

CHAPTER VI.

QUESTIONS AND ANSWERS.

On the 4th of December, at 5 a.m. by terrestrial reckoning, the travellers awoke, having been fifty-four hours on their journey. They had only been five hours and forty minutes more than half the time assigned for the accomplishment of their journey, but they had come more than seven-tenths of the distance. This peculiarity was due to their regularly-decreasing speed.

When they looked at the earth through the port-light at the bottom, it only looked like a black spot drowned in the sun's rays. No crescent or pale light was now to be seen. The next day at midnight the earth would be new at the precise moment when the moon would be full. Above, the Queen of Night was nearing the line followed by the projectile, so as to meet it at the hour indicated. All around the dark vault was studded with brilliant specks which seemed to move slowly; but through the great distance they were at their relative size did not seem to alter much.

The sun and the stars appeared exactly as they do from the earth. The moon was considerably enlarged; but the travellers' not very powerful telescopes did not as yet allow them to make very useful observations on her surface, or to reconnoitre the topographical or geological details.

The time went by in interminable conversations. The talk was especially

about the moon. Each brought his contingent of particular knowledge. Barbicane's and Nicholl's were always serious, Michel Ardan's always fanciful. The projectile, its situation and direction, the incidents that might arise, the precautions necessitated by its fall upon the moon, all this afforded inexhaustible material for conjecture.

Whilst breakfasting a question of Michel's relative to the projectile provoked a rather curious answer from Barbicane, and one worthy of being recorded.

Michel, supposing the bullet to be suddenly stopped whilst still endowed with its formidable initial velocity, wished to know what the consequences would have been.

"But," answered Barbicane, "I don't see how the projectile could have been stopped."

"But let us suppose it," answered Nicholl.

"It is an impossible supposition," replied the practical president, "unless the force of impulsion had failed. But in that case its speed would have gradually decreased, and would not have stopped abruptly."

"Admit that it had struck against some body in space."

"What body?"

"The enormous meteor we met."

"Then," said Nicholl, "the projectile would have been broken into a thousand pieces, and we with it."

"More than that," answered Barbicane, "we should have been burnt alive."

"Burnt!" exclaimed Michel. "I regret it did not happen for us just to see."

"And you would have seen with a vengeance," answered Barbicane. "It is now known that heat is only a modification of movement when water is heated--that is to say, when heat is added to it--that means the giving of movement to its particles."

"That is an ingenious theory!" said Michel.

"And a correct one, my worthy friend, for it explains all the phenomena of caloric. Heat is only molecular movement, a single oscillation of the particles of a body. When the brake is put on a train it stops. But what becomes of the movement which animated it? Why do they grease the axles of the wheels? In order to prevent them catching fire from the movement lost by transformation. Do you understand?"

"Admirably," answered Michel. "For example, when I have been running

some time, and am covered with sweat, why am I forced to stop? Simply because my movement has been transformed into heat."

Barbicane could not help laughing at this *répartie* of Michel's. Then resuming his theory--

"Thus," said he, "in case of a collision, it would have happened to our projectile as it does to the metal cannon-ball after striking armour-plate; it would fall burning, because its movement had been transformed into heat. In consequence, I affirm that if our bullet had struck against the asteroid, its speed, suddenly annihilated, would have produced heat enough to turn it immediately into vapour."

"Then," asked Nicholl, "what would happen if the earth were to be suddenly stopped in her movement of translation?"

"Her temperature would be carried to such a point," answered Barbicane, "that she would be immediately reduced to vapour."

"Good," said Michel; "that means of ending the world would simplify many things."

"And suppose the earth were to fall upon the sun?" said Nicholl.

"According to calculations," answered Barbicane, "that would develop a heat equal to that produced by 1,600 globes of coal, equal in volume to

the terrestrial globe."

"A good increase of temperature for the sun," replied Michel Ardan, "of which the inhabitants of Uranus or Neptune will probably not complain, for they must be dying of cold on their planet."

"Thus, then, my friends, any movement suddenly stopped produces heat. This theory makes it supposed that the sun is constantly fed by an incessant fall of bodies upon its surface. It has been calculated--"

"Now I shall be crushed," murmured Michel, "for figures are coming."

"It has been calculated," continued Barbicane imperturbably, "that the shock of each asteroid upon the sun must produce heat equal to that of 4,000 masses of coal of equal volume."

"And what is the heat of the sun?" asked Michel.

"It is equal to that which would be produced by a stratum of coal surrounding the sun to a depth of twenty-seven kilometres."

"And that heat--"

"Could boil 2,900,000,000 of cubic myriametres of water an hour." (A myriametre is equal to rather more than 6.2138 miles, or 6 miles 1 furlong 28 poles.)

"And we are not roasted by it?" cried Michel.

"No," answered Barbicane, "because the terrestrial atmosphere absorbs four-tenths of the solar heat. Besides, the quantity of heat intercepted by the earth is only two thousand millionth of the total."

"I see that all is for the best," replied Michel, "and that our atmosphere is a useful invention, for it not only allows us to breathe, but actually prevents us roasting."

"Yes," said Nicholl, "but, unfortunately, it will not be the same on the moon."

"Bah!" said Michel, always confident. "If there are any inhabitants they breathe. If there are no longer any they will surely have left enough oxygen for three people, if only at the bottom of those ravines where it will have accumulated by reason of its weight! Well, we shall not climb the mountains! That is all."

And Michel, getting up, went to look at the lunar disc, which was shining with intolerable brilliancy.

"Faith!" said he, "it must be hot up there."

"Without reckoning," answered Nicholl, "that daylight lasts 360 hours."

