BOOK II.

CHAPTER I. THE ASTRONOMER

By the return of the expedition, conveying its contribution from Formentera, the known population of Gallia was raised to a total of thirty-six.

On learning the details of his friends' discoveries, Count Timascheff did not hesitate in believing that the exhausted individual who was lying before him was the author alike of the two unsigned documents picked up at sea, and of the third statement so recently brought to hand by the carrier-pigeon. Manifestly, he had arrived at some knowledge of Gallia's movements: he had estimated her distance from the sun; he had calculated the diminution of her tangential speed; but there was nothing to show that he had arrived at the conclusions which were of the most paramount interest to them all. Had he ascertained the true character of her orbit? had he established any data from which it would be possible to reckon what time must elapse before she would again approach the earth?

The only intelligible words which the astronomer had uttered had been, "My comet!"

To what could the exclamation refer? Was it to be conjectured that a fragment of the earth had been chipped off by the collision of a comet? and if so, was it implied that the name of the comet itself was Gallia, and were they mistaken in supposing that such was the name given by the savant to the little world that had been so suddenly launched into space? Again and again they discussed these questions; but no satisfactory answer could be found. The only man who was able to throw any light upon the subject was lying amongst them in an unconscious and half-dying condition.

Apart from motives of humanity, motives of self-interest made it a matter of the deepest concern to restore animation to that senseless form. Ben Zoof, after making the encouraging remark that savants have as many lives as a cat, proceeded, with Negrete's assistance, to give the body such a vigorous rubbing as would have threatened serious injury to any ordinary mortal, whilst they administered cordials and restoratives from the Dobryna's medical stores powerful enough, one might think, to rouse the very dead.

Meanwhile the captain was racking his brain in his exertions to recall what were the circumstances of his previous acquaintance with the Frenchman upon whose features he was gazing; he only grew more and more convinced that he had once been familiar with them. Perhaps it was not

altogether surprising that he had almost forgotten him; he had never seen him since the days of his youth, that time of life which, with a certain show of justice, has been termed the age of ingratitude; for, in point of fact, the astronomer was none other than Professor Palmyrin Rosette, Servadac's old science-master at the Lycee Charlemagne.

After completing his year of elementary studies, Hector Servadac had entered the school at Saint Cyr, and from that time he and his former tutor had never met, so that naturally they would well-nigh pass from each other's recollection. One thing, however, on the other hand, might conduce to a mutual and permanent impression on their memories; during the year at the Lycee, young Servadac, never of a very studious turn of mind, had contrived, as the ringleader of a set of like caliber as himself, to lead the poor professor a life of perpetual torment. On the discovery of each delinquency he would fume and rage in a manner that was a source of unbounded delight to his audience.

Two years after Servadac left the Lycee, Professor Rosette had thrown up all educational employment in order that he might devote himself entirely to the study of astronomy. He endeavored to obtain a post at the Observatory, but his ungenial character was so well known in scientific circles that he failed in his application; however, having some small private means, he determined on his own account to carry on his researches without any official salary. He had really considerable

genius for the science that he had adopted; besides discovering three of the latest of the telescopic planets, he had worked out the elements of the three hundred and twenty-fifth comet in the catalogue; but his chief delight was to criticize the publications of other astronomers, and he was never better pleased than when he detected a flaw in their reckonings.

When Ben Zoof and Negrete had extricated their patient from the envelope of furs in which he had been wrapped by Servadac and the lieutenant, they found themselves face to face with a shrivelled little man, about five feet two inches high, with a round bald head, smooth and shiny as an ostrich's egg, no beard unless the unshorn growth of a week could be so described, and a long hooked nose that supported a huge pair of spectacles such as with many near-sighted people seems to have become a part of their individuality. His nervous system was remarkably developed, and his body might not inaptly be compared to one of the Rhumkorff's bobbins of which the thread, several hundred yards in length, is permeated throughout by electric fluid. But whatever he was, his life, if possible, must be preserved. When he had been partially divested of his clothing, his heart was found to be still beating, though very feebly. Asserting that while there was life there was hope, Ben Zoof recommenced his friction with more vigor than ever.

When the rubbing had been continued without a moment's intermission for

the best part of half an hour, the astronomer heaved a faint sigh, which ere long was followed by another and another. He half opened his eyes, closed them again, then opened them completely, but without exhibiting any consciousness whatever of his situation. A few words seemed to escape his lips, but they were quite unintelligible. Presently he raised his right hand to his forehead as though instinctively feeling for something that was missing; then, all of a sudden, his features became contracted, his face flushed with apparent irritation, and he exclaimed fretfully, "My spectacles!--where are my spectacles?"

In order to facilitate his operations, Ben Zoof had removed the spectacles in spite of the tenacity with which they seemed to adhere to the temples of his patient; but he now rapidly brought them back and readjusted them as best he could to what seemed to be their natural position on the aquiline nose. The professor heaved a long sigh of relief, and once more closed his eyes.

Before long the astronomer roused himself a little more, and glanced inquiringly about him, but soon relapsed into his comatose condition. When next he opened his eyes, Captain Servadac happened to be bending down closely over him, examining his features with curious scrutiny. The old man darted an angry look at him through the spectacles, and said sharply, "Servadac, five hundred lines to-morrow!"

It was an echo of days of old. The words were few, but they were enough to recall the identity which Servadac was trying to make out.

"Is it possible?" he exclaimed. "Here is my old tutor, Mr. Rosette, in very flesh and blood."

"Can't say much for the flesh," muttered Ben Zoof.

The old man had again fallen back into a torpid slumber. Ben Zoof continued, "His sleep is getting more composed. Let him alone; he will come round yet. Haven't I heard of men more dried up than he is, being brought all the way from Egypt in cases covered with pictures?"

"You idiot!--those were mummies; they had been dead for ages."

Ben Zoof did not answer a word. He went on preparing a warm bed, into which he managed to remove his patient, who soon fell into a calm and natural sleep.

Too impatient to await the awakening of the astronomer and to hear what representations he had to make, Servadac, the count, and the lieutenant, constituting themselves what might be designated "the Academy of Sciences" of the colony, spent the whole of the remainder of the day in starting and discussing the wildest conjectures about their situation.

The hypothesis, to which they had now accustomed themselves for so long, that a new asteroid had been formed by a fracture of the earth's surface, seemed to fall to the ground when they found that Professor Palmyrin Rosette had associated the name of Gallia, not with their present home, but with what he called "my comet"; and that theory being abandoned, they were driven to make the most improbable speculations to replace it.

Alluding to Rosette, Servadac took care to inform his companions that, although the professor was always eccentric, and at times very irascible, yet he was really exceedingly good-hearted; his bark was worse than his bite; and if suffered to take their course without observation, his outbreaks of ill-temper seldom lasted long.

"We will certainly do our best to get on with him," said the count. "He is no doubt the author of the papers, and we must hope that he will be able to give us some valuable information."

"Beyond a question the documents have originated with him," assented the lieutenant. "Gallia was the word written at the top of every one of them, and Gallia was the first word uttered by him in our hearing."

The astronomer slept on. Meanwhile, the three together had no hesitation in examining his papers, and scrutinizing the figures on his

extemporized blackboard. The handwriting corresponded with that of the papers already received; the blackboard was covered with algebraical symbols traced in chalk, which they were careful not to obliterate; and the papers, which consisted for the most part of detached scraps, presented a perfect wilderness of geometrical figures, conic sections of every variety being repeated in countless profusion.

Lieutenant Procope pointed out that these curves evidently had reference to the orbits of comets, which are variously parabolic, hyperbolic, or elliptic. If either of the first two, the comet, after once appearing within the range of terrestrial vision, would vanish forever in the outlying regions of space; if the last, it would be sure, sooner or later, after some periodic interval, to return.

From the prima facie appearance of his papers, then, it seemed probable that the astronomer, during his sojourn at Formentera, had been devoting himself to the study of cometary orbits; and as calculations of this kind are ordinarily based upon the assumption that the orbit is a parabola, it was not unlikely that he had been endeavoring to trace the path of some particular comet.

"I wonder whether these calculations were made before or after the 1st of January; it makes all the difference," said Lieutenant Procope.

"We must bide our time and hear," replied the count.

Servadac paced restlessly up and down. "I would give a month of my life," he cried, impetuously, "for every hour that the old fellow goes sleeping on."

"You might be making a bad bargain," said Procope, smiling. "Perhaps after all the comet has had nothing to do with the convulsion that we have experienced."

"Nonsense!" exclaimed the captain; "I know better than that, and so do you. Is it not as clear as daylight that the earth and this comet have been in collision, and the result has been that our little world has been split off and sent flying far into space?"

Count Timascheff and the lieutenant looked at each other in silence. "I do not deny your theory," said Procope after a while. "If it be correct, I suppose we must conclude that the enormous disc we observed on the night of the catastrophe was the comet itself; and the velocity with which it was traveling must have been so great that it was hardly arrested at all by the attraction of the earth."

"Plausible enough," answered Count Timascheff; "and it is to this comet that our scientific friend here has given the name of Gallia."

It still remained a puzzle to them all why the astronomer should apparently be interested in the comet so much more than in the new little world in which their strange lot was cast.

"Can you explain this?" asked the count.

"There is no accounting for the freaks of philosophers, you know," said Servadac; "and have I not told you that this philosopher in particular is one of the most eccentric beings in creation?"

"Besides," added the lieutenant, "it is exceedingly likely that his observations had been going on for some considerable period before the convulsion happened."

Thus, the general conclusion arrived at by the Gallian Academy of Science was this: That on the night of the 31st of December, a comet, crossing the ecliptic, had come into collision with the earth, and that the violence of the shock had separated a huge fragment from the globe, which fragment from that date had been traversing the remote inter-planetary regions. Palmyrin Rosette would doubtless confirm their solution of the phenomenon.

CHAPTER II. A REVELATION

To the general population of the colony the arrival of the stranger was a matter of small interest. The Spaniards were naturally too indolent to be affected in any way by an incident that concerned themselves so remotely; while the Russians felt themselves simply reliant on their master, and as long as they were with him were careless as to where or how they spent their days. Everything went on with them in an accustomed routine; and they lay down night after night, and awoke to their avocations morning after morning, just as if nothing extraordinary had occurred.

All night long Ben Zoof would not leave the professor's bedside. He had constituted himself sick nurse, and considered his reputation at stake if he failed to set his patient on his feet again. He watched every movement, listened to every breath, and never failed to administer the strongest cordials upon the slightest pretext. Even in his sleep Rosette's irritable nature revealed itself. Ever and again, sometimes in a tone of uneasiness, and sometimes with the expression of positive anger, the name of Gallia escaped his lips, as though he were dreaming that his claim to the discovery of the comet was being contested or denied; but although his attendant was on the alert to gather all he

could, he was able to catch nothing in the incoherent sentences that served to throw any real light upon the problem that they were all eager to solve.

When the sun reappeared on the western horizon the professor was still sound asleep; and Ben Zoof, who was especially anxious that the repose which promised to be so beneficial should not be disturbed, felt considerable annoyance at hearing a loud knocking, evidently of some blunt heavy instrument against a door that had been placed at the entrance of the gallery, more for the purpose of retaining internal warmth than for guarding against intrusion from without.

"Confound it!" said Ben Zoof. "I must put a stop to this;" and he made his way towards the door.

"Who's there?" he cried, in no very amiable tone.

"I." replied the quavering voice.

"Who are you?"

"Isaac Hakkabut. Let me in; do, please, let me in."

"Oh, it is you, old Ashtaroth, is it? What do you want? Can't you get

anybody to buy your stuffs?"

"Nobody will pay me a proper price."

"Well, old Shimei, you won't find a customer here. You had better be off."

"No; but do, please--do, please, let me in," supplicated the Jew. "I want to speak to his Excellency, the governor."

"The governor is in bed, and asleep."

"I can wait until he awakes."

"Then wait where you are."

And with this inhospitable rejoinder the orderly was about to return to his place at the side of his patient, when Servadac, who had been roused by the sound of voices, called out, "What's the matter, Ben Zoof?"

"Oh, nothing, sir; only that hound of a Hakkabut says he wants to speak to you."

"Let him in, then."

Ben Zoof hesitated.

"Let him in, I say," repeated the captain, peremptorily.

However reluctantly, Ben Zoof obeyed. The door was unfastened, and Isaac Hakkabut, enveloped in an old overcoat, shuffled into the gallery. In a few moments Servadac approached, and the Jew began to overwhelm him with the most obsequious epithets. Without vouchsafing any reply, the captain beckoned to the old man to follow him, and leading the way to the central hall, stopped, and turning so as to look him steadily in the face, said, "Now is your opportunity. Tell me what you want."

"Oh, my lord, my lord," whined Isaac, "you must have some news to tell me."

"News? What do you mean?"

"From my little tartan yonder, I saw the yawl go out from the rock here on a journey, and I saw it come back, and it brought a stranger; and I thought--I thought--I thought--"

"Well, you thought--what did you think?"

"Why, that perhaps the stranger had come from the northern shores of the Mediterranean, and that I might ask him--"

He paused again, and gave a glance at the captain.

"Ask him what? Speak out, man?"

"Ask him if he brings any tidings of Europe," Hakkabut blurted out at last.

Servadac shrugged his shoulders in contempt and turned away. Here was a man who had been resident three months in Gallia, a living witness of all the abnormal phenomena that had occurred, and yet refusing to believe that his hope of making good bargains with European traders was at an end. Surely nothing, thought the captain, will convince the old rascal now; and he moved off in disgust. The orderly, however, who had listened with much amusement, was by no means disinclined for the conversation to be continued. "Are you satisfied, old Ezekiel?" he asked.

"Isn't it so? Am I not right? Didn't a stranger arrive here last night?" inquired the Jew.

"Yes, quite true."

"Where from?"

"From the Balearic Isles."

"The Balearic Isles?" echoed Isaac.

"Yes."

"Fine quarters for trade! Hardly twenty leagues from Spain! He must have brought news from Europe!"

"Well, old Manasseh, what if he has?"

"I should like to see him."

"Can't be."

The Jew sidled close up to Ben Zoof, and laying his hand on his arm, said in a low and insinuating tone, "I am poor, you know; but I would give you a few reals if you would let me talk to this stranger."

But as if he thought he was making too liberal an offer, he added, "Only it must be at once."

"He is too tired; he is worn out; he is fast asleep," answered Ben Zoof.

"But I would pay you to wake him."

The captain had overheard the tenor of the conversation, and interposed sternly, "Hakkabut! if you make the least attempt to disturb our visitor, I shall have you turned outside that door immediately."

"No offense, my lord, I hope," stammered out the Jew. "I only meant--"

"Silence!" shouted Servadac. The old man hung his head, abashed.

"I will tell you what," said Servadac after a brief interval; "I will give you leave to hear what this stranger has to tell as soon as he is able to tell us anything; at present we have not heard a word from his lips."

The Jew looked perplexed.

"Yes," said Servadac; "when we hear his story, you shall hear it too."

"And I hope it will be to your liking, old Ezekiel!" added Ben Zoof in a voice of irony.

They had none of them long to wait, for within a few minutes Rosette's peevish voice was heard calling, "Joseph! Joseph!"

The professor did not open his eyes, and appeared to be slumbering on, but very shortly afterwards called out again, "Joseph! Confound the fellow! where is he?" It was evident that he was half dreaming about a former servant now far away on the ancient globe. "Where's my blackboard, Joseph?"

"Quite safe, sir," answered Ben Zoof, quickly.

Rosette unclosed his eyes and fixed them full upon the orderly's face. "Are you Joseph?" he asked.

"At your service, sir," replied Ben Zoof with imperturbable gravity.

"Then get me my coffee, and be quick about it."

Ben Zoof left to go into the kitchen, and Servadac approached the professor in order to assist him in rising to a sitting posture.

"Do you recognize your quondam pupil, professor?" he asked.

"Ah, yes, yes; you are Servadac," replied Rosette. "It is twelve years or more since I saw you; I hope you have improved."

"Quite a reformed character, sir, I assure you," said Servadac, smiling.

"Well, that's as it should be; that's right," said the astronomer with fussy importance. "But let me have my coffee," he added impatiently; "I cannot collect my thoughts without my coffee."

Fortunately, Ben Zoof appeared with a great cup, hot and strong. After draining it with much apparent relish, the professor got out of bed, walked into the common hall, round which he glanced with a pre-occupied air, and proceeded to seat himself in an armchair, the most comfortable which the cabin of the Dobryna had supplied. Then, in a voice full of satisfaction, and that involuntarily recalled the exclamations of delight that had wound up the two first of the mysterious documents that had been received, he burst out, "Well, gentlemen, what do you think of Gallia?"

There was no time for anyone to make a reply before Isaac Hakkabut had darted forward.

"By the God--"

"Who is that?" asked the startled professor; and he frowned, and made a gesture of repugnance.

Regardless of the efforts that were made to silence him, the Jew continued, "By the God of Abraham, I beseech you, give me some tidings of Europe!"

"Europe?" shouted the professor, springing from his seat as if he were electrified; "what does the man want with Europe?"

"I want to get there!" screeched the Jew; and in spite of every exertion to get him away, he clung most tenaciously to the professor's chair, and again and again implored for news of Europe.

Rosette made no immediate reply. After a moment or two's reflection, he turned to Servadac and asked him whether it was not the middle of April.

"It is the twentieth," answered the captain.

"Then to-day," said the astronomer, speaking with the greatest deliberation--"to-day we are just three millions of leagues away from Europe."

The Jew was utterly crestfallen.

"You seem here," continued the professor, "to be very ignorant of the state of things."

"How far we are ignorant," rejoined Servadac, "I cannot tell. But I will tell you all that we do know, and all that we have surmised." And as briefly as he could, he related all that had happened since the memorable night of the thirty-first of December; how they had experienced the shock; how the Dobryna had made her voyage; how they had discovered nothing except the fragments of the old continent at Tunis, Sardinia, Gibraltar, and now at Formentera; how at intervals the three anonymous documents had been received; and, finally, how the settlement at Gourbi Island had been abandoned for their present quarters at Nina's Hive.

The astronomer had hardly patience to hear him to the end. "And what do you say is your surmise as to your present position?" he asked.

"Our supposition," the captain replied, "is this. We imagine that we are on a considerable fragment of the terrestrial globe that has been detached by collision with a planet to which you appear to have given the name of Gallia."

"Better than that!" cried Rosette, starting to his feet with excitement.

"How? Why? What do you mean?" cried the voices of the listeners.

"You are correct to a certain degree," continued the professor. "It is quite true that at 47' 35.6" after two o'clock on the morning of the first of January there was a collision; my comet grazed the earth; and the bits of the earth which you have named were carried clean away."

They were all fairly bewildered.

"Where, then," cried Servadac eagerly, "where are we?"

"You are on my comet, on Gallia itself!"

And the professor gazed around him with a perfect air of triumph.

CHAPTER III. THE PROFESSOR'S EXPERIENCES

"Yes, my comet!" repeated the professor, and from time to time he knitted his brows, and looked around him with a defiant air, as though he could not get rid of the impression that someone was laying an unwarranted claim to its proprietorship, or that the individuals before him were intruders upon his own proper domain.

But for a considerable while, Servadac, the count, and the lieutenant remained silent and sunk in thought. Here then, at last, was the unriddling of the enigma they had been so long endeavoring to solve; both the hypotheses they had formed in succession had now to give way before the announcement of the real truth. The first supposition, that the rotatory axis of the earth had been subject to some accidental modification, and the conjecture that replaced it, namely, that a certain portion of the terrestrial sphere had been splintered off and carried into space, had both now to yield to the representation that the earth had been grazed by an unknown comet, which had caught up some scattered fragments from its surface, and was bearing them far away into sidereal regions. Unfolded lay the past and the present before them; but this only served to awaken a keener interest about the future. Could the professor throw any light upon that? they longed to inquire, but did not yet venture to ask him.

Meanwhile Rosette assumed a pompous professional air, and appeared to be waiting for the entire party to be ceremoniously introduced to him. Nothing unwilling to humor the vanity of the eccentric little man, Servadac proceeded to go through the expected formalities.

"Allow me to present to you my excellent friend, the Count Timascheff," he said.

"You are very welcome," said Rosette, bowing to the count with a smile of condescension.

"Although I am not precisely a voluntary resident on your comet, Mr. Professor, I beg to acknowledge your courteous reception," gravely responded Timascheff.

Servadac could not quite conceal his amusement at the count's irony, but continued, "This is Lieutenant Procope, the officer in command of the Dobryna."

The professor bowed again in frigid dignity.

"His yacht has conveyed us right round Gallia," added the captain.

"Round Gallia?" eagerly exclaimed the professor.

"Yes, entirely round it," answered Servadac, and without allowing time for reply, proceeded, "And this is my orderly, Ben Zoof."

"Aide-de-camp to his Excellency the Governor of Gallia," interposed Ben Zoof himself, anxious to maintain his master's honor as well as his own.

Rosette scarcely bent his head.

The rest of the population of the Hive were all presented in succession: the Russian sailors, the Spaniards, young Pablo, and little Nina, on whom the professor, evidently no lover of children, glared fiercely through his formidable spectacles. Isaac Hakkabut, after his introduction, begged to be allowed to ask one question.

"How soon may we hope to get back?" he inquired.

"Get back!" rejoined Rosette, sharply; "who talks of getting back? We have hardly started yet."

Seeing that the professor was inclined to get angry, Captain Servadac adroitly gave a new turn to the conversation by asking him whether he would gratify them by relating his own recent experiences. The

astronomer seemed pleased with the proposal, and at once commenced a verbose and somewhat circumlocutory address, of which the following summary presents the main features.

The French Government, being desirous of verifying the measurement already made of the arc of the meridian of Paris, appointed a scientific commission for that purpose. From that commission the name of Palmyrin Rosette was omitted, apparently for no other reason than his personal unpopularity. Furious at the slight, the professor resolved to set to work independently on his own account, and declaring that there were inaccuracies in the previous geodesic operations, he determined to re-examine the results of the last triangulation which had united Formentera to the Spanish coast by a triangle, one of the sides of which measured over a hundred miles, the very operation which had already been so successfully accomplished by Arago and Biot.

Accordingly, leaving Paris for the Balearic Isles, he placed his observatory on the highest point of Formentera, and accompanied as he was only by his servant, Joseph, led the life of a recluse. He secured the services of a former assistant, and dispatched him to a high peak on the coast of Spain, where he had to superintend a reverberator, which, with the aid of a glass, could be seen from Formentera. A few books and instruments, and two months' victuals, was all the baggage he took with him, except an excellent astronomical telescope, which was, indeed,

almost part and parcel of himself, and with which he assiduously scanned the heavens, in the sanguine anticipation of making some discovery which would immortalize his name.

The task he had undertaken demanded the utmost patience. Night after night, in order to fix the apex of his triangle, he had to linger on the watch for the assistant's signal-light, but he did not forget that his predecessors, Arago and Biot, had had to wait sixty-one days for a similar purpose. What retarded the work was the dense fog which, it has been already mentioned, at that time enveloped not only that part of Europe, but almost the entire world.

Never failing to turn to the best advantage the few intervals when the mist lifted a little, the astronomer would at the same time cast an inquiring glance at the firmament, as he was greatly interested in the revision of the chart of the heavens, in the region contiguous to the constellation Gemini.

To the naked eye this constellation consists of only six stars, but through a telescope ten inches in diameter, as many as six thousand are visible. Rosette, however, did not possess a reflector of this magnitude, and was obliged to content himself with the good but comparatively small instrument he had.

On one of these occasions, whilst carefully gauging the recesses of Gemini, he espied a bright speck which was unregistered in the chart, and which at first he took for a small star that had escaped being entered in the catalogue. But the observation of a few separate nights soon made it manifest that the star was rapidly changing its position with regard to the adjacent stars, and the astronomer's heart began to leap at the thought that the renown of the discovery of a new planet would be associated with his name.

Redoubling his attention, he soon satisfied himself that what he saw was not a planet; the rapidity of its displacement rather forced him to the conjecture that it must be a comet, and this opinion was soon strengthened by the appearance of a coma, and subsequently confirmed, as the body approached the sun, by the development of a tail.

A comet! The discovery was fatal to all further progress in the triangulation. However conscientiously the assistant on the Spanish coast might look to the kindling of the beacon, Rosette had no glances to spare for that direction; he had no eyes except for the one object of his notice, no thoughts apart from that one quarter of the firmament.

A comet! No time must be lost in calculating its elements.

Now, in order to calculate the elements of a comet, it is always deemed

the safest mode of procedure to assume the orbit to be a parabola. Ordinarily, comets are conspicuous at their perihelia, as being their shortest distances from the sun, which is the focus of their orbit, and inasmuch as a parabola is but an ellipse with its axis indefinitely produced, for some short portion of its pathway the orbit may be indifferently considered either one or the other; but in this particular case the professor was right in adopting the supposition of its being parabolic.

Just as in a circle, it is necessary to know three points to determine the circumference; so in ascertaining the elements of a comet, three different positions must be observed before what astronomers call its "ephemeris" can be established.

But Professor Rosette did not content himself with three positions; taking advantage of every rift in the fog he made ten, twenty, thirty observations both in right ascension and in declination, and succeeded in working out with the most minute accuracy the five elements of the comet which was evidently advancing with astounding rapidity towards the earth.

These elements were:

1. The inclination of the plane of the cometary orbit to the plane of

the ecliptic, an angle which is generally considerable, but in this case the planes were proved to coincide.

2. The position of the ascending node, or the point where the comet crossed the terrestrial orbit.

These two elements being obtained, the position in space of the comet's orbit was determined.

3. The direction of the axis major of the orbit, which was found by calculating the longitude of the comet's perihelion.

4. The perihelion distance from the sun, which settled the precise form of the parabola.

5. The motion of the comet, as being retrograde, or, unlike the planets, from east to west.

Rosette thus found himself able to calculate the date at which the comet would reach its perihelion, and, overjoyed at his discovery, without thinking of calling it Palmyra or Rosette, after his own name, he resolved that it should be known as Gallia.

His next business was to draw up a formal report. Not only did he at

once recognize that a collision with the earth was possible, but he soon foresaw that it was inevitable, and that it must happen on the night of the 31st of December; moreover, as the bodies were moving in opposite directions, the shock could hardly fail to be violent.

