun from large portions of Saturn during months, and even years, at a stretch. Such prolonged eclipses would be very uncomfortable, to say the least.'

"'I did not think of that,' said Eikōn. 'To be sure, the rings do only seem to shine on that side which is towards the sun. O yes and I see quite plainly the ring-shadow thrown upon Saturn.'

"'That would be a disadvantage,' repeated Stella. 'Besides, it seems probable that Saturn, like Jupiter, is quite enwrapped in clouds. The actual Saturn within those clouds may be a good deal smaller than we suppose, and may also be in an extremely heated condition still.'

"'Then, of course, no one could well live upon Saturn,' said Eikōn slowly. 'But the moons,' he added; 'Stella, what of the eight moons?'

"'Ah, that may be,' she answered. 'Saturn, with his beautiful rings, might form a very delightful secondary sun to those eight small worlds. But we do not know that this is the case, Eikōn.'

"'I should think it very likely,' said Eikōn wistfully. 'If only one could be quite sure of everything, Stella!'

"Stella shook her head and smiled again, at this sign of childish impatience.

Part IX

"'Eikōn, we have come a long way,' she said. 'Are you weary?'

"'My wings are getting tired,' confessed Eikōn. 'But do not let us give up yet. I have not seen all the Solar System.'

"'We have journeyed now nearly ten times as far from the sun as our own earth,' said Stella. 'Are you prepared to go as much as the whole of that great distance over again before reaching the orbit of Uranus?'

"'So much!' said Eikōn, astonished.

"'Uranus is quite double the distance of Saturn from the sun, twenty times as far as Earth.'

"'Well we will go,' said Eikōn resolutely. 'I do not wish to be beaten now.'

"Then, with laboring though still rapid flight, they passed onward through these dreary extents of space. All around was empty space empty, at least, to human eyes and ears—space, unbroken by the presence of a single planet; space, unlightened save by the glittering stars, and by one distant tiny sun, shining intensely still, yet with ever-lessening power; space, cold, forlorn, and desolate. Some comets and many meteorites they might, no doubt, have seen on their way; but the children's wings were growing weary, and attention flagged.

"'The year of Uranus is eighty-four of our earthly years,' said Stella, as they went. 'A man who should be eighty-four years old on earth, would, on Uranus, have just completed his first year. I did not tell you the speed of Saturn, which is only five miles each second. Uranus journeys at the rate of four miles, and Neptune at the rate of three miles each second. A change, indeed, from

Mercury's whirling flight. But the pull of the sun's attraction is greatly lessened here.'

"'We seem passing into dusk,' remarked Eikōn. 'The sun is strangely brilliant still; but his rays have little power.'

"'The sun is still the great center, Eikōn. Uranus and Neptune are held captive by him, no less than Mercury and Venus.'

"Presently they came upon another world, not nearly so large as Saturn, yet very much larger than Earth. This world travelled on his lonely pathway, at a distance from the sun of some 1,700 millions of miles. So Stella told Eikōn. Four moons accompanied Uranus in his journey round the sun.

"'I would not live here,' murmured Eikōn.

Part X

"'I have only one more world to show you,' Stella said. 'Eikōn, shall we rest satisfied and turn homewards?'

"Eikōn shook his head.

"'Think,' she urged; 'the way is long, and our wings are failing us. Jupiter was five times as far from the sun as Earth. Saturn was nearly twice as far as Jupiter. Uranus is twice as far as Saturn. Neptune will be not very much less than twice as far as Uranus.'

"But Eikōn would not give up. With toiling wings and tired imaginations, they still pressed onward; and this last great breadth of darkening space was crossed.

"At length they were near enough to see another lonely world, slightly larger than Uranus, rolling on his dreary course through untracked space. Eikōn caught a glimpse of one faint moon, journeying side by side with the large planet. The sun now showed as scarcely more than a very brilliant and dazzling star.

"'About one hundred Earths would make a planet as large as Neptune,' Stella's voice said. 'Neptune's year is one hundred and sixty-five of our earthly years. See how small the sun has grown, Eikōn, yet he controls still the movements of Neptune.'

"'And what comes next?' asked the boy, in awestruck tones.' After Neptune what next?'

"'Next! The stars,' she said. 'We know of no planets beyond Neptune.'

"Eikōn gazed about at the radiant points of light which shone around above, below, and on every side as he floated with Stella in silent space. 'Which is the nearest star of all?' he asked. 'Could we not visit one star, before we go home? '

"'What! when your wings are already weary!' she said. 'Eikōn, the whole distance which we have already come is but a step on the way to the nearest star. Are you prepared to repeat this great journey more than seven thousand times?'

"Eikōn made a sign of dissent.

"'But between us and the nearest star!" he said; 'what lies between, dear Stella?'

"'I do not know,' she replied. 'A passing comet here or there, perhaps. Some comets do come, it is said, from distant stars, to visit our sun. Nothing else is there, so far as we are aware, except space and darkness.'

"'Darkness all the way! No sunlight, Stella?'

"'The stars are suns,' said Stella. 'But they are very far away. The nearest is our own sun. The next nearest is more than seven thousand times more distant. There must be between a great gap of darkness and emptiness to human eyes and ears. It is not darkness to God, Eikōn,' she added softly. 'It is not emptiness to Him. I do not suppose it is darkness or emptiness to His angels. There may be many a sight there which our eyes could not see, and many a sound which our ears could not hear.'

"'But, oh Stella! it is too forlorn, too dreary!' cried the boy. 'I cannot stay in these desolate wastes. Oh, let us go home! Take me back to the regions of warm sunshine!'

"And even as he spoke the lonely planet faded from sight; the glittering stars vanished. He had one glimpse of a parting smile from Stella. Then a blaze of summer sunshine was about him once more; and birds sang gleefully on every side. Eikōn's dream was ended."

Chapter XXIII
What Might Have Been Seen

"Oh, I wish I wish he hadn't ended in such a dreadful hurry," cried Ikon. "I do like that dream. And I did so want them to go from Neptune to a real star. Why couldn't they?"

"I do not think you quite understand how far distant the real stars are," said Fritz.

"O yes, I do!" replied Ikon, in a rather injured tone. "Of course I do, because Herr Lehrer told me. If our earth was only four inches off from the sun, the nearest fixed star would be fourteen miles off. There, Mr. Fritz!"

"Not badly answered," said Fritz.

"But couldn't Eikōn and Stella have gone?"

"Hardly," said Fritz. "Their wings were tired. And I am tired of reading."

"I'm sure you must be tired, because that was such a great long dream. It has been so very very good of you, to write such a lot for me," said Ikon gratefully. "I can't thank you enough, not nearly. I do wish you weren't going away!"

"I shall not be gone many months," said Fritz. "And you won't mind, because somebody else is coming."

"Somebody else! Who?" asked Ikon.

"Ah! that is the question."

"Not my Professor?" cried Ikon.

"No, not Herr Lehrer. You must not ask who it is."

"Well I won't," said Ikon, sighing. "Though I do want tremendously to know. I'll only try to guess. But I don't think there's anybody else I know, so it must be a stranger. O Mr. Fritz, do please just tell me what Eikōn and Stella would have seen if they had gone on to the nearest star."

"They would first have gone a long long way through darkness," said Fritz slowly. "Darkness except for the light of all the stars."

"And the sun and moon," said Ikon.

"The sun would be merely one star among others; and the moon would be quite invisible at that distance. You forget that we are talking of far-off space, beyond Neptune."

"Would the stars look as bright there as here?"

"Much brighter, for there would be no air to dim them."

"Oh, then they would shine and wouldn't twinkle; like when Eikōn saw them from on the moon," said Ikon.

"Exactly so. But out in space, where we suppose the children to be, they would see stars all round, in every direction above and below too."

"It seems so funny to think of standing on nothing, and there being really no up and down," said Ikon thoughtfully.

"I don't say there is really no up and down out in space, Ikon. I only say we do not know that there is beyond what we on our little world choose to call 'north' and 'south.'"

"Please go on and tell me what the children would see," entreated Ikon.

"They would have an immensely long journey," said Fritz. "On and on and on through space, with distant stars always shining steadily on every side. And by-and-by, as they came a little nearer the star to which they were going, they would pass into just a little more light. This light would grow and grow. The star, too, would become bigger and brighter, first like our sun seen from Neptune, then like our sun seen from Uranus, then from Saturn, then from Jupiter, and so on. They would gradually pass into another blaze of light and heat, such as the planets near our sun enjoy."

"Wouldn't there be any more planets?" asked Ikon.

"Very probably. We cannot from earth see planets at such a distance. A planet only shines, as a rule, by borrowed light; and that is too dim to reach our eyes. So of course one cannot speak with certainty. But it is most

likely that many of the stars have their own families of worlds, just like our sun."

"And comets too and little meteorites?" asked Ikon.

"Probably," repeated Fritz.

"Mr. Fritz," said Ikon, "somebody was talking one day about a meteor. Is that the same as a meteorite?"

"A meteorite means a little meteor," said Fritz. "Meteors shine brightly and pass quickly away, as meteorites do."

"Then meteors are shooting-stars too," said Ikon.

"Meteors are generally too big to be called stars," said Fritz. "There was rather a fine one seen here lately; and I dare say that was how you heard them talked about. I was walking on the Downs with a friend, and had a good view of it."

"Do tell me what it was like," said Ikon.

"Well it was much larger than a common shooting-star," said Fritz. "And it did not go so fast, or die out so rapidly. It seemed to leave quite a trail of light in the sky. Sometimes meteors are seen to explode with a noise. However, they are not nearly so common as meteorites."

"They aren't like the real stars I mean, they are not suns," said Ikon, half questioningly.

"Certainly not. We don't know much about the real nature of meteors; but, at all events, they are not suns. If a

real star came so near our earth as the meteors come, the earth would be burnt up."

"Would Eikōn have seen meteors as well as meteorites, if he had gone on?" inquired Ikon.

"Not meteors aflame, Ikon. They probably catch fire, like the meteorites, passing through our atmosphere."

"I do wish Eikōn had gone on and seen it all."

"I think you are a little boy who is never satisfied," said Fritz.

"O yes, I'm quite satisfied," cried Ikon. "It has been so delicious. O Mr. Fritz, do please tell me something. There were such lots in the dream about attraction, and I couldn't understand, and I was afraid to speak, because you don't like me to interrupt."

"Well you may speak now," said Fritz. "Didn't I explain to you one day about gravitation? "

"O yes gravitation and attraction. I haven't forgotten all that," said Ikon. "You told me how the earth pulls and pulls and pulls everything down to itself. And that is why things are heavy."

"In the same manner the sun attracts," said Fritz. "He pulls and pulls all the planets towards himself. And that is why the planets are heavy."

"Are they heavy? Is our earth heavy?" asked Ikon.

"Certainly they are. We are able to calculate, from the manner in which the sun pulls, and in which they pull each other, how heavy each planet is, compared with the rest."

"Stella said Jupiter and Saturn weren't so heavy as she thought they would be, Mr. Fritz."

Fritz laughed to himself at the wording of the sentence. "Jupiter and Saturn do not weigh so much as we should expect from their seeming size," he said.

"So perhaps they aren't really so big, except for the clouds all round them," added Ikon. "I wonder why the sun pulls so at all the planets."

"I cannot tell you why, Ikon except that God has made all substances with this curious power of attracting or pulling every other substance. The planets attract one another and attract the sun also. But the enormous size and weight of the sun make his pulling by far the most important."

"I wonder what would happen if the sun didn't keep on pulling," said Ikon.

"Something very dreadful would happen, Ikon. The earth and all the planets would rush away from him, far off into space, and would be lost in cold and darkness."

"But why" asked Ikon. "Why shouldn't all the planets just stay quiet where they are, near to the sun?"

"Because none of the planets are quiet," replied Fritz. "They are all rushing round the sun at a great speed. When

a heavy body is moving fast, it is always naturally inclined to go forward in a straight path. Now the sun's attraction prevents this. The sun keeps pulling each planet out of a straight course, and forcing it to travel in a bent path round and round himself. But if once the sun ceased pulling, all the planets would rush madly away into space, leaving the sun behind them."

Ikon sat and thought.

"On the other hand," continued Fritz" if the planets did not rush, but were ' quiet,' as you suggested just now, they would all fall down upon the sun and perish."

"Would they?" said Ikon.

"Certainly. The attraction of the sun is so great, that only the rapid rush of the planets can keep them from being dragged too near."

"And the nearest planets have to go the fastest," said Ikon.

"Yes. The less distance, the greater attraction," said Fritz.

"And the farthest planets have to go the slowest," said Ikon. "But it isn't very slow. Jupiter goes five hundred miles a minute."

"Quite correct," said Fritz.

"Mr. Fritz, suppose Jupiter took to going six hundred miles a minute?"

"Then he would gradually move to an orbit farther away from the sun than now," said Fritz.

"And suppose he went slower?" said Ikon. "Suppose he didn't go more than four hundred miles a minute? O please let me guess; wouldn't he go nearer to the sun?"

"Yes, certainly. But that ought not to be a mere guess," said Fritz. "You ought to feel sure that it would be so."

Chapter XXIV
How the Moon Goes Round

"Mr. Fritz, I'm afraid you are in a great hurry to go," said Ikon wistfully. "But there's one thing more that I want most dreadfully to know about, and nobody has told me; not Herr Lehrer, nor you neither."

"You need not say 'nor' and 'neither' too," said Fritz. "One negative is enough. What do you want to know?"

"About the moon's halves and quarters," said Ikon. "What you called the moon's 'faces,' Mr. Fritz."

"Phases, not faces," said Fritz. "The changes through which the moon seems to pass every month."

"Yes. I don't know why the moon doesn't always look round, like the sun," said Ikon. "I've been thinking and thinking, and I can't make it out one bit."

"Quite right to try," said Fritz. Then he sat for some seconds, considering while Ikon stared hard at him, as if expecting to read an explanation in his face.

"Have you a lamp and a small globe, Ikon?"

"O yes, there's a lamp in the schoolroom, and there's the school globe," said Ikon. "Herr Lehrer gave me a lesson with them. But it's daylight now."

"Never mind. We can make it dark. Come."

Ikon followed in high glee. Fritz seemed to know the room well.

"We shall want the lamp lighted," he said. "Stay—you need not call anyone. I understand lamps. Give me some matches."

Ikon procured a box from somewhere near. Fritz lighted the lamp, put it on the center table, let down the blinds, and drew the curtains.