"And by way of compensation night has the same duration," said Barbicane, "and as heat is restored by radiation, their temperature must be that of planetary space."

"A fine country truly!" said Nicholl.

"Never mind! I should like to be there already! It will be comical to have the earth for a moon, to see it rise on the horizon, to recognise the configuration of its continents, to say to oneself, 'There's America and there's Europe;' then to follow it till it is lost in the rays of the sun! By-the-bye, Barbicane, have the Selenites any eclipses?"

"Yes, eclipses of the sun," answered Barbicane, "when the centres of the three stars are on the same line with the earth in the middle. But they are merely annular eclipses, during which the earth, thrown like a screen across the solar disc, allows the greater part to be seen."

"Why is there no total eclipse?" asked Nicholl. "Is it because the cone of shade thrown by the earth does not extend beyond the moon?"

"Yes, if you do not take into account the refraction produced by the terrestrial atmosphere, not if you do take that refraction into account. Thus, let δ be the horizontal parallax and p the apparent semidiameter--"

"Ouf!" said Michel, "half of v zero square! Do speak the vulgar tongue, man of algebra!"

"Well, then, in popular language," answered Barbicane, "the mean distance between the moon and the earth being sixty terrestrial radii, the length of the cone of shadow, by dint of refraction, is reduced to less than forty-two radii. It follows, therefore, that during the eclipses the moon is beyond the cone of pure shade, and the sun sends it not only rays from its edges, but also rays from its centre."

"Then," said Michel in a grumbling tone, "why is there any eclipse when there ought to be none?"

"Solely because the solar rays are weakened by the refraction, and the atmosphere which they traverse extinguishes the greater part of them."

"That reason satisfies me," answered Michel; "besides, we shall see for ourselves when we get there. Now, Barbicane, do you believe that the moon is an ancient comet?"

"What an idea!"

"Yes," replied Michel, with amiable conceit, "I have a few ideas of that kind."

"But that idea does not originate with Michel," answered Nicholl.

"Then I am only a plagiarist."

"Without doubt," answered Nicholl. "According to the testimony of the ancients, the Arcadians pretended that their ancestors inhabited the earth before the moon became her satellite. Starting from this fact, certain savants think the moon was a comet which its orbit one day brought near enough to the earth to be retained by terrestrial attraction."

"And what truth is there in that hypothesis?" asked Michel.

"None," answered Barbicane, "and the proof is that the moon has not kept a trace of the gaseous envelope that always accompanies comets."

"But," said Nicholl, "might not the moon, before becoming the earth's satellite, have passed near enough to the sun to leave all her gaseous substances by evaporation?"

"It might, friend Nicholl, but it is not probable."

"Why?"

"Because--because, I really don't know."

"Ah, what hundreds of volumes we might fill with what we don't know!"

exclaimed Michel. "But I say," he continued, "what time is it?"

"Three o'clock," answered Nicholl.

"How the time goes," said Michel, "in the conversation of savants like us! Decidedly I feel myself getting too learned! I feel that I am becoming a well of knowledge!"

So saying, Michel climbed to the roof of the projectile, "in order better to observe the moon," he pretended. In the meanwhile his companions watched the vault of space through the lower port-light. There was nothing fresh to signalise.

When Michel Ardan came down again he approached the lateral port-light, and suddenly uttered an exclamation of surprise.

"What is the matter now?" asked Barbicane.

The president approached the glass and saw a sort of flattened sack floating outside at some yards' distance from the projectile. This object seemed motionless like the bullet, and was consequently animated with the same ascensional movement.

"Whatever can that machine be?" said Michel Ardan. "Is it one of the corpuscles of space which our projectile holds in its radius of attraction, and which will accompany it as far as the moon?"

"What I am astonished at," answered Nicholl, "is that the specific weight of this body, which is certainly superior to that of the bullet, allows it to maintain itself so rigorously on its level."

"Nicholl," said Barbicane, after a moment's reflection, "I do not know what that object is, but I know perfectly why it keeps on a level with the projectile."

"Why, pray?"

"Because we are floating in the void where bodies fall or move--which is the same thing--with equal speed whatever their weight or form may be. It is the air which, by its resistance, creates differences in weight. When you pneumatically create void in a tube, the objects you throw down it, either lead or feathers, fall with the same rapidity. Here in space you have the same cause and the same effect."

"True," said Nicholl, "and all we throw out of the projectile will accompany us to the moon."

"Ah! what fools we are!" cried Michel.

"Why this qualification?" asked Barbicane.

"Because we ought to have filled the projectile with useful objects,

books, instruments, tools, &c. We could have thrown them all out, and they would all have followed in our wake! But, now I think of it, why can't we take a walk outside this? Why can't we go into space through the port-light? What delight it would be to be thus suspended in ether, more favoured even than birds that are forced to flap their wings to sustain them!"

"Agreed," said Barbicane, "but how are we to breathe?"

"Confounded air to fail so inopportunately!"

"But if it did not fail, Michel, your density being inferior to that of the projectile, you would soon remain behind."

"Then it is a vicious circle."

"All that is most vicious."

"And we must remain imprisoned in our vehicle."

"Yes, we must."

"Ah!" cried Michel in a formidable voice.

"What is the matter with you?" asked Nicholl.

"I know, I guess what this pretended asteroid is! It is not a broken piece of planet!"

"What is it, then?" asked Nicholl.

"It is our unfortunate dog! It is Diana's husband!"

In fact, this deformed object, reduced to nothing, and quite unrecognisable, was the body of Satellite flattened like a bagpipe without wind, and mounting, for ever mounting!