To say that he was elated at the prospect was far below the truth; his delight amounted almost to delirium. Anyone else would have hurried from the solitude of Formentera in sheer fright; but, without communicating a word of his startling discovery, he remained resolutely at his post. From occasional newspapers which he had received, he had learnt that fogs, dense as ever, continued to envelop both hemispheres, so that he was assured that the existence of the comet was utterly unknown elsewhere; and the ignorance of the world as to the peril that threatened it averted the panic that would have followed the publication of the facts, and left the philosopher of Formentera in sole possession of the great secret. He clung to his post with the greater persistency, because his calculations had led him to the conclusion that the comet would strike the earth somewhere to the south of Algeria, and as it had a solid nucleus, he felt sure that, as he expressed it, the effect would be "unique," and he was anxious to be in the vicinity.

The shock came, and with it the results already recorded. Palmyrin Rosette was suddenly separated from his servant Joseph, and when, after a long period of unconsciousness, he came to himself, he found that

he was the solitary occupant of the only fragment that survived of the Balearic Archipelago.

Such was the substance of the narrative which the professor gave with sundry repetitions and digressions; while he was giving it, he frequently paused and frowned as if irritated in a way that seemed by no means justified by the patient and good-humored demeanor of his audience.

"But now, gentlemen," added the professor, "I must tell you something more. Important changes have resulted from the collision; the cardinal points have been displaced; gravity has been diminished: not that I ever supposed for a minute, as you did, that I was still upon the earth. No! the earth, attended by her moon, continued to rotate along her proper orbit. But we, gentlemen, have nothing to complain of; our destiny might have been far worse; we might all have been crushed to death, or the comet might have remained in adhesion to the earth; and in neither of these cases should we have had the satisfaction of making this marvelous excursion through untraversed solar regions. No, gentlemen, I repeat it, we have nothing to regret."

And as the professor spoke, he seemed to kindle with the emotion of such supreme contentment that no one had the heart to gainsay his assertion. Ben Zoof alone ventured an unlucky remark to the effect that if the

comet had happened to strike against Montmartre, instead of a bit of Africa, it would have met with some resistance.

"Pshaw!" said Rosette, disdainfully. "A mole-hill like Montmartre would have been ground to powder in a moment."

"Mole-hill!" exclaimed Ben Zoof, stung to the quick. "I can tell you it would have caught up your bit of a comet and worn it like a feather in a cap."

The professor looked angry, and Servadac having imposed silence upon his orderly, explained the worthy soldier's sensitiveness on all that concerned Montmartre. Always obedient to his master, Ben Zoof held his tongue; but he felt that he could never forgive the slight that had been cast upon his beloved home.

It was now all-important to learn whether the astronomer had been able to continue his observations, and whether he had learned sufficient of Gallia's path through space to make him competent to determine, at least approximately, the period of its revolution round the sun. With as much tact and caution as he could, Lieutenant Procope endeavored to intimate the general desire for some information on this point.

"Before the shock, sir," answered the professor, "I had conclusively

demonstrated the path of the comet; but, in consequence of the modifications which that shock has entailed upon my comet's orbit, I have been compelled entirely to recommence my calculations."

The lieutenant looked disappointed.

"Although the orbit of the earth was unaltered," continued the professor, "the result of the collision was the projection of the comet into a new orbit altogether."

"And may I ask," said Procope, deferentially, "whether you have got the elements of the fresh orbit?"

"Yes."

"Then perhaps you know--"

"I know this, sir, that at 47 minutes 35.6 seconds after two o'clock on the morning of the 1st of January last, Gallia, in passing its ascending node, came in contact with the earth; that on the 10th of January it crossed the orbit of Venus; that it reached its perihelion on the 15th; that it re-crossed the orbit of Venus; that on the 1st of February it passed its descending node; on the 13th crossed the orbit of Mars; entered the zone of the telescopic planets on the 10th of March, and,

attracting Nerina, carried it off as a satellite."

Servadac interposed:

"We are already acquainted with well-nigh all these extraordinary facts; many of them, moreover, we have learned from documents which we have picked up, and which, although unsigned, we cannot entertain a doubt have originated with you."

Professor Rosette drew himself up proudly and said: "Of course, they originated with me. I sent them off by hundreds. From whom else could they come?"

"From no one but yourself, certainly," rejoined the count, with grave politeness.

Hitherto the conversation had thrown no light upon the future movements of Gallia, and Rosette was disposed apparently to evade, or at least to postpone, the subject. When, therefore, Lieutenant Procope was about to press his inquiries in a more categorical form, Servadac, thinking it advisable not prematurely to press the little savant too far, interrupted him by asking the professor how he accounted for the earth having suffered so little from such a formidable concussion.

"I account for it in this way," answered Rosette: "the earth was traveling at the rate of 28,000 leagues an hour, and Gallia at the rate of 57,000 leagues an hour, therefore the result was the same as though a train rushing along at a speed of about 86,000 leagues an hour had suddenly encountered some obstacle. The nucleus of the comet, being excessively hard, has done exactly what a ball would do fired with that velocity close to a pane of glass. It has crossed the earth without cracking it."

"It is possible you may be right," said Servadac, thoughtfully.

"Right! of course I am right!" replied the snappish professor. Soon, however, recovering his equanimity, he continued: "It is fortunate that the earth was only touched obliquely; if the comet had impinged perpendicularly, it must have plowed its way deep below the surface, and the disasters it might have caused are beyond reckoning. Perhaps," he added, with a smile, "even Montmartre might not have survived the calamity."

"Sir!" shouted Ben Zoof, quite unable to bear the unprovoked attack.

"Quiet, Ben Zoof!" said Servadac sternly.

Fortunately for the sake of peace, Isaac Hakkabut, who at length was

beginning to realize something of the true condition of things, came forward at this moment, and in a voice trembling with eagerness, implored the professor to tell him when they would all be back again upon the earth.

"Are you in a great hurry?" asked the professor coolly.

The Jew was about to speak again, when Captain Servadac interposed: "Allow me to say that, in somewhat more scientific terms, I was about to ask you the same question. Did I not understand you to say that, as the consequence of the collision, the character of the comet's orbit has been changed?"

"You did, sir."

"Did you imply that the orbit has ceased to be a parabola?"

"Just so."

"Is it then an hyperbola? and are we to be carried on far and away into remote distance, and never, never to return?"

"I did not say an hyperbola."

"And is it not?"

"It is not."

"Then it must be an ellipse?"

"Yes."

"And does its plane coincide with the plane of the earth?"

"Yes."

"Then it must be a periodic comet?"

"It is."

Servadac involuntarily raised a ringing shout of joy that echoed again along the gallery.

"Yes," continued the professor, "Gallia is a periodic comet, and allowing for the perturbations to which it is liable from the attraction of Mars and Jupiter and Saturn, it will return to the earth again in two years precisely."

"You mean that in two years after the first shock, Gallia will meet the earth at the same point as they met before?" said Lieutenant Procope.

"I am afraid so," said Rosette.

"Why afraid?"

"Because we are doing exceedingly well as we are." The professor stamped his foot upon the ground, by way of emphasis, and added, "If I had my will, Gallia should never return to the earth again!"

CHAPTER IV. A REVISED CALENDAR

All previous hypotheses, then, were now forgotten in the presence of the one great fact that Gallia was a comet and gravitating through remote solar regions. Captain Servadac became aware that the huge disc that had been looming through the clouds after the shock was the form of the retreating earth, to the proximity of which the one high tide they had experienced was also to be attributed.

As to the fulfillment of the professor's prediction of an ultimate return to the terrestrial sphere, that was a point on which it must be owned that the captain, after the first flush of his excitement was over, was not without many misgivings.

The next day or two were spent in providing for the accommodation of the new comer. Fortunately his desires were very moderate; he seemed to live among the stars, and as long as he was well provided with coffee, he cared little for luxuries, and paid little or no regard to the ingenuity with which all the internal arrangements of Nina's Hive had been devised. Anxious to show all proper respect to his former tutor, Servadac proposed to leave the most comfortable apartment of the place at his disposal; but the professor resolutely declined to occupy it, saying that what he required was a small chamber, no matter how small,

provided that it was elevated and secluded, which he could use as an observatory and where he might prosecute his studies without disturbance. A general search was instituted, and before long they were lucky enough to find, about a hundred feet above the central grotto, a small recess or reduct hollowed, as it were, in the mountain side, which would exactly answer their purpose. It contained room enough for a bed, a table, an arm-chair, a chest of drawers, and, what was of still more consequence, for the indispensable telescope. One small stream of lava, an off-shoot of the great torrent, sufficed to warm the apartment enough.

In these retired quarters the astronomer took up his abode. It was on all hands acknowledged to be advisable to let him go on entirely in his own way. His meals were taken to him at stated intervals; he slept but little; carried on his calculations by day, his observations by night, and very rarely made his appearance amongst the rest of the little community.

The cold now became very intense, the thermometer registering 30 degrees F. below zero. The mercury, however, never exhibited any of those fluctuations that are ever and again to be observed in variable climates, but continued slowly and steadily to fall, and in all probability would continue to do so until it reached the normal temperature of the regions of outlying space.

This steady sinking of the mercury was accompanied by a complete stillness of the atmosphere; the very air seemed to be congealed; no particle of it stirred; from zenith to horizon there was never a cloud; neither were there any of the damp mists or dry fogs which so often extend over the polar regions of the earth; the sky was always clear; the sun shone by day and the stars by night without causing any perceptible difference in the temperature.

These peculiar conditions rendered the cold endurable even in the open air. The cause of so many of the diseases that prove fatal to Arctic explorers resides in the cutting winds, unwholesome fogs, or terrible snow drifts, which, by drying up, relaxing, or otherwise affecting the lungs, make them incapable of fulfilling their proper functions. But during periods of calm weather, when the air has been absolutely still, many polar navigators, well-clothed and properly fed, have been known to withstand a temperature when the thermometer has fallen to 60 degrees below zero. It was the experience of Parry upon Melville Island, of Kane beyond latitude 81 degrees north, and of Hall and the crew of the Polaris, that, however intense the cold, in the absence of the wind they could always brave its rigor.

Notwithstanding, then, the extreme lowness of the temperature, the little population found that they were able to move about in the open

air with perfect immunity. The governor general made it his special care to see that his people were all well fed and warmly clad. Food was both wholesome and abundant, and besides the furs brought from the Dobryna's stores, fresh skins could very easily be procured and made up into wearing apparel. A daily course of out-door exercise was enforced upon everyone; not even Pablo and Nina were exempted from the general rule; the two children, muffled up in furs, looking like little Esquimeaux, skated along together, Pablo ever at his companion's side, ready to give her a helping hand whenever she was weary with her exertions.

After his interview with the newly arrived astronomer, Isaac Hakkabut slunk back again to his tartan. A change had come over his ideas; he could no longer resist the conviction that he was indeed millions and millions of miles away from the earth, where he had carried on so varied and remunerative a traffic. It might be imagined that this realization of his true position would have led him to a better mind, and that, in some degree at least, he would have been induced to regard the few fellow-creatures with whom his lot had been so strangely cast, otherwise than as mere instruments to be turned to his own personal and pecuniary advantage; but no--the desire of gain was too thoroughly ingrained into his hard nature ever to be eradicated, and secure in his knowledge that he was under the protection of a French officer, who, except under the most urgent necessity, would not permit him to be molested in retaining

his property, he determined to wait for some emergency to arise which should enable him to use his present situation for his own profit.

On the one hand, the Jew took it into account that although the chances of returning to the earth might be remote, yet from what he had heard from the professor he could not believe that they were improbable; on the other, he knew that a considerable sum of money, in English and Russian coinage, was in the possession of various members of the little colony, and this, although valueless now, would be worth as much as ever if the proper condition of things should be restored; accordingly, he set his heart on getting all the monetary wealth of Gallia into his possession, and to do this he must sell his goods. But he would not sell them yet; there might come a time when for many articles the supply would not be equal to the demand; that would be the time for him; by waiting he reckoned he should be able to transact some lucrative business.

Such in his solitude were old Isaac's cogitations, whilst the universal population of Nina's Hive were congratulating themselves upon being rid of his odious presence.

As already stated in the message brought by the carrier pigeon, the distance traveled by Gallia in April was 39,000,000 leagues, and at the end of the month she was 110,000,000 leagues from the sun. A diagram

representing the elliptical orbit of the planet, accompanied by an ephemeris made out in minute detail, had been drawn out by the professor. The curve was divided into twenty-four sections of unequal length, representing respectively the distance described in the twenty-four months of the Gallian year, the twelve former divisions, according to Kepler's law, gradually diminishing in length as they approached the point denoting the aphelion and increasing as they neared the perihelion.

It was on the 12th of May that Rosette exhibited this result of his labors to Servadac, the count, and the lieutenant, who visited his apartment and naturally examined the drawing with the keenest interest. Gallia's path, extending beyond the orbit of Jupiter, lay clearly defined before their eyes, the progress along the orbit and the solar distances being inserted for each month separately. Nothing could look plainer, and if the professor's calculations were correct (a point upon which they dared not, if they would, express the semblance of a doubt), Gallia would accomplish her revolution in precisely two years, and would meet the earth, which would in the same period of time have completed two annual revolutions, in the very same spot as before. What would be the consequences of a second collision they scarcely ventured to think.

Without lifting his eye from the diagram, which he was still carefully scrutinizing, Servadac said, "I see that during the month of May, Gallia

will only travel 30,400,000 leagues, and that this will leave her about 140,000,000 leagues distant from the sun."

"Just so," replied the professor.

"Then we have already passed the zone of the telescopic planets, have we not?" asked the count.

"Can you not use your eyes?" said the professor, testily. "If you will look you will see the zone marked clearly enough upon the map."

Without noticing the interruption, Servadac continued his own remarks, "The comet then, I see, is to reach its aphelion on the 15th of January, exactly a twelvemonth after passing its perihelion."

"A twelvemonth! Not a Gallian twelvemonth?" exclaimed Rosette.

Servadac looked bewildered. Lieutenant Procope could not suppress a smile.

"What are you laughing at?" demanded the professor, turning round upon him angrily.

"Nothing, sir; only it amuses me to see how you want to revise the

terrestrial calendar."

"I want to be logical, that's all."

"By all manner of means, my dear professor, let us be logical."

"Well, then, listen to me," resumed the professor, stiffly. "I presume you are taking it for granted that the Gallian year--by which I mean the time in which Gallia makes one revolution round the sun--is equal in length to two terrestrial years."

They signified their assent.

"And that year, like every other year, ought to be divided into twelve months."

"Yes, certainly, if you wish it," said the captain, acquiescing.

"If I wish it!" exclaimed Rosette. "Nothing of the sort! Of course a year must have twelve months!"

"Of course," said the captain.

"And how many days will make a month?" asked the professor.

"I suppose sixty or sixty-two, as the case may be. The days now are only half as long as they used to be," answered the captain.

"Servadac, don't be thoughtless!" cried Rosette, with all the petulant impatience of the old pedagogue. "If the days are only half as long as they were, sixty of them cannot make up a twelfth part of Gallia's year--cannot be a month."

"I suppose not," replied the confused captain.

"Do you not see, then," continued the astronomer, "that if a Gallian month is twice as long as a terrestrial month, and a Gallian day is only half as long as a terrestrial day, there must be a hundred and twenty days in every month?"

"No doubt you are right, professor," said Count Timascheff; "but do you not think that the use of a new calendar such as this would practically be very troublesome?"

"Not at all! not at all! I do not intend to use any other," was the professor's bluff reply.

After pondering for a few moments, the captain spoke again. "According,

then, to this new calendar, it isn't the middle of May at all; it must now be some time in March."

"Yes," said the professor, "to-day is the 26th of March. It is the 266th day of the Gallian year. It corresponds with the 133d day of the terrestrial year. You are quite correct, it is the 26th of March."

"Strange!" muttered Servadac.

"And a month, a terrestrial month, thirty old days, sixty new days hence, it will be the 86th of March."

"Ha, ha!" roared the captain; "this is logic with a vengeance!"

The old professor had an undefined consciousness that his former pupil was laughing at him; and as it was growing late, he made an excuse that he had no more leisure. The visitors accordingly quitted the observatory.

It must be owned that the revised calendar was left to the professor's sole use, and the colony was fairly puzzled whenever he referred to such unheard-of dates as the 47th of April or the 118th of May.

According to the old calendar, June had now arrived; [illustration

omitted] [page intentionally blank] and by the professor's tables Gallia during the month would have advanced 27,500,000 leagues farther along its orbit, and would have attained a distance of 155,000,000 leagues from the sun. The thermometer continued to fall; the atmosphere remained clear as heretofore. The population performed their daily avocations with systematic routine; and almost the only thing that broke the monotony of existence was an occasional visit from the blustering, nervous, little professor, when some sudden fancy induced him to throw aside his astronomical studies for a time, and pay a visit to the common hall. His arrival there was generally hailed as the precursor of a little season of excitement. Somehow or other the conversation would eventually work its way round to the topic of a future collision between the comet and the earth; and in the same degree as this was a matter of sanguine anticipation to Captain Servadac and his friends, it was a matter of aversion to the astronomical enthusiast, who had no desire to quit his present quarters in a sphere which, being of his own discovery, he could hardly have cared for more if it had been of his own creation. The interview would often terminate in a scene of considerable animation.

On the 27th of June (old calendar) the professor burst like a cannon-ball into the central hall, where they were all assembled, and without a word of salutation or of preface, accosted the lieutenant in the way in which in earlier days he had been accustomed to speak to an

idle school-boy, "Now, lieutenant! no evasions! no shufflings! Tell me, have you or have you not circumnavigated Gallia?"

The lieutenant drew himself up stiffly. "Evasions! shufflings! I am not accustomed, sir--" he began in a tone evidencing no little resentment; but catching a hint from the count he subdued his voice, and simply said, "We have."

"And may I ask," continued the professor, quite unaware of his previous discourtesy, "whether, when you made your voyage, you took any account of distances?"

"As approximately as I could," replied the lieutenant; "I did what I could by log and compass. I was unable to take the altitude of sun or star."

"At what result did you arrive? What is the measurement of our equator?"

"I estimate the total circumference of the equator to be about 1,400 miles."

"Ah!" said the professor, more than half speaking to himself, "a circumference of 1,400 miles would give a diameter of about 450 miles. That would be approximately about one-sixteenth of the diameter of the

earth."

Raising his voice, he continued, "Gentlemen, in order to complete my account of my comet Gallia, I require to know its area, its mass, its volume, its density, its specific gravity."

"Since we know the diameter," remarked the lieutenant, "there can be no difficulty in finding its surface and its volume."

"And did I say there was any difficulty?" asked the professor, fiercely. "I have been able to reckon that ever since I was born."

"Cock-a-doodle-doo!" cried Ben Zoof, delighted at any opportunity of paying off his old grudge.

The professor looked at him, but did not vouchsafe a word. Addressing the captain, he said, "Now, Servadac, take your paper and a pen, and find me the surface of Gallia."

With more submission than when he was a school-boy, the captain sat down and endeavored to recall the proper formula.

"The surface of a sphere? Multiply circumference by diameter."

"Right!" cried Rosette; "but it ought to be done by this time."

"Circumference, 1,400; diameter, 450; area of surface, 630,000," read the captain.

"True," replied Rosette, "630,000 square miles; just 292 times less than that of the earth."

"Pretty little comet! nice little comet!" muttered Ben Zoof.

The astronomer bit his lip, snorted, and cast at him a withering look, but did not take any further notice.

"Now, Captain Servadac," said the professor, "take your pen again, and find me the volume of Gallia."

The captain hesitated.

"Quick, quick!" cried the professor, impatiently; "surely you have not forgotten how to find the volume of a sphere!"

"A moment's breathing time, please."

"Breathing time, indeed! A mathematician should not want breathing

time! Come, multiply the surface by the third of the radius. Don't you recollect?"

Captain Servadac applied himself to his task while the by-standers waited, with some difficulty suppressing their inclination to laugh. There was a short silence, at the end of which Servadac announced that the volume of the comet was 47,880,000 cubic miles.

"Just about 5,000 times less than the earth," observed the lieutenant.

"Nice little comet! pretty little comet!" said Ben Zoof.

The professor scowled at him, and was manifestly annoyed at having the insignificant dimensions of his comet pointed out in so disparaging a manner. Lieutenant Procope further remarked that from the earth he supposed it to be about as conspicuous as a star of the seventh magnitude, and would require a good telescope to see it.

"Ha, ha!" laughed the orderly, aloud; "charming little comet! so pretty; and so modest!"

"You rascal!" roared the professor, and clenched his hand in passion, as if about to strike him. Ben Zoof laughed the more, and was on the point of repeating his satirical comments, when a stern order from the captain

made him hold his tongue. The truth was that the professor was just as sensitive about his comet as the orderly was about Montmartre, and if the contention between the two had been allowed to go on unchecked, it is impossible to say what serious quarrel might not have arisen.

When Professor Rosette's equanimity had been restored, he said, "Thus, then, gentlemen, the diameter, the surface, the volume of my comet are settled; but there is more to be done. I shall not be satisfied until, by actual measurement, I have determined its mass, its density, and the force of gravity at its surface."

"A laborious problem," remarked Count Timascheff.

"Laborious or not, it has to be accomplished. I am resolved to find out what my comet weighs."

"Would it not be of some assistance, if we knew of what substance it is composed?" asked the lieutenant.

"That is of no moment at all," replied the professor; "the problem is independent of it."

"Then we await your orders," was the captain's reply.

"You must understand, however," said Rosette, "that there are various preliminary calculations to be made; you will have to wait till they are finished."

"As long as you please," said the count.

"No hurry at all," observed the captain, who was not in the least impatient to continue his mathematical exercises.

"Then, gentlemen," said the astronomer, "with your leave we will for this purpose make an appointment a few weeks hence. What do you say to the 62d of April?"

Without noticing the general smile which the novel date provoked, the astronomer left the hall, and retired to his observatory.

CHAPTER V. WANTED: A STEELYARD

Under the still diminishing influence of the sun's attraction, but without let or hindrance, Gallia continued its interplanetary course, accompanied by Nerina, its captured satellite, which performed its fortnightly revolutions with unvarying regularity.

Meanwhile, the question beyond all others important was ever recurring to the minds of Servadac and his two companions: were the astronomer's calculations correct, and was there a sound foundation for his prediction that the comet would again touch the earth? But whatever might be their doubts or anxieties, they were fain to keep all their misgivings to themselves; the professor was of a temper far too cross-grained for them to venture to ask him to revise or re-examine the results of his observations.

The rest of the community by no means shared in their uneasiness. Negrete and his fellow-countrymen yielded to their destiny with philosophical indifference. Happier and better provided for than they had ever been in their lives, it did not give them a passing thought, far less cause any serious concern, whether they were still circling round the sun, or whether they were being carried right away within the limits of another system. Utterly careless of the future, the majos,

light-hearted as ever, carolled out their favorite songs, just as if they had never quitted the shores of their native land.

Happiest of all were Pablo and Nina. Racing through the galleries of the Hive, clambering over the rocks upon the shore, one day skating far away across the frozen ocean, the next fishing in the lake that was kept liquid by the heat of the lava-torrent, the two children led a life of perpetual enjoyment. Nor was their recreation allowed to interfere with their studies. Captain Servadac, who in common with the count really liked them both, conceived that the responsibilities of a parent in some degree had devolved upon him, and took great care in superintending their daily lessons, which he succeeded in making hardly less pleasant than their sports.

Indulged and loved by all, it was little wonder that young Pablo had no longing for the scorching plains of Andalusia, or that little Nina had lost all wish to return with her pet goat to the barren rocks of Sardinia. They had now a home in which they had nothing to desire.

"Have you no father nor mother?" asked Pablo, one day.

"No," she answered.

"No more have I," said the boy, "I used to run along by the side of the

diligences when I was in Spain."

"I used to look after goats at Madalena," said Nina; "but it is much nicer here--I am so happy here. I have you for a brother, and everybody is so kind. I am afraid they will spoil us, Pablo," she added, smiling.

"Oh, no, Nina; you are too good to be spoiled, and when I am with you, you make me good too," said Pablo, gravely.

July had now arrived. During the month Gallia's advance along its orbit would be reduced to 22,000,000 leagues, the distance from the sun at the end being 172,000,000 leagues, about four and a half times as great as the average distance of the earth from the sun. It was traveling now at about the same speed as the earth, which traverses the ecliptic at a rate of 21,000,000 leagues a month, or 28,800 leagues an hour.

In due time the 62d April, according to the revised Gallian calendar, dawned; and in punctual fulfillment of the professor's appointment, a note was delivered to Servadac to say that he was ready, and hoped that day to commence operations for calculating the mass and density of his comet, as well as the force of gravity at its surface.

A point of far greater interest to Captain Servadac and his friends would have been to ascertain the nature of the substance of which the

comet was composed, but they felt pledged to render the professor any aid they could in the researches upon which he had set his heart. Without delay, therefore, they assembled in the central hall, where they were soon joined by Rosette, who seemed to be in fairly good temper.

"Gentlemen," he began, "I propose to-day to endeavor to complete our observations of the elements of my comet. Three matters of investigation are before us. First, the measure of gravity at its surface; this attractive force we know, by the increase of our own muscular force, must of course be considerably less than that at the surface of the earth. Secondly, its mass, that is, the quality of its matter. And thirdly, its density or quantity of matter in a unit of its volume. We will proceed, gentlemen, if you please, to weigh Gallia."

Ben Zoof, who had just entered the hall, caught the professor's last sentence, and without saying a word, went out again and was absent for some minutes. When he returned, he said, "If you want to weigh this comet of yours, I suppose you want a pair of scales; but I have been to look, and I cannot find a pair anywhere. And what's more," he added mischievously, "you won't get them anywhere."

A frown came over the professor's countenance. Servadac saw it, and gave his orderly a sign that he should desist entirely from his bantering.

"I require, gentlemen," resumed Rosette, "first of all to know by how much the weight of a kilogramme here differs from its weight upon the earth; the attraction, as we have said, being less, the weight will proportionately be less also."

"Then an ordinary pair of scales, being under the influence of attraction, I suppose, would not answer your purpose," submitted the lieutenant.

"And the very kilogramme weight you used would have become lighter," put in the count, deferentially.

"Pray, gentlemen, do not interrupt me," said the professor, authoritatively, as if ex cathedra. "I need no instruction on these points."

Procope and Timascheff demurely bowed their heads.