"Why, it is just like night," explained Ikon.

"Now for the globe," said Fritz. "That is rather too large for convenience. Have you a big india-rubber ball? Thanks that will do," as Ikon eagerly drew one out of a low cupboard.

"Now, stand near the table. Not too near. Remember, Ikon, that lamp is the sun. Your head is the earth. This ball is the moon."

"Am I to go spinning round the sun?" asked Ikon.

"Properly you ought, of course, to do so. But as our business now is with the appearance of the moon seen from earth, it will simplify matters to have you stand still. You must suppose that all the time you really are spinning on your axis and travelling round the sun; and that the moon is doing the same. The phases of the moon, however, can be quite as well shown without those movements."

Fritz held the ball outside Ikon, on the side away from the lamp. He held it a little raised above Ikon's head, so as to be out of Ikon's shadow.

"Now remember," he said again, "that people on the real earth can only see so much of the real moon as the sun lights up. The dark side of the moon is invisible to us. The sun is a star, and shines equally all round; but the moon is a planet, with a bright side and a dark side."

"O yes like the lamp and the ball," assented Ikon.

"How much of the bright side of the ball can you see now, Ikon?"

"I can see it all," said Ikon. "It is all bright towards me; and I can't see any of the dark side."

"Then, if this were the moon, very bright and far away, it would show a flat round surface like our full-moon," said Fritz. "At full-moon, the moon is outside the earth, away from the sun; and we see the full round bright side."

Fritz removed the ball slowly to one side of Ikon.

"You must turn gently, so as to look at the ball still," he said. "The real earth spins incessantly, and also has people all round to look. But you have only one pair of eyes. Now, how much of the bright part of the ball can you see?"

"I can't see all the bright side, Mr. Fritz. I can see half of the bright part, and half of the shady part."

"That is the half-moon," said Fritz "the shady part being invisible in the case of the real moon."

"But that doesn't look like the shape of the half-moon," said Ikon.

"Merely because the ball is near, and you can see its rounded surface and also its dark side. If it were so far off as to look flat, if the dark part were hidden and the bright part were very bright indeed, then you would have exactly the half-moon shape."

Fritz moved the ball slowly on, till it was between Ikon and the lamp a little lower down than Ikon's eyes, so as not to hide the lamp from him.

"Now," he said, while so moving "you can see less and less of the bright side, as it turns more and more away from you. That is how the half-moon grows into the crescent moon. How much can you see of the bright side of the ball now, Ikon?"

"I can't see a bit of it," said Ikon. "The bright part is quite turned away, and I can only see the dull half."

"Which means that you would not be able to see the real moon at all. That is what we call new moon. The new moon at first is quite invisible, because the bright side is turned entirely away, and only the unlighted half of the moon is towards us."

Fritz moved slowly on again, till he was on the other side of Ikon.

"Half-moon again," he said. "From a little crescent of light it increases gradually to half-moon; then on and on to full-moon once more."

"I think I do really understand now," said Ikon. "Mr. Fritz, didn't you once say that Venus had halves and quarters like the moon?"

"Yes. The explanation is very much the same," said Fritz. "Venus is a planet, with a bright and dark side. Sometimes we see the whole of the bright side, and sometimes only part of it. But I do not think you had better confuse your mind with going into that subject today. Try to be clear about the moon first."

"I'll try and not forget," said Ikon.

"I told you just now that we could never see the dark side of the moon," said Fritz. "But sometimes we do catch a glimpse of it, shining faintly not shining with sunlight, but with light borrowed from our bright earth."

"How funny!" said Ikon.

"Beautiful, rather than funny, I should say. Ikon, when I held the ball between your head and the lamp, I held it rather low. Why was that?"

"So as not to hide the lamp from me!" asked Ikon.

"Yes. I did so because it is so in reality. The real moon, passing between the real earth and sun, does not generally pass exactly between, but is as a rule a little higher or a little lower. Sometimes, however, it really does come exactly between. What is the result?"

Fritz lifted the ball as he spoke, and held it between the lamp and Ikon's eyes.

"Why I can't see the lamp," said Ikon.

"Which means that people on earth would be unable to see the sun," said Fritz.

"Does the moon truly hide the sun sometimes, Mr. Fritz?"

"Now and then it does so, at regular intervals—just when its pathway lies precisely between the earth and sun. That is what we call an eclipse of the sun, or a hiding of the sun. People used to be very much frightened in old days to see a black body creeping over the bright sun. But now we know what it means. Astronomers can tell us beforehand exactly when such an event will happen."

"Is the sun hidden for a great while?" asked Ikon.

"No only for a few minutes at the most. Sometimes the moon only comes enough between to pass over a part of the sun's face. But now and then we have what we call a total eclipse, when the moon quite covers the sun. Those are the times when, for a few seconds, the sea of fire round the sun may be seen in a telescope, and the tall flame-mountains, and the lovely corona. For the round dark moon hides the dazzling body of the sun, and then these appearances become visible."

"I remember about the flame-mountains and the corona," said Ikon. "Mr. Fritz, when you held the ball on the other side of my head, you put it up high. Was that for the same reason?"

"Do you think my reason could have been just the same, Ikon? Think before you speak."

"The ball couldn't have hidden the lamp from me, because it was on the other side of my head, and not between," said Ikon, after a pause.

"True. But something else would have been hidden, if I had held the ball lower."

"Would it?"

Fritz stretched out his hand with the india-rubber ball, to the "full-moon" position. This time, however, the ball was as low as Ikon's head.

"How much of the bright side of the ball can you see now?" he asked.

"Why, the ball isn't bright at all, Mr. Fritz; not any part of it. The lamplight can't get to the ball."

"Why not?"

"It is too low down. My head comes right between."

"Between what?"

"The lamp and the ball," said Ikon.

"In other words, the earth comes between the sun and moon, and cuts off all sunlight from the moon,' said Fritz. "Then instead of a bright full-moon, the shadow of earth hides the moon from our sight—just as the shadow of your head now falls upon the ball."

"But I can see the ball, Mr. Fritz."

"Yes, because it is so near. We cannot see the moon when she is in shade. That hiding of the moon by the earth's shadow we call an eclipse of the moon. It happens now and then at stated times."

"Do astronomers know beforehand?" asked Ikon.

"Yes, always."

Then Fritz put down the ball.

"I must go now," he said. "Good-bye, Ikon. I have quite enjoyed our story-readings. By-and-by, when I come home again, I should like to show you some stars through my telescope. You must grow strong before then, so that Dormer will not be afraid of the night air. Meanwhile I expect you and Stella will become fast friends."

"Oh, is Stella coming?" cried Ikon. "The real live Stella! Will she be a dear little girl in white?"

"Dear me, I quite forgot," exclaimed Fritz. "I was not to have said anything. Well never mind; you must have known soon. Yes, she is coming next week, to pay your father a visit."

"And me too?" asked Ikon.

"I suppose so."

"Will she stay long?"

"A few days, perhaps. You will soon be friends. Good-bye, Ikon."

And Fritz vanished.

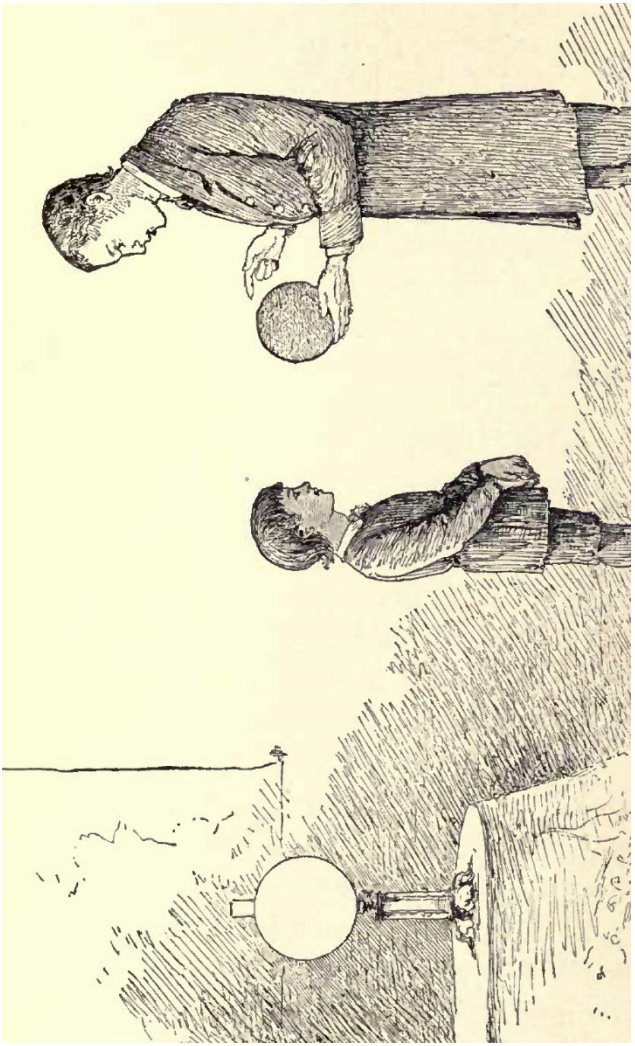
Chapter XXV
Stella

Nearly a week passed. Ikon sat one day alone in his playroom, indulging in dreams of the coming visitor. A vision floated before his mind's eye of a gentle little maid, robed in white, with long fair hair and gauzy wings. Of course he knew the wings to be a mistake, but he never could banish them when thinking of Stella.

Suddenly the door-handle turned, and somebody entered.

Ikon looked up, and a great rush of disappointment swept over him. Was this Stella? No wings, of course; that he knew he must expect. No floating fair locks either, or snowy frock, or childish form. The newcomer was many years older than Ikon; quite a full-blown young lady, he thought sorrowfully. She was dressed in brown from head to foot; and her fair hair was rolled up into a neat coil; and her blue eyes were sparkling and full of fun, not at all dreamy or star-like.

Ikon said nothing. He did not even get up. He was so dreadfully disappointed that he quite forgot to be polite, and only sat still, staring with all his might.



But the young lady did not seem at all distressed. She came straight up to the boy, with a light decided step, and said smilingly,

"How do you do? Are you Ikon?"

" Yes," said Ikon dismally.

"And I am Stella. Now we know one another, don't we?"

Ikon could say nothing. His eyes filled with tears.

"You don't mean to say you are sorry to see me?" asked Stella, bending over him with a kind look.

Ikon could not help it. He burst into a sob, and said—

"Oh, I did think Stella was to be a dear little girl. Mr. Fritz told me so."

"Mr. Fritz saw me years ago, and he can't imagine that I have grown any older," said Stella.

Then she threw aside her brown hat, and pulled off her brown gloves, and sat down beside Ikon, and kissed him.

"Come, you are not going to be miserable," she said. "Think how uncomfortable I shall feel, if you don't give me a welcome. You really need not mind about my age. People say I am a child still in many ways. And seventeen is not so very old."

"It's most dreadfully grown up," said Ikon in a doleful voice.

"O but I am not grown up at all yet. I don't know how to grow up, and I never did. You and I are going to have all sorts of fun together. And my father says you are just as fond of the stars as I always have been."

"Are you fond of the stars?" asked Ikon, a little comforted.

"I love them dearly. Don't you?"

"O yes. Only I want to know more about them," said Ikon.

"Well, perhaps I can tell you a few little things," said Stella. Then, with a merry look in her eyes, she added, "I believe you and I have already taken a long journey together not to the stars, but to the planets. Naughty Mr. Fritz! "

"But that was quite a little girl," said Ikon.

"A little girl with wings and a white frock. I used to wear white frocks a great deal when I was small. Well, I have not wings, Ikon, certainly, except invisible ones."

"Herr Lehrer said I had wings," remarked Ikon.

"So he told me."

"Do you know that dear nice Herr Lehrer?" cried Ikon.

"Know him! He is my father."

"O then I shall love you," said Ikon, with great eagerness.

"Did you not know that I was his child?" asked Stella. "No wonder I have learnt to love the stars, Ikon, with such a father to teach me."

"Does Dormer know you are here?" Ikon presently inquired.

"Yes; and everything is all right. My box has gone to my room; and I have had a cup of tea; and I told Dormer she need not trouble herself about me anymore till I have to dress for dinner. I thought it would be pleasant to come and make your acquaintance the first thing. For it seemed as if we ought to know one another, after taking that long journey together among the planets."

"But it wasn't me. It was Eikōn," said Ikon.

"I don't think that makes much difference," said Stella.

Ikon crept a little nearer to his new friend, and very soon her hand was passed softly over his hair.

"I hope you will stay a long while here," he said wistfully.

"Only a week, just now, I am afraid. But we shall soon meet again, I hope."

"Will you talk to me about the stars this week?"asked Ikon.

"I'll talk to you about anything you like, Ikon."

"I want to, know about the real stars," said Ikon. "I have heard lots about the planets. But it's always the planets, and not the stars."

"The planets are not so far off, so of course they come first," said Stella.

"Yes, I liked to know about them first. It wasn't so difficult, I suppose, as farther-off things would be," said

Ikon seriously. "But I should like to learn now about the real far-off stars."

"Do you happen to know which is the nearest star of all!" asked Stella.

"No," said Ikon, "I never heard its name."

"Are you quite sure?"

"O yes; quite," said Ikon.

"Curious," said Stella quietly. "Did neither my father nor Fritz ever speak of the sun?"

"Oh, the sun!" Ikon exclaimed.

"That is the nearest star," said Stella. "Don't you know that the sun is a star?"

"I forgot," said Ikon. Then a smile broke over his face, and he said, "I think you are the nearest star of all just now."

Chapter XXVI
Star Journeyings

"How much do you know about the stars, Ikon?" asked Stella.

"I don't know more than a very very little," said Ikon.

They were out in the garden together, sitting under a tree, and enjoying a lovely spring day.

Ikon could not help thinking about the dream-story of the journey to the sun, and of the children with wings. But he no longer wished to exchange the real Stella for the fancy Stella. He loved her already, though she had not been twenty-four hours in the house.

"Tell me something of what you do know," said Stella.

"I know the stars are always in the sky always bright," said Ikon, after some thought. "Only we can't see them in the day because of the sunlight."

"Because of the sunlight and air together," said Stella. "Sunlight alone would not hide the stars. The air weaves a veil of sunbeams, and the stars cannot shine through this veil."

"O yes I remember it was air too," said Ikon. "And the stars rise and set, like the sun. There are always stars rising

and stars setting, all day and night. And they don't really move, because they are fixed stars; but the earth spins round and round, and that makes the stars seem to rise and set and the sun and moon too."