The professor resumed. "Upon a steelyard, or spring-balance, dependent upon mere tension or flexibility, the attraction will have no influence. If I suspend a weight equivalent to the weight of a kilogramme, the index will register the proper weight on the surface of Gallia. Thus I shall arrive at the difference I want: the difference between the earth's attraction and the comet's. Will you, therefore, have

the goodness to provide me at once with a steelyard and a tested kilogramme?"

The audience looked at one another, and then at Ben Zoof, who was thoroughly acquainted with all their resources. "We have neither one nor the other," said the orderly.

The professor stamped with vexation.

"I believe old Hakkabut has a steelyard on board his tartan," said Ben Zoof, presently.

"Then why didn't you say so before, you idiot?" roared the excitable little man.

Anxious to pacify him, Servadac assured him that every exertion should be made to procure the instrument, and directed Ben Zoof to go to the Jew and borrow it.

"No, stop a moment," he said, as Ben Zoof was moving away on his, errand; "perhaps I had better go with you myself; the old Jew may make a difficulty about lending us any of his property."

"Why should we not all go?" asked the count; "we should see what kind of

a life the misanthrope leads on board the Hansa."

The proposal met with general approbation. Before they started, Professor Rosette requested that one of the men might be ordered to cut him a cubic decimeter out of the solid substance of Gallia. "My engineer is the man for that," said the count; "he will do it well for you if you will give him the precise measurement."

"What! you don't mean," exclaimed the professor, again going off into a passion, "that you haven't a proper measure of length?"

Ben Zoof was sent off to ransack the stores for the article in question, but no measure was forthcoming. "Most likely we shall find one on the tartan," said the orderly.

"Then let us lose no time in trying," answered the professor, as he hustled with hasty strides into the gallery.

The rest of the party followed, and were soon in the open air upon the rocks that overhung the shore. They descended to the level of the frozen water and made their way towards the little creek where the Dobryna and the Hansa lay firmly imprisoned in their icy bonds.

The temperature was low beyond previous experience; but well muffled up

in fur, they all endured it without much actual suffering. Their breath issued in vapor, which was at once congealed into little crystals upon their whiskers, beards, eyebrows, and eyelashes, until their faces, covered with countless snow-white prickles, were truly ludicrous. The little professor, most comical of all, resembled nothing so much as the cub of an Arctic bear.

It was eight o'clock in the morning. The sun was rapidly approaching the zenith; but its disc, from the extreme remoteness, was proportionately dwarfed; its beams being all but destitute of their proper warmth and radiance. The volcano to its very summit and the surrounding rocks were still covered with the unsullied mantle of snow that had fallen while the atmosphere was still to some extent charged with vapor; but on the north side the snow had given place to the cascade of fiery lava, which, making its way down the sloping rocks as far as the vaulted opening of the central cavern, fell thence perpendicularly into the sea. Above the cavern, 130 feet up the mountain, was a dark hole, above which the stream of lava made a bifurcation in its course. From this hole projected the case of an astronomer's telescope; it was the opening of Palmyrin Rosette's observatory.

Sea and land seemed blended into one dreary whiteness, to which the pale blue sky offered scarcely any contrast. The shore was indented with the marks of many footsteps left by the colonists either on their way to

collect ice for drinking purposes, or as the result of their skating expeditions; the edges of the skates had cut out a labyrinth of curves complicated as the figures traced by aquatic insects upon the surface of a pool.

Across the quarter of a mile of level ground that lay between the mountain and the creek, a series of footprints, frozen hard into the snow, marked the course taken by Isaac Hakkabut on his last return from Nina's Hive.

On approaching the creek, Lieutenant Procope drew his companions' attention to the elevation of the Dobryna's and Hansa's waterline, both vessels being now some fifteen feet above the level of the sea.

"What a strange phenomenon!" exclaimed the captain.

"It makes me very uneasy," rejoined the lieutenant; "in shallow places like this, as the crust of ice thickens, it forces everything upwards with irresistible force."

"But surely this process of congelation must have a limit!" said the count.

"But who can say what that limit will be? Remember that we have not yet

reached our maximum of cold," replied Procope.

"Indeed, I hope not!" exclaimed the professor; "where would be the use of our traveling 200,000,000 leagues from the sun, if we are only to experience the same temperature as we should find at the poles of the earth?"

"Fortunately for us, however, professor," said the lieutenant, with a smile, "the temperature of the remotest space never descends beyond 70 degrees below zero."

"And as long as there is no wind," added Servadac, "we may pass comfortably through the winter, without a single attack of catarrh."

Lieutenant Procope proceeded to impart to the count his anxiety about the situation of his yacht. He pointed out that by the constant superposition of new deposits of ice, the vessel would be elevated to a great height, and consequently in the event of a thaw, it must be exposed to a calamity similar to those which in polar seas cause destruction to so many whalers.

There was no time now for concerting measures offhand to prevent the disaster, for the other members of the party had already reached the spot where the Hansa lay bound in her icy trammels. A flight of steps,

recently hewn by Hakkabut himself, gave access for the present to the gangway, but it was evident that some different contrivance would have to be resorted to when the tartan should be elevated perhaps to a hundred feet.

A thin curl of blue smoke issued from the copper funnel that projected above the mass of snow which had accumulated upon the deck of the Hansa. The owner was sparing of his fuel, and it was only the non-conducting layer of ice enveloping the tartan that rendered the internal temperature endurable.

"Hi! old Nebuchadnezzar, where are you?" shouted Ben Zoof, at the full strength of his lungs.

At the sound of his voice, the cabin door opened, and the Jew's head and shoulders protruded onto the deck.

CHAPTER VI. MONEY AT A PREMIUM

"Who's there? I have nothing here for anyone. Go away!" Such was the inhospitable greeting with which Isaac Hakkabut received his visitors.

"Hakkabut! do you take us for thieves?" asked Servadac, in tones of stern displeasure.

"Oh, your Excellency, my lord, I did not know that it was you," whined the Jew, but without emerging any farther from his cabin.

"Now, old Hakkabut, come out of your shell! Come and show the governor proper respect, when he gives you the honor of his company," cried Ben Zoof, who by this time had clambered onto the deck.

After considerable hesitation, but still keeping his hold upon the cabin-door, the Jew made up his mind to step outside. "What do you want?" he inquired, timorously.

"I want a word with you," said Servadac, "but I do not want to stand talking out here in the cold."

Followed by the rest of the party, he proceeded to mount the steps. The

Jew trembled from head to foot. "But I cannot let you into my cabin. I am a poor man; I have nothing to give you," he moaned piteously.

"Here he is!" laughed Ben Zoof, contemptuously; "he is beginning his chapter of lamentations over again. But standing out here will never do. Out of the way, old Hakkabut, I say! out of the way!" and, without more ado, he thrust the astonished Jew on one side and opened the door of the cabin.

Servadac, however, declined to enter until he had taken the pains to explain to the owner of the tartan that he had no intention of laying violent hands upon his property, and that if the time should ever come that his cargo was in requisition for the common use, he should receive a proper price for his goods, the same as he would in Europe.

"Europe, indeed!" muttered the Jew maliciously between his teeth. "European prices will not do for me. I must have Gallian prices--and of my own fixing, too!"

So large a portion of the vessel had been appropriated to the cargo that the space reserved for the cabin was of most meager dimensions. In one corner of the compartment stood a small iron stove, in which smoldered a bare handful of coals; in another was a trestle-board which served as a bed; two or three stools and a rickety deal table, together with a few

cooking utensils, completed a stock of furniture which was worthy of its proprietor.

On entering the cabin, Ben Zoof's first proceeding was to throw on the fire a liberal supply of coals, utterly regardless of the groans of poor Isaac, who would almost as soon have parted with his own bones as submit to such reckless expenditure of his fuel. The perishing temperature of the cabin, however, was sufficient justification for the orderly's conduct, and by a little skillful manipulation he soon succeeded in getting up a tolerable fire.

The visitors having taken what seats they could, Hakkabut closed the door, and, like a prisoner awaiting his sentence, stood with folded hands, expecting the captain to speak.

"Listen," said Servadac; "we have come to ask a favor."

Imagining that at least half his property was to be confiscated, the Jew began to break out into his usual formula about being a poor man and having nothing to spare; but Servadac, without heeding his complainings, went on: "We are not going to ruin you, you know."

Hakkabut looked keenly into the captain's face.

"We have only come to know whether you can lend us a steelyard."

So far from showing any symptom of relief, the old miser exclaimed, with a stare of astonishment, as if he had been asked for some thousand francs: "A steelyard?"

"Yes!" echoed the professor, impatiently; "a steelyard."

"Have you not one?" asked Servadac.

"To be sure he has!" said Ben Zoof.

Old Isaac stammered and stuttered, but at last confessed that perhaps there might be one amongst the stores.

"Then, surely, you will not object to lend it to us?" said the captain.

"Only for one day," added the professor.

The Jew stammered again, and began to object. "It is a very delicate instrument, your Excellency. The cold, you know, the cold may do injury to the spring; and perhaps you are going to use it to weigh something very heavy."

"Why, old Ephraim, do you suppose we are going to weigh a mountain with it?" said Ben Zoof.

"Better than that!" cried out the professor, triumphantly; "we are going to weigh Gallia with it; my comet."

"Merciful Heaven!" shrieked Isaac, feigning consternation at the bare suggestion.

Servadac knew well enough that the Jew was holding out only for a good bargain, and assured him that the steelyard was required for no other purpose than to weigh a kilogramme, which (considering how much lighter everything had become) could not possibly put the slightest strain upon the instrument.

The Jew still spluttered, and moaned, and hesitated.

"Well, then," said Servadac, "if you do not like to lend us your steelyard, do you object to sell it to us?"

Isaac fairly shrieked aloud. "God of Israel!" he ejaculated, "sell my steelyard? Would you deprive me of one of the most indispensable of my means of livelihood? How should I weigh my merchandise without my steelyard--my solitary steelyard, so delicate and so correct?"

The orderly wondered how his master could refrain from strangling the old miser upon the spot; but Servadac, rather amused than otherwise, determined to try another form of persuasion. "Come, Hakkabut, I see that you are not disposed either to lend or to sell your steelyard. What do you say to letting us hire it?"

The Jew's eyes twinkled with a satisfaction that he was unable to conceal. "But what security would you give? The instrument is very valuable;" and he looked more cunning than ever.

"What is it worth? If it is worth twenty francs, I will leave a deposit of a hundred. Will that satisfy you?"

He shook his head doubtfully. "It is very little; indeed, it is too little, your Excellency. Consider, it is the only steelyard in all this new world of ours; it is worth more, much more. If I take your deposit it must be in gold--all gold. But how much do you agree to give me for the hire--the hire, one day?"

"You shall have twenty francs," said Servadac.

"Oh, it is dirt cheap; but never mind, for one day, you shall have it. Deposit in gold money a hundred francs, and twenty francs for the hire."

The old man folded his hands in meek resignation.

"The fellow knows how to make a good bargain," said Servadac, as Isaac, after casting a distrustful look around, went out of the cabin.

"Detestable old wretch!" replied the count, full of disgust.

Hardly a minute elapsed before the Jew was back again, carrying his precious steelyard with ostentatious care. It was of an ordinary kind. A spring balance, fitted with a hook, held the article to be weighed; a pointer, revolving on a disc, indicated the weight of the article. Professor Rosette was manifestly right in asserting that such a machine would register results quite independently of any change in the force of attraction. On the earth it would have registered a kilogramme as a kilogramme; here it recorded a different value altogether, as the result of the altered force of gravity.

Gold coinage to the worth of one hundred and twenty francs was handed over to the Jew, who clutched at the money with unmistakable eagerness. The steelyard was committed to the keeping of Ben Zoof, and the visitors prepared to quit the Hansa.

All at once it occurred to the professor that the steelyard would be absolutely useless to him, unless he had the means for ascertaining the

precise measurement of the unit of the soil of Gallia which he proposed to weigh. "Something more you must lend me," he said, addressing the Jew. "I must have a measure, and I must have a kilogramme."

"I have neither of them," answered Isaac. "I have neither. I am sorry; I am very sorry." And this time the old Jew spoke the truth. He would have been really glad to do another stroke or two of business upon terms as advantageous as the transaction he had just concluded.

Palmyrin Rosette scratched his head in perplexity, glaring round upon his companions as if they were personally responsible for his annoyance. He muttered something about finding a way out of his difficulty, and hastily mounted the cabin-ladder. The rest followed, but they had hardly reached the deck when the chink of money was heard in the room below. Hakkabut was locking away the gold in one of the drawers.

Back again, down the ladder, scrambled the little professor, and before the Jew was aware of his presence he had seized him by the tail of his slouchy overcoat. "Some of your money! I must have money!" he said.

"Money!" gasped Hakkabut; "I have no money." He was pale with fright, and hardly knew what he was saying.

"Falsehood!" roared Rosette. "Do you think I cannot see?" And peering

down into the drawer which the Jew was vainly trying to close, he cried, "Heaps of money! French money! Five-franc pieces! the very thing I want! I must have them!"

The captain and his friends, who had returned to the cabin looked on with mingled amusement and bewilderment.

"They are mine!" shrieked Hakkabut.

"I will have them!" shouted the professor.

"You shall kill me first!" bellowed the Jew.

"No, but I must!" persisted the professor again.

It was manifestly time for Servadac to interfere. "My dear professor," he said, smiling, "allow me to settle this little matter for you."

"Ah! your Excellency," moaned the agitated Jew, "protect me! I am but a poor man--"

"None of that, Hakkabut. Hold your tongue." And, turning to Rosette, the captain said, "If, sir, I understand right, you require some silver five-franc pieces for your operation?"

"Forty," said Rosette, surlily.

"Two hundred francs!" whined Hakkabut.

"Silence!" cried the captain.

"I must have more than that," the professor continued. "I want ten two-franc pieces, and twenty half-francs."

"Let me see," said Servadac, "how much is that in all? Two hundred and thirty francs, is it not?"

"I dare say it is," answered the professor.

"Count, may I ask you," continued Servadac, "to be security to the Jew for this loan to the professor?"

"Loan!" cried the Jew, "do you mean only a loan?"

"Silence!" again shouted the captain.

Count Timascheff, expressing his regret that his purse contained only paper money, begged to place it at Captain Servadac's disposal.

"No paper, no paper!" exclaimed Isaac. "Paper has no currency in Gallia."

"About as much as silver," coolly retorted the count.

"I am a poor man," began the Jew.

"Now, Hakkabut, stop these miserable lamentations of yours, once for all. Hand us over two hundred and thirty francs in silver money, or we will proceed to help ourselves."

Isaac began to yell with all his might: "Thieves! thieves!"

In a moment Ben Zoof's hand was clasped tightly over his mouth. "Stop that howling, Belshazzar!"

"Let him alone, Ben Zoof. He will soon come to his senses," said Servadac, quietly.

When the old Jew had again recovered himself, the captain addressed him. "Now, tell us, what interest do you expect?"

Nothing could overcome the Jew's anxiety to make another good bargain.

He began: "Money is scarce, very scarce, you know--"

"No more of this!" shouted Servadac. "What interest, I say, what interest do you ask?"

Faltering and undecided still, the Jew went on. "Very scarce, you know. Ten francs a day, I think, would not be unreasonable, considering--"

The count had no patience to allow him to finish what he was about to say. He flung down notes to the value of several rubles. With a greediness that could not be concealed, Hakkabut grasped them all. Paper, indeed, they were; but the cunning Israelite knew that they would in any case be security far beyond the value of his cash. He was making some eighteen hundred per cent. interest, and accordingly chuckled within himself at his unexpected stroke of business.

The professor pocketed his French coins with a satisfaction far more demonstrative. "Gentlemen," he said, "with these franc pieces I obtain the means of determining accurately both a meter and a kilogramme."

CHAPTER VII. GALLIA WEIGHED

A quarter of an hour later, the visitors to the Hansa had reassembled in the common hall of Nina's Hive.

"Now, gentlemen, we can proceed," said the professor. "May I request that this table may be cleared?"

Ben Zoof removed the various articles that were lying on the table, and the coins which had just been borrowed from the Jew were placed upon it in three piles, according to their value.

The professor commenced. "Since none of you gentlemen, at the time of the shock, took the precaution to save either a meter measure or a kilogramme weight from the earth, and since both these articles are necessary for the calculation on which we are engaged, I have been obliged to devise means of my own to replace them."

This exordium delivered, he paused and seemed to watch its effect upon his audience, who, however, were too well acquainted with the professor's temper to make any attempt to exonerate themselves from the rebuke of carelessness, and submitted silently to the implied reproach.

"I have taken pains," he continued, "to satisfy myself that these coins are in proper condition for my purpose. I find them unworn and unchipped; indeed, they are almost new. They have been hoarded instead of circulated; accordingly, they are fit to be utilized for my purpose of obtaining the precise length of a terrestrial meter."

Ben Zoof looked on in perplexity, regarding the lecturer with much the same curiosity as he would have watched the performances of a traveling mountebank at a fair in Montmartre; but Servadac and his two friends had already divined the professor's meaning. They knew that French coinage is all decimal, the franc being the standard of which the other coins, whether gold, silver, or copper, are multiples or measures; they knew, too, that the caliber or diameter of each piece of money is rigorously determined by law, and that the diameters of the silver coins representing five francs, two francs, and fifty centimes measure thirty-seven, twenty-seven, and eighteen millimeters respectively; and they accordingly guessed that Professor Rosette had conceived the plan of placing such a number of these coins in juxtaposition that the length of their united diameters should measure exactly the thousand millimeters that make up the terrestrial meter.

The measurement thus obtained was by means of a pair of compasses divided accurately into ten equal portions, or decimeters, each of course 3.93 inches long. A lath was then cut of this exact length and

given to the engineer of the Dobryna, who was directed to cut out of the solid rock the cubic decimeter required by the professor.

The next business was to obtain the precise weight of a kilogramme. This was by no means a difficult matter. Not only the diameters, but also the weights, of the French coins are rigidly determined by law, and as the silver five-franc pieces always weigh exactly twenty-five grammes, the united weight of forty of these coins is known to amount to one kilogramme.

"Oh!" cried Ben Zoof; "to be able to do all this I see you must be rich as well as learned."

With a good-natured laugh at the orderly's remark, the meeting adjourned for a few hours. By the appointed time the engineer had finished his task, and with all due care had prepared a cubic decimeter of the material of the comet.

"Now, gentlemen," said Professor Rosette, "we are in a position to complete our calculation; we can now arrive at Gallia's attraction, density, and mass."

Everyone gave him his complete attention.

"Before I proceed," he resumed, "I must recall to your minds Newton's general law, 'that the attraction of two bodies is directly proportional to the product of their masses, and inversely proportional to the square of their distances.'"

"Yes," said Servadac; "we remember that."

"Well, then," continued the professor, "keep it in mind for a few minutes now. Look here! In this bag are forty five-franc pieces--altogether they weigh exactly a kilogramme; by which I mean that if we were on the earth, and I were to hang the bag on the hook of the steelyard, the indicator on the dial would register one kilogramme. This is clear enough, I suppose?"

As he spoke the professor designedly kept his eyes fixed upon Ben Zoof. He was avowedly following the example of Arago, who was accustomed always in lecturing to watch the countenance of the least intelligent of his audience, and when he felt that he had made his meaning clear to him, he concluded that he must have succeeded with all the rest. In this case, however, it was technical ignorance, rather than any lack of intelligence, that justified the selection of the orderly for this special attention.

Satisfied with his scrutiny of Ben Zoof's face, the professor went on.

"And now, gentlemen, we have to see what these coins weigh here upon Gallia."

He suspended the money bag to the hook; the needle oscillated, and stopped. "Read it off!" he said.

The weight registered was one hundred and thirty-three grammes.

"There, gentlemen, one hundred and thirty-three grammes! Less than one-seventh of a kilogramme! You see, consequently, that the force of gravity here on Gallia is not one-seventh of what it is upon the earth!"

"Interesting!" cried Servadac, "most interesting! But let us go on and compute the mass."

"No, captain, the density first," said Rosette.

"Certainly," said the lieutenant; "for, as we already know the volume, we can determine the mass as soon as we have ascertained the density."

The professor took up the cube of rock. "You know what this is," he went on to say. "You know, gentlemen, that this block is a cube hewn from the substance of which everywhere, all throughout your voyage of circumnavigation, you found Gallia to be composed--a substance to which

your geological attainments did not suffice to assign a name."

"Our curiosity will be gratified," said Servadac, "if you will enlighten our ignorance."

But Rosette did not take the slightest notice of the interruption.

"A substance it is which no doubt constitutes the sole material of the comet, extending from its surface to its innermost depths. The probability is that it would be so; your experience confirms that probability: you have found no trace of any other substance. Of this rock here is a solid decimeter; let us get at its weight, and we shall have the key which will unlock the problem of the whole weight of Gallia. We have demonstrated that the force of attraction here is only one-seventh of what it is upon the earth, and shall consequently have to multiply the apparent weight of our cube by seven, in order to ascertain its proper weight. Do you understand me, goggle-eyes?"

This was addressed to Ben Zoof, who was staring hard at him. "No!" said Ben Zoof.

"I thought not; it is of no use waiting for your puzzle-brains to make it out. I must talk to those who can understand."

The professor took the cube, and, on attaching it to the hook of the steelyard, found that its apparent weight was one kilogramme and four hundred and thirty grammes.

"Here it is, gentlemen; one kilogramme, four hundred and thirty grammes. Multiply that by seven; the product is, as nearly as possible, ten kilogrammes. What, therefore, is our conclusion? Why, that the density of Gallia is just about double the density of the earth, which we know is only five kilogrammes to a cubic decimeter. Had it not been for this greater density, the attraction of Gallia would only have been one-fifteenth instead of one-seventh of the terrestrial attraction."

The professor could not refrain from exhibiting his gratification that, however inferior in volume, in density, at least, his comet had the advantage over the earth.

Nothing further now remained than to apply the investigations thus finished to the determining of the mass or weight. This was a matter of little labor.

"Let me see," said the captain; "what is the force of gravity upon the various planets?"

"You can't mean, Servadac, that you have forgotten that? But you always

were a disappointing pupil."

The captain could not help himself: he was forced to confess that his memory had failed him.

"Well, then," said the professor, "I must remind you. Taking the attraction on the earth as 1, that on Mercury is 1.15, on Venus it is.92, on Mars.5, and on Jupiter 2.45; on the moon the attraction is.16, whilst on the surface of the sun a terrestrial kilogramme would weigh 28 kilogrammes."

"Therefore, if a man upon the surface of the sun were to fall down, he would have considerable difficulty in getting up again. A cannon ball, too, would only fly a few yards," said Lieutenant Procope.

"A jolly battle-field for cowards!" exclaimed Ben Zoof.

"Not so jolly, Ben Zoof, as you fancy," said his master; "the cowards would be too heavy to run away."

Ben Zoof ventured the remark that, as the smallness of Gallia secured to its inhabitants such an increase of strength and agility, he was almost sorry that it had not been a little smaller still.

"Though it could not anyhow have been very much smaller," he added, looking slyly at the professor.

"Idiot!" exclaimed Rosette. "Your head is too light already; a puff of wind would blow it away."

"I must take care of my head, then, and hold it on," replied the irrepressible orderly.

Unable to get the last word, the professor was about to retire, when Servadac detained him.

"Permit me to ask you one more question," he said. "Can you tell me what is the nature of the soil of Gallia?"

"Yes, I can answer that. And in this matter I do not think your impertinent orderly will venture to put Montmartre into the comparison. This soil is of a substance not unknown upon the earth." And speaking very slowly, the professor said: "It contains 70 per cent. of tellurium, and 30 per cent. of gold."

Servadac uttered an exclamation of surprise.

"And the sum of the specific gravities of these two substances is 10,

precisely the number that represents Gallia's density."

"A comet of gold!" ejaculated the captain.

"Yes; a realization of what the illustrious Maupertuis has already deemed probable," replied the astronomer.

"If Gallia, then, should ever become attached to the earth, might it not bring about an important revolution in all monetary affairs?" inquired the count.

"No doubt about it!" said Rosette, with manifest satisfaction. "It would supply the world with about 246,000 trillions of francs."

"It would make gold about as cheap as dirt, I suppose," said Servadac.

The last observation, however, was entirely lost upon the professor, who had left the hall with an air almost majestic, and was already on his way to the observatory.

"And what, I wonder, is the use of all these big figures?" said Ben Zoof to his master, when next day they were alone together.

"That's just the charm of them, my good fellow," was the captain's cool

reply, "that they are of no use whatever."

CHAPTER VIII. JUPITER SOMEWHAT CLOSE

Except as to the time the comet would take to revolve round the sun, it must be confessed that all the professor's calculations had comparatively little interest for anyone but himself, and he was consequently left very much to pursue his studies in solitude.

The following day was the 1st of August, or, according to Rosette, the 63rd of April. In the course of this month Gallia would travel 16,500,000 leagues, attaining at the end a distance of 197,000,000 leagues from the sun. This would leave 81,000,000 leagues more to be traversed before reaching the aphelion of the 15th of January, after which it would begin once more to approach the sun.

But meanwhile, a marvelous world, never before so close within the range of human vision, was revealing itself. No wonder that Palmyrin Rosette cared so little to quit his observatory; for throughout those calm, clear Gallian nights, when the book of the firmament lay open before him, he could revel in a spectacle which no previous astronomer had ever been permitted to enjoy.

The glorious orb that was becoming so conspicuous an object was none other than the planet Jupiter, the largest of all the bodies existing

within the influence of solar attraction. During the seven months that had elapsed since its collision with the earth, the comet had been continuously approaching the planet, until the distance between them was scarcely more than 61,000,000 leagues, and this would go on diminishing until the 15th of October.

Under these circumstances, was it perfectly certain that no danger could accrue? Was not Gallia, when its pathway led it into such close proximity to this enormous planet, running a risk of being attracted within its influence? Might not that influence be altogether disastrous? The professor, it is true, in his estimate of the duration of his comet's revolution, had represented that he had made all proper allowances for any perturbations that would be caused either by Jupiter, by Saturn, or by Mars; but what if there were any errors in his calculations? what if there should be any elements of disturbance on which he had not reckoned?

Speculations of this kind became more and more frequent, and Lieutenant Procope pointed out that the danger incurred might be of a fourfold character: first, that the comet, being irresistibly attracted, might be drawn on to the very surface of the planet, and there annihilated; secondly, that as the result of being brought under that attraction, it might be transformed into a satellite, or even a sub-satellite, of that mighty world; thirdly, that it might be diverted into a new orbit, which

would never be coincident with the ecliptic; or, lastly, its course might be so retarded that it would only reach the ecliptic too late to permit any junction with the earth. The occurrence of any one of these contingencies would be fatal to their hopes of reunion with the globe, from which they had been so strangely severed.

To Rosette, who, without family ties which he had never found leisure or inclination to contract, had no shadow of desire to return to the earth, it would be only the first of these probabilities that could give him any concern. Total annihilation might not accord with his views, but he would be quite content for Gallia to miss its mark with regard to the earth, indifferent whether it revolved as a new satellite around Jupiter, or whether it wended its course through the untraversed regions of the milky way. The rest of the community, however, by no means sympathized with the professor's sentiments, and the following month was a period of considerable doubt and anxiety.

On the 1st of September the distance between Gallia and Jupiter was precisely the same as the mean distance between the earth and the sun; on the 16th, the distance was further reduced to 26,000,000 leagues. The planet began to assume enormous dimensions, and it almost seemed as if the comet had already been deflected from its elliptical orbit, and was rushing on in a straight line towards the overwhelming luminary.

The more they contemplated the character of this gigantic planet, the more they became impressed with the likelihood of a serious perturbation in their own course. The diameter of Jupiter is 85,390 miles, nearly eleven times as great as that of the earth; his volume is 1,387 times, and his mass 300 times greater; and although the mean density is only about a quarter of that of the earth, and only a third of that of water (whence it has been supposed that the superficies of Jupiter is liquid), yet his other proportions were large enough to warrant the apprehension that important disturbances might result from his proximity.

"I forget my astronomy, lieutenant," said Servadac. "Tell me all you can about this formidable neighbor."

The lieutenant having refreshed his memory by reference to Flammarion's Recits de l'Infini, of which he had a Russian translation, and some other books, proceeded to recapitulate that Jupiter accomplishes his revolution round the sun in 4,332 days 14 hours and 2 minutes; that he travels at the rate of 467 miles a minute along an orbit measuring 2,976 millions of miles; and that his rotation on his axis occupies only 9 hours and 55 minutes.

"His days, then, are shorter than ours?" interrupted the captain.

"Considerably," answered the lieutenant, who went on to describe how the

displacement of a point at the equator of Jupiter was twenty-seven times as rapid as on the earth, causing the polar compression to be about 2,378 miles; how the axis, being nearly perpendicular, caused the days and nights to be nearly of the same length, and the seasons to be invariable; and how the amount of light and heat received by the planet is only a twenty-fifth part of that received by the earth, the average distance from the sun being 475,693,000 miles.

"And how about these satellites? Sometimes, I suppose, Jupiter has the benefit of four moons all shining at once?" asked Servadac.

Of the satellites, Lieutenant Procope went on to say that one is rather smaller than our own moon; that another moves round its primary at an interval about equal to the moon's distance from ourselves; but that they all revolve in considerably less time: the first takes only l day 18 hours 27 minutes; the second takes 3 days 13 hours 14 minutes; the third, 7 days 3 hours 42 minutes; whilst the largest of all takes but 16 days 16 hours 32 minutes. The most remote revolves round the planet at a distance of 1,192,820 miles.

"They have been enlisted into the service of science," said Procope. "It is by their movements that the velocity of light has been calculated; and they have been made available for the determination of terrestrial longitudes."

"It must be a wonderful sight," said the captain.

"Yes," answered Procope. "I often think Jupiter is like a prodigious clock with four hands."

"I only hope that we are not destined to make a fifth hand," answered Servadac.

Such was the style of the conversation that was day by day reiterated during the whole month of suspense. Whatever topic might be started, it seemed soon to settle down upon the huge orb that was looming upon them with such threatening aspect.

"The more remote that these planets are from the sun," said Procope, "the more venerable and advanced in formation are they found to be. Neptune, situated 2,746,271,000 miles from the sun, issued from the solar nebulosity, thousands of millions of centuries back. Uranus, revolving 1,753,851,000 miles from the center of the planetary system, is of an age amounting to many hundred millions of centuries. Jupiter, the colossal planet, gravitating at a distance of 475,693,000 miles, may be reckoned as 70,000,000 centuries old. Mars has existed for 1,000,000,000 years at a distance of 139,212,000 miles. The earth, 91,430,000 miles from the sun, quitted his burning bosom 100,000,000

years ago. Venus, revolving now 66,131,000 miles away, may be assigned the age of 50,000,000 years at least; and Mercury, nearest of all, and youngest of all, has been revolving at a distance of 35,393,000 miles for the space of 10,000,000 years--the same time as the moon has been evolved from the earth."

Servadac listened attentively. He was at a loss what to say; and the only reply he made to the recital of this novel theory was to the effect that, if it were true, he would prefer being captured by Mercury than by Jupiter, for Mercury, being so much the younger, would probably prove the less imperative and self-willed master.

It was on the 1st of September that the comet had crossed the orbit of Jupiter, and on the 1st of October the two bodies were calculated to be at their minimum separation. No direct shock, however, could be apprehended; the demonstration was sufficiently complete that the orbit of Gallia did not coincide with that of the planet, the orbit of Jupiter being inclined at an angle of 1 degrees 19 mins to the orbit of the earth, with which that of Gallia was, no doubt, coincident.

As the month of September verged towards its close, Jupiter began to wear an aspect that must have excited the admiration of the most ignorant or the most indifferent observer. Its salient points were illumined with novel and radiant tints, and the solar rays, reflected

from its disc, glowed with a mingled softness and intensity upon Gallia, so that Nerina had to pale her beauty.

Who could wonder that Rosette, enthusiast as he was, should be irremovable from his observatory? Who could expect otherwise than that, with the prospect before him of viewing the giant among planets, ten times nearer than any mortal eye had ever done, he should have begrudged every moment that distracted his attention?

Meanwhile, as Jupiter grew large, the sun grew small.

From its increased remoteness the diameter of the sun's disc was diminished to 5 degrees 46 mins.

And what an increased interest began to be associated with the satellites! They were visible to the naked eye! Was it not a new record in the annals of science?

Although it is acknowledged that they are not ordinarily visible on earth without the aid of a somewhat powerful telescope, it has been asserted that a favored few, endued with extraordinary powers of vision, have been able to identify them with an unassisted eye; but here, at least, in Nina's Hive were many rivals, for everyone could so far distinguish them one from the other as to describe them by their colors.

The first was of a dull white shade; the second was blue; the third was white and brilliant; the fourth was orange, at times approaching to a red. It was further observed that Jupiter itself was almost void of scintillation.

Rosette, in his absorbing interest for the glowing glories of the planet, seemed to be beguiled into comparative forgetfulness of the charms of his comet; but no astronomical enthusiasm of the professor could quite allay the general apprehension that some serious collision might be impending.

Time passed on. There was nothing to justify apprehension. The question was continually being asked, "What does the professor really think?"

"Our friend the professor," said Servadac, "is not likely to tell us very much; but we may feel pretty certain of one thing: he wouldn't keep us long in the dark, if he thought we were not going back to the earth again. The greatest satisfaction he could have would be to inform us that we had parted from the earth for ever."

"I trust from my very soul," said the count, "that his prognostications are correct."

"The more I see of him, and the more I listen to him," replied Servadac,

"the more I become convinced that his calculations are based on a solid foundation, and will prove correct to the minutest particular."

Ben Zoof here interrupted the conversation. "I have something on my mind," he said.

"Something on your mind? Out with it!" said the captain.

"That telescope!" said the orderly; "it strikes me that that telescope which the old professor keeps pointed up at yonder big sun is bringing it down straight upon us."

The captain laughed heartily.

"Laugh, captain, if you like; but I feel disposed to break the old telescope into atoms."

"Ben Zoof," said Servadac, his laughter exchanged for a look of stern displeasure, "touch that telescope, and you shall swing for it!"

The orderly looked astonished.

"I am governor here," said Servadac.

Ben Zoof knew what his master meant, and to him his master's wish was law.

The interval between the comet and Jupiter was, by the 1st of October, reduced to 43,000,000 miles. The belts all parallel to Jupiter's equator were very distinct in their markings. Those immediately north and south of the equator were of a dusky hue; those toward the poles were alternately dark and light; the intervening spaces of the planet's superficies, between edge and edge, being intensely bright. The belts themselves were occasionally broken by spots, which the records of astronomy describe as varying both in form and in extent.

The physiology of belts and spots alike was beyond the astronomer's power to ascertain; and even if he should be destined once again to take his place in an astronomical congress on the earth, he would be just as incapable as ever of determining whether or no they owed their existence to the external accumulation of vapor, or to some internal agency. It would not be Professor Rosette's lot to enlighten his brother savants to any great degree as to the mysteries that are associated with this, which must ever rank as one of the most magnificent amongst the heavenly orbs.

As the comet approached the critical point of its career it cannot be denied that there was an unacknowledged consciousness of alarm. Mutually

reserved, though ever courteous, the count and the captain were secretly drawn together by the prospect of a common danger; and as their return to the earth appeared to them to become more and more dubious, they abandoned their views of narrow isolation, and tried to embrace the wider philosophy that acknowledges the credibility of a habitable universe.

But no philosophy could be proof against the common instincts of their humanity; their hearts, their hopes, were set upon their natural home; no speculation, no science, no experience, could induce them to give up their fond and sanguine anticipation that once again they were to come in contact with the earth.

"Only let us escape Jupiter," said Lieutenant Procope, repeatedly, "and we are free from anxiety."

"But would not Saturn lie ahead?" asked Servadac and the count in one breath.

"No!" said Procope; "the orbit of Saturn is remote, and does not come athwart our path. Jupiter is our sole hindrance. Of Jupiter we must say, as William Tell said, 'Once through the ominous pass and all is well.'"

The 15th of October came, the date of the nearest approximation of the

comet to the planet. They were only 31,000,000 miles apart. What would now transpire? Would Gallia be diverted from its proper way? or would it hold the course that the astronomer had predicted?

Early next morning the captain ventured to take the count and the lieutenant up to the observatory. The professor was in the worst of tempers.

That was enough. It was enough, without a word, to indicate the course which events had taken. The comet was pursuing an unaltered way.

The astronomer, correct in his prognostications, ought to have been the most proud and contented of philosophers; his pride and contentment were both overshadowed by the certainty that the career of his comet was destined to be so transient, and that it must inevitably once again come into collision with the earth.

CHAPTER IX MARKET PRICES IN GALLIA

"All right!" said Servadac, convinced by the professor's ill humor that the danger was past; "no doubt we are in for a two years' excursion, but fifteen months more will take us back to the earth!"

"And we shall see Montmartre again!" exclaimed Ben Zoof, in excited tones that betrayed his delight in the anticipation.

To use a nautical expression, they had safely "rounded the point," and they had to be congratulated on their successful navigation; for if, under the influence of Jupiter's attraction, the comet had been retarded for a single hour, in that hour the earth would have already traveled 2,300,000 miles from the point where contact would ensue, and many centuries would elapse before such a coincidence would possibly again occur.

On the 1st of November Gallia and Jupiter were 40,000,000 miles apart. It was little more than ten weeks to the 15th of January, when the comet would begin to re-approach the sun. Though light and heat were now reduced to a twenty-fifth part of their terrestrial intensity, so that a perpetual twilight seemed to have settled over Gallia, yet the population felt cheered even by the little that was left, and buoyed

up by the hope that they should ultimately regain their proper position with regard to the great luminary, of which the temperature has been estimated as not less than 5,000,000 degrees.

Of the anxiety endured during the last two months Isaac Hakkabut had known nothing. Since the day he had done his lucky stroke of business he had never left the tartan; and after Ben Zoof, on the following day, had returned the steelyard and the borrowed cash, receiving back the paper roubles deposited, all communication between the Jew and Nina's Hive had ceased. In the course of the few minutes' conversation which Ben Zoof had held with him, he had mentioned that he knew that the whole soil of Gallia was made of gold; but the old man, guessing that the orderly was only laughing at him as usual, paid no attention to the remark, and only meditated upon the means he could devise to get every bit of the money in the new world into his own possession. No one grieved over the life of solitude which Hakkabut persisted in leading. Ben Zoof giggled heartily, as he repeatedly observed "it was astonishing how they reconciled themselves to his absence."

The time came, however, when various circumstances prompted him to think he must renew his intercourse with the inhabitants of the Hive. Some of his goods were beginning to spoil, and he felt the necessity of turning them into money, if he would not be a loser; he hoped, moreover, that the scarcity of his commodities would secure very high prices.

It happened, just about this same time, that Ben Zoof had been calling his master's attention to the fact that some of their most necessary provisions would soon be running short, and that their stock of coffee, sugar, and tobacco would want replenishing. Servadac's mind, of course, turned to the cargo on board the Hansa, and he resolved, according to his promise, to apply to the Jew and become a purchaser. Mutual interest and necessity thus conspired to draw Hakkabut and the captain together.

Often and often had Isaac gloated in his solitude over the prospect of first selling a portion of his merchandise for all the gold and silver in the colony. His recent usurious transaction had whetted his appetite. He would next part with some more of his cargo for all the paper money they could give him; but still he should have goods left, and they would want these. Yes, they should have these, too, for promissory notes. Notes would hold good when they got back again to the earth; bills from his Excellency the governor would be good bills; anyhow there would be the sheriff. By the God of Israel! he would get good prices, and he would get fine interest!

Although he did not know it, he was proposing to follow the practice of the Gauls of old, who advanced money on bills for payment in a future life. Hakkabut's "future life," however, was not many months in advance of the present.

Still Hakkabut hesitated to make the first advance, and it was accordingly with much satisfaction that he hailed Captain Servadac's appearance on board the Hansa.

"Hakkabut," said the captain, plunging without further preface into business, "we want some coffee, some tobacco, and other things. I have come to-day to order them, to settle the price, and to-morrow Ben Zoof shall fetch the goods away."

"Merciful, heavens!" the Jew began to whine; but Servadac cut him short.

"None of that miserable howling! Business! I am come to buy your goods. I shall pay for them."

"Ah yes, your Excellency," whispered the Jew, his voice trembling like a street beggar. "Don't impose on me. I am poor; I am nearly ruined already."

"Cease your wretched whining!" cried Servadac. "I have told you once, I shall pay for all I buy."

"Ready money?" asked Hakkabut.

"Yes, ready money. What makes you ask?" said the captain, curious to hear what the Jew would say.

"Well, you see--you see, your Excellency," stammered out the Jew, "to give credit to one wouldn't do, unless I gave credit to another. You are solvent--I mean honorable, and his lordship the count is honorable; but maybe--maybe--"

"Well?" said Servadac, waiting, but inclined to kick the old rascal out of his sight.

"I shouldn't like to give credit," he repeated.

"I have not asked you for credit. I have told you, you shall have ready money."

"Very good, your Excellency. But how will you pay me?"

"Pay you? Why, we shall pay you in gold and silver and copper, while our money lasts, and when that is gone we shall pay you in bank notes."

"Oh, no paper, no paper!" groaned out the Jew, relapsing into his accustomed whine.

"Nonsense, man!" cried Servadac.

"No paper!" reiterated Hakkabut.

"Why not? Surely you can trust the banks of England, France, and Russia."

"Ah no! I must have gold. Nothing so safe as gold."

"Well then," said the captain, not wanting to lose his temper, "you shall have it your own way; we have plenty of gold for the present. We will leave the bank notes for by and by." The Jew's countenance brightened, and Servadac, repeating that he should come again the next day, was about to quit the vessel.

"One moment, your Excellency," said Hakkabut, sidling up with a hypocritical smile; "I suppose I am to fix my own prices."

"You will, of course, charge ordinary prices--proper market prices; European prices, I mean."

"Merciful heavens!" shrieked the old man, "you rob me of my rights; you defraud me of my privilege. The monopoly of the market belongs to me. It is the custom; it is my right; it is my privilege to fix my own prices."

Servadac made him understand that he had no intention of swerving from his decision.

"Merciful heavens!" again howled the Jew, "it is sheer ruin. The time of monopoly is the time for profit; it is the time for speculation."

"The very thing, Hakkabut, that I am anxious to prevent. Just stop now, and think a minute. You seem to forget my rights; you are forgetting that, if I please, I can confiscate all your cargo for the common use. You ought to think yourself lucky in getting any price at all. Be contented with European prices; you will get no more. I am not going to waste my breath on you. I will come again to-morrow;" and, without allowing Hakkabut time to renew his lamentations, Servadac went away.

All the rest of the day the Jew was muttering bitter curses against the thieves of Gentiles in general, and the governor of Gallia in particular, who were robbing him of his just profits, by binding him down to a maximum price for his goods, just as if it were a time of revolution in the state. But he would be even with them yet; he would have it all out of them: he would make European prices pay, after all. He had a plan--he knew how; and he chuckled to himself, and grinned maliciously.

True to his word, the captain next morning arrived at the tartan. He was accompanied by Ben Zoof and two Russian sailors. "Good-morning, old Eleazar; we have come to do our little bit of friendly business with you, you know," was Ben Zoof's greeting.

"What do you want to-day?" asked the Jew.

"To-day we want coffee, and we want sugar, and we want tobacco. We must have ten kilogrammes of each. Take care they are all good; all first rate. I am commissariat officer, and I am responsible."

"I thought you were the governor's aide-de-camp," said Hakkabut.

"So I am, on state occasions; but to-day, I tell you. I am superintendent of the commissariat department. Now, look sharp!"

Hakkabut hereupon descended into the hold of the tartan, and soon returned, carrying ten packets of tobacco, each weighing one kilogramme, and securely fastened by strips of paper, labeled with the French government stamp.

"Ten kilogrammes of tobacco at twelve francs a kilogramme: a hundred and twenty francs," said the Jew.

Ben Zoof was on the point of laying down the money, when Servadac stopped him.

"Let us just see whether the weight is correct."

Hakkabut pointed out that the weight was duly registered on every packet, and that the packets had never been unfastened. The captain, however, had his own special object in view, and would not be diverted. The Jew fetched his steelyard, and a packet of the tobacco was suspended to it.

"Merciful heavens!" screamed Isaac.

The index registered only 133 grammes!

"You see, Hakkabut, I was right. I was perfectly justified in having your goods put to the test," said Servadac, quite seriously.

"But--but, your Excellency--" stammered out the bewildered man.

"You will, of course, make up the deficiency," the captain continued, not noticing the interruption.

"Oh, my lord, let me say--" began Isaac again.

"Come, come, old Caiaphas, do you hear? You are to make up the deficiency," exclaimed Ben Zoof.

"Ah, yes, yes; but--"

The unfortunate Israelite tried hard to speak, but his agitation prevented him. He understood well enough the cause of the phenomenon, but he was overpowered by the conviction that the "cursed Gentiles" wanted to cheat him. He deeply regretted that he had not a pair of common scales on board.

"Come, I say, old Jedediah, you are a long while making up what's short," said Ben Zoof, while the Jew was still stammering on.

As soon as he recovered his power of articulation, Isaac began to pour out a medley of lamentations and petitions for mercy. The captain was inexorable. "Very sorry, you know, Hakkabut. It is not my fault that the packet is short weight; but I cannot pay for a kilogramme except I have a kilogramme."

Hakkabut pleaded for some consideration.

"A bargain is a bargain," said Servadac. "You must complete your

contract."

And, moaning and groaning, the miserable man was driven to make up the full weight as registered by his own steelyard. He had to repeat the process with the sugar and coffee: for every kilogramme he had to weigh seven. Ben Zoof and the Russians jeered him most unmercifully.

"I say, old Mordecai, wouldn't you rather give your goods away, than sell them at this rate? I would."

"I say, old Pilate, a monopoly isn't always a good thing, is it?"

"I say, old Sepharvaim, what a flourishing trade you're driving!"

Meanwhile seventy kilogrammes of each of the articles required were weighed, and the Jew for each seventy had to take the price of ten.

All along Captain Servadac had been acting only in jest. Aware that old Isaac was an utter hypocrite, he had no compunction in turning a business transaction with him into an occasion for a bit of fun. But the joke at an end, he took care that the Jew was properly paid all his legitimate due.

CHAPTER X. FAR INTO SPACE

A month passed away. Gallia continued its course, bearing its little population onwards, so far removed from the ordinary influence of human passions that it might almost be said that its sole ostensible vice was represented by the greed and avarice of the miserable Jew.

After all, they were but making a voyage--a strange, yet a transient, excursion through solar regions hitherto untraversed; but if the professor's calculations were correct--and why should they be doubted?--their little vessel was destined, after a two years' absence, once more to return "to port." The landing, indeed, might be a matter of difficulty; but with the good prospect before them of once again standing on terrestrial shores, they had nothing to do at present except to make themselves as comfortable as they could in their present quarters.

Thus confident in their anticipations, neither the captain, the count, nor the lieutenant felt under any serious obligation to make any extensive provisions for the future; they saw no necessity for expending the strength of the people, during the short summer that would intervene upon the long severity of winter, in the cultivation or the preservation

of their agricultural resources. Nevertheless, they often found themselves talking over the measures they would have been driven to adopt, if they had found themselves permanently attached to their present home.

Even after the turning-point in their career, they knew that at least nine months would have to elapse before the sea would be open to navigation; but at the very first arrival of summer they would be bound to arrange for the Dobryna and the Hansa to retransport themselves and all their animals to the shores of Gourbi Island, where they would have to commence their agricultural labors to secure the crops that must form their winter store. During four months or thereabouts, they would lead the lives of farmers and of sportsmen; but no sooner would their haymaking and their corn harvest have been accomplished, than they would be compelled again, like a swarm of bees, to retire to their semi-troglodyte existence in the cells of Nina's Hive.

Now and then the captain and his friends found themselves speculating whether, in the event of their having to spend another winter upon Gallia, some means could not be devised by which the dreariness of a second residence in the recesses of the volcano might be escaped. Would not another exploring expedition possibly result in the discovery of a vein of coal or other combustible matter, which could be turned to account in warming some erection which they might hope to put up?

A prolonged existence in their underground quarters was felt to be monotonous and depressing, and although it might be all very well for a man like Professor Rosette, absorbed in astronomical studies, it was ill suited to the temperaments of any of themselves for any longer period than was absolutely indispensable.

One contingency there was, almost too terrible to be taken into account. Was it not to be expected that the time might come when the internal fires of Gallia would lose their activity, and the stream of lava would consequently cease to flow? Why should Gallia be exempt from the destiny that seemed to await every other heavenly body? Why should it not roll onwards, like the moon, a dark cold mass in space?

In the event of such a cessation of the volcanic eruption, whilst the comet was still at so great a distance from the sun, they would indeed be at a loss to find a substitute for what alone had served to render life endurable at a temperature of 60 degrees below zero. Happily, however, there was at present no symptom of the subsidence of the lava's stream; the volcano continued its regular and unchanging discharge, and Servadac, ever sanguine, declared that it was useless to give themselves any anxiety upon the matter.

On the 15th of December, Gallia was 276,000,000 leagues from the sun, and, as it was approximately to the extremity of its axis major, would

travel only some 11,000,000 or 12,000,000 leagues during the month. Another world was now becoming a conspicuous object in the heavens, and Palmyrin Rosette, after rejoicing in an approach nearer to Jupiter than any other mortal man had ever attained, was now to be privileged to enjoy a similar opportunity of contemplating the planet Saturn. Not that the circumstances were altogether so favorable. Scarcely 31,000,000 miles had separated Gallia from Jupiter; the minimum distance of Saturn would not be less than 415,000,000 miles; but even this distance, although too great to affect the comet's progress more than had been duly reckoned on, was considerably shorter than what had ever separated Saturn from the earth.

To get any information about the planet from Rosette appeared quite impossible. Although equally by night and by day he never seemed to quit his telescope, he did not evince the slightest inclination to impart the result of his observations. It was only from the few astronomical works that happened to be included in the Dobryna's library that any details could be gathered, but these were sufficient to give a large amount of interesting information.

Ben Zoof, when he was made aware that the earth would be invisible to the naked eye from the surface of Saturn, declared that he then, for his part, did not care to learn any more about such a planet; to him it was indispensable that the earth should remain in sight, and it was his

great consolation that hitherto his native sphere had never vanished from his gaze.

At this date Saturn was revolving at a distance of 420,000,000 miles from Gallia, and consequently 874,440,000 miles from the sun, receiving only a hundredth part of the light and heat which that luminary bestows upon the earth. On consulting their books of reference, the colonists found that Saturn completes his revolution round the sun in a period of 29 years and 167 days, traveling at the rate of more than 21,000 miles an hour along an orbit measuring 5,490 millions of miles in length. His circumference is about 220,000 miles; his superficies, 144,000 millions of square miles; his volume, 143,846 millions of cubic miles. Saturn is 735 times larger than the earth, consequently he is smaller than Jupiter; in mass he is only 90 times greater than the earth, which gives him a density less than that of water. He revolves on his axis in 10 hours 29 minutes, causing his own year to consist of 86,630 days; and his seasons, on account of the great inclination of his axis to the plane of his orbit, are each of the length of seven terrestrial years.

Although the light received from the sun is comparatively feeble, the nights upon Saturn must be splendid. Eight satellites--Mimas, Enceladus, Tethys, Dione, Rhea, Titan, Hyperion, and Japetus--accompany the planet; Mimas, the nearest to its primary, rotating on its axis in 221/2 hours, and revolving at a distance of only 120,800 miles, whilst Japetus,

the most remote, occupies 79 days in its rotation, and revolves at a distance of 2,314,000 miles.

Another most important contribution to the magnificence of the nights upon Saturn is the triple ring with which, as a brilliant setting, the planet is encompassed. To an observer at the equator, this ring, which has been estimated by Sir William Herschel as scarcely 100 miles in thickness, must have the appearance of a narrow band of light passing through the zenith 12,000 miles above his head. As the observer, however, increases his latitude either north or south, the band will gradually widen out into three detached and concentric rings, of which the innermost, dark though transparent, is 9,625 miles in breadth; the intermediate one, which is brighter than the planet itself, being 17,605 miles broad; and the outer, of a dusky hue, being 8,660 miles broad.