"Do you happen to know whether we always see the same stars at the same hour of the night, all the year round, Ikon?"

"No," Ikon said slowly. "I don't think so. I'm almost quite sure we don't. Because my star went away. And Herr Lehrer said they did change a little every day."

"Did seem to change," said Stella.

"Is that only seeming too?" asked Ikon.

"Nothing more. It is caused by the earth's own movement; not her daily spinning, but her yearly journey round the sun. Day after day as she moves on in her orbit, slight changes seem to take place."

"What sort of changes?" asked Ikon.

"If you watch any particular star set tonight, that star will set tomorrow night four minutes earlier. It is the same with all the stars. Four minutes every day mounts up to half-an-hour in a week, or six hours in three months. So a star which is above the horizon at nine o'clock this evening, may be below the horizon at nine o'clock a few weeks hence. By-and-by most of the stars which are now hidden from us by daylight, will be visible at night. There is a constant steady change going on through all the year."

"But some stars don't set at all," said Ikon.

"Some stars never set to us who live in the northern hemisphere, and those stars never rise to people who live in the southern hemisphere. Some stars which are always seen in the south are never seen in the north. But there are constellations which we see at night in winter, and can't see in summer and others which we see in summer and can't see in winter."

"I wish I could understand it all properly," said Ikon, with knitted brows.

"You must have patience," said Stella, patting his cheek. "These things take a long while to learn properly. I am only giving you a few ideas now, to make you wish to know more. Tell me if you quite understand something else. What is our sun really?"

"It's a great big hot blazing" Ikon hesitated, and then said "star."

"You are sure it is a star?"

"Yes," Ikon said; and then he paused again. "Is it a fixed star?"

"Yes and no," said Stella. "Fixed and not fixed."

"The sun seems to move every day," said Ikon.

"Yes, but you know that to be merely in seeming. When we talk of fixed stars, do you know what we mean?"

"Why that the stars don't really move at all," said Ikon.

"No; we only mean that they do not seem to move."

"But they do," Ikon began, and paused.

"They seem all to sweep over the sky or round the North Pole in company, every night. They do not seem to move about among themselves. We never see one star going faster than another. We never see a constellation breaking up, or taking a new shape. The stars do not seem to travel in space like the planets, each on its own separate pathway."

"O no, I understand," Ikon said brightly.

"And yet the stars really do move," said' Stella.

"The sun journeys, and the stars journey. Every single star, so far as we know, is rushing through space, with his own particular speed, and on his own particular pathway. Some go faster, and some go more slowly. Some go this way and some go that way. The sun is only one among multitudes of rushing stars."

Ikon's eyes were wide open. "Mr. Fritz didn't say so," he observed. "When Eikōn saw the sun in his dream, it was quite still; only turning round and round."

"And yet the sun does move," said Stella.

"Very very slowly, I suppose," suggested Ikon.

"Why, no I don't call it so very slowly. The sun travels at the rate of about four miles each second or two hundred and forty miles a minute."

"I do wonder he doesn't leave some of the planets behind him," said Ikon. "Not most of them, though, of course he wouldn't, because they go so much faster than that."

"They go faster round the sun. But that is quite another matter. You are confusing two things together."

"Am I?" said Ikon.

"Yes. When you think of the planets' journeys round the sun, you must think of the sun as nearly in the center, quite still and fixed. But when you think of the sun's journey in space, you must picture all the planets as journeying with him, just at the same speed as himself. They travel in their orbits round the sun; and also they travel with the sun in his great orbit among the stars. Just, as the moon travels round the earth, and also travels with the earth round the sun."

"There seem such lots of ways of going," said Ikon.

"Yes; but you must not jumble up all the separate motions together. Try to have them clear in your mind. There is no real confusion."

"Only it's a little puzzling," said Ikon, in a tone of apology.

"Think of the moon for a minute," said Stella.

"First, she spins on her own axis. Secondly, she travels round the earth. Thirdly, she goes with the earth round

the sun. Fourthly, she and the earth journey with the sun through space."

"Four," murmured Ikon.

"But there is no confusion. Everything fits in with everything else. The moon's journey round the earth does not interfere with her turning on her axis. The moon's journey round the sun does not interfere with her journey round the earth. The moon's journey through space does not interfere with her journey round the sun."

"Does the sun make all the planets go with him?" asked Ikon.

"Yes very much as the earth makes you and me go with her. The planets are all held in and drawn on by the sun's mighty attraction. When the children in the dream saw the sun at rest, it must have been because they were in the Solar System, and so were journeying with the sun and planets as part of the Solar System. You and I are always travelling with the earth, but we don't feel ourselves to be moving; and the earth seems to us to be at rest."

"Was that what Mr. Fritz meant in his story?"

"I don't know what else he could have meant," said Stella, smiling.

Chapter XXVII
Fast, Yet Slow

"But the stars don't go as fast as the sun goes," said Ikon.

"Some of them very much faster. Our sun is rather a slow star," replied Stella.

Ikon evidently thought he had caught Stella in a mistake. He drew his brows together, and burst out with a "But—"

"Well?" she said, looking amused; "don't be afraid to speak out, Ikon."

"If the stars were really all rushing and rushing about all sorts of different ways, they couldn't all stay always looking just exactly the very same," said Ikon, with extreme eagerness.

"No, they couldn't," said Stella, shaking her head "Changes must show in time."

"But they don't," said Ikon.

Stella smiled again, and was silent.

"I know they don't, because Herr Lehrer said so," pursued Ikon. "Or else it was Mr. Fritz; but I think it was

Herr Lehrer. He said that if Abraham was to see the stars now, he wouldn't see any change."

"You mean that if Abraham were to look at the stars from earth, he would not find them different from what they appeared four thousand years ago, seen then from earth," said Stella.

"Was Abraham four thousand years ago?" asked Ikon.

"Somewhere about that," said Stella.

Then she drew a little Bible out of her pocket, and opened it.

"I suppose you and my father were thinking of this passage," she remarked

"'And He brought him forth abroad, and said, Look now toward heaven, and tell the stars, if thou be able to number them.' "

" Abraham did see the stars then, didn't he?" said Ikon.

"Yes and very often besides, no doubt."

Stella turned over the leaves of her Bible, till she came to the ninth chapter of Job, when she read again

"'How should a man be just with God. Which alone spreadeth out the heavens... Which maketh Arcturus, Orion and Pleiades?'"

"Is Arcturus in the Bible?" said Ikon, greatly interested. "O let me see, please. What are the other two?"

"Orion is a splendid group of stars, supposed to be a man with a sword and belt. Pleiades is a small cluster of many stars very close together. Five or six can be commonly seen in England; sometimes seven, with good sight. There is a curious soft shine about the Pleiades. We see Orion and Pleiades in the winter and spring months, in England."

Stella turned over some more leaves.

"Listen, Ikon. This is in the thirty-eighth chapter of Job:

"'Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion?'"

"What does 'sweet influences' mean?" asked Ikon.

"I don't know unless—it means the attraction which those distant suns exercise over other stars and worlds," said Stella.

"I wonder if it is that!" said Ikon. "Then the Plei—"

"Pleiades," said Stella.

"The Pleiades are they real suns too?"

"We believe so. There is no doubt of it," said Stella.

Closing her Bible, she added:

"You see, Ikon, these constellations seem to have been known long ago in the days of Job and Abraham. Many of the chief constellations and leading stars had their names

given to them in very early times farther back than we should imagine."

Ikon said "Yes," and waited, for Stella plainly had more to say.

"I should not wonder," she went on slowly, "if a man had studied the stars from earth, in Abraham's days, and were to study them again now, in the same manner I should not wonder if he were to see no changes."

"No," said Ikon; "that was what Herr Lehrer meant."

"But that does not at all settle the question about the stars moving," said Stella. "There were no telescopes in Abraham's days, Ikon, no means of making such close and delicate measurements as are made now."

"No," said Ikon.

"And without such measurements, and without powerful telescopes, the real movements of stars could not possibly be discovered. The stars are so very very far away, that changes among them, seen from earth, take place with extreme slowness. How slowly you would never guess."

"Tell me about them, please," said Ikon.

"Arcturus, for instance," began Stella.

"My star!" whispered Ikon.

"Arcturus is one of the fastest stars known to us. Arcturus is known to be constantly rushing through space at the rate of fifty-four miles each second."

"Oh—h!" exclaimed Ikon. "Why that's ever so much faster than even little Mercury."

"Not much less than twice the speed of Mercury. And yet, Ikon, though Arcturus is really journeying at this tremendous rate, we cannot see his speed. He seems to creep across the sky, in the slowest fashion. If you watched Arcturus steadily for a hundred years, with the most exact means of measuring his position, you would only find him crawl over a little bit of the sky, one-eighth as broad as the full moon."

"But why doesn't he go faster?"

"Arcturus does go faster really. He only does not seem to go fast."

"Well, but why doesn't he seem?" inquired Ikon.

"Did you ever take a journey by rail?" asked Stella.

Ikon nodded, and said, "Twice."

"Do you remember looking out of the carriage-window, and seeing everything seem to move the hedges and fields near at hand, and the houses and hills far off?"

"O yes they did hurry by," said Ikon.

"Which seemed to go faster those near at hand, or those more distant?"

"Oh, the things near at hand," said Ikon. "The telegraph posts just seemed to fly, and the bank went so fast I could hardly look at it. The hills a long way off crept quite slowly."

"Those were only seeming movements, not real," said Stella. "It was the train which moved, not the fields and trees. But you may understand from this, why the stars seem to go so very slowly."

"I suppose it is because they are such a great way off," said Ikon.

"Exactly that. As we look out from our earth, we see the heavenly bodies moving really moving, not only seeming to do so. Just as if in the train, you had been at rest, and all the houses and fields and hills had been whirling round you."

"How funny that would be," said Ikon.

"The appearance is the same in either case," said Stella. "The planets are near, and they seem to go fast. The stars are far away, and they seem to go very slowly. But this does not show that the stars may not be moving quite as quickly as any of the planets."

"No," said Ikon.

"We see almost no change in the groups of stars, since the days of Abraham," continued Stella. "But that is nothing. Four thousand years is only a very little while in the history of a star."

"Four thousand years seems such an enormous time," said Ikon wonderingly.

"Yes to you and me. It is a long while in the history of man. But it is not long at all in the history of the stars.

Some of the stars are so distant that twenty or thirty miles a second for four thousand years of travelling, only means such a tiny movement in our sky, that we cannot even perceive it."

"The stars must be very very old," said Ikon seriously.

"I don't know how old, Ikon. I don't know how long ago God made them. Their age is very great beside man's little life. But it is nothing beside the ages of Him who is 'King of Eternity!'"

Chapter XXVIII
How Many Stars There Are!

"Do you think Abraham knew how many stars there were, Miss Stella?" asked Ikon next day. They had been so busy in the garden and fields together, as to have no time for talking about the stars. But now it was evening, and after dark.

"No, I think not," Stella answered.

"God asked him to tell," remarked Ikon.

"Yes if he were able. But I am quite sure he was not able. Of course God could have told Abraham, and then he would have known. I do not believe that God did tell him, though. That sort of thing men are generally left to find out for themselves."

"Do people know now?" asked Ikon.

"We know more now than men knew in those days. We certainly do not know how many stars there are."

"I wonder how many Abraham could see."

"Oh, that's an easier question," said Stella. "It is said that we hardly ever see more than about three thousand stars at once."

"I should think it was millions sometimes," said Ikon.

"No: not more than about three thousand. Not nearly so many, except with a clear sky, and on a good night. A man with particularly strong eyes can of course see more than most people. And in the country where Abraham lived, the clear sky and air would make a larger number visible than in England."

"Three thousand isn't so very many," said Ikon.

"No; but I am only telling of those which can be seen with our own eyes, and no binocular or telescope to help. Great numbers lie beyond, quite out of sight to man's naked eye."

"I should like to know how many stars there really are," said Ikon.

"People generally want to know more than they can," said Stella. "Ikon, it is a very warm evening. Shall we go out into the garden, and have a look at the stars?"

"O do, please," Ikon said, in delight.

Dormer made no objections, only she insisted on much wrapping up. And presently they left the house together.

Ikon's father had an engagement that evening, and Stella had chosen to take tea with Ikon, instead of dining alone. So now she was free, not needing to dress for late dinner; and Ikon was charmed to have her quite to himself.

It was a beautiful night, perfectly cloudless. The stars shone brilliantly, and no moon dimmed them. Stella went with Ikon to a little rising ground near, where they had a fine view of the heavens.

"You are well placed for watching the stars," she said. "I wish our garden at home were as good."

"Don't they all shine and shine?" said Ikon, in a hushed voice. "Miss Stella, do tell me some of the names."

"Can you find me first the Great Bear and the Little Bear? Not that direction, Ikon. Don't you know that the Pole-star is in the north?"

"I always forget where north is," said Ikon.

He found the Great Bear first, and then the Little Bear, not so easily. "That is the Pole-star, Miss Stella, the tip of the Little Bear's tail. O do please tell me are those stars all really and truly moving all going along quite fast?"

Stella simply said, "Yes."

"As fast as our sun and Arcturus?" continued Ikon.

"Our sun and Arcturus don't go at the same pace," said Stella. "Arcturus travels fifty-four miles each second, and our sun only travels four miles a second. Look, Ikon—there is Arcturus—to the east. That bright star."

"My star!" cried Ikon. "The dear star that I lost! I'm so glad."

"Does it look like the same again?" asked Stella, smiling.

"I don't know. The stars are all so much alike only some are brighter. I think I should feel quite sure if I could see it over the poplars again. But my star was bright like that."

"If you can remember the day and hour when you saw it this year, you may look again next year at the same day and hour, and you will see your star in the same spot," said Stella.

"Arcturus does look so very very quiet," said Ikon, in a hesitating voice.

"So quiet, that you find it hard to believe he can really be whirling along at such a rate, don't you? Yes there is that difficulty with the stars. We are not able to understand their great distance."

"Miss Stella, does the Pole-star go along very fast?"

"Not very. About a mile and a half each moment."

"I think that's quite slow," said Ikon.

"More than five thousand miles an hour. Not so very slow, after all," said Stella, smiling. "Now I want to show you Orion. Look over there, low down in the west a large bright constellation, something like a man in shape. At least we fancy it so, and a picture of the constellation would give the outline of a man. There is a star for the head, and one for each arm, and one for each foot. There are three bright stars for the belt, and three fainter ones for

the sword hanging at Orion's side. It is a wonderful group of bright stars."