Such, they read, is the general outline of this strange appendage, which revolves in its own plane in 10 hours 32 minutes. Of what matter it is composed, and how it resists disintegration, is still an unsettled question; but it might almost seem that the Designer of the universe, in permitting its existence, had been willing to impart to His intelligent creatures the manner in which celestial bodies are evolved, and that this remarkable ring-system is a remnant of the nebula from which Saturn was himself developed, and which, from some unknown cause, has become solidified. If at any time it should disperse, it would either fall

into fragments upon the surface of Saturn, or the fragments, mutually coalescing, would form additional satellites to circle round the planet in its path.

To any observer stationed on the planet, between the extremes of lat. 45 degrees on either side of the equator, these wonderful rings would present various strange phenomena. Sometimes they would appear as an illuminated arch, with the shadow of Saturn passing over it like the hour-hand over a dial; at other times they would be like a semi-aureole of light. Very often, too, for periods of several years, daily eclipses of the sun must occur through the interposition of this triple ring.

Truly, with the constant rising and setting of the satellites, some with bright discs at their full, others like silver crescents, in quadrature, as well as by the encircling rings, the aspect of the heavens from the surface of Saturn must be as impressive as it is gorgeous.

Unable, indeed, the Gallians were to realize all the marvels of this strange world. After all, they were practically a thousand times further off than the great astronomers have been able to approach by means of their giant telescopes. But they did not complain; their little comet, they knew, was far safer where it was; far better out of the reach of an attraction which, by affecting their path, might have annihilated their best hopes.

The distances of several of the brightest of the fixed stars have been estimated. Amongst others, Vega in the constellation Lyra is 100 millions of millions of miles away; Sirius in Canis Major, 123 millions of millions; the Pole-star, 282 millions of millions; and Capella, 340 millions of millions of miles, a figure represented by no less than fifteen digits.

The hard numerical statement of these enormous figures, however, fails altogether in any adequate way to convey a due impression of the magnitude of these distances. Astronomers, in their ingenuity, have endeavored to use some other basis, and have found "the velocity of light" to be convenient for their purpose. They have made their representations something in this way:

"Suppose," they say, "an observer endowed with an infinite length of vision: suppose him stationed on the surface of Capella; looking thence towards the earth, he would be a spectator of events that had happened seventy years previously; transport him to a star ten times distant, and he will be reviewing the terrestrial sphere of 720 years back; carry him away further still, to a star so remote that it requires something less than nineteen centuries for light to reach it, and he would be a witness of the birth and death of Christ; convey him further again, and he shall be looking upon the dread desolation of the Deluge; take him away

further yet (for space is infinite), and he shall be a spectator of the Creation of the spheres. History is thus stereotyped in space; nothing once accomplished can ever be effaced."

Who can altogether be astonished that Palmyrin Rosette, with his burning thirst for astronomical research, should have been conscious of a longing for yet wider travel through the sidereal universe? With his comet now under the influence of one star, now of another, what various systems might he not have explored! what undreamed-of marvels might not have revealed themselves before his gaze! The stars, fixed and immovable in name, are all of them in motion, and Gallia might have followed them in their un-tracked way.

But Gallia had a narrow destiny. She was not to be allowed to wander away into the range of attraction of another center; nor to mingle with the star clusters, some of which have been entirely, others partially resolved; nor was she to lose herself amongst the 5,000 nebulae which have resisted hitherto the grasp of the most powerful reflectors. No; Gallia was neither to pass beyond the limits of the solar system, nor to travel out of sight of the terrestrial sphere. Her orbit was circumscribed to little over 1,500 millions of miles; and, in comparison with the infinite space beyond, this was a mere nothing.

CHAPTER XI. A FETE DAY

The temperature continued to decrease; the mercurial thermometer, which freezes at 42 degrees below zero, was no longer of service, and the spirit thermometer of the Dobryna had been brought into use. This now registered 53 degrees below freezing-point.

In the creek, where the two vessels had been moored for the winter, the elevation of the ice, in anticipation of which Lieutenant Procope had taken the precautionary measure of beveling, was going on slowly but irresistibly, and the tartan was upheaved fifty feet above the level of the Gallian Sea, while the schooner, as being lighter, had been raised to a still greater altitude.

So irresistible was this gradual process of elevation, so utterly defying all human power to arrest, that the lieutenant began to feel very anxious as to the safety of his yacht. With the exception of the engine and the masts, everything had been cleared out and conveyed to shore, but in the event of a thaw it appeared that nothing short of a miracle could prevent the hull from being dashed to pieces, and then all means of leaving the promontory would be gone. The Hansa, of course, would share a similar fate; in fact, it had already heeled over to such

an extent as to render it quite dangerous for its obstinate owner, who, at the peril of his life, resolved that he would stay where he could watch over his all-precious cargo, though continually invoking curses on the ill-fate of which he deemed himself the victim.

There was, however, a stronger will than Isaac Hakkabut's. Although no one of all the community cared at all for the safety of the Jew, they cared very much for the security of his cargo, and when Servadac found that nothing would induce the old man to abandon his present quarters voluntarily, he very soon adopted measures of coercion that were far more effectual than any representations of personal danger.

"Stop where you like, Hakkabut," said the captain to him; "but understand that I consider it my duty to make sure that your cargo is taken care of. I am going to have it carried across to land, at once."

Neither groans, nor tears, nor protestations on the part of the Jew, were of the slightest avail. Forthwith, on the 20th of December, the removal of the goods commenced.

Both Spaniards and Russians were all occupied for several days in the work of unloading the tartan. Well muffled up as they were in furs, they were able to endure the cold with impunity, making it their special care to avoid actual contact with any article made of metal, which, in the

low state of the temperature, would inevitably have taken all the skin off their hands, as much as if it had been red-hot. The task, however, was brought to an end without accident of any kind; and when the stores of the Hansa were safely deposited in the galleries of the Hive, Lieutenant Procope avowed that he really felt that his mind had been unburdened from a great anxiety.

Captain Servadac gave old Isaac full permission to take up his residence amongst the rest of the community, promised him the entire control over his own property, and altogether showed him so much consideration that, but for his unbounded respect for his master, Ben Zoof would have liked to reprimand him for his courtesy to a man whom he so cordially despised.

Although Hakkabut clamored most vehemently about his goods being carried off "against his will," in his heart he was more than satisfied to see his property transferred to a place of safety, and delighted, moreover, to know that the transport had been effected without a farthing of expense to himself. As soon, then, as he found the tartan empty, he was only too glad to accept the offer that had been made him, and very soon made his way over to the quarters in the gallery where his merchandise had been stored. Here he lived day and night. He supplied himself with what little food he required from his own stock of provisions, a small spirit-lamp sufficing to perform all the operations of his meager

cookery. Consequently all intercourse between himself and the rest of the inhabitants was entirely confined to business transactions, when occasion required that some purchase should be made from his stock of commodities. Meanwhile, all the silver and gold of the colony was gradually finding its way to a double-locked drawer, of which the Jew most carefully guarded the key.

The 1st of January was drawing near, the anniversary of the shock which had resulted in the severance of thirty-six human beings from the society of their fellow-men. Hitherto, not one of them was missing. The unvarying calmness of the climate, notwithstanding the cold, had tended to maintain them in good health, and there seemed no reason to doubt that, when Gallia returned to the earth, the total of its little population would still be complete.

The 1st of January, it is true, was not properly "New Year's Day" in Gallia, but Captain Servadac, nevertheless, was very anxious to have it observed as a holiday.

"I do not think," he said to Count Timascheff and Lieutenant Procope, "that we ought to allow our people to lose their interest in the world to which we are all hoping to return; and how can we cement the bond that ought to unite us, better than by celebrating, in common with our fellow-creatures upon earth, a day that awakens afresh the kindliest

sentiments of all? Besides," he added, smiling, "I expect that Gallia, although invisible just at present to the naked eye, is being closely watched by the telescopes of our terrestrial friends, and I have no doubt that the newspapers and scientific journals of both hemispheres are full of accounts detailing the movements of the new comet."

"True," asserted the count. "I can quite imagine that we are occasioning no small excitement in all the chief observatories."

"Ay, more than that," said the lieutenant; "our Gallia is certain to be far more than a mere object of scientific interest or curiosity. Why should we doubt that the elements of a comet which has once come into collision with the earth have by this time been accurately calculated? What our friend the professor has done here, has been done likewise on the earth, where, beyond a question, all manner of expedients are being discussed as to the best way of mitigating the violence of a concussion that must occur."

The lieutenant's conjectures were so reasonable that they commanded assent. Gallia could scarcely be otherwise than an object of terror to the inhabitants of the earth, who could by no means be certain that a second collision would be comparatively so harmless as the first. Even to the Gallians themselves, much as they looked forward to the event, the prospect was not unmixed with alarm, and they would rejoice in the

invention of any device by which it was likely the impetus of the shock might be deadened.

Christmas arrived, and was marked by appropriate religious observance by everyone in the community, with the exception of the Jew, who made a point of secluding himself more obstinately than ever in the gloomy recesses of his retreat.

To Ben Zoof the last week of the year was full of bustle. The arrangements for the New Year fete were entrusted to him, and he was anxious, in spite of the resources of Gallia being so limited, to make the program for the great day as attractive as possible.

It was a matter of debate that night whether the professor should be invited to join the party; it was scarcely likely that he would care to come, but, on the whole, it was felt to be advisable to ask him. At first Captain Servadac thought of going in person with the invitation; but, remembering Rosette's dislike to visitors, he altered his mind, and sent young Pablo up to the observatory with a formal note, requesting the pleasure of Professor Rosette's company at the New Year's fete.

Pablo was soon back, bringing no answer except that the professor had told him that "to-day was the 125th of June, and that to-morrow would be the 1st of July."

Consequently, Servadac and the count took it for granted that Palmyrin Rosette declined their invitation.

An hour after sunrise on New Year's Day, Frenchmen, Russians, Spaniards, and little Nina, as the representative of Italy, sat down to a feast such as never before had been seen in Gallia. Ben Zoof and the Russian cook had quite surpassed themselves. The wines, part of the Dobryna's stores, were of excellent quality. Those of the vintages of France and Spain were drunk in toasting their respective countries, and even Russia was honored in a similar way by means of a few bottles of kummel. The company was more than contented--it was as jovial as Ben Zoof could desire; and the ringing cheers that followed the great toast of the day--"A happy return to our Mother Earth," must fairly have startled the professor in the silence of his observatory.

The dejeuner over, there still remained three hours of daylight. The sun was approaching the zenith, but so dim and enfeebled were his rays that they were very unlike what had produced the wines of Bordeaux and Burgundy which they had just been enjoying, and it was necessary for all, before starting upon an excursion that would last over nightfall, to envelop themselves in the thickest of clothing.

Full of spirits, the party left the Hive, and chattering and singing as

they went, made their way down to the frozen shore, where they fastened on their skates. Once upon the ice, everyone followed his own fancy, and some singly, some in groups, scattered themselves in all directions. Captain Servadac, the count, and the lieutenant were generally seen together. Negrete and the Spaniards, now masters of their novel exercise, wandered fleetly and gracefully hither and thither, occasionally being out of sight completely. The Russian sailors, following a northern custom, skated in file, maintaining their rank by means of a long pole passed under their right arms, and in this way they described a trackway of singular regularity. The two children, blithe as birds, flitted about, now singly, now arm-in-arm, now joining the captain's party, now making a short peregrination by themselves, but always full of life and spirit. As for Ben Zoof, he was here, there, and everywhere, his imperturbable good temper ensuring him a smile of welcome whenever he appeared.

Thus coursing rapidly over the icy plain, the whole party had soon exceeded the line that made the horizon from the shore. First, the rocks of the coast were lost to view; then the white crests of the cliffs were no longer to be seen; and at last, the summit of the volcano, with its corona of vapor, was entirely out of sight. Occasionally the skaters were obliged to stop to recover their breath, but, fearful of frost-bite, they almost instantly resumed their exercise, and proceeded nearly as far as Gourbi Island before they thought about retracing their

course.

But night was coming on, and the sun was already sinking in the east with the rapidity to which the residents on Gallia were by this time well accustomed. The sunset upon this contracted horizon was very remarkable. There was not a cloud nor a vapor to catch the tints of the declining beams; the surface of the ice did not, as a liquid sea would, reflect the last green ray of light; but the radiant orb, enlarged by the effect of refraction, its circumference sharply defined against the sky, sank abruptly, as though a trap had been opened in the ice for its reception.

Before the daylight ended. Captain Servadac had cautioned the party to collect themselves betimes into one group. "Unless you are sure of your whereabouts before dark," he said, "you will not find it after. We have come out like a party of skirmishers; let us go back in full force."

The night would be dark; their moon was in conjunction, and would not be seen; the stars would only give something of that "pale radiance" which the poet Corneille has described.

Immediately after sunset the torches were lighted, and the long series of flames, fanned by the rapid motion of their bearers, had much the appearance of an enormous fiery banner. An hour later, and the volcano

appeared like a dim shadow on the horizon, the light from the crater shedding a lurid glare upon the surrounding gloom. In time the glow of the burning lava, reflected in the icy mirror, fell upon the troop of skaters, and cast their lengthened shadows grotesquely on the surface of the frozen sea.

Later still, half an hour or more afterwards, the torches were all but dying out. The shore was close at hand. All at once, Ben Zoof uttered a startled cry, and pointed with bewildered excitement towards the mountain. Involuntarily, one and all, they plowed their heels into the ice and came to a halt. Exclamations of surprise and horror burst from every lip. The volcano was extinguished! The stream of burning lava had suddenly ceased to flow!

Speechless with amazement, they stood still for some moments. There was not one of them that did not realize, more or less, how critical was their position. The sole source of the heat that had enabled them to brave the rigor of the cold had failed them! death, in the cruellest of all shapes, seemed staring them in the face--death from cold! Meanwhile, the last torch had flickered out.

It was quite dark.

"Forward!" cried Servadac, firmly.

At the word of command they advanced to the shore; clambered with no little difficulty up the slippery rocks; gained the mouth of the gallery; groped their way into the common hall.

How dreary! how chill it seemed!

The fiery cataract no longer spread its glowing covering over the mouth of the grotto. Lieutenant Procope leaned through the aperture. The pool, hitherto kept fluid by its proximity to the lava, was already encrusted with a layer of ice.

Such was the end of the New Year's Day so happily begun.

CHAPTER XII. THE BOWELS OF THE COMET

The whole night was spent in speculating, with gloomy forebodings, upon the chances of the future. The temperature of the hall, now entirely exposed to the outer air, was rapidly falling, and would quickly become unendurable. Far too intense was the cold to allow anyone to remain at the opening, and the moisture on the walls soon resolved itself into icicles. But the mountain was like the body of a dying man, that retains awhile a certain amount of heat at the heart after the extremities have become cold and dead. In the more interior galleries there was still a certain degree of warmth, and hither Servadac and his companions were glad enough to retreat.

Here they found the professor, who, startled by the sudden cold, had been fain to make a precipitate retreat from his observatory. Now would have been the opportunity to demand of the enthusiast whether he would like to prolong his residence indefinitely upon his little comet. It is very likely that he would have declared himself ready to put up with any amount of discomfort to be able to gratify his love of investigation; but all were far too disheartened and distressed to care to banter him upon the subject on which he was so sensitive.

Next morning, Servadac thus addressed his people. "My friends, except

from cold, we have nothing to fear. Our provisions are ample--more than enough for the remaining period of our sojourn in this lone world of ours; our preserved meat is already cooked; we shall be able to dispense with all fuel for cooking purposes. All that we require is warmth--warmth for ourselves; let us secure that, and all may be well. Now, I do not entertain a doubt but that the warmth we require is resident in the bowels of this mountain on which we are living; to the depth of those bowels we must penetrate; there we shall obtain the warmth which is indispensable to our very existence."

His tone, quite as much as his words, restored confidence to many of his people, who were already yielding to a feeling of despair. The count and the lieutenant fervently, but silently, grasped his hand.

"Nina," said the captain, "you will not be afraid to go down to the lower depths of the mountain, will you?"

"Not if Pablo goes," replied the child.

"Oh yes, of course, Pablo will go. You are not afraid to go, are you, Pablo?" he said, addressing the boy.

"Anywhere with you, your Excellency," was the boy's prompt reply.

And certain it was that no time must be lost in penetrating below the heart of the volcano; already the most protected of the many ramifications of Nina's Hive were being pervaded by a cold that was insufferable. It was an acknowledged impossibility to get access to the crater by the exterior declivities of the mountain-side; they were far too steep and too slippery to afford a foothold. It must of necessity be entered from the interior.

Lieutenant Procope accordingly undertook the task of exploring all the galleries, and was soon able to report that he had discovered one which he had every reason to believe abutted upon the central funnel. His reason for coming to this conclusion was that the caloric emitted by the rising vapors of the hot lava seemed to be oozing, as it were, out of the tellurium, which had been demonstrated already to be a conductor of heat. Only succeed in piercing through this rock for seven or eight yards, and the lieutenant did not doubt that his way would be opened into the old lava-course, by following which he hoped descent would be easy.

Under the lieutenant's direction the Russian sailors were immediately set to work. Their former experience had convinced them that spades and pick-axes were of no avail, and their sole resource was to proceed by blasting with gunpowder. However skillfully the operation might be carried on, it must necessarily occupy several days, and during that

time the sufferings from cold must be very severe.

"If we fail in our object, and cannot get to the depths of the mountain, our little colony is doomed," said Count Timascheff.

"That speech is not like yourself," answered Servadac, smiling. "What has become of the faith which has hitherto carried you so bravely through all our difficulties?"

The count shook his head, as if in despair, and said, sadly, "The Hand that has hitherto been outstretched to help seems now to be withdrawn."

"But only to test our powers of endurance," rejoined the captain, earnestly. "Courage, my friend, courage! Something tells me that this cessation of the eruption is only partial; the internal fire is not all extinct. All is not over yet. It is too soon to give up; never despair!"

Lieutenant Procope quite concurred with the captain. Many causes, he knew, besides the interruption of the influence of the oxygen upon the mineral substances in Gallia's interior, might account for the stoppage of the lava-flow in this one particular spot, and he considered it more than probable that a fresh outlet had been opened in some other part of the surface, and that the eruptive matter had been diverted into the new channel. But at present his business was to prosecute his labors so

that a retreat might be immediately effected from their now untenable position.

Restless and agitated, Professor Rosette, if he took any interest in these discussions, certainly took no share in them. He had brought his telescope down from the observatory into the common hall, and there at frequent intervals, by night and by day, he would endeavor to continue his observations; but the intense cold perpetually compelled him to desist, or he would literally have been frozen to death. No sooner, however, did he find himself obliged to retreat from his study of the heavens, than he would begin overwhelming everybody about him with bitter complaints, pouring out his regrets that he had ever quitted his quarters at Formentera.

On the 4th of January, by persevering industry, the process of boring was completed, and the lieutenant could hear that fragments of the blasted rock, as the sailors cleared them away with their spades, were rolling into the funnel of the crater. He noticed, too, that they did not fall perpendicularly, but seemed to slide along, from which he inferred that the sides of the crater were sloping; he had therefore reason to hope that a descent would be found practicable.

Larger and larger grew the orifice; at length it would admit a man's body, and Ben Zoof, carrying a torch, pushed himself through it,

followed by the lieutenant and Servadac. Procope's conjecture proved correct. On entering the crater, they found that the sides slanted at the angle of about 4 degrees; moreover, the eruption had evidently been of recent origin, dating probably only from the shock which had invested Gallia with a proportion of the atmosphere of the earth, and beneath the coating of ashes with which they were covered, there were various irregularities in the rock, not yet worn away by the action of the lava, and these afforded a tolerably safe footing.

"Rather a bad staircase!" said Ben Zoof, as they began to make their way down.

In about half an hour, proceeding in a southerly direction, they had descended nearly five hundred feet. From time to time they came upon large excavations that at first sight had all the appearance of galleries, but by waving his torch, Ben Zoof could always see their extreme limits, and it was evident that the lower strata of the mountain did not present the same system of ramification that rendered the Hive above so commodious a residence.

It was not a time to be fastidious; they must be satisfied with such accommodation as they could get, provided it was warm. Captain Servadac was only too glad to find that his hopes about the temperature were to a certain extent realized. The lower they went, the greater was the

diminution in the cold, a diminution that was far more rapid than that which is experienced in making the descent of terrestrial mines. In this case it was a volcano, not a colliery, that was the object of exploration, and thankful enough they were to find that it had not become extinct. Although the lava, from some unknown cause, had ceased to rise in the crater, yet plainly it existed somewhere in an incandescent state, and was still transmitting considerable heat to inferior strata.

Lieutenant Procope had brought in his hand a mercurial thermometer, and Servadac carried an aneroid barometer, by means of which he could estimate the depth of their descent below the level of the Gallian Sea. When they were six hundred feet below the orifice the mercury registered a temperature of 6 degrees below zero.

"Six degrees!" said Servadac; "that will not suit us. At this low temperature we could not survive the winter. We must try deeper down. I only hope the ventilation will hold out."

There was, however, nothing to fear on the score of ventilation. The great current of air that rushed into the aperture penetrated everywhere, and made respiration perfectly easy.

The descent was continued for about another three hundred feet, which

brought the explorers to a total depth of nine hundred feet from their old quarters. Here the thermometer registered 12 degrees above zero--a temperature which, if only it were permanent, was all they wanted. There was no advantage in proceeding any further along the lava-course; they could already hear the dull rumblings that indicated that they were at no great distance from the central focus.

"Quite near enough for me!" exclaimed Ben Zoof. "Those who are chilly are welcome to go as much lower as they like. For my part, I shall be quite warm enough here."

After throwing the gleams of torch-light in all directions, the explorers seated themselves on a jutting rock, and began to debate whether it was practicable for the colony to make an abode in these lower depths of the mountain. The prospect, it must be owned, was not inviting. The crater, it is true, widened out into a cavern sufficiently large, but here its accommodation ended. Above and below were a few ledges in the rock that would serve as receptacles for provisions; but, with the exception of a small recess that must be reserved for Nina, it was clear that henceforth they must all renounce the idea of having separate apartments. The single cave must be their dining-room, drawing-room, and dormitory, all in one. From living the life of rabbits in a warren, they were reduced to the existence of moles, with the difference that they could not, like them, forget their troubles in a

long winter's sleep.

The cavern, however, was quite capable of being lighted by means of lamps and lanterns. Among the stores were several barrels of oil and a considerable quantity of spirits of wine, which might be burned when required for cooking purposes. Moreover, it would be unnecessary for them to confine themselves entirely to the seclusion of their gloomy residence; well wrapped up, there would be nothing to prevent them making occasional excursions both to the Hive and to the sea-shore. A supply of fresh water would be constantly required; ice for this purpose must be perpetually carried in from the coast, and it would be necessary to arrange that everyone in turn should perform this office, as it would be no sinecure to clamber up the sides of the crater for 900 feet, and descend the same distance with a heavy burden.

But the emergency was great, and it was accordingly soon decided that the little colony should forthwith take up its quarters in the cave. After all, they said, they should hardly be much worse off than thousands who annually winter in Arctic regions. On board the whaling-vessels, and in the establishments of the Hudson's Bay Company, such luxuries as separate cabins or sleeping-chambers are never thought of; one large apartment, well heated and ventilated, with as few corners as possible, is considered far more healthy; and on board ship the entire hold, and in forts a single floor, is appropriated to this

purpose. The recollection of this fact served to reconcile them, in a great degree, to the change to which they felt it requisite to submit.

Having remounted the ascent, they made the result of their exploration known to the mass of the community, who received the tidings with a sense of relief, and cordially accepted the scheme of the migration.

The first step was to clear the cavern of its accumulation of ashes, and then the labor of removal commenced in earnest. Never was a task undertaken with greater zest. The fear of being to a certainty frozen to death if they remained where they were, was a stimulus that made everyone put forth all his energies. Beds, furniture, cooking utensils--first the stores of the Dobryna, then the cargo of the tartan--all were carried down with the greatest alacrity, and the diminished weight combined with the downhill route to make the labor proceed with incredible briskness.

Although Professor Rosette yielded to the pressure of circumstances, and allowed himself to be conducted to the lower regions, nothing would induce him to allow his telescope to be carried underground; and as it was undeniable that it would certainly be of no service deep down in the bowels of the mountain, it was allowed to remain undisturbed upon its tripod in the great hall of Nina's Hive.

As for Isaac Hakkabut, his outcry was beyond description lamentable. Never, in the whole universe, had a merchant met with such reverses; never had such a pitiable series of losses befallen an unfortunate man. Regardless of the ridicule which his abject wretchedness excited, he howled on still, and kept up an unending wail; but meanwhile he kept a keen eye upon every article of his property, and amidst universal laughter insisted on having every item registered in an inventory as it was transferred to its appointed place of safety. Servadac considerately allowed the whole of the cargo to be deposited in a hollow apart by itself, over which the Jew was permitted to keep a watch as vigilant as he pleased.

By the 10th the removal was accomplished. Rescued, at all events, from the exposure to a perilous temperature of 60 degrees below zero, the community was installed in its new home. The large cave was lighted by the Dobryna's lamps, while several lanterns, suspended at intervals along the acclivity that led to their deserted quarters above, gave a weird picturesqueness to the scene, that might vie with any of the graphic descriptions of the "Arabian Nights' Entertainments."

"How do you like this, Nina?" said Ben Zoof.

"Va bene!" replied the child. "We are only living in the cellars instead of upon the ground floor."

"We will try and make ourselves comfortable," said the orderly.

"Oh yes, we will be happy here," rejoined the child; "it is nice and warm."

Although they were as careful as they could to conceal their misgivings from the rest, Servadac and his two friends could not regard their present situation without distrust. When alone, they would frequently ask each other what would become of them all, if the volcanic heat should really be subsiding, or if some unexpected perturbation should retard the course of the comet, and compel them to an indefinitely prolonged residence in their grim abode. It was scarcely likely that the comet could supply the fuel of which ere long they would be in urgent need. Who could expect to find coal in the bowels of Gallia,--coal, which is the residuum of ancient forests mineralized by the lapse of ages? Would not the lava-cinders exhumed from the extinct volcano be their last poor resource?

"Keep up your spirits, my friends," said Servadac; "we have plenty of time before us at present. Let us hope that as fresh difficulties arise, fresh ways of escape will open. Never despair!"

"True," said the count; "it is an old saying that 'Necessity is the

mother of invention.' Besides, I should think it very unlikely that the internal heat will fail us now before the summer."

The lieutenant declared that he entertained the same hope. As the reason of his opinion he alleged that the combustion of the eruptive matter was most probably of quite recent origin, because the comet before its collision with the earth had possessed no atmosphere, and that consequently no oxygen could have penetrated to its interior.