Ikon was very eager to understand the whole. Stella patiently explained, till he seemed satisfied.



"Now see not far from Orion, but more to the south, and very low down, there, Ikon a very brilliant star. That is Sirius."

"I've seen Sirius before. I know that star," said Ikon, in a tone of satisfaction. "Herr Lehrer told me it was a beautiful sun, most likely ever so much bigger than our sun."

"Sirius travels about fourteen miles a second not so slowly as our sun, and not so fast as Arcturus," said Stella.

"Sirius is so splendidly bright," said Ikon. "At least it was last time I saw it."

"Sirius is too low just now, to look his best. We will go back to the Pole-star, Ikon."

"I'm looking," said Ikon.

"You must take that for a starting-point in learning the constellations. The Pole-star scarcely seems to move at all. All constellations near the Pole-star seem to sweep round it once in every twenty-four hours."

"Yes that's only 'seeming,'" said Ikon. "It's because the earth spins. Miss Stella, does the Great Bear sweep round the Pole Star?"

"Certainly. Can you see the Great Bear?"

"O yes. Quite well. There he is!"

"Now, look at the other side of the Pole-star, opposite the Great Bear. There are five bright stars, shaped very

much like a W some say like an easy-chair. That constellation is called Cassiopeia."

"What a funny name!" Ikon said.

"The Great Bear and Cassiopeia are opposite each other, with the Pole-star between. On the other two sides of the Pole-star we shall find two bright stars, which you ought to know. There, on one side is Capella on the other side, opposite Capella, is Vega. So now you have four starting-points. The Great Bear and Cassiopeia opposite each other; Capella and Vega between those two, and opposite each other; with the Pole-star in the center."

"Won't you tell me more names?" asked Ikon.

"Not too many at once. But I will tell you how to find your favorite, Arcturus. You see, he cannot always be known by nearness to the poplar trees."

Ikon laughed, and said "No."

"Look at the Great Bear, Ikon. His tail points to a triangle of bright stars that is, three stars arranged in the shape of a triangle. I hope you know what a triangle is. Have you found them? "

"No," Ikon said doubtfully at first; and then "O yes; I do see quite well."

"The brightest of these three is Arcturus," said Stella. "So, while two stars of the Great Bear point to the Pole-star, three others point towards Arcturus."

"But they aren't called pointers too?" said Ikon.

"No. It is much more important to us to know where the Pole-star is, than to know where Arcturus is. So we think more of that pointing than of the other."

"But I do like to know where Arcturus is. I'll be sure not to forget," Ikon said joyously.

"One thing more I must show you," said Stella. "See there, Ikon rather low, and very far away from Orion a little group of stars close together, shining softly. You will see them better if you look at the sky close to them, instead of at the stars themselves. That little cluster of soft stars is called the Pleiades."

"That was what Job wrote about?" said Ikon.

"Yes. They are faint and dim, seen from earth; but we believe them to be, in reality, great and powerful suns, probably far more glorious than our own sun."

"I should like to go and see the stars," said Ikon.

"Ah, we don't know what a journey that would be," said Stella. "Look at all those stars, and think how tremendously far away they are from us! And that is nothing. If you had only a little telescope, hundreds of new stars beyond would appear. And with stronger telescopes, the hundreds would grow into thousands, and the thousands into millions; and still there would be no sign of any end to the stars. Suns beyond suns, and suns beyond suns, as far as man can see as far as man can imagine. It is wonderful!"

After a pause she said, "Do you see that hazy band over part of the sky? Look, Ikon like a broad river of dim light. Follow it carefully."

"I've often seen that," said Ikon. "It goes right across the sky. I wonder what it is."

"It is called the Milky Way," said Stella. "The Milky Way is made of stars hundreds, thousands, millions of stars! Some may be very large, and some very small; some more near and some more distant. But that stream of soft light across the sky is just the shining of countless suns far far away!"

"Miss Stella, does God know all about those suns?" asked Ikon.

"Why, Ikon, He made them! The Bible says, 'He calleth them all by their names.'"

"And would God be sorry if one of them died?" asked Ikon wistfully.

"I don't know," Stella said, gravely smiling. "The stars are His lamps, Ikon. If a lamp is not needed any longer, we put it out. There is no need to be sorry for that when the lamp has done its work. Some few stars have seemed to die out at different times so, perhaps, their work as lamps was done."

"Miss Stella," said Ikon softly—"Miss Stella, the stars seem to be such a great great way off. Do you think Heaven is among the stars or right away beyond them?"

"I don't know," Stella again answered gently.

"Perhaps among them, Ikon. Christ did not tell us where the 'place' was that He went to 'prepare.' But where He is, there Heaven is!"

Then they were both silent.

"Miss Stella," Ikon began once more, "are all those stars every one of the stars in the Milky Way moving like our sun?"

"There is no doubt that they are," said Stella. "So far as we are able to see, no sun or world in all the universe is at rest."

"But where are they all going to?" asked Ikon.

"Ah that I cannot tell you," Stella said. "It may be that they all travel round some far-off center, like the planets travelling round the sun. But we know so little."

Then the two went slowly indoors together, out of the solemn presence of those shining heavenly lamps.

Chapter XXIX
A Few More Questions

"Miss Stella, are the brightest stars always the biggest and the nearest?"

It was a day or two later, and Stella had come into the playroom with Ikon for a chat on his favorite subject. She was obliged to shorten her stay, and could only remain till the following morning.

Ikon did not, however, seem at all heart-broken. On the contrary, he had been in very high spirits all day, and had quite tired himself out with racing about.

For Stella had invited him to go a few weeks later, to pay a long visit to herself and Herr Lehrer. Ikon was so delighted with the prospect, that he hardly knew how to contain himself.

So to quiet him down, Stella took him to the playroom, for one more little talk about the stars. And no sooner were they seated than Ikon brought out the above question.

"No, not always," replied Stella. "Some of the nearer stars are small and look dim to us; and some of the farther ones are large and brilliant. Sirius is the brightest star we see, but he is by no means the nearest. Still, of course, a

great many stars are only faint through their great distance."

"I wonder why some of the stars are alone, and some are in Constellations," said Ikon.

"All the stars are in Constellations," replied Stella.

"Not Arcturus!"

"Arcturus is in the Constellation Boötes."

"And Vega!"

" Vega is in the Constellation Lyra; Capella is in the Constellation Auriga; Sirius in in the Constellation Canis Major."

"Oh I didn't know," responded Ikon.

"I want you to understand about these constellations, Ikon. They are not a real grouping of stars, not a grouping of stars really nearest together, I mean but only a fancy arrangement of stars, as they appear to us."

Ikon's assent had a puzzled sound.

"The stars which look near together may not really be near together," continued Stella. "Just as we might see the moon and Jupiter quite close to one another; yet they would really be far distant millions and millions of miles separating them."

"O yes—I see," Ikon said, brightening.

"The whole sky is parcelled out into different groups of constellations. Every star that we can see, with or

without a telescope, must be in one or another constellation. It is convenient to have the heavens so mapped out for man's use. But the real arrangement of the stars is a very different matter. The very nearest and the very farthest stars are classed together by us in one constellation and that of course is not their real arrangement."

"How are they really arranged?" Ikon inquired.

"We don't know much about that yet. We see stars in twos and threes and fours sometimes in clusters, and rings, and spirals, and streams. And often they really do belong together they are parts of one system or family of suns, going round and round one center in company."

"Couldn't you show me them some day?" asked Ikon.

"Perhaps my father will through his telescope. There are many stars which appear like only one to our eyes; but if we look through a telescope the one divides into two. Sometimes the two will even divide into four. Fancy worlds with four suns to light them, Ikon!"

"Wouldn't that be splendid?" said Ikon.

"Still more splendid, perhaps, if the suns were of different colors," said Stella. "What do you think of a red sun and a green sun?"

"But are there really suns like that?" Ikon asked.

"There really are many double-stars of different colors; two suns, with perhaps a family of planets

belonging to them. We cannot see the planets at this distance, so that is doubtful; but we do see the colors of the stars."

"I should like to have a beautiful red sun and a green sun shining in the sky at once," said Ikon.

"Perhaps the effect would not be so surprising as you think. Red and green together make white, and it may be that a red and a green sun together would give white light, such as we have from our sun. Still, the idea is very wonderful."

"Are any of the big stars pretty colors?" asked Ikon.

"Any of the brighter stars, do you mean? Sirius is a white sun now, but we believe that he was once a red sun. Arcturus is a red sun. Capella and the Pole-star are yellow and our own sun is one of the yellow stars. Vega is bluish. In the southern sky there is one group of beautiful blue suns. One can hardly fancy how that would appear to a world moving among them."

"Miss Stella, do the stars in the tail of the Great Bear all travel together?" asked Ikon suddenly.

"They are not near together," said Stella. "The space between those separate stars is enormous. It has been thought possible that they may be moving in something of the same direction. But when we talk of a double or quadruple star, we mean stars so near together that they really belong to one another. They may even then be much farther apart than the sun and Neptune, but they

travel round one center, and to our eyes without a telescope they generally look like one star."

"Everything seems such a great way off from everything, in the sky," said Ikon.

"No crowding, is there?" said Stella.

"O no! But the stars do seem dreadfully far," said Ikon.

"Did you ever hear of a Nebula?" asked Stella.

Ikon shook his head.

"We must get my father to show you one in his telescope. A nebula is a faint glimmer of light; only light, at first. But seen through a very powerful telescope, this glimmer of light will sometimes open partly out into a close cluster of stars, thousands of stars together, with more dim light behind."

"I should like to see a nebula oh, very much!" said Ikon.

"We will not forget. I must tell you more about this someday."

"There must be such lots more stars with a telescope than without it," said Ikon.

Stella laughed. "Yes," she said. "You have a funny way of expressing yourself, Ikon; but I know what you mean. It is very wonderful to count the number of stars visible to the naked eye, on one little patch of sky, and then to see what hundreds more become visible through a telescope, in that very same patch."

"I do wonder how many really bright stars there are in the sky," said Ikon.

"Stars of the First Magnitude, about twenty altogether. Of the Second Magnitude, about sixty-five, and of the Third Magnitude about two hundred. But these are scattered all round the world. Only about half the number can be seen anywhere at once."

"And we don't want a telescope to see those?"

"No. Our eyes can see stars up to about the Sixth Magnitude without help. After this a binocular is needed; then a small telescope, then a larger and larger one. And the number of stars visible soon mount up to hundreds of thousands, and to millions. How many hundreds of millions more may lie beyond, out of reach of the most powerful telescope ever made, we cannot even guess."

"I wonder how far off Sirius is," said Ikon.

"About four times the distance of the nearest star known to us," said Stella. "Ikon, do you know how fast light travels?"

"I didn't know it travelled at all," said Ikon.

"O yes, it does. Light is not everywhere at once. It journeys very fast in little waves much faster than the fastest star. Every second light flashes through thousands of miles not much less than two hundred thousand miles."

"That's tremendously fast," said Ikon.

"Here is a ray of sunlight falling in through the window," said Stella. "It has come straight from the sun. See how steady the shining is. Wave after wave of brightness comes more quickly than you and I can even fancy. The journey from sun to earth is very long. How much time shall we allow the little ray of light for that journey, Ikon?"

"I don't know," Ikon said doubtfully.

"Only eight minutes and a half. Look the ray is falling on my hand now. Only eight minutes and a half ago that same ray left the burning glowing sun."

"It's quicker than Eikōn went in his dream," murmured Ikon.

"I don't know how fast Wings of Imagination may carry one in a dream; but we do know how fast light can travel. It comes from the sun to us in eight minutes and a half. But from the nearest fixed star, light cannot arrive in less than three years and a half."

"What's the name of the nearest fixed star?" asked Ikon.

"Alpha Centauri. Don't forget, Ikon three years and a half, travelling at the rate of more than one hundred and ninety thousand miles each second."

"I'll try to remember," Ikon said soberly.

"From Sirius, light comes to us in twenty years."

"Oh!" Ikon said.

"From the Pole-star in about fifty years."

"I wonder the light doesn't get almost tired of going on."

"No fear of that," said Stella. "Think, Ikon when you looked at the Pole-star, two nights ago, the little ray of light which shone into your eyes had left the star itself fifty years ago long before you were born. For the Pole-star is two hundred millions of millions of miles away."

"And other stars?" said Ikon.

"Other stars are more distant still; so the light-journeys from them are longer. But you need not try to take in everything at once," Stella said.

Then Dormer entered the room, with a letter, which Stella opened and read.

"As I expected," she observed; "I must go home by the earliest train tomorrow. So you and I have had our last chat, Ikon, just for a little while. But very soon, I hope, you will come to us."

"I should be so sorry if it wasn't for that," said Ikon. Then he looked up in Stella's face suddenly, "Miss Stella, there's one thing I do want to ask."

"Ask," said Stella, smiling.

"I'm so puzzled, because Herr Lehrer is a German, and he is your father; so you must be German too, and yet you don't seem German."

"No; I am not at all German," said Stella. "My mother is English, and I have almost always lived in England."

"And you aren't like Herr Lehrer, are you?" said Ikon.

"Not much," replied Stella. "They say I take after my mother. I am only like him, Ikon and like you, too, in my love for the beautiful stars."

THE END

Star Stories for Little Folks

by Gertrude Chandler Warner

Preface

A LETTER TO YOU

Dear _____ ,

(Write your own name here.)

Before you read this little book, Dr. Lorry says I must tell you that the stars are not always in the same place in the sky. If you are not acquainted with them, it is easier to find them when they are just coming up in the east. So under the name of each group of stars, you will find the best time of year to look for it.

In the winter, I always had my lessons at seven o'clock, but after April it was so light that we changed the time to eight o'clock. Since then, there is a new plan to SAVE DAYLIGHT, so from April to October while this plan lasts, you will have to go out at nine o'clock on the dates printed with each lesson.

Dr. Lorry laughed when he found that his pictures were going into a real Astronomy book, and said if he had known this, he would have been more particular. But I have been able to learn the stars from them very easily.

As soon as you find a constellation, write the date on the dotted line under its picture. Then you will know

when you have earned your diploma. I hope you will have as good a time as I did, finding the fifteen constellations.

Your little friend,

Helen.

I. The Two Dippers

Look for the Dippers early in November

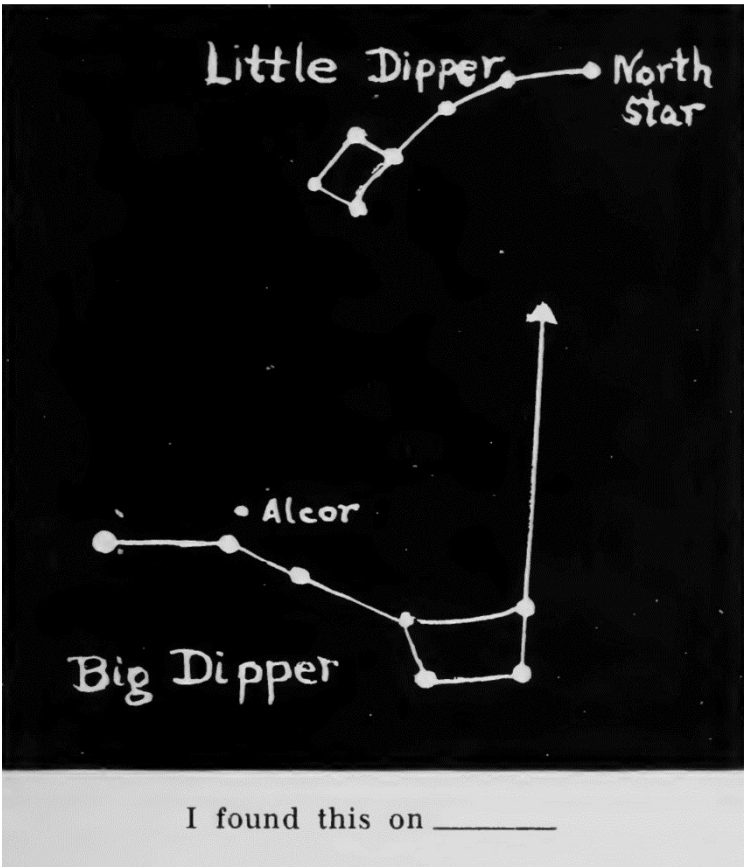
Doctor Lorry had solemnly promised Helen that when she grew strong enough to go out in the yard at seven o'clock, he would come up on purpose to point out some of the most beautiful stars, and teach her their names.

Night after night Helen had tossed in her white bed by the window. It was only when the kind nurse had pushed the shade up—slip, slip, creak, creak,—and let Helen look out at the wonderful starry sky, that she had been able to rest at all.

And now here she was down in the hall, dressed warmly from the top of her brown fur hat, with its scarlet rose, to her brown fur leggings, waiting for the big, burly doctor to keep his promise. And he kept it. He came chugging up in his long gray car, looking like a bear in his fur coat.

"Only fifteen minutes, sister," he said to Helen. "We mustn't take cold. We will go out to the garden path and face north, to get a view of the Big Dipper. No course of lectures is complete without the Big Dipper to start from."

"Please let it be a course of lectures," begged Helen.



"Very well," agreed Dr. Lorry, good-naturedly. "Now just take a look at this."

He turned a tiny flashlight on a black card with white stars dotted on it in the shape of the Dipper.

"The Dipper is right side up, right above those trees. Four stars make the bowl and three the long handle."

"I see!" cried Helen.

"Now," continued the doctor, "the two stars through which the arrow was drawn are called Pointers, because they point almost to the North Star. Do you see it? A very faint star?"

"Yes," cried Helen again, "and it is the very tail of the Little Dipper's handle, exactly like the picture."

"Good!" said Dr. Lorry, very much pleased. "You have sharp enough eyes to see little Alcor, I think. If a person can see Alcor, he has very good eyes. Look in the handle of the Big Dipper, directly above the first star from the end. Alcor is the Rider, and the bright star below it is his Horse."

"I see both," said Helen. "My eyes are all right."

"Good! Now we must go in."

Helen went very obediently.

"How different the stars look when I'm outdoors!" she said.

But when she was lying in bed again, looking out at the starry sky, the Big Dipper already seemed like a dear old friend.

II. Auriga, The Wagoner

Look for Auriga during the middle of November

"Do come in just a minute, Dr. Lorry, and see what I've made," begged Helen, the second night the doctor came to tell her about the stars.

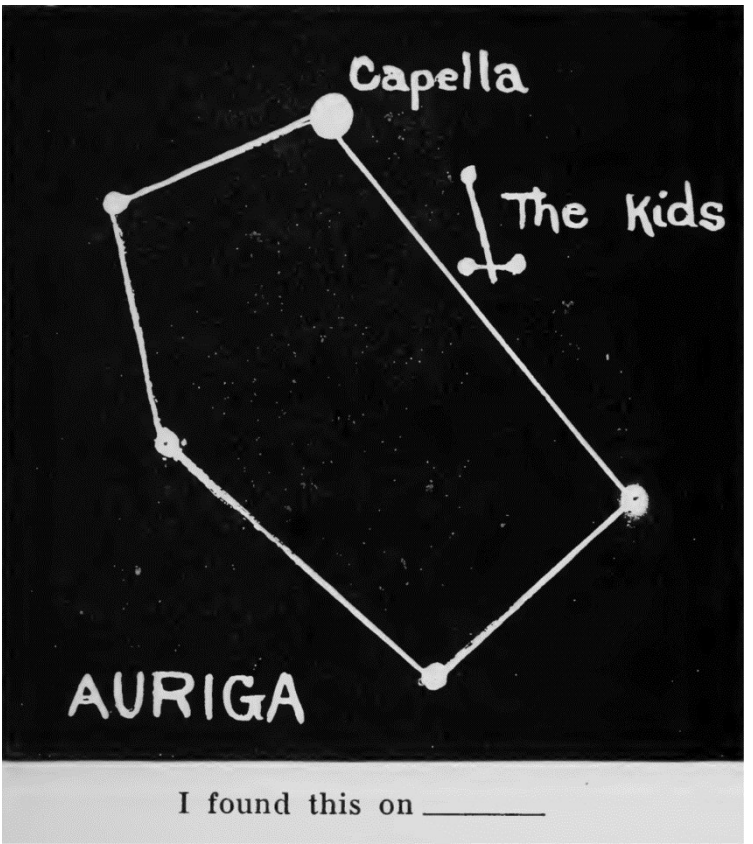
Dr. Lorry put on his eye-glasses and sat down near the library lamp, to look at the small blue book Helen handed to him. It was made of six squares of black paper pasted on larger white cards.

On the first square Helen had drawn the Dippers in white ink, and underneath on the card she had written all she had learned about them. On the blue cover in large white letters was printed: MY STAR BOOK.

"That's a fine idea!" exclaimed the doctor.

"I wish every little girl in the United States had one. Tonight we'll learn a group of stars that will be harder to draw. It is called Au-ri'-ga, or the Wagoner. We'll go to the same place to see it, and face north."

When they had found the Big Dipper, Dr. Lorry said, "Now, instead of using the two real Pointers to find Auriga, just imagine that the two top stars of the bowl are pointing east, or to the right. You see they point out a very, very bright star, the only bright one anywhere near?"



"Yes," answered Helen, "brighter than even the Dipper?"

"Yes, a star of the first magnitude, we say, meaning brightness. Now, see what we are to look for."

This time the flashlight showed a large figure made of five stars, one of which was the bright star when the light was turned away.

Helen looked up into the darkness and saw the exact copy of the little drawing smiling down upon her — only so very large and grand.

"The bright star is named Ca-pel'-la, the Goat. Playing near her are the three little Kids."

Helen skipped with pleasure when she found them. "This is a prettier group than the Dipper."

"A prettier constellation, we say," said the doctor, smiling and leading the way back to the house.

III. Taurus, The Bull

You can see this during December

"The moon is so bright we can't see the stars well, now," Dr. Lorry had telephoned, and it seemed a long time to Helen before they stood once more, looking up at the bright Capella, now much higher up in the sky.

"Helen, what color is Capella?" asked Dr. Lorry.

"White," answered Helen. "All the stars are white."

"Ahem!" said the doctor, "are they, though? Suppose you draw a line through Capella and the three Kids until it comes to that very bright star in the east. What color's that?"

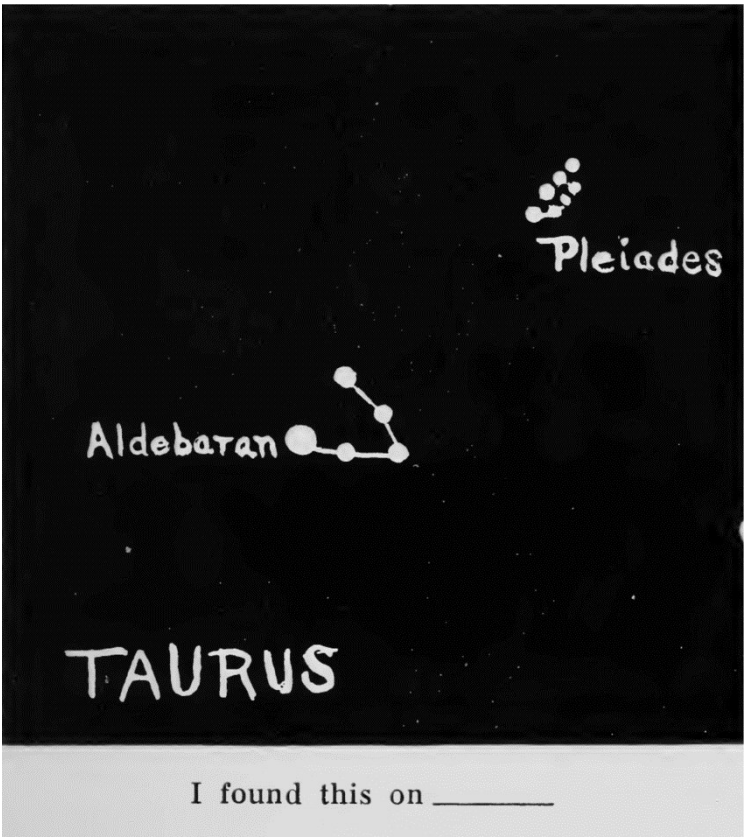
"Why, red said Helen, in astonishment.

"Red is correct," said the doctor. "We have yellow ones, green ones, blue ones —"

"Blue ones!"

"Bluish, we say," smiled her companion. "That red star is called Al-deb'-a-ran, or the Bull's Eye, because it forms the eye in the constellation of Tau'-rus, the Bull. You see it is in that V-shaped figure? That is the Bull's face."

"I don't think it looks much like a bull's face," said Helen, after a moment.



"Neither do I," agreed the doctor. "All these names were made up about three thousand years ago, you see. Perhaps if we were naming the constellations, we might do it differently. Now, just a little higher up, do you see a tiny bunch of stars?"

"Yes, three, four, five tiny ones."

Dr. Lorry was silent.

"Six — seven!" cried Helen, after a moment.

"Bright eyes!" said the doctor. "I see seven, too. They are called the Ple'-ia-des, or sometimes the Seven Sisters. You'll find the Pleiades mentioned in the Bible. Now, see if you can find where before I come again."

IV. Orion

Orion can best be seen early in January

Helen had her book all ready in the hall to show the doctor, the Bull carefully drawn, Aldebaran tinted a rosy red, and the Pleiades shining in their places like tiny jewels. Underneath she had written:

That maketh the Bear, Orion, and Pleiades,

And the chambers of the south.

Job 9: 9.

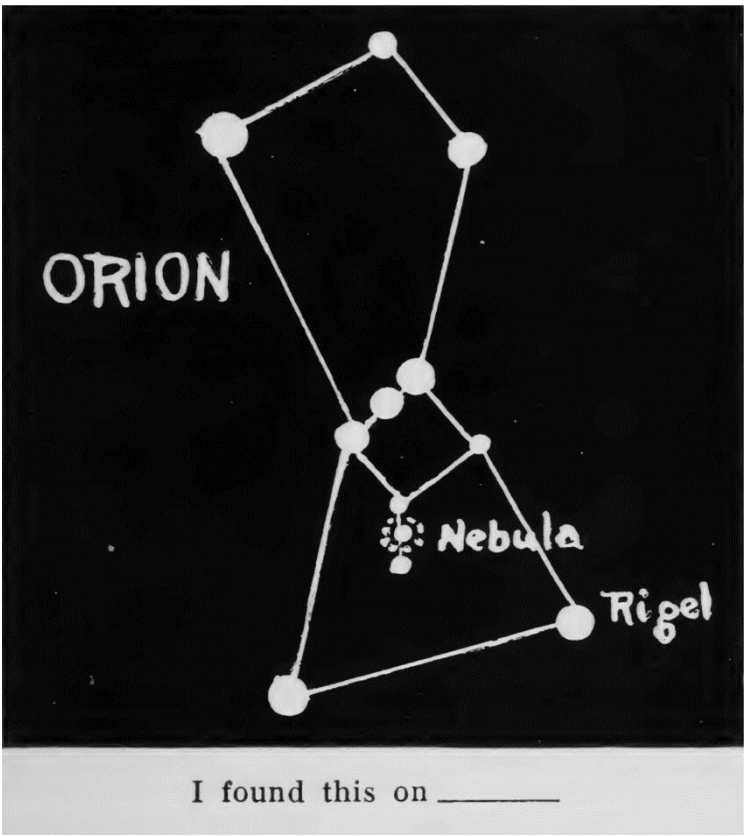
Canst thou bind the cluster of the Pleiades,

Or loose the bands of Orion?

Job 38: 31.

"Mother helped me find the verses," explained Helen, "but I really don't understand them."

"Orion is the constellation we have tonight," said Dr. Lorry, opening the front door. "This time we will face east. See our old friends, Auriga, Taurus, and the Pleiades? Now we will add to them O-ri-on, the Giant Hunter. Here is his picture."



The black card showed a figure somewhat the shape of Auriga, only a belt of three large stars went across the middle. Then Helen gazed upwards.

"I see a square of bright stars that I always used to call the Little Dipper," said Helen.

"O-ho!" said the doctor, "you're looking for something too small. Orion himself is much, much larger.

That is only his belt and sword. His shoulders and head are above, and his feet—"

"Oh, so large!" interrupted Helen. "And he is bright, isn't he?"

"I guess you see him," said the doctor. "He is the most beautiful constellation we have. The three bright stars make his belt, and his sword is stuck through his belt. In the handle of his sword is a hazy cloud called the Great Nebula.