"Most likely you are right," replied the count; "and so far from dreading a failure of the internal heat, I am not quite sure that we may not be exposed to a more terrible calamity still?"

"What?" asked Servadac.

"The calamity of the eruption breaking out suddenly again, and taking us by surprise."

"Heavens!" cried the captain, "we will not think of that."

"The outbreak may happen again," said the lieutenant, calmly; "but it will be our fault, our own lack of vigilance, if we are taken by surprise." And so the conversation dropped.

The 15th of January dawned; and the comet was 220,000,000 leagues from the sun.

Gallia had reached its aphelion.

CHAPTER XIII. DREARY MONTHS

Henceforth, then, with a velocity ever increasing, Gallia would re-approach the sun.

Except the thirteen Englishmen who had been left at Gibraltar, every living creature had taken refuge in the dark abyss of the volcano's crater.

And with those Englishmen, how had it fared?

"Far better than with ourselves," was the sentiment that would have been universally accepted in Nina's Hive. And there was every reason to conjecture that so it was. The party at Gibraltar, they all agreed, would not, like themselves, have been compelled to have recourse to a stream of lava for their supply of heat; they, no doubt, had had abundance of fuel as well as food; and in their solid casemate, with its substantial walls, they would find ample shelter from the rigor of the cold. The time would have been passed at least in comfort, and perhaps in contentment; and Colonel Murphy and Major Oliphant would have had leisure more than sufficient for solving the most abstruse problems of the chess-board. All of them, too, would be happy in the confidence that when the time should come, England would have full meed of praise to

award to the gallant soldiers who had adhered so well and so manfully to their post.

It did, indeed, more than once occur to the minds both of Servadac and his friends that, if their condition should become one of extreme emergency, they might, as a last resource, betake themselves to Gibraltar, and there seek a refuge; but their former reception had not been of the kindest, and they were little disposed to renew an acquaintanceship that was marked by so little cordiality. Not in the least that they would expect to meet with any inhospitable rebuff. Far from that; they knew well enough that Englishmen, whatever their faults, would be the last to abandon their fellow-creatures in the hour of distress. Nevertheless, except the necessity became far more urgent than it had hitherto proved, they resolved to endeavor to remain in their present quarters. Up till this time no casualties had diminished their original number, but to undertake so long a journey across that unsheltered expanse of ice could scarcely fail to result in the loss of some of their party.

However great was the desire to find a retreat for every living thing in the deep hollow of the crater, it was found necessary to slaughter almost all the domestic animals before the removal of the community from Nina's Hive. To have stabled them all in the cavern below would have been quite impossible, whilst to have left them in the upper galleries

would only have been to abandon them to a cruel death; and since meat could be preserved for an indefinite time in the original store-places, now colder than ever, the expedient of killing the animals seemed to recommend itself as equally prudent and humane.

Naturally the captain and Ben Zoof were most anxious that their favorite horses should be saved, and accordingly, by dint of the greatest care, all difficulties in the way were overcome, and Zephyr and Galette were conducted down the crater, where they were installed in a large hole and provided with forage, which was still abundant.

Birds, subsisting only on scraps thrown out to them did not cease to follow the population in its migration, and so numerous did they become that multitudes of them had repeatedly to be destroyed.

The general re-arrangement of the new residence was no easy business, and occupied so much time that the end of January arrived before they could be said to be fairly settled. And then began a life of dreary monotony. Then seemed to creep over everyone a kind of moral torpor as well as physical lassitude, which Servadac, the count, and the lieutenant did their best not only to combat in themselves, but to counteract in the general community. They provided a variety of intellectual pursuits; they instituted debates in which everybody was encouraged to take part; they read aloud, and explained extracts from

the elementary manuals of science, or from the books of adventurous travel which their library supplied; and Russians and Spaniards, day after day, might be seen gathered round the large table, giving their best attention to instruction which should send them back to Mother Earth less ignorant than they had left her.

Selfish and morose, Hakkabut could never be induced to be present at these social gatherings. He was far too much occupied in his own appropriated corner, either in conning his accounts, or in counting his money. Altogether, with what he had before, he now possessed the round sum of 150,000 francs, half of which was in sterling gold; but nothing could give him any satisfaction while he knew that the days were passing, and that he was denied the opportunity of putting out his capital in advantageous investments, or securing a proper interest.

Neither did Palmyrin Rosette find leisure to take any share in the mutual intercourse. His occupation was far too absorbing for him to suffer it to be interrupted, and to him, living as he did perpetually in a world of figures, the winter days seemed neither long nor wearisome. Having ascertained every possible particular about his comet, he was now devoting himself with equal ardor to the analysis of all the properties of the satellite Nerina, to which he appeared to assert the same claim of proprietorship.

In order to investigate Nerina it was indispensable that he should make several actual observations at various points of the orbit; and for this purpose he repeatedly made his way up to the grotto above, where, in spite of the extreme severity of the cold, he would persevere in the use of his telescope till he was all but paralyzed. But what he felt more than anything was the want of some retired apartment, where he could pursue his studies without hindrance or intrusion.

It was about the beginning of February, when the professor brought his complaint to Captain Servadac, and begged him to assign him a chamber, no matter how small, in which he should be free to carry on his task in silence and without molestation. So readily did Servadac promise to do everything in his power to provide him with the accommodation for which he asked, that the professor was put into such a manifest good temper that the captain ventured to speak upon the matter that was ever uppermost in his mind.

"I do not mean," he began timidly, "to cast the least imputation of inaccuracy upon any of your calculations, but would you allow me, my dear professor, to suggest that you should revise your estimate of the duration of Gallia's period of revolution. It is so important, you know, so all important; the difference of one half minute, you know, would so certainly mar the expectation of reunion with the earth--"

And seeing a cloud gathering on Rosette's face, he added:

"I am sure Lieutenant Procope would be only too happy to render you any assistance in the revision."

"Sir," said the professor, bridling up, "I want no assistant; my calculations want no revision. I never make an error. I have made my reckoning as far as Gallia is concerned. I am now making a like estimate of the elements of Nerina."

Conscious how impolitic it would be to press this matter further, the captain casually remarked that he should have supposed that all the elements of Nerina had been calculated long since by astronomers on the earth. It was about as unlucky a speech as he could possibly have made. The professor glared at him fiercely.

"Astounding, sir!" he exclaimed. "Yes! Nerina was a planet then; everything that appertained to the planet was determined; but Nerina is a moon now. And do you not think, sir, that we have a right to know as much about our moon as those terrestrials"--and he curled his lip as he spoke with a contemptuous emphasis--"know of theirs?"

"I beg pardon," said the corrected captain.

"Well then, never mind," replied the professor, quickly appeased; "only will you have the goodness to get me a proper place for study?"

"I will, as I promised, do all I can," answered Servadac.

"Very good," said the professor. "No immediate hurry; an hour hence will do."

But in spite of this condescension on the part of the man of science, some hours had to elapse before any place of retreat could be discovered likely to suit his requirements; but at length a little nook was found in the side of the cavern just large enough to hold an armchair and a table, and in this the astronomer was soon ensconced to his entire satisfaction.

Buried thus, nearly 900 feet below ground, the Gallians ought to have had unbounded mental energy to furnish an adequate reaction to the depressing monotony of their existence; but many days would often elapse without any one of them ascending to the surface of the soil, and had it not been for the necessity of obtaining fresh water, it seemed almost probable that there would never have been an effort made to leave the cavern at all.

A few excursions, it is true, were made in the downward direction. The

three leaders, with Ben Zoof, made their way to the lower depths of the crater, not with the design of making any further examination as to the nature of the rock--for although it might be true enough that it contained thirty per cent. of gold, it was as valueless to them as granite--but with the intention of ascertaining whether the subterranean fire still retained its activity. Satisfied upon this point, they came to the conclusion that the eruption which had so suddenly ceased in one spot had certainly broken out in another.

February, March, April, May, passed wearily by; but day succeeded to day with such gloomy sameness that it was little wonder that no notice was taken of the lapse of time. The people seemed rather to vegetate than to live, and their want of vigor became at times almost alarming. The readings around the long table ceased to be attractive, and the debates, sustained by few, became utterly wanting in animation. The Spaniards could hardly be roused to quit their beds, and seemed to have scarcely energy enough to eat. The Russians, constitutionally of more enduring temperament, did not give way to the same extent, but the long and drear confinement was beginning to tell upon them all. Servadac, the count, and the lieutenant all knew well enough that it was the want of air and exercise that was the cause of much of this mental depression; but what could they do? The most serious remonstrances on their part were entirely in vain. In fact, they themselves occasionally fell a prey to the same lassitude both of body and mind. Long fits of drowsiness,

combined with an utter aversion to food, would come over them. It almost seemed as if their entire nature had become degenerate, and that, like tortoises, they could sleep and fast till the return of summer.

Strange to say, little Nina bore her hardships more bravely than any of them. Flitting about, coaxing one to eat, another to drink, rousing Pablo as often as he seemed yielding to the common languor, the child became the life of the party. Her merry prattle enlivened the gloom of the grim cavern like the sweet notes of a bird; her gay Italian songs broke the monotony of the depressing silence; and almost unconscious as the half-dormant population of Gallia were of her influence, they still would have missed her bright presence sorely. The months still glided on; how, it seemed impossible for the inhabitants of the living tomb to say. There was a dead level of dullness.

At the beginning of June the general torpor appeared slightly to relax its hold upon its victims. This partial revival was probably due to the somewhat increased influence of the sun, still far, far away. During the first half of the Gallian year, Lieutenant Procope had taken careful note of Rosette's monthly announcements of the comet's progress, and he was able now, without reference to the professor, to calculate the rate of advance on its way back towards the sun. He found that Gallia had re-crossed the orbit of Jupiter, but was still at the enormous distance of 197,000,000 leagues from the sun, and he reckoned that in about four

months it would have entered the zone of the telescopic planets.

Gradually, but uninterruptedly, life and spirits continued to revive, and by the end of the month Servadac and his little colony had regained most of their ordinary physical and mental energies. Ben Zoof, in particular, roused himself with redoubled vigor, like a giant refreshed from his slumbers. The visits, consequently, to the long-neglected galleries of Nina's Hive became more and more frequent.

One day an excursion was made to the shore. It was still bitterly cold, but the atmosphere had lost nothing of its former stillness, and not a cloud was visible from horizon to zenith. The old footmarks were all as distinct as on the day in which they had been imprinted, and the only portion of the shore where any change was apparent was in the little creek. Here the elevation of the ice had gone on increasing, until the schooner and the tartan had been uplifted to a height of 150 feet, not only rendering them quite inaccessible, but exposing them to all but certain destruction in the event of a thaw.

Isaac Hakkabut, immovable from the personal oversight of his property in the cavern, had not accompanied the party, and consequently was in blissful ignorance of the fate that threatened his vessel. "A good thing the old fellow wasn't there to see," observed Ben Zoof; "he would have screamed like a peacock. What a misfortune it is," he added, speaking to

himself, "to have a peacock's voice, without its plumage!"

During the months of July and August, Gallia advanced 164,000,000 leagues along her orbit. At night the cold was still intense, but in the daytime the sun, here full upon the equator, caused an appreciable difference of 20 degrees in the temperature. Like birds, the population spent whole days exposed to its grateful warmth, rarely returning till nightfall to the shade of their gloomy home.

This spring-time, if such it may be called, had a most enlivening influence upon all. Hope and courage revived as day by day the sun's disc expanded in the heavens, and every evening the earth assumed a greater magnitude amongst the fixed stars. It was distant yet, but the goal was cheeringly in view.

"I can't believe that yonder little speck of light contains my mountain of Montmartre," said Ben Zoof, one night, after he had been gazing long and steadily at the far-off world.

"You will, I hope, some day find out that it does," answered his master.

"I hope so," said the orderly, without moving his eye from the distant sphere. After meditating a while, he spoke again. "I suppose Professor Rosette couldn't make his comet go straight back, could he?"

"Hush!" cried Servadac.

Ben Zoof understood the correction.

"No," continued the captain; "it is not for man to disturb the order of the universe. That belongs to a Higher Power than ours!"

CHAPTER XIV. THE PROFESSOR PERPLEXED

Another month passed away, and it was now September, but it was still impossible to leave the warmth of the subterranean retreat for the more airy and commodious quarters of the Hive, where "the bees" would certainly have been frozen to death in their cells. It was altogether quite as much a matter of congratulation as of regret that the volcano showed no symptoms of resuming its activity; for although a return of the eruption might have rendered their former resort again habitable, any sudden outbreak would have been disastrous to them where they were, the crater being the sole outlet by which the burning lava could escape.

"A wretched time we have had for the last seven months," said the orderly one day to his master; "but what a comfort little Nina has been to us all!"

"Yes, indeed," replied Servadac; "she is a charming little creature. I hardly know how we should have got on without her."

"What is to become of her when we arrive back at the earth?"

"Not much fear, Ben Zoof, but that she will be well taken care of. Perhaps you and I had better adopt her."

"Ay, yes," assented the orderly. "You can be her father, and I can be her mother."

Servadac laughed. "Then you and I shall be man and wife."

"We have been as good as that for a long time," observed Ben Zoof, gravely.

By the beginning of October, the temperature had so far moderated that it could scarcely be said to be intolerable. The comet's distance was scarcely three times as great from the sun as the earth from the sun, so that the thermometer rarely sunk beyond 35 degrees below zero. The whole party began to make almost daily visits to the Hive, and frequently proceeded to the shore, where they resumed their skating exercise, rejoicing in their recovered freedom like prisoners liberated from a dungeon. Whilst the rest were enjoying their recreation, Servadac and the count would hold long conversations with Lieutenant Procope about their present position and future prospects, discussing all manner of speculations as to the results of the anticipated collision with the earth, and wondering whether any measures could be devised for mitigating the violence of a shock which might be terrible in its consequences, even if it did not entail a total annihilation of themselves.

There was no visitor to the Hive more regular than Rosette. He had already directed his telescope to be moved back to his former observatory, where, as much as the cold would permit him, he persisted in making his all-absorbing studies of the heavens.

The result of these studies no one ventured to inquire; but it became generally noticed that something was very seriously disturbing the professor's equanimity. Not only would he be seen toiling more frequently up the arduous way that lay between his nook below and his telescope above, but he would be heard muttering in an angry tone that indicated considerable agitation.

One day, as he was hurrying down to his study, he met Ben Zoof, who, secretly entertaining a feeling of delight at the professor's manifest discomfiture, made some casual remark about things not being very straight. The way in which his advance was received the good orderly never divulged, but henceforward he maintained the firm conviction that there was something very much amiss up in the sky.

To Servadac and his friends this continual disquietude and ill-humor on the part of the professor occasioned no little anxiety. From what, they asked, could his dissatisfaction arise? They could only conjecture that he had discovered some flaw in his reckonings; and if this were so,

might there not be reason to apprehend that their anticipations of coming into contact with the earth, at the settled time, might all be falsified?

Day followed day, and still there was no cessation of the professor's discomposure. He was the most miserable of mortals. If really his calculations and his observations were at variance, this, in a man of his irritable temperament, would account for his perpetual perturbation. But he entered into no explanation; he only climbed up to his telescope, looking haggard and distressed, and when compelled by the frost to retire, he would make his way back to his study more furious than ever. At times he was heard giving vent to his vexation. "Confound it! what does it mean? what is she doing? All behind! Is Newton a fool? Is the law of universal gravitation the law of universal nonsense?" And the little man would seize his head in both his hands, and tear away at the scanty locks which he could ill afford to lose.

Enough was overheard to confirm the suspicion that there was some irreconcilable discrepancy between the results of his computation and what he had actually observed; and yet, if he had been called upon to say, he would have sooner insisted that there was derangement in the laws of celestial mechanism, than have owned there was the least probability of error in any of his own calculations. Assuredly, if the poor professor had had any flesh to lose he would have withered away to

a shadow.

But this state of things was before long to come to an end. On the 12th, Ben Zoof, who was hanging about outside the great hall of the cavern, heard the professor inside utter a loud cry. Hurrying in to ascertain the cause, he found Rosette in a state of perfect frenzy, in which ecstasy and rage seemed to be struggling for the predominance.

"Eureka! Eureka!" yelled the excited astronomer.

"What, in the name of peace, do you mean?" bawled Ben Zoof, in open-mouthed amazement.

"Eureka!" again shrieked the little man.

"How? What? Where?" roared the bewildered orderly.

"Eureka! I say," repeated Rosette; "and if you don't understand me, you may go to the devil!"

Without availing himself of this polite invitation, Ben Zoof betook himself to his master. "Something has happened to the professor," he said; "he is rushing about like a madman, screeching and yelling 'Eureka!'"

"Eureka?" exclaimed Servadac. "That means he has made a discovery;" and, full of anxiety, he hurried off to meet the professor.

But, however great was his desire to ascertain what this discovery implied, his curiosity was not yet destined to be gratified. The professor kept muttering in incoherent phrases: "Rascal! he shall pay for it yet. I will be even with him! Cheat! Thrown me out!" But he did not vouchsafe any reply to Servadac's inquiries, and withdrew to his study.

From that day Rosette, for some reason at present incomprehensible, quite altered his behavior to Isaac Hakkabut, a man for whom he had always hitherto evinced the greatest repugnance and contempt. All at once he began to show a remarkable interest in the Jew and his affairs, paying several visits to the dark little storehouse, making inquiries as to the state of business and expressing some solicitude about the state of the exchequer.

The wily Jew was taken somewhat by surprise, but came to an immediate conclusion that the professor was contemplating borrowing some money; he was consequently very cautious in all his replies.

It was not Hakkabut's habit ever to advance a loan except at an

extravagant rate of interest, or without demanding far more than an adequate security. Count Timascheff, a Russian nobleman, was evidently rich; to him perhaps, for a proper consideration, a loan might be made: Captain Servadac was a Gascon, and Gascons are proverbially poor; it would never do to lend any money to him; but here was a professor, a mere man of science, with circumscribed means; did he expect to borrow? Certainly Isaac would as soon think of flying, as of lending money to him. Such were the thoughts that made him receive all Rosette's approaches with a careful reservation.

It was not long, however, before Hakkabut was to be called upon to apply his money to a purpose for which he had not reckoned. In his eagerness to effect sales, he had parted with all the alimentary articles in his cargo without having the precautionary prudence to reserve enough for his own consumption. Amongst other things that failed him was his stock of coffee, and as coffee was a beverage without which he deemed it impossible to exist, he found himself in considerable perplexity.

He pondered the matter over for a long time, and ultimately persuaded himself that, after all, the stores were the common property of all, and that he had as much right to a share as anyone else. Accordingly, he made his way to Ben Zoof, and, in the most amiable tone he could assume, begged as a favor that he would let him have a pound of coffee.

The orderly shook his head dubiously.

"A pound of coffee, old Nathan? I can't say."

"Why not? You have some?" said Isaac.

"Oh yes! plenty--a hundred kilogrammes."

"Then let me have one pound. I shall be grateful."

"Hang your gratitude!"

"Only one pound! You would not refuse anybody else."

"That's just the very point, old Samuel; if you were anybody else, I should know very well what to do. I must refer the matter to his Excellency."

"Oh, his Excellency will do me justice."

"Perhaps you will find his justice rather too much for you." And with this consoling remark, the orderly went to seek his master.

Rosette meanwhile had been listening to the conversation, and secretly

rejoicing that an opportunity for which he had been watching had arrived. "What's the matter, Master Isaac? Have you parted with all your coffee?" he asked, in a sympathizing voice, when Ben Zoof was gone.

"Ah! yes, indeed," groaned Hakkabut, "and now I require some for my own use. In my little black hole I cannot live without my coffee."

"Of course you cannot," agreed the professor.

"And don't you think the governor ought to let me have it?"

"No doubt."

"Oh, I must have coffee," said the Jew again.

"Certainly," the professor assented. "Coffee is nutritious; it warms the blood. How much do you want?"

"A pound. A pound will last me for a long time."

"And who will weigh it for you?" asked Rosette, scarcely able to conceal the eagerness that prompted the question.

"Why, they will weigh it with my steelyard, of course. There is no other

balance here." And as the Jew spoke, the professor fancied he could detect the faintest of sighs.

"Good, Master Isaac; all the better for you! You will get your seven pounds instead of one!"

"Yes; well, seven, or thereabouts--thereabouts," stammered the Jew with considerable hesitation.

Rosette scanned his countenance narrowly, and was about to probe him with further questions, when Ben Zoof returned. "And what does his Excellency say?" inquired Hakkabut.

"Why, Nehemiah, he says he shan't give you any."

"Merciful heavens!" began the Jew.

"He says he doesn't mind selling you a little."

"But, by the holy city, why does he make me pay for what anybody else could have for nothing?"

"As I told you before, you are not anybody else; so, come along. You can afford to buy what you want. We should like to see the color of your

money."

"Merciful heavens!" the old man whined once more.

"Now, none of that! Yes or no? If you are going to buy, say so at once; if not, I shall shut up shop."

Hakkabut knew well enough that the orderly was not a man to be trifled with, and said, in a tremulous voice, "Yes, I will buy."

The professor, who had been looking on with much interest, betrayed manifest symptoms of satisfaction.

"How much do you want? What will you charge for it?" asked Isaac, mournfully, putting his hand into his pocket and chinking his money.

"Oh, we will deal gently with you. We will not make any profit. You shall have it for the same price that we paid for it. Ten francs a pound, you know."

The Jew hesitated.

"Come now, what is the use of your hesitating? Your gold will have no value when you go back to the world."

"What do you mean?" asked Hakkabut, startled.

"You will find out some day," answered Ben Zoof, significantly.

Hakkabut drew out a small piece of gold from his pocket, took it close under the lamp, rolled it over in his hand, and pressed it to his lips. "Shall you weigh me the coffee with my steelyard?" he asked, in a quavering voice that confirmed the professor's suspicions.

"There is nothing else to weigh it with; you know that well enough, old Shechem," said Ben Zoof. The steelyard was then produced; a tray was suspended to the hook, and upon this coffee was thrown until the needle registered the weight of one pound. Of course, it took seven pounds of coffee to do this.

"There you are! There's your coffee, man!" Ben Zoof said.

"Are you sure?" inquired Hakkabut, peering down close to the dial. "Are you quite sure that the needle touches the point?"

"Yes; look and see."

"Give it a little push, please."

"Why?"

"Because--because--"

"Well, because of what?" cried the orderly, impatiently.

"Because I think, perhaps--I am not quite sure--perhaps the steelyard is not quite correct."

The words were not uttered before the professor, fierce as a tiger, had rushed at the Jew, had seized him by the throat, and was shaking him till he was black in the face.

"Help! help!" screamed Hakkabut. "I shall be strangled."

"Rascal! consummate rascal! thief! villain!" the professor reiterated, and continued to shake the Jew furiously.

Ben Zoof looked on and laughed, making no attempt to interfere; he had no sympathy with either of the two.

The sound of the scuffling, however, drew the attention of Servadac, who, followed by his companions, hastened to the scene. The combatants

were soon parted. "What is the meaning of all this?" demanded the captain.

As soon as the professor had recovered his breath, exhausted by his exertions, he said, "The old reprobate, the rascal has cheated us! His steelyard is wrong! He is a thief!"

Captain Servadac looked sternly at Hakkabut.

"How is this, Hakkabut? Is this a fact?"

"No, no--yes--no, your Excellency, only--"

"He is a cheat, a thief!" roared the excited astronomer. "His weights deceive!"

"Stop, stop!" interposed Servadac; "let us hear. Tell me, Hakkabut--"

"The steelyard lies! It cheats! it lies!" roared the irrepressible Rosette.

"Tell me, Hakkabut, I say," repeated Servadac.

The Jew only kept on stammering, "Yes--no--I don't know."

But heedless of any interruption, the professor continued, "False weights! That confounded steelyard! It gave a false result! The mass was wrong! The observations contradicted the calculations; they were wrong! She was out of place! Yes, out of place entirely."

"What!" cried Servadac and Procope in a breath, "out of place?"

"Yes, completely," said the professor.

"Gallia out of place?" repeated Servadac, agitated with alarm.

"I did not say Gallia," replied Rosette, stamping his foot impetuously; "I said Nerina."

"Oh, Nerina," answered Servadac. "But what of Gallia?" he inquired, still nervously.

"Gallia, of course, is on her way to the earth. I told you so. But that Jew is a rascal!"

CHAPTER XV. A JOURNEY AND A DISAPPOINTMENT

It was as the professor had said. From the day that Isaac Hakkabut had entered upon his mercantile career, his dealings had all been carried on by a system of false weight. That deceitful steelyard had been the mainspring of his fortune. But when it had become his lot to be the purchaser instead of the vendor, his spirit had groaned within him at being compelled to reap the fruits of his own dishonesty. No one who had studied his character could be much surprised at the confession that was extorted from him, that for every supposed kilogramme that he had ever sold the true weight was only 750 grammes, or just five and twenty per cent. less than it ought to have been.

The professor, however, had ascertained all that he wanted to know. By estimating his comet at a third as much again as its proper weight, he had found that his calculations were always at variance with the observed situation of the satellite, which was immediately influenced by the mass of its primary.

But now, besides enjoying the satisfaction of having punished old Hakkabut, Rosette was able to recommence his calculations with reference to the elements of Nerina upon a correct basis, a task to which he devoted himself with redoubled energy.

It will be easily imagined that Isaac Hakkabut, thus caught in his own trap, was jeered most unmercifully by those whom he had attempted to make his dupes. Ben Zoof, in particular, was never wearied of telling him how on his return to the world he would be prosecuted for using false weights, and would certainly become acquainted with the inside of a prison. Thus badgered, he secluded himself more than ever in his dismal hole, never venturing, except when absolutely obliged, to face the other members of the community.

On the 7th of October the comet re-entered the zone of the telescopic planets, one of which had been captured as a satellite, and the origin of the whole of which is most probably correctly attributed to the disintegration of some large planet that formerly revolved between the orbits of Mars and Jupiter. By the beginning of the following month half of this zone had been traversed, and only two months remained before the collision with the earth was to be expected. The temperature was now rarely below 12 degrees below zero, but that was far too cold to permit the slightest symptoms of a thaw. The surface of the sea remained as frozen as ever, and the two vessels, high up on their icy pedestals, remained unaltered in their critical position.