"Now, just throw back your head and look at all these stars at once, and see if you can imagine any one great enough to make Orion and the Pleiades and those great, open spaces over in the southern sky? We couldn't string those seven stars of the Pleiades on a chain of fire. Could you break up Orion and let those wonderful stars wander around through the sky?"

"Why, those are my verses," said Helen, in surprise. "How easy!"

"Just a minute," said the doctor, suddenly, turning around once more before they went in. "What color would you call Rigel (Ri'-jel), Orion's left foot?"

"Bluer," said Helen.

V. Gemini, The Twins

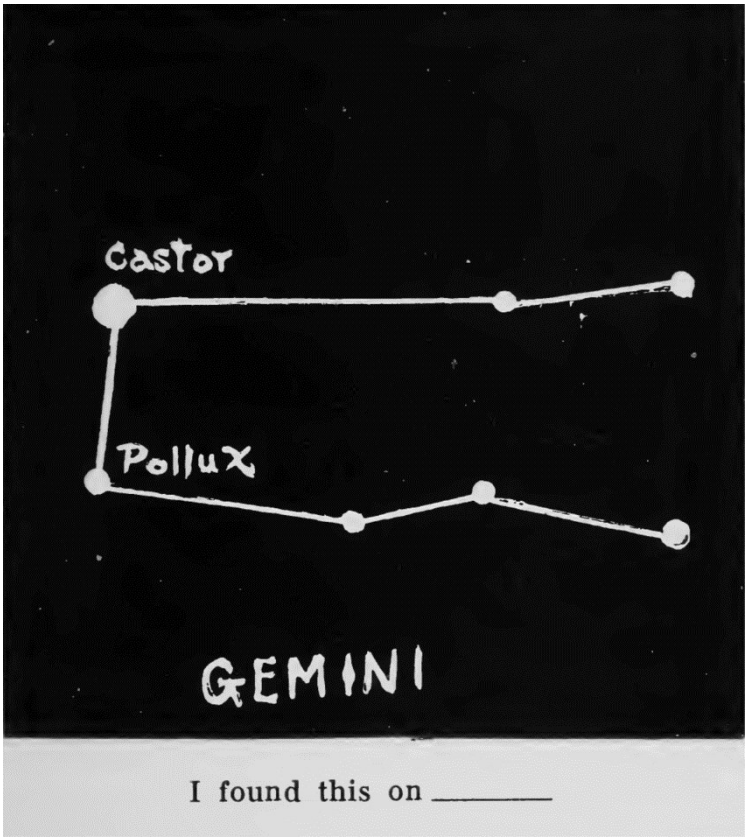
Look for this during the middle of January

"We will find the Twins, Cas'-tor and Pol-lux, tonight," said Dr. Lorry, guiding Helen along the dark path. "They are rather hard to point out, but once you see the picture … " he fumbled in his pocket for his little black card and light.

"Castor is a bright star, perfectly white, and Pollux is a little brighter star, as yellow as gold. To help you find them, I will say there is a spelling-match up in the sky just below Auriga, and just at the left of Orion, and Castor and Pollux are choosing sides. Castor has two stars on his side and Pollux has three."

Helen laughed, put her hand over the light, and looked up to hunt for the two lines of spellers. She soon found them.

"For Orion is pointing right at them," she said.



"This lesson is so short, I want to show you something else. Do you see a faint, silvery band crossing the sky, passing through Auriga, and very near Gemini? It is made of so many millions of stars, and they are so far away, that it looks milky. It is called the Milky Way. You can study it with your opera-glasses, and find many clusters and drifts of stars in it, to keep you from getting impatient for your next lesson."

VI. Canis Major, The Great Dog

You will find this early in February

"Orion has a great hunting dog," said Dr. Lorry, as if he were going to tell a story, "and he is forever chasing a rabbit. He never catches it, and he is always after it. He runs so fast that he is standing on his hind legs all the time, his tail sticking out straight, and his front feet in the air. His nose is the very brightest star in the sky. Here he is!" The black card showed the picture of the Great Dog.

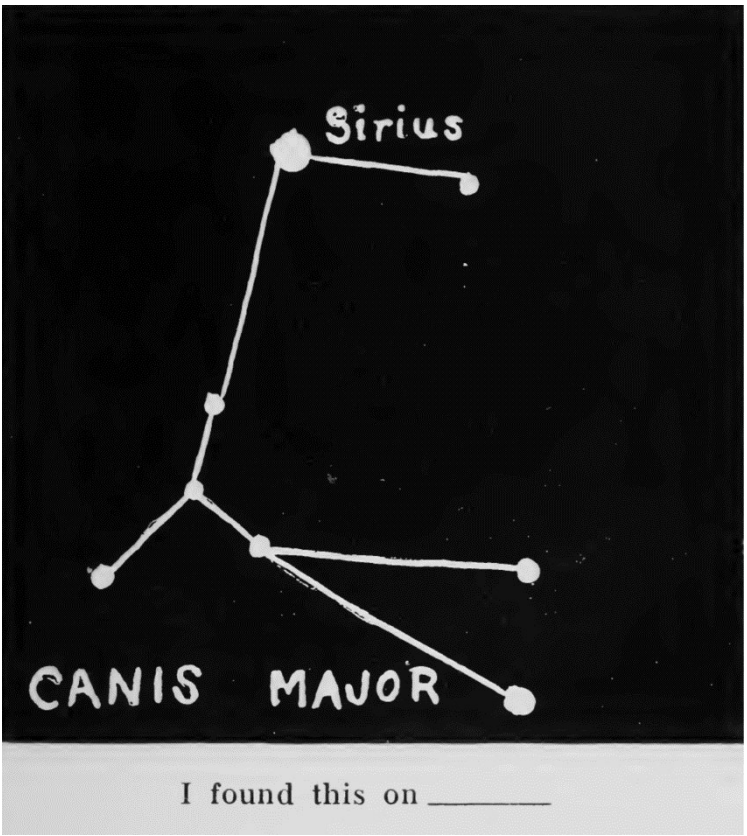
"Now look up behind Orion, just coming up over the hill. Si'ri-us, his nose, is called the dog-star, and when it rises with the sun, we say dog-days have come."

"Where is the rabbit?" asked Helen.

"Right under Orion's feet," answered the doctor. "Can you see a rough square with three stars curved over it, for the rabbit's back? Four very faint stars on the right are the rabbit's ears."

"I think Rigel and Sirius are the prettiest stars I know," said Helen.

"You did well to remember Rigel's name," said Dr. Lorry, looking surprised.



"Well, you see," explained Helen, timidly, "I come out nearly every night with mother and I point out all the things I learn to Edith and Donald. Of course I don't know very much about the stars, but they love to hear it."

"Good!" said the doctor. "Now, I don't know very much about the stars, but I learn more when I tell you, and you learn more when you tell Edith and Donald. You

might even let them copy your book." "I have," said Helen, laughing.

VII. Leo, The Lion

Look for Leo late in March

One day Dr. Lorry had a telephone call.

"Do you want your grass cut?" asked a small, eager voice.

"My grass cut! Why, it's not up yet. Grass doesn't come up until April, young lady."

"Well, anyway, I've found something in the sky that looks like a sickle," explained Helen. "You know, one of those curved knives we cut grass with."

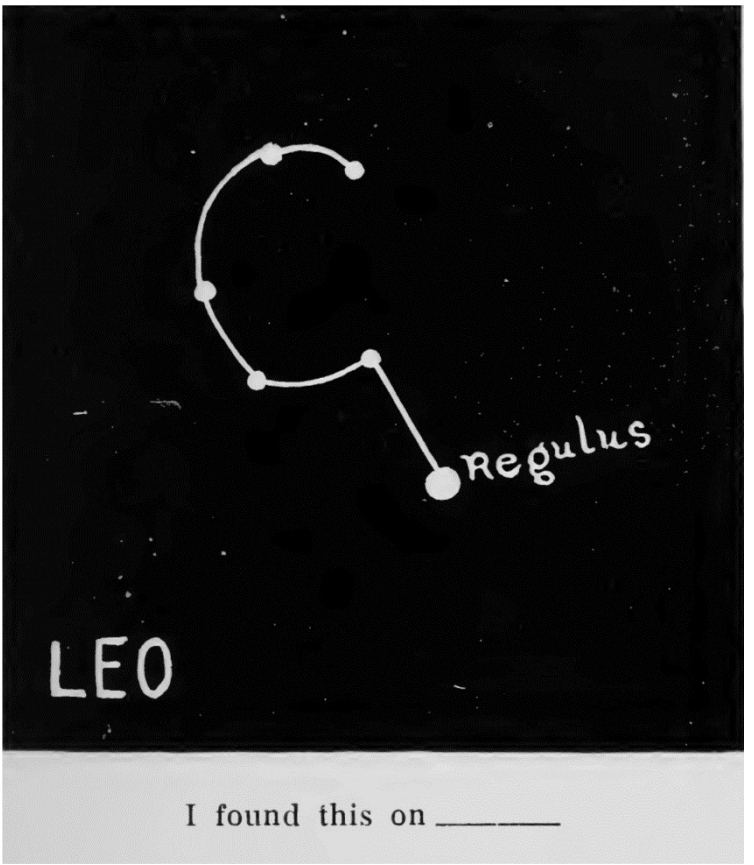
"Have you, indeed?" cried Dr. Lorry. "I'll be over tonight, then, as soon as it's dark, and take a star lesson from you."

And actually, when Dr. Lorry ran up the front steps, the little teacher was ready for her pupil with a black card, bearing the picture of a beautiful star sickle.

"That's fine," said the doctor, following Helen out into the garden. "And it's one of the few constellations that really looks like its name. Ah! there it is!"

"What is the first magnitude star in the handle?" asked Helen, mischievously.

"First magnitude!" echoed Dr. Lorry. "You're a good pupil. Well, that is Regulus. This constellation is sometimes called Leo, the Lion, as well as the Sickle, And Regulus is the lion's heart."



"You couldn't possibly mistake Leo, could you?" said Helen.

"Not if you look directly east during the last of March at seven o'clock, at the constellation just coming up," laughed Dr. Lorry.

"There is one more interesting thing about Leo. There is a shower of meteors near Leo, called the Leonids, every November from the tenth to the fifteenth. They are bluish and very swift."

"Oh, do let's watch next November!" Helen said.

"Let's wait until 1932," suggested Dr. Lorry, "because they are magnificent every thirty-three years. And it wouldn't do to sit up until after midnight very often."

"I'll see you, then, in 1932," said Helen.

VIII. Boötes, The Herdsman

Look for this the last part of April

"The very first thing you must learn about our new constellation," began Dr. Lorry, glancing at the sky, "is to pronounce its name correctly. Boötes is pronounced Bo-o-tease.

"And the next thing is to see his picture," went on the doctor, bringing out his card.

"It looks like a kite," said Helen.

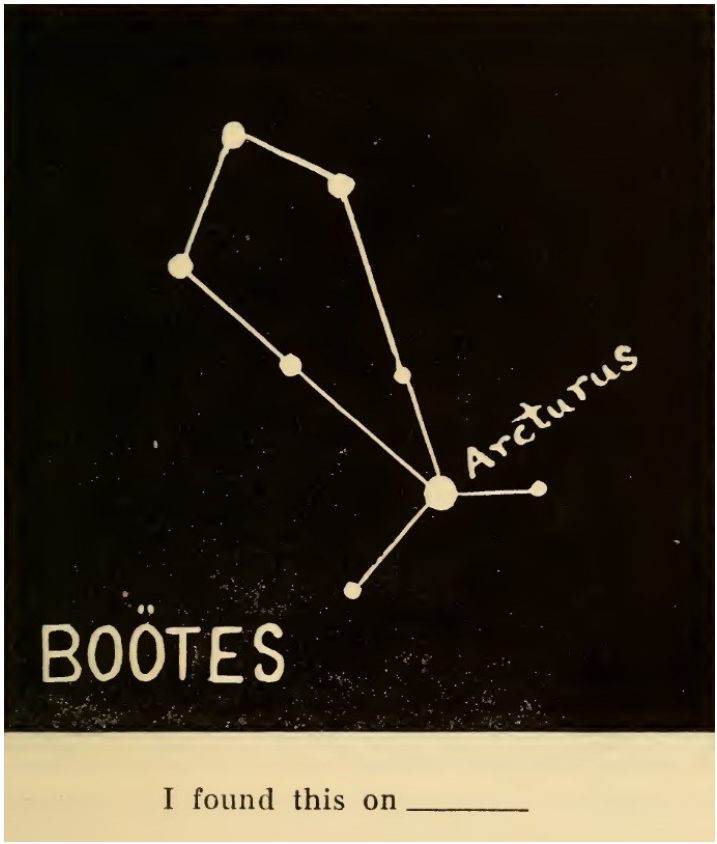
"Yes; and the way to find it is to look at the Big Dipper, using the two top stars as pointers, and following to the right or east, until you come to a big, big, — "

"Reddish-yellow star!" said Helen.

"Yes," said the doctor, looking up at the big star. "Do you see it?" Its name is Arc-tu-rus, and it is mentioned in the Bible, so it is pretty old. Boötes is the Herdsman, and Arcturus is his right knee."

"Let's call it a kite," said Helen.

"Very well," agreed Dr. Lorry, "only don't let anyone think he is anything but a Herdsman. He is very much easier to find if you look for a kite, however."



"Do you notice how light it is now at seven?" asked Helen.

"Perhaps next time I had better wait until eight o'clock," suggested the doctor. "It is almost too bright to see the stars at all.

"I love to learn the stars," said Helen. "I can find all those I learned first, even if they are farther toward the

west, because I've watched them. See! Orion is just setting, and Gemini and Amiga are just above. And Sirius will soon be out of sight at night."

"Keep it up, Helen," was all Dr. Lorry said.

IX. Corona, The Northern Crown

You can find the Crown early in May

"The constellation this time is one that I like myself," said Dr. Lorry, fanning himself with his straw hat. "It is Co-ro'-na or the Northern Crown. Down in South America and Australia you can see the Southern Crown."

"Do you mean there are stars we can't ever see up here in New England?"

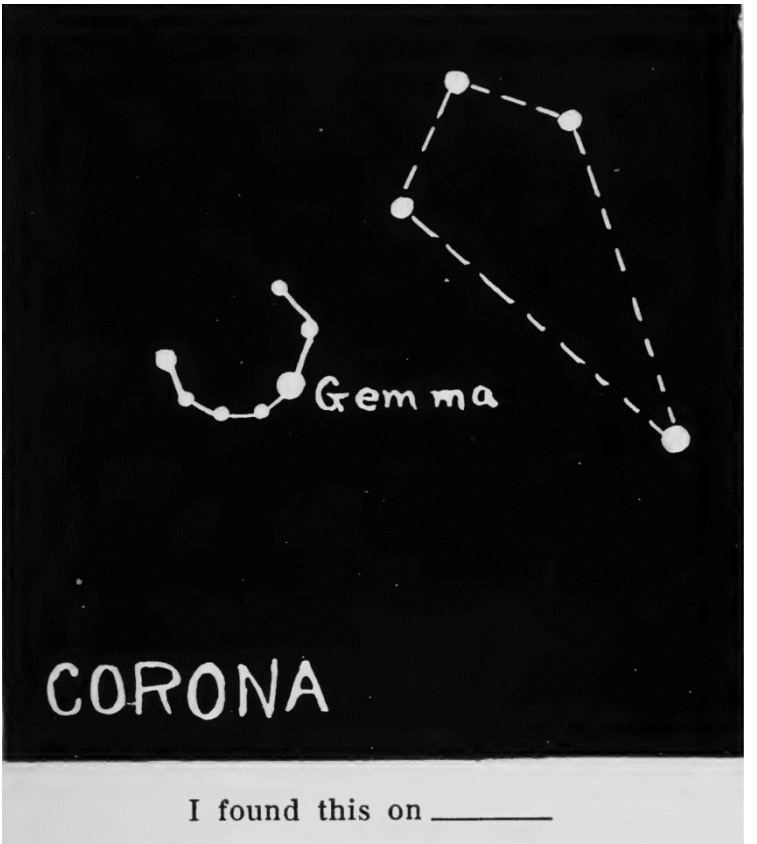
"Yes, indeed," replied Dr. Lorry. "There is another whole set of constellations to learn when we move south. Now, just see on the diagram where Corona is, just beside Boötes. The middle star of the crown is the brightest one, just as it should be."

"Oh! that is so easy," said Helen, immediately finding the beautiful crown in the dark blue sky.

"That bright star's name is Gemma, the Pearl," said the doctor.

"I shouldn't say that Gemma was a first magnitude star, should you?" asked Helen.

"Just what magnitude would you say Gemma was?" inquired Dr. Lorry.



"Second," guessed Helen.

"Right, as usual," said the doctor. "Now let me see if you can find another star without a picture. It is Spica, the brightest star in Virgo. Most of the stars in Virgo are faint, but Spica is very bright. Begin with the star in the Crown nearest Boötes, and draw a line with your eye through

Arcturus, and you almost strike that pure white star in the southern sky."

"I see it!" cried Helen.

"Spica is the ear of corn which the Virgin is holding in her left hand," explained Dr. Lorry.

"Spica and Regulus look alike," said Helen.

"So they do," said the doctor.

X. *Lyra, The Lyre*

Look for this in early June

"I'm sorry to send this young lady to the beach," said Dr. Lorry to Helen's mother, as they stood in the garden. "I shall miss these lessons myself, but I think the seashore will do more for Helen than school."

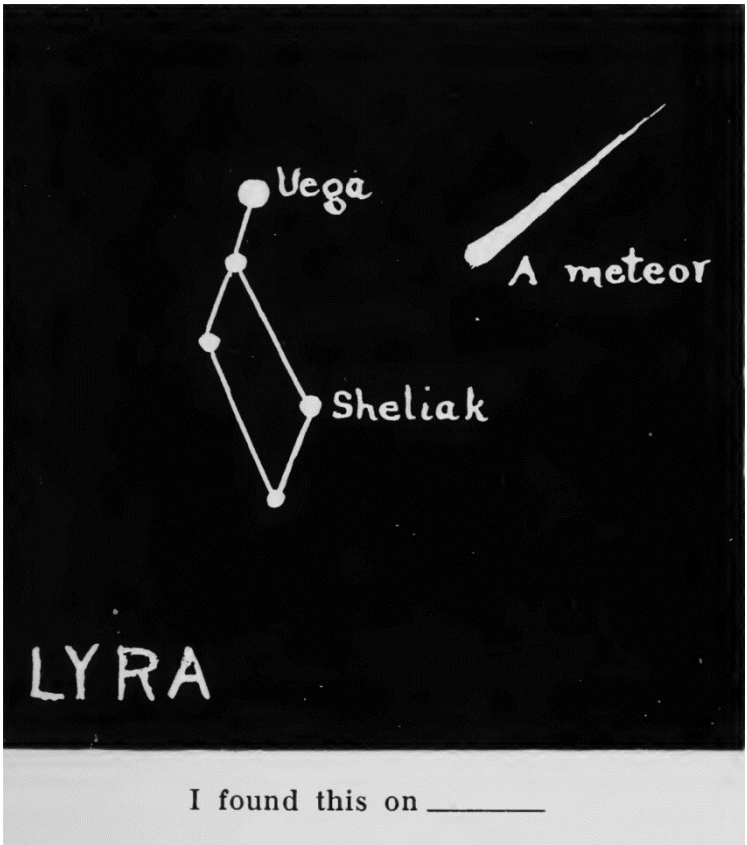
"I shall miss my star lessons more than school," cried Helen. "I'll tell you a beautiful plan. Why can't I pick out some stars at the beach and send them to you to find out their names?"

"That will be very fine," said the doctor, heartily. "I will teach you just this one before you go. It will be Lyra, the Lyre. Look up in the northeastern sky and see if you can pick out this musical instrument. That bright star at the top is Vega."

"That is easy to find, because there isn't any other bright star in this part of the sky," said Helen.

"Vega is more than ten million times as far from us as the sun is," went on the doctor. "And Sheliak, which is named on the diagram, often changes its brightness; sometimes it is fourth magnitude; sometimes as bright as third. We call such a star a variable."

"How queer!" said Helen.



"Many things are wonderful about the sky," said Dr. Loriy, flashing his pocket light on the black card. "I have drawn a meteor on this diagram. This is rather a large meteor, to show you how they look. We call them shooting stars sometimes, and I want you to notice them at the beach."

"How do you find one?" asked Helen.

"You just watch," explained Dr. Lorry, "until you see one. You are sure to see one if you watch long enough. Sometimes a piece of one strikes the earth, and we call these pieces meteorites. They are made of metal which has been melted and cooled very rapidly."

"I wish I could find one," said Helen. "Anyway I'll write to you soon after I get to the seashore."

XI. Cygnus, The Swan

The Swan is visible early in July

To tell the truth, the hotel at the beach was rather lonesome, when Helen and her mother went down in June. But after a hot week or two, more people came. One evening, just before Helen went upstairs to bed, she sat with her elbows on the piazza railing, looking at the sky.

"See, mother! there is Lyra 'way up high!"

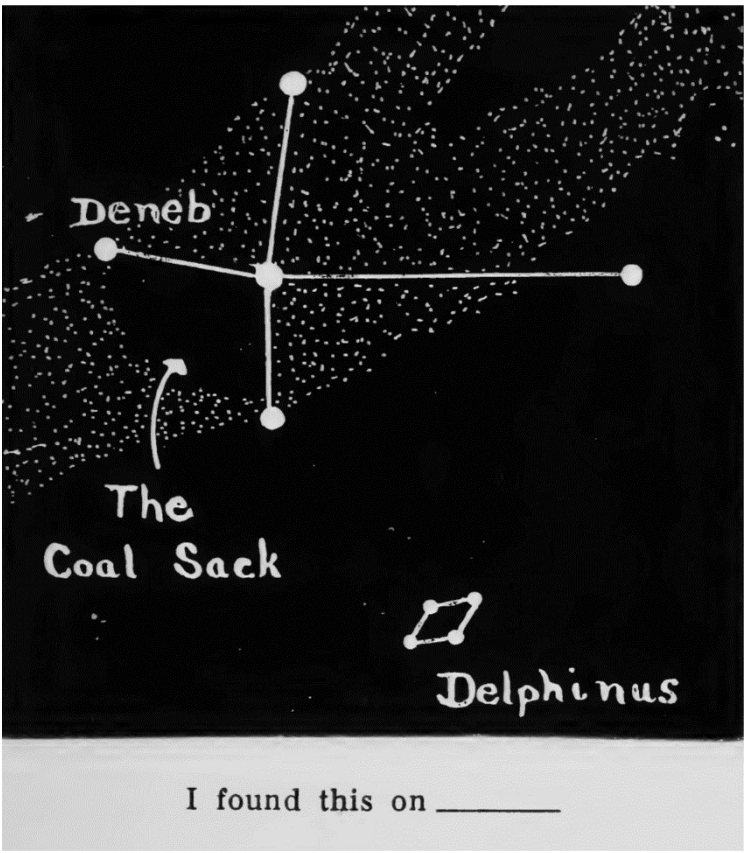
"And what do you know about Lyra?" asked a puzzled voice beside her. She turned to see a young man, who had arrived that day, in the next chair.

"She is learning the constellations," explained Helen's mother. "And we're trying to pick out a new one to send home to her teacher to find out its name."

"Good!" said the young man, heartily. "Does she know Cygnus, the Swan?"

"Oh, no!" said Helen. "Wouldn't it be great fun if I could really learn one and surprise the doctor! Do you know about the stars?"

"Just a little," said the young man. "I can show you the Swan. Do you see where the Milky Way divides itself? See a large perfect cross at the left?"



"With one brighter star at the top?" said Helen.

"Yes, that is Deneb, the Swan's tail. Do you know what the Milky Way is?"

"It is thousands of faint stars," said Helen, timidly.

"Yes, and there is a place in the Swan where these faint stars stop. See, just left of the middle star? That is the Coal

Sack. Then just below Cygnus is a tiny diamond of four stars. That is Delphinus, the Dolphin."

"Isn't that cunning?" said Helen. "Won't the doctor be surprised? Thank you ever so much for telling me, and will you show me another sometime?"

"Surely," said the young man, smiling to himself.

XII. Scorpio

Look for this late in July

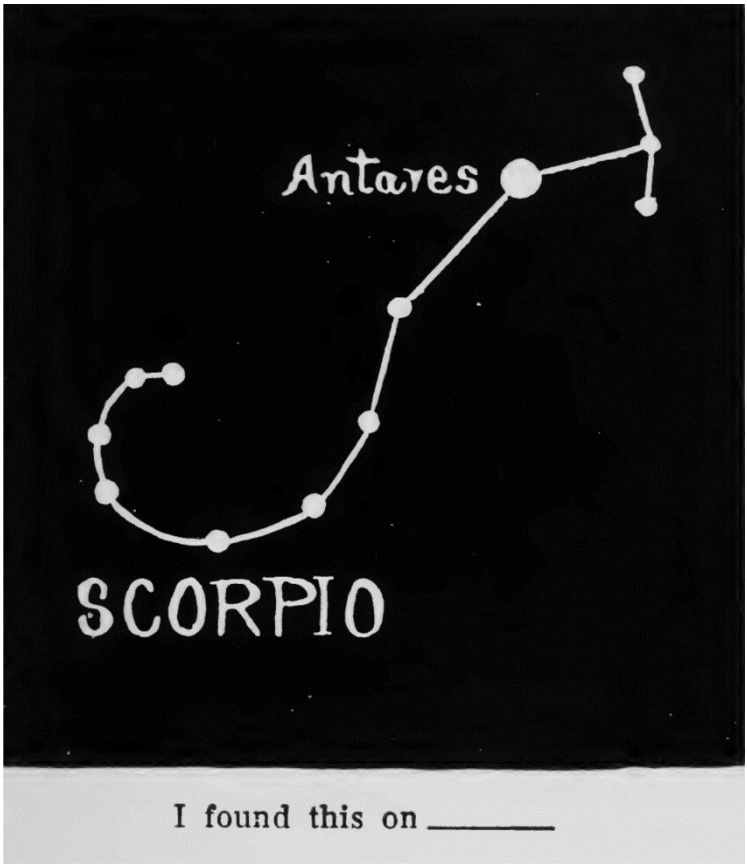
"Dear Dr. Lorry," wrote Helen, "I knew you'd be awfully surprised to hear that I had found out the name of the Swan. And the way we found out was this. A man here offered to teach me, and mother happened to find out that he really is a Star Professor at the big college in New York!

"He takes a lot of pains with me. Last night he took our steamer chairs off the piazza down to the sand. It is so much more comfortable, and you can see so much better leaning back. It doesn't make your neck ache, either.

"He taught us the Scorpion this time. I really think it looks like a Scorpion, with its tail curled over its back. He says a good way to find Scorpio is to face south, and the handle of the Dipper points to it. But if you face south, you can hardly miss it, as An-ta-res, the Scorpion's heart, is so very bright and red. When I first looked at Antares, it looked red, but after the professor called my attention to its color, I saw it was bright green, too. It is a funny color, but very pretty.

"My favorite stars so far are Regulus, Vega, Antares and Rigel. You didn't expect I'd remember Rigel, did you?

"How do you like me for a teacher?



"Your little friend,

"Helen."

XIII. Sagittarius, The Archer

Wait until the last of August for this

"I think the Archer is up high enough tonight for us to study," said Helen's star friend, settling the three steamer chairs in a row on the sand.

"Just at the left of the Scorpion, you will see a figure that looks like the Big Dipper upside down."

"Oh! almost exactly like the Dipper?" cried Helen.