It was about this time that the question began to be mooted whether it would not be right to reopen some communication with the Englishmen at

Gibraltar. Not that any doubt was entertained as to their having been able successfully to cope with the rigors of the winter; but Captain Servadac, in a way that did honor to his generosity, represented that, however uncourteous might have been their former behavior, it was at least due to them that they should be informed of the true condition of things, which they had had no opportunity of learning; and, moreover, that they should be invited to co-operate with the population of Nina's Hive, in the event of any measures being suggested by which the shock of the approaching collision could be mitigated.

The count and the lieutenant both heartily concurred in Servadac's sentiments of humanity and prudence, and all agreed that if the intercourse were to be opened at all, no time could be so suitable as the present, while the surface of the sea presented a smooth and solid footing. After a thaw should set in, neither the yacht nor the tartan could be reckoned on for service, and it would be inexpedient to make use of the steam launch, for which only a few tons of coal had been reserved, just sufficient to convey them to Gourbi Island when the occasion should arise; whilst as to the yawl, which, transformed into a sledge, had performed so successful a trip to Formentera, the absence of wind would make that quite unavailable. It was true that with the return of summer temperature, there would be certain to be a derangement in the atmosphere of Gallia, which would result in wind, but for the present the air was altogether too still for the yawl to have any prospects of

making its way to Gibraltar.

The only question remaining was as to the possibility of going on foot. The distance was somewhere about 240 miles. Captain Servadac declared himself quite equal to the undertaking. To skate sixty or seventy miles a day would be nothing, he said, to a practical skater like himself. The whole journey there and back might be performed in eight days. Provided with a compass, a sufficient supply of cold meat, and a spirit lamp, by which he might boil his coffee, he was perfectly sure he should, without the least difficulty, accomplish an enterprise that chimed in so exactly with his adventurous spirit.

Equally urgent were both the count and the lieutenant to be allowed to accompany him; nay, they even offered to go instead; but Servadac, expressing himself as most grateful for their consideration, declined their offer, and avowed his resolution of taking no other companion than his own orderly.

Highly delighted at his master's decision, Ben Zoof expressed his satisfaction at the prospect of "stretching his legs a bit," declaring that nothing could induce him to permit the captain to go alone. There was no delay. The departure was fixed for the following morning, the 2nd of November.

Although it is not to be questioned that a genuine desire of doing an act of kindness to his fellow-creatures was a leading motive of Servadac's proposed visit to Gibraltar, it must be owned that another idea, confided to nobody, least of all to Count Timascheff, had been conceived in the brain of the worthy Gascon. Ben Zoof had an inkling that his master was "up to some other little game," when, just before starting, he asked him privately whether there was a French tricolor among the stores. "I believe so," said the orderly.

"Then don't say a word to anyone, but fasten it up tight in your knapsack."

Ben Zoof found the flag, and folded it up as he was directed. Before proceeding to explain this somewhat enigmatical conduct of Servadac, it is necessary to refer to a certain physiological fact, coincident but unconnected with celestial phenomena, originating entirely in the frailty of human nature. The nearer that Gallia approached the earth, the more a sort of reserve began to spring up between the captain and Count Timascheff. Though they could not be said to be conscious of it, the remembrance of their former rivalry, so completely buried in oblivion for the last year and ten months, was insensibly recovering its hold upon their minds, and the question was all but coming to the surface as to what would happen if, on their return to earth, the handsome Madame de L---- should still be free. From companions in peril,

would they not again be avowed rivals? Conceal it as they would, a coolness was undeniably stealing over an intimacy which, though it could never be called affectionate, had been uniformly friendly and courteous.

Under these circumstances, it was not surprising that Hector Servadac should not have confided to the count a project which, wild as it was, could scarcely have failed to widen the unacknowledged breach that was opening in their friendship.

The project was the annexation of Ceuta to the French dominion. The Englishmen, rightly enough, had continued to occupy the fragment of Gibraltar, and their claim was indisputable. But the island of Ceuta, which before the shock had commanded the opposite side of the strait, and had been occupied by Spaniards, had since been abandoned, and was therefore free to the first occupant who should lay claim to it. To plant the tricolor upon it, in the name of France, was now the cherished wish of Servadac's heart.

"Who knows," he said to himself, "whether Ceuta, on its return to earth, may not occupy a grand and commanding situation? What a proud thing it would be to have secured its possession to France!"

Next morning, as soon as they had taken their brief farewell of their friends, and were fairly out of sight of the shore, Servadac imparted

his design to Ben Zoof, who entered into the project with the greatest zest, and expressed himself delighted, not only at the prospect of adding to the dominions of his beloved country, but of stealing a march upon England.

Both travelers were warmly clad, the orderly's knapsack containing all the necessary provisions. The journey was accomplished without special incident; halts were made at regular intervals, for the purpose of taking food and rest. The temperature by night as well as by day was quite endurable, and on the fourth afternoon after starting, thanks to the straight course which their compass enabled them to maintain, the adventurers found themselves within a few miles of Ceuta.

As soon as Ben Zoof caught sight of the rock on the western horizon, he was all excitement. Just as if he were in a regiment going into action, he talked wildly about "columns" and "squares" and "charges." The captain, although less demonstrative, was hardly less eager to reach the rock. They both pushed forward with all possible speed till they were within a mile and a half of the shore, when Ben Zoof, who had a very keen vision, stopped suddenly, and said that he was sure he could see something moving on the top of the island.

"Never mind, let us hasten on," said Servadac. A few minutes carried them over another mile, when Ben Zoof stopped again.

"What is it, Ben Zoof?" asked the captain.

"It looks to me like a man on a rock, waving his arms in the air," said the orderly.

"Plague on it!" muttered Servadac; "I hope we are not too late." Again they went on; but soon Ben Zoof stopped for the third time.

"It is a semaphore, sir; I see it quite distinctly." And he was not mistaken; it had been a telegraph in motion that had caught his eye.

"Plague on it!" repeated the captain.

"Too late, sir, do you think?" said Ben Zoof.

"Yes, Ben Zoof; if that's a telegraph--and there is no doubt of it--somebody has been before us and erected it; and, moreover, if it is moving, there must be somebody working it now."

He was keenly disappointed. Looking towards the north, he could distinguish Gibraltar faintly visible in the extreme distance, and upon the summit of the rock both Ben Zoof and himself fancied they could make out another semaphore, giving signals, no doubt, in response to the one

here.

"Yes, it is only too clear; they have already occupied it, and established their communications," said Servadac.

"And what are we to do, then?" asked Ben Zoof.

"We must pocket our chagrin, and put as good a face on the matter as we can," replied the captain.

"But perhaps there are only four or five Englishmen to protect the place," said Ben Zoof, as if meditating an assault.

"No, no, Ben Zoof," answered Servadac; "we must do nothing rash. We have had our warning, and, unless our representations can induce them to yield their position, we must resign our hope."

Thus discomfited, they had reached the foot of the rock, when all at once, like a "Jack-in-the-box," a sentinel started up before them with the challenge:

"Who goes there?"

"Friends. Vive la France!" cried the captain.

"Hurrah for England!" replied the soldier.

By this time four other men had made their appearance from the upper part of the rock.

"What do you want?" asked one of them, whom Servadac remembered to have seen before at Gibraltar.

"Can I speak to your commanding officer?" Servadac inquired.

"Which?" said the man. "The officer in command of Ceuta?"

"Yes, if there is one."

"I will acquaint him with your arrival," answered the Englishman, and disappeared.

In a few minutes the commanding officer, attired in full uniform, was seen descending to the shore. It was Major Oliphant himself.

Servadac could no longer entertain a doubt that the Englishmen had forestalled him in the occupation of Ceuta. Provisions and fuel had evidently been conveyed thither in the boat from Gibraltar before the

sea had frozen, and a solid casemate, hollowed in the rock, had afforded Major Oliphant and his contingent ample protection from the rigor of the winter. The ascending smoke that rose above the rock was sufficient evidence that good fires were still kept up; the soldiers appeared to have thriven well on what, no doubt, had been a generous diet, and the major himself, although he would scarcely have been willing to allow it, was slightly stouter than before.

Being only about twelve miles distant from Gibraltar, the little garrison at Ceuta had felt itself by no means isolated in its position; but by frequent excursions across the frozen strait, and by the constant use of the telegraph, had kept up their communication with their fellow-countrymen on the other island. Colonel Murphy and the major had not even been forced to forego the pleasures of the chessboard. The game that had been interrupted by Captain Servadac's former visit was not yet concluded; but, like the two American clubs that played their celebrated game in 1846 between Washington and Baltimore, the two gallant officers made use of the semaphore to communicate their well-digested moves.

The major stood waiting for his visitor to speak.

"Major Oliphant, I believe?" said Servadac, with a courteous bow.

"Yes, sir, Major Oliphant, officer in command of the garrison at Ceuta,"

was the Englishman's reply. "And to whom," he added, "may I have the honor of speaking?"

"To Captain Servadac, the governor general of Gallia."

"Indeed!" said the major, with a supercilious look.

"Allow me to express my surprise," resumed the captain, "at seeing you installed as commanding officer upon what I have always understood to be Spanish soil. May I demand your claim to your position?"

"My claim is that of first occupant."

"But do you not think that the party of Spaniards now resident with me may at some future time assert a prior right to the proprietorship?"

"I think not, Captain Servadac."

"But why not?" persisted the captain.

"Because these very Spaniards have, by formal contract, made over Ceuta, in its integrity, to the British government."

Servadac uttered an exclamation of surprise.

"And as the price of that important cession," continued Major Oliphant, "they have received a fair equivalent in British gold."

"Ah!" cried Ben Zoof, "that accounts for that fellow Negrete and his people having such a lot of money."

Servadac was silent. It had become clear to his mind what had been the object of that secret visit to Ceuta which he had heard of as being made by the two English officers. The arguments that he had intended to use had completely fallen through; all that he had now to do was carefully to prevent any suspicion of his disappointed project.

"May I be allowed to ask, Captain Servadac, to what I am indebted for the honor of this visit?" asked Major Oliphant presently.

"I have come, Major Oliphant, in the hope of doing you and your companions a service," replied Servadac, rousing himself from his reverie.

"Ah, indeed!" replied the major, as though he felt himself quite independent of all services from exterior sources.

"I thought, major, that it was not unlikely you were in ignorance of

the fact that both Ceuta and Gibraltar have been traversing the solar regions on the surface of a comet."

The major smiled incredulously; but Servadac, nothing daunted, went on to detail the results of the collision between the comet and the earth, adding that, as there was the almost immediate prospect of another concussion, it had occurred to him that it might be advisable for the whole population of Gallia to unite in taking precautionary measures for the common welfare.

"In fact, Major Oliphant," he said in conclusion, "I am here to inquire whether you and your friends would be disposed to join us in our present quarters."

"I am obliged to you, Captain Servadac," answered the major stiffly; "but we have not the slightest intention of abandoning our post. We have received no government orders to that effect; indeed, we have received no orders at all. Our own dispatch to the First Lord of the Admiralty still awaits the mail."

"But allow me to repeat," insisted Servadac, "that we are no longer on the earth, although we expect to come in contact with it again in about eight weeks."

"I have no doubt," the major answered, "that England will make every effort to reclaim us."

Servadac felt perplexed. It was quite evident that Major Oliphant had not been convinced of the truth of one syllable of what he had been saying.

"Then I am to understand that you are determined to retain your two garrisons here and at Gibraltar?" asked Servadac, with one last effort at persuasion.

"Certainly; these two posts command the entrance of the Mediterranean."

"But supposing there is no longer any Mediterranean?" retorted the captain, growing impatient.

"Oh, England will always take care of that," was Major Oliphant's cool reply. "But excuse me," he added presently; "I see that Colonel Murphy has just telegraphed his next move. Allow me to wish you good-afternoon."

And without further parley, followed by his soldiers, he retired into the casemate, leaving Captain Servadac gnawing his mustache with mingled rage and mortification.

"A fine piece of business we have made of this!" said Ben Zoof, when he found himself alone with his master.

"We will make our way back at once," replied Captain Servadac.

"Yes, the sooner the better, with our tails between our legs," rejoined the orderly, who this time felt no inclination to start off to the march of the Algerian zephyrs. And so the French tricolor returned as it had set out--in Ben Zoof's knapsack.

On the eighth evening after starting, the travelers again set foot on the volcanic promontory just in time to witness a great commotion.

Palmyrin Rosette was in a furious rage. He had completed all his calculations about Nerina, but that perfidious satellite had totally disappeared. The astronomer was frantic at the loss of his moon. Captured probably by some larger body, it was revolving in its proper zone of the minor planets.

CHAPTER XVI. A BOLD PROPOSITION

On his return Servadac communicated to the count the result of his expedition, and, though perfectly silent on the subject of his personal project, did not conceal the fact that the Spaniards, without the smallest right, had sold Ceuta to the English.

Having refused to quit their post, the Englishmen had virtually excluded themselves from any further consideration; they had had their warning, and must now take the consequences of their own incredulity.

Although it had proved that not a single creature either at Gourbi Island, Gibraltar, Ceuta, Madalena, or Formentera had received any injury whatever at the time of the first concussion, there was nothing in the least to make it certain that a like immunity from harm would attend the second. The previous escape was doubtless owing to some slight, though unaccountable, modification in the rate of motion; but whether the inhabitants of the earth had fared so fortunately, was a question that had still to be determined.

The day following Servadac's return, he and the count and Lieutenant Procope met by agreement in the cave, formally to discuss what would be the most advisable method of proceeding under their present prospects.

Ben Zoof was, as a matter of course, allowed to be present, and Professor Rosette had been asked to attend; but he declined on the plea of taking no interest in the matter. Indeed, the disappearance of his moon had utterly disconcerted him, and the probability that he should soon lose his comet also, plunged him into an excess of grief which he preferred to bear in solitude.

Although the barrier of cool reserve was secretly increasing between the captain and the count, they scrupulously concealed any outward token of their inner feelings, and without any personal bias applied their best energies to the discussion of the question which was of such mutual, nay, of such universal interest.

Servadac was the first to speak. "In fifty-one days, if Professor Rosette has made no error in his calculations, there is to be a recurrence of collision between this comet and the earth. The inquiry that we have now to make is whether we are prepared for the coming shock. I ask myself, and I ask you, whether it is in our power, by any means, to avert the evil consequences that are only too likely to follow?"

Count Timascheff, in a voice that seemed to thrill with solemnity, said: "In such events we are at the disposal of an over-ruling Providence; human precautions cannot sway the Divine will."

"But with the most profound reverence for the will of Providence," replied the captain, "I beg to submit that it is our duty to devise whatever means we can to escape the threatening mischief. Heaven helps them that help themselves."

"And what means have you to suggest, may I ask?" said the count, with a faint accent of satire.

Servadac was forced to acknowledge that nothing tangible had hitherto presented itself to his mind.

"I don't want to intrude," observed Ben Zoof, "but I don't understand why such learned gentlemen as you cannot make the comet go where you want it to go."

"You are mistaken, Ben Zoof, about our learning," said the captain; "even Professor Rosette, with all his learning, has not a shadow of power to prevent the comet and the earth from knocking against each other."

"Then I cannot see what is the use of all this learning," the orderly replied.

"One great use of learning," said Count Timascheff with a smile, "is to make us know our own ignorance."

While this conversation had been going on, Lieutenant Procope had been sitting in thoughtful silence. Looking up, he now said, "Incident to this expected shock, there may be a variety of dangers. If, gentlemen, you will allow me, I will enumerate them; and we shall, perhaps, by taking them seriatim, be in a better position to judge whether we can successfully grapple with them, or in any way mitigate their consequences."

There was a general attitude of attention. It was surprising how calmly they proceeded to discuss the circumstances that looked so threatening and ominous.

"First of all," resumed the lieutenant, "we will specify the different ways in which the shock may happen."

"And the prime fact to be remembered," interposed Servadac, "is that the combined velocity of the two bodies will be about 21,000 miles an hour."

"Express speed, and no mistake!" muttered Ben Zoof.

"Just so," assented Procope. "Now, the two bodies may impinge either

directly or obliquely. If the impact is sufficiently oblique, Gallia may do precisely what she did before: she may graze the earth; she may, or she may not, carry off a portion of the earth's atmosphere and substance, and so she may float away again into space; but her orbit would undoubtedly be deranged, and if we survive the shock, we shall have small chance of ever returning to the world of our fellow-creatures."

"Professor Rosette, I suppose," Ben Zoof remarked, "would pretty soon find out all about that."

"But we will leave this hypothesis," said the lieutenant; "our own experience has sufficiently shown us its advantages and its disadvantages. We will proceed to consider the infinitely more serious alternative of direct impact; of a shock that would hurl the comet straight on to the earth, to which it would become attached."

"A great wart upon her face!" said Ben Zoof, laughing.

The captain held up his finger to his orderly, making him understand that he should hold his tongue.

"It is, I presume, to be taken for granted," continued Lieutenant Procope, "that the mass of the earth is comparatively so large that, in

the event of a direct collision, her own motion would not be sensibly retarded, and that she would carry the comet along with her, as part of herself."

"Very little question of that, I should think," said Servadac.

"Well, then," the lieutenant went on, "what part of this comet of ours will be the part to come into collision with the earth? It may be the equator, where we are; it may be at the exactly opposite point, at our antipodes; or it may be at either pole. In any case, it seems hard to foresee whence there is to come the faintest chance of deliverance."

"Is the case so desperate?" asked Servadac.

"I will tell you why it seems so. If the side of the comet on which we are resident impinges on the earth, it stands to reason that we must be crushed to atoms by the violence of the concussion."

"Regular mincemeat!" said Ben Zoof, whom no admonitions could quite reduce to silence.

"And if," said the lieutenant, after a moment's pause, and the slightest possible frown at the interruption--"and if the collision should occur at our antipodes, the sudden check to the velocity of the comet would be

quite equivalent to a shock in situ; and, another thing, we should run the risk of being suffocated, for all our comet's atmosphere would be assimilated with the terrestrial atmosphere, and we, supposing we were not dashed to atoms, should be left as it were upon the summit of an enormous mountain (for such to all intents and purposes Gallia would be), 450 miles above the level of the surface of the globe, without a particle of air to breathe."

"But would not our chances of escape be considerably better," asked Count Timascheff, "in the event of either of the comet's poles being the point of contact?"

"Taking the combined velocity into account," answered the lieutenant, "I confess that I fear the violence of the shock will be too great to permit our destruction to be averted."

A general silence ensued, which was broken by the lieutenant himself. "Even if none of these contingencies occur in the way we have contemplated, I am driven to the suspicion that we shall be burnt alive."

"Burnt alive!" they all exclaimed in a chorus of horror.

"Yes. If the deductions of modern science be true, the speed of the

comet, when suddenly checked, will be transmuted into heat, and that heat will be so intense that the temperature of the comet will be raised to some millions of degrees."

No one having anything definite to allege in reply to Lieutenant Procope's forebodings, they all relapsed into silence. Presently Ben Zoof asked whether it was not possible for the comet to fall into the middle of the Atlantic.

Procope shook his head. "Even so, we should only be adding the fate of drowning to the list of our other perils."

"Then, as I understand," said Captain Servadac, "in whatever way or in whatever place the concussion occurs, we must be either crushed, suffocated, roasted, or drowned. Is that your conclusion, lieutenant?"

"I confess I see no other alternative," answered Procope, calmly.

"But isn't there another thing to be done?" said Ben Zoof.

"What do you mean?" his master asked.

"Why, to get off the comet before the shock comes."

"How could you get off Gallia?"

"That I can't say," replied the orderly.

"I am not sure that that could not be accomplished," said the lieutenant.

All eyes in a moment were riveted upon him, as, with his head resting on his hands, he was manifestly cogitating a new idea. "Yes, I think it could be accomplished," he repeated. "The project may appear extravagant, but I do not know why it should be impossible. Ben Zoof has hit the right nail on the head; we must try and leave Gallia before the shock."

"Leave Gallia! How?" said Count Timascheff.

The lieutenant did not at once reply. He continued pondering for a time, and at last said, slowly and distinctly, "By making a balloon!"

Servadac's heart sank.

"A balloon!" he exclaimed. "Out of the question! Balloons are exploded things. You hardly find them in novels. Balloon, indeed!"

"Listen to me," replied Procope. "Perhaps I can convince you that my idea is not so chimerical as you imagine." And, knitting his brow, he proceeded to establish the feasibility of his plan. "If we can ascertain the precise moment when the shock is to happen, and can succeed in launching ourselves a sufficient time beforehand into Gallia's atmosphere, I believe it will transpire that this atmosphere will amalgamate with that of the earth, and that a balloon whirled along by the combined velocity would glide into the mingled atmosphere and remain suspended in mid-air until the shock of the collision is overpast."

Count Timascheff reflected for a minute, and said, "I think, lieutenant, I understand your project. The scheme seems tenable; and I shall be ready to co-operate with you, to the best of my power, in putting it into execution."

"Only, remember," continued Procope, "there are many chances to one against our success. One instant's obstruction and stoppage in our passage, and our balloon is burnt to ashes. Still, reluctant as I am to acknowledge it, I confess that I feel our sole hope of safety rests in our getting free from this comet."

"If the chances were ten thousand to one against us," said Servadac, "I think the attempt ought to be made."

"But have we hydrogen enough to inflate a balloon?" asked the count.

"Hot air will be all that we shall require," the lieutenant answered; "we are only contemplating about an hour's journey."

"Ah, a fire-balloon! A montgolfier!" cried Servadac. "But what are you going to do for a casing?"

"I have thought of that. We must cut it out of the sails of the Dobryna; they are both light and strong," rejoined the lieutenant. Count Timascheff complimented the lieutenant upon his ingenuity, and Ben Zoof could not resist bringing the meeting to a conclusion by a ringing cheer.

Truly daring was the plan of which Lieutenant Procope had thus become the originator; but the very existence of them all was at stake, and the design must be executed resolutely. For the success of the enterprise it was absolutely necessary to know, almost to a minute, the precise time at which the collision would occur, and Captain Servadac undertook the task, by gentle means or by stern, of extracting the secret from the professor.

To Lieutenant Procope himself was entrusted the superintendence of the construction of the montgolfier, and the work was begun at once. It was

to be large enough to carry the whole of the twenty-three residents in the volcano, and, in order to provide the means of floating aloft long enough to give time for selecting a proper place for descent, the lieutenant was anxious to make it carry enough hay or straw to maintain combustion for a while, and keep up the necessary supply of heated air.

The sails of the Dobryna, which had all been carefully stowed away in the Hive, were of a texture unusually close, and quite capable of being made airtight by means of a varnish, the ingredients of which were rummaged out of the promiscuous stores of the tartan. The lieutenant himself traced out the pattern and cut out the strips, and all hands were employed in seaming them together. It was hardly the work for little fingers, but Nina persisted in accomplishing her own share of it. The Russians were quite at home at occupation of this sort, and having initiated the Spaniards into its mysteries, the task of joining together the casing was soon complete. Isaac Hakkabut and the professor were the only two members of the community who took no part in this somewhat tedious proceeding.

A month passed away, but Servadac found no opportunity of getting at the information he had pledged himself to gain. On the sole occasion when he had ventured to broach the subject with the astronomer, he had received for answer that as there was no hurry to get back to the earth, there need be no concern about any dangers of transit.

Indeed, as time passed on, the professor seemed to become more and more inaccessible. A pleasant temperature enabled him to live entirely in his observatory, from which intruders were rigidly shut out. But Servadac bided his time. He grew more and more impressed with the importance of finding out the exact moment at which the impact would take place, but was content to wait for a promising opportunity to put any fresh questions on the subject to the too reticent astronomer.

Meanwhile, the earth's disc was daily increasing in magnitude; the comet traveled 50,000,000 leagues during the month, at the close of which it was not more than 78,000,000 leagues from the sun.

A thaw had now fairly set in. The breaking up of the frozen ocean was a magnificent spectacle, and "the great voice of the sea," as the whalers graphically describe it, was heard in all its solemnity. Little streams of water began to trickle down the declivities of the mountain and along the shelving shore, only to be transformed, as the melting of the snow continued, into torrents or cascades. Light vapors gathered on the horizon, and clouds were formed and carried rapidly along by breezes to which the Gallian atmosphere had long been unaccustomed. All these were doubtless but the prelude to atmospheric disturbances of a more startling character; but as indications of returning spring, they were greeted with a welcome which no apprehensions for the future could

prevent being glad and hearty.

A double disaster was the inevitable consequence of the thaw. Both the schooner and the tartan were entirely destroyed. The basement of the icy pedestal on which the ships had been upheaved was gradually undermined, like the icebergs of the Arctic Ocean, by warm currents of water, and on the night of the 12th the huge block collapsed en masse, so that on the following morning nothing remained of the Dobryna and the Hansa except the fragments scattered on the shore.

Although certainly expected, the catastrophe could not fail to cause a sense of general depression. Well-nigh one of their last ties to Mother Earth had been broken; the ships were gone, and they had only a balloon to replace them!

To describe Isaac Hakkabut's rage at the destruction of the tartan would be impossible. His oaths were simply dreadful; his imprecations on the accursed race were full of wrath. He swore that Servadac and his people were responsible for his loss; he vowed that they should be sued and made to pay him damages; he asserted that he had been brought from Gourbi Island only to be plundered; in fact, he became so intolerably abusive, that Servadac threatened to put him into irons unless he conducted himself properly; whereupon the Jew, finding that the captain was in earnest, and would not hesitate to carry the threat into effect,

was fain to hold his tongue, and slunk back into his dim hole.

By the 14th the balloon was finished, and, carefully sewn and well varnished as it had been, it was really a very substantial structure. It was covered with a network that had been made from the light rigging of the yacht, and the car, composed of wicker-work that had formed partitions in the hold of the Hansa, was quite commodious enough to hold the twenty-three passengers it was intended to convey. No thought had been bestowed upon comfort or convenience, as the ascent was to last for so short a time, merely long enough for making the transit from atmosphere to atmosphere.

The necessity was becoming more and more urgent to get at the true hour of the approaching contact, but the professor seemed to grow more obstinate than ever in his resolution to keep his secret.

On the 15th the comet crossed the orbit of Mars, at the safe distance of 56,000,000 leagues; but during that night the community thought that their last hour had taken them unawares. The volcano rocked and trembled with the convulsions of internal disturbance, and Servadac and his companions, convinced that the mountain was doomed to some sudden disruption, rushed into the open air.

The first object that caught their attention as they emerged upon the

open rocks was the unfortunate professor, who was scrambling down the mountain-side, piteously displaying a fragment of his shattered telescope.

It was no time for condolence.

A new marvel arrested every eye. A fresh satellite, in the gloom of night, was shining conspicuously before them.

That satellite was a part of Gallia itself!

By the expansive action of the inner heat, Gallia, like Gambart's comet, had been severed in twain; an enormous fragment had been detached and launched into space!

The fragment included Ceuta and Gibraltar, with the two English garrisons!

CHAPTER XVII. THE VENTURE MADE

What would be the consequences of this sudden and complete disruption, Servadac and his people hardly dared to think.

The first change that came under their observation was the rapidity of the sun's appearances and disappearances, forcing them to the conviction that although the comet still rotated on its axis from east to west, yet the period of its rotation had been diminished by about one-half. Only six hours instead of twelve elapsed between sunrise and sunrise; three hours after rising in the west the sun was sinking again in the east.

"We are coming to something!" exclaimed Servadac. "We have got a year of something like 2,880 days."

"I shouldn't think it would be an easy matter to find saints enough for such a calendar as that!" said Ben Zoof.

Servadac laughed, and remarked that they should have the professor talking about the 238th of June, and the 325th of December.

It soon became evident that the detached portion was not revolving round the comet, but was gradually retreating into space. Whether it

had carried with it any portion of atmosphere, whether it possessed any other condition for supporting life, and whether it was likely ever again to approach to the earth, were all questions that there were no means of determining. For themselves the all-important problem was--what effect would the rending asunder of the comet have upon its rate of progress? and as they were already conscious of a further increase of muscular power, and a fresh diminution of specific gravity, Servadac and his associates could not but wonder whether the alteration in the mass of the comet would not result in its missing the expected coincidence with the earth altogether.

Although he professed himself incompetent to pronounce a decided opinion, Lieutenant Procope manifestly inclined to the belief that no alteration would ensue in the rate of Gallia's velocity; but Rosette, no doubt, could answer the question directly, and the time had now arrived in which he must be compelled to divulge the precise moment of collision.

But the professor was in the worst of tempers. Generally taciturn and morose, he was more than usually uncivil whenever any one ventured to speak to him. The loss of his telescope had doubtless a great deal to do with his ill-humor; but the captain drew the most favorable conclusions from Rosette's continued irritation. Had the comet been in any way projected from its course, so as to be likely to fail in coming into

contact with the earth, the professor would have been quite unable to conceal his satisfaction. But they required to know more than the general truth, and felt that they had no time to lose in getting at the exact details.

The opportunity that was wanted soon came.

On the 18th, Rosette was overheard in furious altercation with Ben Zoof. The orderly had been taunting the astronomer with the mutilation of his little comet. A fine thing, he said, to split in two like a child's toy. It had cracked like a dry nut; and mightn't one as well live upon an exploding bomb?--with much more to the same effect. The professor, by way of retaliation, had commenced sneering at the "prodigious" mountain of Montmartre, and the dispute was beginning to look serious when Servadac entered.

Thinking he could turn the wrangling to some good account, so as to arrive at the information he was so anxiously seeking, the captain pretended to espouse the views of his orderly; he consequently brought upon himself the full force of the professor's wrath.

Rosette's language became more and more violent, till Servadac, feigning to be provoked beyond endurance, cried:

"You forget, sir, that you are addressing the Governor-General of Gallia."

"Governor-General! humbug!" roared Rosette. "Gallia is my comet!"

"I deny it," said Servadac. "Gallia has lost its chance of getting back to the earth. Gallia has nothing to do with you. Gallia is mine; and you must submit to the government which I please to ordain."

"And who told you that Gallia is not going back to the earth?" asked the professor, with a look of withering scorn.

"Why, isn't her mass diminished? Isn't she split in half? Isn't her velocity all altered?" demanded the captain.

"And pray who told you this?" again said the professor, with a sneer.

"Everybody. Everybody knows it, of course," replied Servadac.

"Everybody is very clever. And you always were a very clever scholar too. We remember that of old, don't we?"

"Sir!"

"You nearly mastered the first elements of science, didn't you?"

"Sir!"

"A credit to your class!"

"Hold your tongue, sir!" bellowed the captain again, as if his anger was uncontrollable.

"Not I," said the professor.

"Hold your tongue!" repeated Servadac.

"Just because the mass is altered you think the velocity is altered?"

"Hold your tongue!" cried the captain, louder than ever.

"What has mass to do with the orbit? Of how many comets do you know the mass, and yet you know their movements? Ignorance!" shouted Rosette.

"Insolence!" retorted Servadac.

Ben Zoof, really thinking that his master was angry, made a threatening movement towards the professor.

"Touch me if you dare!" screamed Rosette, drawing himself up to the fullest height his diminutive figure would allow. "You shall answer for your conduct before a court of justice!"

"Where? On Gallia?" asked the captain.

"No; on the earth."

"The earth! Pshaw! You know we shall never get there; our velocity is changed."

"On the earth," repeated the professor, with decision.

"Trash!" cried Ben Zoof. "The earth will be too far off!"

"Not too far off for us to come across her orbit at 42 minutes and 35.6 seconds past two o'clock on the morning of this coming 1st of January."

"Thanks, my dear professor--many thanks. You have given me all the information I required;" and, with a low bow and a gracious smile, the captain withdrew. The orderly made an equally polite bow, and followed his master. The professor, completely nonplussed, was left alone.

Thirteen days, then--twenty-six of the original Gallian days, fifty-two of the present--was all the time for preparation that now remained. Every preliminary arrangement was hurried on with the greatest earnestness.

There was a general eagerness to be quit of Gallia. Indifferent to the dangers that must necessarily attend a balloon ascent under such unparalleled circumstances, and heedless of Lieutenant Procope's warning that the slightest check in their progress would result in instantaneous combustion, they all seemed to conclude that it must be the simplest thing possible to glide from one atmosphere to another, so that they were quite sanguine as to the successful issue of their enterprise. Captain Servadac made a point of showing himself quite enthusiastic in his anticipations, and to Ben Zoof the going up in a balloon was the supreme height of his ambition. The count and the lieutenant, of colder and less demonstrative temperament, alike seemed to realize the possible perils of the undertaking, but even they were determined to put a bold face upon every difficulty.

The sea had now become navigable, and three voyages were made to Gourbi Island in the steam launch, consuming the last of their little reserve of coal.

The first voyage had been made by Servadac with several of the sailors.

They found the gourbi and the adjacent building quite uninjured by the severity of the winter; numbers of little rivulets intersected the pasture-land; new plants were springing up under the influence of the equatorial sun, and the luxuriant foliage was tenanted by the birds which had flown back from the volcano. Summer had almost abruptly succeeded to winter, and the days, though only three hours long, were intensely hot.

Another of the voyages to the island had been to collect the dry grass and straw which was necessary for inflating the balloon. Had the balloon been less cumbersome it would have been conveyed to the island, whence the start would have been effected; but as it was, it was more convenient to bring the combustible material to the balloon.

The last of the coal having been consumed, the fragments of the shipwrecked vessels had to be used day by day for fuel. Hakkabut began making a great hubbub when he found that they were burning some of the spars of the Hansa; but he was effectually silenced by Ben Zoof, who told him that if he made any more fuss, he should be compelled to pay 50,000 francs for a balloon-ticket, or else he should be left behind.

By Christmas Day everything was in readiness for immediate departure. The festival was observed with a solemnity still more marked than the anniversary of the preceding year. Every one looked forward to spending

New Year's Day in another sphere altogether, and Ben Zoof had already promised Pablo and Nina all sorts of New Year's gifts.

It may seem strange, but the nearer the critical moment approached, the less Hector Servadac and Count Timascheff had to say to each other on the subject. Their mutual reserve became more apparent; the experiences of the last two years were fading from their minds like a dream; and the fair image that had been the cause of their original rivalry was ever rising, as a vision, between them.

The captain's thoughts began to turn to his unfinished rondo; in his leisure moments, rhymes suitable and unsuitable, possible and impossible, were perpetually jingling in his imagination. He labored under the conviction that he had a work of genius to complete. A poet he had left the earth, and a poet he must return.

Count Timascheff's desire to return to the world was quite equaled by Lieutenant Procope's. The Russian sailors' only thought was to follow their master, wherever he went. The Spaniards, though they would have been unconcerned to know that they were to remain upon Gallia, were nevertheless looking forward with some degree of pleasure to revisiting the plains of Andalusia; and Nina and Pablo were only too delighted at the prospect of accompanying their kind protectors on any fresh excursion whatever.

The only malcontent was Palmyrin Rosette. Day and night he persevered in his astronomical pursuits, declared his intention of never abandoning his comet, and swore positively that nothing should induce him to set foot in the car of the balloon.

The misfortune that had befallen his telescope was a never-ending theme of complaint; and just now, when Gallia was entering the narrow zone of shooting-stars, and new discoveries might have been within his reach, his loss made him more inconsolable than ever. In sheer desperation, he endeavored to increase the intensity of his vision by applying to his eyes some belladonna which he found in the Dobryna's medicine chest; with heroic fortitude he endured the tortures of the experiment, and gazed up into the sky until he was nearly blind. But all in vain; not a single fresh discovery rewarded his sufferings.

No one was quite exempt from the feverish excitement which prevailed during the last days of December. Lieutenant Procope superintended his final arrangements. The two low masts of the schooner had been erected firmly on the shore, and formed supports for the montgolfier, which had been duly covered with the netting, and was ready at any moment to be inflated. The car was close at hand. Some inflated skins had been attached to its sides, so that the balloon might float for a time, in the event of its descending in the sea at a short distance from the

shore. If unfortunately, it should come down in mid-ocean, nothing but the happy chance of some passing vessel could save them all from the certain fate of being drowned.

The 31st came. Twenty-four hours hence and the balloon, with its large living freight, would be high in the air. The atmosphere was less buoyant than that of the earth, but no difficulty in ascending was to be apprehended.

Gallia was now within 96,000,000 miles of the sun, consequently not much more than 4,000,000 miles from the earth; and this interval was being diminished at the rate of nearly 208,000 miles an hour, the speed of the earth being about 70,000 miles, that of the comet being little less than 138,000 miles an hour.

It was determined to make the start at two o'clock, three-quarters of an hour, or, to speak correctly 42 minutes 35.6 seconds, before the time predicted by the professor as the instant of collision. The modified rotation of the comet caused it to be daylight at the time.

An hour previously the balloon was inflated with perfect success, and the car was securely attached to the network. It only awaited the stowage of the passengers.

Isaac Hakkabut was the first to take his place in the car. But scarcely had he done so, when Servadac noticed that his waist was encompassed by an enormous girdle that bulged out to a very extraordinary extent. "What's all this, Hakkabut?" he asked.

"It's only my little bit of money, your Excellency; my modest little fortune--a mere bagatelle," said the Jew.

"And what may your little fortune weigh?" inquired the captain.

"Only about sixty-six pounds!" said Isaac.

"Sixty-six pounds!" cried Servadac. "We haven't reckoned for this."

"Merciful heavens!" began the Jew.

"Sixty-six pounds!" repeated Servadac. "We can hardly carry ourselves; we can't have any dead weight here. Pitch it out, man, pitch it out!"

"God of Israel!" whined Hakkabut.

"Out with it, I say!" cried Servadac.

"What, all my money, which I have saved so long, and toiled for so

hard?"

"It can't be helped," said the captain, unmoved.

"Oh, your Excellency!" cried the Jew.

"Now, old Nicodemus, listen to me," interposed Ben Zoof; "you just get rid of that pouch of yours, or we will get rid of you. Take your choice. Quick, or out you go!"

The avaricious old man was found to value his life above his money; he made a lamentable outcry about it, but he unfastened his girdle at last, and put it out of the car.

Very different was the case with Palmyrin Rosette. He avowed over and over again his intention of never quitting the nucleus of his comet. Why should he trust himself to a balloon, that would blaze up like a piece of paper? Why should he leave the comet? Why should he not go once again upon its surface into the far-off realms of space?

His volubility was brought to a sudden check by Servadac's bidding two of the sailors, without more ado, to take him in their arms and put him quietly down at the bottom of the car.

To the great regret of their owners, the two horses and Nina's pet goat were obliged to be left behind. The only creature for which there was found a place was the carrier-pigeon that had brought the professor's message to the Hive. Servadac thought it might probably be of service in carrying some communication to the earth.

When every one, except the captain and his orderly, had taken their places, Servadac said, "Get in, Ben Zoof."

"After you, sir," said Ben Zoof, respectfully.

"No, no!" insisted Servadac; "the captain must be the last to leave the ship!"

A moment's hesitation and the orderly clambered over the side of the car. Servadac followed. The cords were cut. The balloon rose with stately calmness into the air.

CHAPTER XVIII. SUSPENSE

When the balloon had reached an elevation of about 2,500 yards, Lieutenant Procope determined to maintain it at that level. A wire-work stove, suspended below the casing, and filled with lighted hay, served to keep the air in the interior at a proper temperature.

Beneath their feet was extended the basin of the Gallian Sea. An inconsiderable speck to the north marked the site of Gourbi Island. Ceuta and Gibraltar, which might have been expected in the west, had utterly disappeared. On the south rose the volcano, the extremity of the promontory that jutted out from the continent that formed the framework of the sea; whilst in every direction the strange soil, with its commixture of tellurium and gold, gleamed under the sun's rays with a perpetual iridescence.

Apparently rising with them in their ascent, the horizon was well-defined. The sky above them was perfectly clear; but away in the northwest, in opposition to the sun, floated a new sphere, so small that it could not be an asteroid, but like a dim meteor. It was the fragment that the internal convulsion had rent from the surface of the comet, and which was now many thousands of leagues away, pursuing the new orbit into which it had been projected. During the hours of daylight it

was far from distinct, but after nightfall it would assume a definite luster.

The object, however, of supreme interest was the great expanse of the terrestrial disc, which was rapidly drawing down obliquely towards them. It totally eclipsed an enormous portion of the firmament above, and approaching with an ever-increasing velocity, was now within half its average distance from the moon. So close was it, that the two poles could not be embraced in one focus. Irregular patches of greater or less brilliancy alternated on its surface, the brighter betokening the continents, the more somber indicating the oceans that absorbed the solar rays. Above, there were broad white bands, darkened on the side averted from the sun, exhibiting a slow but unintermittent movement; these were the vapors that pervaded the terrestrial atmosphere.

But as the aeronauts were being hurried on at a speed of 70 miles a second, this vague aspect of the earth soon developed itself into definite outlines. Mountains and plains were no longer confused, the distinction between sea and shore was more plainly identified, and instead of being, as it were, depicted on a map, the surface of the earth appeared as though modelled in relief.

Twenty-seven minutes past two, and Gallia is only 72,000 miles from the terrestrial sphere; quicker and quicker is the velocity; ten minutes

later, and they are only 36,000 miles apart!

The whole configuration of the earth is clear.

"Europe! Russia! France!" shout Procope, the count, and Servadac, almost in a breath.

And they are not mistaken. The eastern hemisphere lies before them in the full blaze of light, and there is no possibility of error in distinguishing continent from continent.

The surprise only kindled their emotion to yet keener intensity, and it would be hard to describe the excitement with which they gazed at the panorama that was before them. The crisis of peril was close at hand, but imagination overleaped all consideration of danger; and everything was absorbed in the one idea that they were again within reach of that circle of humanity from which they had supposed themselves severed forever.

And, truly, if they could have paused to study it, that panorama of the states of Europe which was outstretched before their eyes, was conspicuous for the fantastic resemblances with which Nature on the one hand, and international relations on the other, have associated them. There was England, marching like some stately dame towards the east,

trailing her ample skirts and coroneted with the cluster of her little islets; Sweden and Norway, with their bristling spine of mountains, seemed like a splendid lion eager to spring down from the bosom of the ice-bound north; Russia, a gigantic polar bear, stood with its head towards Asia, its left paw resting upon Turkey, its right upon Mount Caucasus; Austria resembled a huge cat curled up and sleeping a watchful sleep; Spain, with Portugal as a pennant, like an unfurled banner, floated from the extremity of the continent; Turkey, like an insolent cock, appeared to clutch the shores of Asia with the one claw, and the land of Greece with the other; Italy, as it were a foot and leg encased in a tight-fitting boot, was juggling deftly with the islands of Sicily, Sardinia, and Corsica; Prussia, a formidable hatchet imbedded in the heart of Germany, its edge just grazing the frontiers of France; whilst France itself suggested a vigorous torso with Paris at its breast.

All at once Ben Zoof breaks the silence: "Montmartre! I see Montmartre!" And, smile at the absurdity as others might, nothing could induce the worthy orderly to surrender his belief that he could actually make out the features of his beloved home.

The only individual whose soul seemed unstirred by the approaching earth was Palmyrin Rosette. Leaning over the side of the car, he kept his eyes fixed upon the abandoned comet, now floating about a mile and a half below him, bright in the general irradiation which was flooding the

surrounding space.

Chronometer in hand, Lieutenant Procope stood marking the minutes and seconds as they fled; and the stillness which had once again fallen upon them all was only broken by his order to replenish the stove, that the montgolfier might retain its necessary level. Servadac and the count continued to gaze upon the earth with an eagerness that almost amounted to awe. The balloon was slightly in the rear of Gallia, a circumstance that augured somewhat favorably, because it might be presumed that if the comet preceded the balloon in its contact with the earth, there would be a break in the suddenness of transfer from one atmosphere to the other.

The next question of anxiety was, where would the balloon alight? If upon terra firma, would it be in a place where adequate resources for safety would be at hand? If upon the ocean, would any passing vessel be within hail to rescue them from their critical position? Truly, as the count observed to his comrades, none but a Divine Pilot could steer them now.

"Forty-two minutes past!" said the lieutenant, and his voice seemed to thrill through the silence of expectation.

There were not 20,000 miles between the comet and the earth!

The calculated time of impact was 2 hours 47 minutes 35.6 seconds. Five minutes more and collision must ensue!

But was it so? Just at this moment, Lieutenant Procope observed that the comet deviated sensibly in an oblique course. Was it possible that after all collision would not occur?

The deviation, however, was not great; it did not justify any anticipation that Gallia would merely graze the earth, as it had done before; it left it certain that the two bodies would inevitably impinge.

"No doubt," said Ben Zoof, "this time we shall stick together."

Another thought occurred. Was it not only too likely that, in the fusion of the two atmospheres, the balloon itself, in which they were being conveyed, would be rent into ribbons, and every one of its passengers hurled into destruction, so that not a Gallian should survive to tell the tale of their strange peregrinations?

Moments were precious; but Hector Servadac resolved that he would adopt a device to secure that at least some record of their excursion in solar distances should survive themselves.

Tearing a leaf from his note-book, he wrote down the name of the comet, the list of the fragments of the earth it had carried off, the names of his companions, and the date of the comet's aphelion; and having subscribed it with his signature, turned to Nina and told her he must have the carrier-pigeon which was nestling in her bosom.

The child's eyes filled with tears; she did not say a word, but imprinting a kiss upon its soft plumage, she surrendered it at once, and the message was hurriedly fastened to its neck. The bird wheeled round and round in a few circles that widened in their diameter, and quickly sunk to an altitude in the comet's atmosphere much inferior to the balloon.

Some minutes more were thus consumed and the interval of distance was reduced to less than 8,000 miles.

The velocity became inconceivably great, but the increased rate of motion was in no way perceptible; there was nothing to disturb the equilibrium of the car in which they were making their aerial adventure.

"Forty-six minutes!" announced the lieutenant.

The glowing expanse of the earth's disc seemed like a vast funnel, yawning to receive the comet and its atmosphere, balloon and all, into

its open mouth.

"Forty-seven!" cried Procope.

There was half a minute yet. A thrill ran through every vein. A vibration quivered through the atmosphere. The montgolfier, elongated to its utmost stretch, was manifestly being sucked into a vortex. Every passenger in the quivering car involuntarily clung spasmodically to its sides, and as the two atmospheres amalgamated, clouds accumulated in heavy masses, involving all around in dense obscurity, while flashes of lurid flame threw a weird glimmer on the scene.

In a mystery every one found himself upon the earth again. They could not explain it, but here they were once more upon terrestrial soil; in a swoon they had left the earth, and in a similar swoon they had come back!

Of the balloon not a vestige remained, and contrary to previous computation, the comet had merely grazed the earth, and was traversing the regions of space, again far away!

CHAPTER XIX. BACK AGAIN

"In Algeria, captain?"

"Yes, Ben Zoof, in Algeria; and not far from Mostaganem." Such were the first words which, after their return to consciousness, were exchanged between Servadac and his orderly.

They had resided so long in the province that they could not for a moment be mistaken as to their whereabouts, and although they were incapable of clearing up the mysteries that shrouded the miracle, yet they were convinced at the first glance that they had been returned to the earth at the very identical spot where they had quitted it.

In fact, they were scarcely more than a mile from Mostaganem, and in the course of an hour, when they had all recovered from the bewilderment occasioned by the shock, they started off in a body and made their way to the town. It was a matter of extreme surprise to find no symptom of the least excitement anywhere as they went along. The population was perfectly calm; every one was pursuing his ordinary avocation; the cattle were browsing quietly upon the pastures that were moist with the dew of an ordinary January morning. It was about eight o'clock; the sun was rising in the east; nothing could be noticed to indicate that

any abnormal incident had either transpired or been expected by the inhabitants. As to a collision with a comet, there was not the faintest trace of any such phenomenon crossing men's minds, and awakening, as it surely would, a panic little short of the certified approach of the millennium.

"Nobody expects us," said Servadac; "that is very certain."

"No, indeed," answered Ben Zoof, with a sigh; he was manifestly disappointed that his return to Mostaganem was not welcomed with a triumphal reception.

They reached the Mascara gate. The first persons that Servadac recognized were the two friends that he had invited to be his seconds in the duel two years ago, the colonel of the 2nd Fusiliers and the captain of the 8th Artillery. In return to his somewhat hesitating salutation, the colonel greeted him heartily, "Ah! Servadac, old fellow! is it you?"

"I, myself," said the captain.

"Where on earth have you been to all this time? In the name of peace, what have you been doing with yourself?"

"You would never believe me, colonel," answered Servadac, "if I were to

tell you; so on that point I had better hold my tongue."

"Hang your mysteries!" said the colonel; "tell me, where have you been?"

"No, my friend, excuse me," replied Servadac; "but shake hands with me in earnest, that I may be sure I am not dreaming." Hector Servadac had made up his mind, and no amount of persuasion could induce him to divulge his incredible experiences.

Anxious to turn the subject, Servadac took the earliest opportunity of asking, "And what about Madame de L----?"

"Madame de L-----!" exclaimed the colonel, taking the words out of his mouth; "the lady is married long ago; you did not suppose that she was going to wait for you. 'Out of sight, out of mind,' you know."

"True," replied Servadac; and turning to the count he said, "Do you hear that? We shall not have to fight our duel after all."

"Most happy to be excused," rejoined the count. The rivals took each other by the hand, and were united henceforth in the bonds of a sincere and confiding friendship.

"An immense relief," said Servadac to himself, "that I have no occasion

to finish that confounded rondo!"

It was agreed between the captain and the count that it would be desirable in every way to maintain the most rigid silence upon the subject of the inexplicable phenomena which had come within their experience. It was to them both a subject of the greatest perplexity to find that the shores of the Mediterranean had undergone no change, but they coincided in the opinion that it was prudent to keep their bewilderment entirely to themselves. Nothing induced them to break their reserve.

The very next day the small community was broken up.

The Dobryna's crew, with the count and the lieutenant, started for Russia, and the Spaniards, provided, by the count's liberality, with a competency that ensured them from want, were despatched to their native shores. The leave taking was accompanied by genuine tokens of regard and goodwill.

For Isaac Hakkabut alone there was no feeling of regret. Doubly ruined by the loss of his tartan, and by the abandonment of his fortune, he disappeared entirely from the scene. It is needless to say that no one troubled himself to institute a search after him, and, as Ben Zoof sententiously remarked, "Perhaps old Jehoram is making money in America

by exhibiting himself as the latest arrival from a comet!"

But however great was the reserve which Captain Servadac might make on his part, nothing could induce Professor Rosette to conceal his experiences. In spite of the denial which astronomer after astronomer gave to the appearance of such a comet as Gallia at all, and of its being refused admission to the catalogue, he published a voluminous treatise, not only detailing his own adventures, but setting forth, with the most elaborate precision, all the elements which settled its period and its orbit. Discussions arose in scientific circles; an overwhelming majority decided against the representations of the professor; an unimportant minority declared themselves in his favor, and a pamphlet obtained some degree of notice, ridiculing the whole debate under the title of "The History of an Hypothesis." In reply to this impertinent criticism of his labors, Rosette issued a rejoinder full with the most vehement expressions of indignation, and reiterating his asseveration that a fragment of Gibraltar was still traversing the regions of space, carrying thirteen Englishmen upon its surface, and concluding by saying that it was the great disappointment of his life that he had not been taken with them.

Pablo and little Nina were adopted, the one by Servadac, the other by the count, and under the supervision of their guardians, were well educated and cared for. Some years later, Colonel, no longer Captain,

Servadac, his hair slightly streaked with grey, had the pleasure of seeing the handsome young Spaniard united in marriage to the Italian, now grown into a charming girl, upon whom the count bestowed an ample dowry; the young people's happiness in no way marred by the fact that they had not been destined, as once seemed likely, to be the Adam and Eve of a new world.

The career of the comet was ever a mystery which neither Servadac nor his orderly could eliminate from the regions of doubt. Anyhow, they were firmer and more confiding friends than ever.

One day, in the environs of Montmartre, where they were secure from eavesdroppers, Ben Zoof incidentally referred to the experiences in the depths of Nina's Hive; but stopped short and said, "However, those things never happened, sir, did they?"

His master could only reply, "Confound it, Ben Zoof! What is a man to believe?"

Note: I have omitted the designation "V. IX. Verne" from those pages where it appeared as the last line; I have also made the following changes to the text:

PAGE	LINE	ORIGINAL	CHANGED TO
16	10	o'clock.	o'clock."
18	4	singe	single
85	6	Parfait!!!	Parfait!!!"
87	5	asteriod	asteroid
130	13	colonly	colony
143	17	tin	tain
161	30	Europe.	Europe."
179	15	Leiutenant	Lieutenant
241	14	coud	could