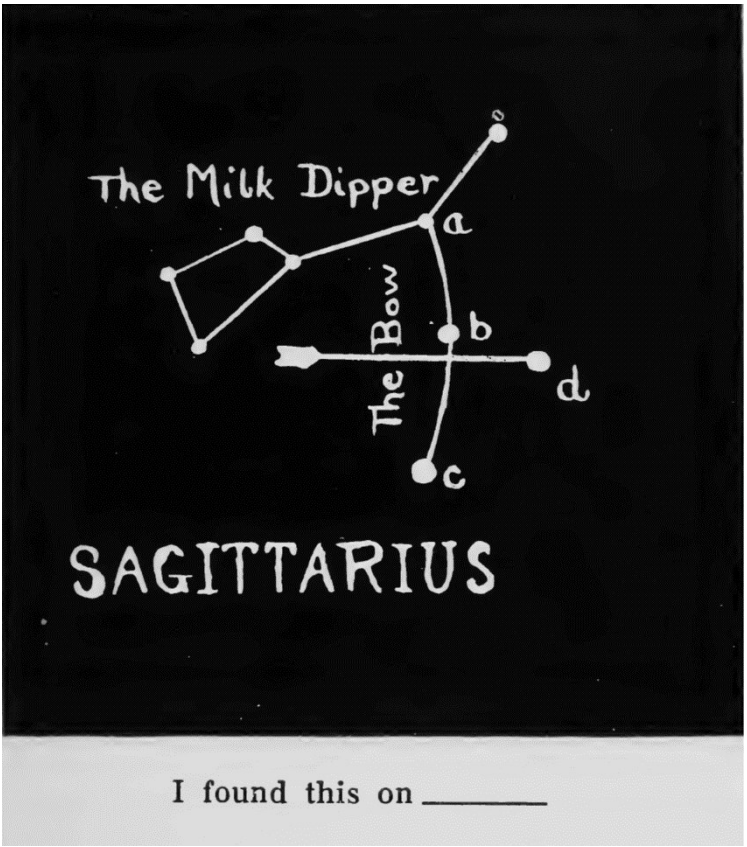
"That is it," agreed the young man. "It is called the Milk Dipper. The other must be a water dipper. Now, this is one part of Sag-it-ta-ri-us. The other part represents a bow and arrow. The three stars in a curved line make the bow."

"And doesn't the star at the right make the arrow?" asked Helen.

"Exactly right!" exclaimed Helen's teacher. "Perhaps you had better letter the bow, a, b, c, when you send the drawing to Dr. Lorry, and the tip of the arrow, d."

Just then a tiny star shot rapidly across the sky.

"A shooting star!" cried Helen. "Did you see it?"



"Yes," said her friend. "You see this one was so bright, it left a faint streak behind it. I'm glad we happened to see it."

"Dr. Lorry said I would see one if I watched long enough."

"That is a wonderful sight," said Helen's mother. "I have learned as much as Helen during these lessons, and I am sorry that we have to go home this week."

"And I shall be sorry to lose such an apt pupil," said the professor, with a low bow.

XIV. The Square Of Pegasus, The Triangle, And Aries, The Ram

These will be visible late in September

"I am glad to be back in my own garden again," said Helen, skipping down the path. "We had a beautiful time at the beach, but I feel more at home here."

"So do I," agreed Dr. Lorry, comfortably, "although Mr. Star Professor knows a lot more than I do."

"He isn't a bit more interesting, though," declared Helen.

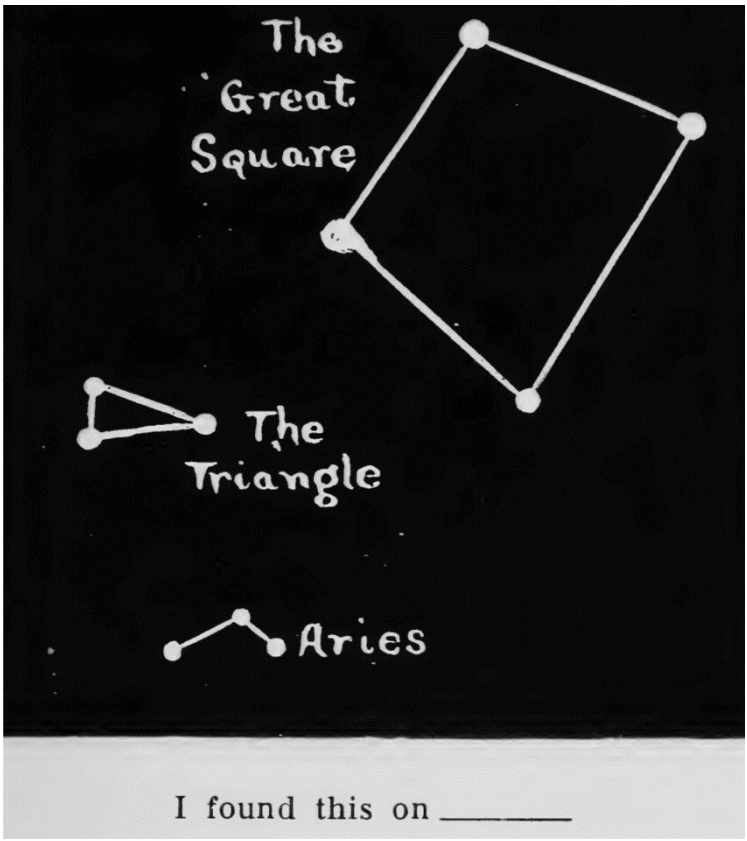
"Well, in return for that compliment, I'll give you a very easy lesson. Face east, and look for a very large, perfect square."

"That is easy; they are such bright stars," said Helen, promptly.

"Now, this is called the Winged Horse," went on the doctor.

"I don't see how it can be," said Helen.

"Well, he is on his back, and his feet are up in the air — up in the sky, I should say."



"I see what might be called feet," replied Helen.

"It isn't necessary to pick them out," said Dr. Lorry. "Just look inside the square before I come again, and count every star you can see within the square."

"Oh, that will be fun!" agreed Helen.

"Now, just below the Great Square is a perfect triangle, called the Triangle."

"I see that, and it looks like its name," said Helen.

"Just below that is A-ri-es, the Ram, made up of three stars. Although Aries is quite small, it is very important. You must be sure to remember it. The right-hand star is the first double star ever seen. Through a telescope it looks like two stars close together. Now, do you think you can remember three constellations in one night?"

"Of course," laughed Helen.

XV. Cassiopeia's Chair

Look for the Chair late in October

"For this constellation we would like those steamer chairs you had at the beach," said Dr. Lorry. "Come, we'll sit in the front seat of my car and lean back."

"How pretty the Milky Way is tonight!" said Helen.

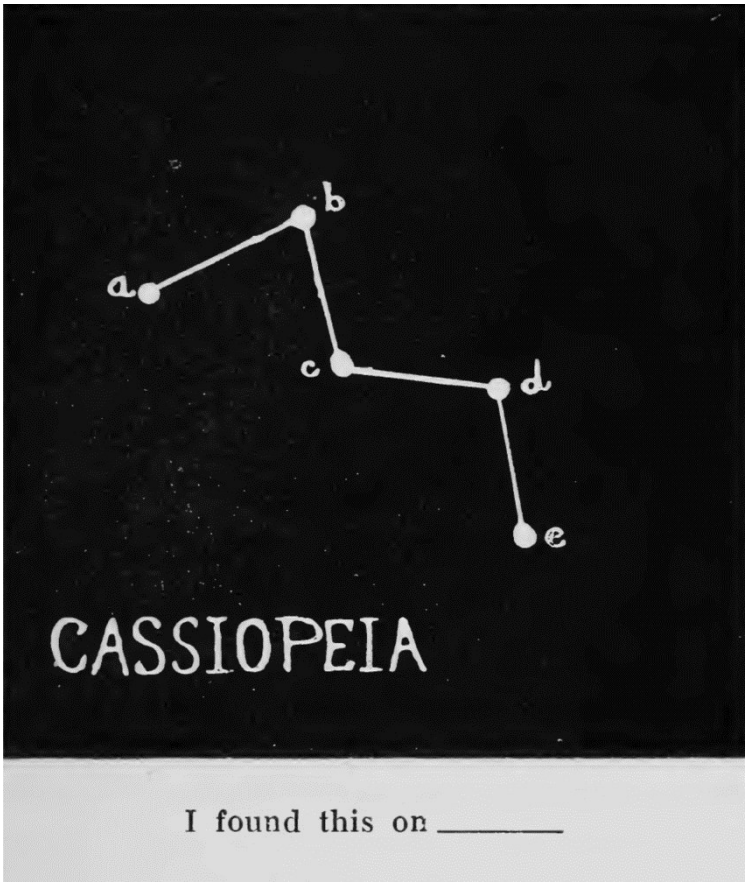
"Yes, and Cass-i-o-pe'-ia's Chair lies almost wholly in the Milky Way. We are facing north. The chair is half-way between the Great Square and the Big Dipper, and looks like a W upside down. See its picture first. You see I have lettered the stars a, b, c, d, and e. The back is formed by a, b and c, the seat by c and d, and the front leg by d and e. Cassiopeia herself is nowhere to be seen."

"I see the chair beautifully," said Helen.

"You can see it at some hour of every pleasant night," said Dr. Lorry. "Hello! what do I see coming up in the east?"

"Oh, oh!" cried Helen, "it's Auriga! And I see Capella, the Goat, and the three little Kids."

"What a good memory you have!" said Dr. Lorry, greatly pleased. "You see we've made the rounds of the sky. We haven't learned every constellation, but we know fifteen of the brightest ones."



"I see the Pleiades and Taurus!" cried Helen.

"Good!" shouted Dr. Lorry, who had been hoping Helen would discover them.

"This week I counted twenty-five stars inside the Square of Pegasus," added Helen.

"That is good, too, because it is possible to see only thirty. Now we must go in. When you think you are forgetting these constellations just try to teach them to somebody else. I think," ended the doctor, with a twinkle, "that during these lessons I have learned as much as anyone."

XVI. The Planets

One January night Helen stood in her window before going to bed, looking out at the stars. As she gazed at Castor and Pollux, she saw a bright star between the two lines of spellers in the spelling-match, which she could not remember seeing before. To make sure, she found her little book, and looked at the picture of Gemini. There was no star like it on the chart.

"I will call up Dr. Lorry and tell him," decided Helen.

"Aha!" said Dr. Lorry over the telephone, greatly pleased that Helen had noticed the extra star. "If you haven't gone to bed, I will come over and give you a new lesson. For that is a Planet which you have found, and not a star at all."

Helen was delighted, and soon the two astronomers were out in the garden.

"Now, the fifteen constellations we have learned," began the doctor, "are made up of FIXED STARS. That is, the stars don't go wandering about without regard for each other. This is why the Dipper always looks like a Dipper to us. But the Planets follow the pathway of the sun, which leads right through the middle of some of the constellations that you know."

"How can you tell a planet from a star?" asked Helen.

"The stars twinkle," replied Dr. Lorry. "The planets glow with a steady light. There are only four planets that you are likely to see, which I will give you in order of their brilliancy. They are VENUS, JUPITER, MARS, and SATURN. The first two are white, Mars is red, and Saturn is that greenish-yellow which you see up there in Gemini. If you will get me your book, I will write out the things you need to know about the planets."

The two star-gazers went in to the library, and this is what Dr. Lorry wrote in Helen's book.

1. Sometimes you will see a bright star in a constellation which is not on the chart.

2. If it does not twinkle, this will be a Planet.

3. If it is red, it is MARS.

4. If it is very bright, in the west, just after sunset, it is VENUS.

5. If it is in the east, or overhead, or in the west more than three hours after sunset, it is JUPITER.

6. If it is not very bright, and is greenish-yellow, it is SATURN.

7. There are only six constellations in this book in which a planet can appear. They are Taurus, Gemini, Leo, Scorpio, Sagittarius and Aries.

As the doctor finished the list, he drew from his pocket a roll tied with bright blue ribbons. "Seeing you have so

nearly finished your lecture-course, I brought along your diploma," he said. "When you have found the four planets, you can write your name on the dotted line, in your best style."

"Oh, with fancy scrolls and flourishes!" cried Helen, unrolling the heavy paper.

This was the DIPLOMA:

This is to certify that _____ has learned fifteen constellations and four planets and is fully qualified to enjoy the oldest and least known of all Nature-Studies.

And before the year was out, Helen's name stood on the dotted line, scrolls, flourishes, and all. So when the time comes, you, little reader, may put your name there, too.

Poems About Stars

Sleep, baby, sleep!
Thy father is watching the sheep;
Thy mother is shaking the dreamland tree,
And down drops a little dream for thee.
Sleep, baby, sleep!

Sleep, baby, sleep!
The great stars are the sheep,
The little stars are the lambs, I guess;
And the bright moon is the shepherdess.
Sleep, baby, sleep!
-German lullaby

The Man in the Moon as he sails the sky
Is a very remarkable skipper.
But he made a mistake
When he tried to take
A drink of milk from the Dipper.

He dipped right into the Milky Way
And slowly and carefully filled it.
The Big Bear growled
And the Little Bear howled,
And scared him so that he spilled it.

Good-night, sleep tight,
    Wake up bright, in the morning light,
    To do what's right,
    With all your might.

I'll be a little sunbeam true,
    A tiny ray of light.
And try in all I say and do,
    To make the world more bright.

Father, we thank thee for the night,
And for the pleasant morning light,
For rest and food and loving care,
And all that makes the world so fair.

God made my life,
    A little light
Within the world to glow,
    A tiny flame that burneth bright,
    Wherever I may go.

At evening, when I go to bed,
    I see the stars shine over head.
They are the little daisies white,
    That dot the meadows of the night.

And often, while I'm dreaming so,
    Across the sky, the moon will go,

She is lady, sweet and fair,
    Who comes to gather daisies there.

All-night long the little stars blink,
    All night-long they twinkle and wink,
All night-long when we're fast asleep,
    Through the cracks in the shutters they peep,
        peep, peep.

I see the moon
    And the moon sees me,
God bless the moon,
    And God bless me.

Oh, look at the moon!
    She is shining up there,
Oh, mother she looks
    Like a lamp, in the air!
Last week she was smaller,
    And shaped like a bow,
But now she's grown bigger
    And round, like an O.

The moon, like a flower
In heaven's high bower,
In silent delight
Sits and smiles on the night.
-Blake

Till rising and gliding out, I wandered off by myself
In the mystical, moist night air, and from time to time
Looked up in perfect silence at the stars.
–Whitman

All night, through archways of the bridged pearl
And portals of pure silver, walks the moon.
–Tennyson

Stars with golden feet are wand-ring
Yonder, and they gently weep
That they cannot earth awaken
Who in night's arms is asleep.
–Heine

Our birth is but a sleep and a forgetting;
The Soul that rises with us, our life's Star,
Hath had elsewhere its setting
And cometh from afar;
Not in entire forgetfulness,
And not in utter nakedness,
But trailing clouds of glory do we come
From God, who is our home:
Heaven lies about us in our infancy!
–Wordsworth

The night has a thousand eyes,
  The day has one;
Yet the light of the whole world dies
  When day is done.

The mind has a thousand eyes,
  The heart but one;
Yet the light of the whole life dies,
  When love is done.
Bourdillon

There is no death. The stars go down
To rise upon some fairer shore;
And bright in heaven's jewelled crown
They shine forever more.
Sir Edward Bulwer-Lytton