CHAPTER V.

THE TEMPERATURE OF SPACE.

This revelation acted like a thunderbolt. Who could have expected such an error in calculation? Barbicane would not believe it. Nicholl went over the figures again. They were correct. The formula which had established them could not be mistrusted, and, when verified, the initial velocity of 16,576 metres, necessary for attaining the neutral point, was found quite right.

The three friends looked at one another in silence. No one thought about breakfast after that. Barbicane, with set teeth, contracted brow, and fists convulsively closed, looked through the port-light. Nicholl folded his arms and examined his calculations. Michel Ardan murmured--

"That's just like savants! That's the way they always do! I would give twenty pistoles to fall upon the Cambridge Observatory and crush it, with all its stupid staff inside!"

All at once the captain made a reflection which struck Barbicane at once.

"Why," said he, "it is seven o'clock in the morning, so we have been thirty-two hours on the road. We have come more than half way, and we

are not falling yet that I know of!"

Barbicane did not answer, but after a rapid glance at the captain he took a compass, which he used to measure the angular distance of the terrestrial globe. Then through the lower port-light he made a very exact observation from the apparent immobility of the projectile. Then rising and wiping the perspiration from his brow, he put down some figures upon paper. Nicholl saw that the president wished to find out from the length of the terrestrial diameter the distance of the bullet from the earth. He looked at him anxiously.

"No!" cried Barbicane in a few minutes' time, "we are not falling! We are already more than 50,000 leagues from the earth! We have passed the point the projectile ought to have stopped at if its speed had been only 11,000 metres at our departure! We are still ascending!"

"That is evident," answered Nicholl; "so we must conclude that our initial velocity, under the propulsion of the 400,000 lbs. of gun-cotton, was greater than the 11,000 metres. I can now explain to myself why we met with the second satellite, that gravitates at more than 2,000 leagues from the earth, in less than thirteen minutes."

"That explanation is so much the more probable," added Barbicane, "because by throwing out the water in our movable partitions the projectile was made considerably lighter all at once."

"That is true," said Nicholl.

"Ah, my brave Nicholl," cried Barbicane, "we are saved!"

"Very well then," answered Michel Ardan tranquilly, "as we are saved, let us have breakfast."

Nicholl was not mistaken. The initial speed had happily been greater than that indicated by the Cambridge Observatory, but the Cambridge Observatory had no less been mistaken.

The travellers, recovered from their false alarm, sat down to table and breakfasted merrily. Though they ate much they talked more. Their confidence was greater after the "algebra incident."

"Why should we not succeed?" repeated Michel Ardan. "Why should we not arrive? We are on the road; there are no obstacles before us, and no stones on our route. It is free--freer than that of a ship that has to struggle with the sea, or a balloon with the wind against it! Now if a ship can go where it pleases, or a balloon ascend where it pleases, why should not our projectile reach the goal it was aimed at?"

"It will reach it," said Barbicane.

"If only to honour the American nation," added Michel Ardan, "the only nation capable of making such an enterprise succeed--the only one that

could have produced a President Barbicane! Ah! now I think of it, now that all our anxieties are over, what will become of us? We shall be as dull as stagnant water."

Barbicane and Nicholl made gestures of repudiation.

"But I foresaw this, my friends," resumed Michel Ardan. "You have only to say the word. I have chess, backgammon, cards, and dominoes at your disposition. We only want a billiard-table!"

"What?" asked Barbicane, "did you bring such trifles as those?"

"Certainly," answered Michel; "not only for our amusement, but also in the praiseworthy intention of bestowing them upon Selenite inns."

"My friend," said Barbicane, "if the moon is inhabited its inhabitants appeared some thousands of years before those of the earth, for it cannot be doubted that the moon is older than the earth. If, therefore, the Selenites have existed for thousands of centuries--if their brains are organised like that of human beings--they have invented all that we have invented, already, and even what we shall only invent in the lapse of centuries. They will have nothing to learn from us, and we shall have everything to learn from them."

"What!" answered Michel, "do you think they have had artists like Phidias, Michael Angelo, or Raphael?"

"Yes."

"Poets like Homer, Virgil, Milton, Lamartine, and Hugo?"

"I am sure of it."

"Philosophers like Plato, Aristotle, Descartes, and Kant?"

"I have no doubt of it."

"Savants like Archimedes, Euclid, Pascal, and Newton?"

"I could swear it."

"Clowns like Arnal, and photographers like--Nadar?"

"I am certain of it."

"Then, friend Barbicane, if these Selenites are as learned as we, and even more so, why have they not hurled a lunar projectile as far as the terrestrial regions?"

"Who says they have not done it?" answered Barbicane seriously.

"In fact," added Nicholl, "it would have been easier to them than to us,

and that for two reasons--the first because the attraction is six times less on the surface of the moon than on the surface of the earth, which would allow a projectile to go up more easily; secondly the projectile would only have 8,000 leagues to travel instead of 80,000, which would require a force of propulsion ten times less."

"Then," resumed Michel, "I repeat--why have they not done it?"

"And I," replied Barbicane, "I repeat--who says they have not done it?"

"When?"

"Hundreds of centuries ago, before man's appearance upon earth."

"And the bullet? Where is the bullet? I ask to see the bullet!"

"My friend," answered Barbicane, "the sea covers five-sixths of our globe, hence there are five good reasons for supposing that the lunar projectile, if it has been fired, is now submerged at the bottom of the Atlantic or Pacific, unless it was buried down some abyss at the epoch when the earth's crust was not sufficiently formed."

"Old fellow," answered Michel, "you have an answer to everything, and I bow before your wisdom. There is one hypothesis I would rather believe than the others, and that is that the Selenites being older than we are wiser, and have not invented gunpowder at all."

At that moment Diana claimed her share in the conversation by a sonorous bark. She asked for her breakfast.

"Ah!" said Michel Ardan, "our arguments make us forget Diana and Satellite!"

A good dish of food was immediately offered to the dog, who devoured it with great appetite.

"Do you know, Barbicane," said Michel, "we ought to have made this projectile a sort of Noah's Ark, and have taken a couple of all the domestic animals with us to the moon."

"No doubt," answered Barbicane, "but we should not have had room enough."

"Oh, we might have been packed a little tighter!"

"The fact is," answered Nicholl, "that oxen, cows, bulls, and horses, all those ruminants would be useful on the lunar continent. Unfortunately we cannot make our projectile either a stable or a cowshed."

"But at least," said Michel Ardan, "we might have brought an ass, nothing but a little ass, the courageous and patient animal old Silenus

loved to exhibit. I am fond of those poor asses! They are the least favoured animals in creation. They are not only beaten during their lifetime, but are still beaten after their death!"

"What do you mean by that?" asked Barbicane.

"Why, don't they use his skin to make drums of?"

Barbicane and Nicholl could not help laughing at this absurd reflection. But a cry from their merry companion stopped them; he was bending over Satellite's niche, and rose up saying--

"Good! Satellite is no longer ill."

"Ah!" said Nicholl.

"No!" resumed Michel, "he is dead. Now," he added in a pitiful tone, "this will be embarrassing! I very much fear, poor Diana, that you will not leave any of your race in the lunar regions!"

The unfortunate Satellite had not been able to survive his wounds. He was dead, stone dead. Michel Ardan, much put out of countenance, looked at his friends.

"This makes another difficulty," said Barbicane. "We can't keep the dead body of this dog with us for another eight-and-forty hours."

"No, certainly not," answered Nicholl, "but our port-lights are hung upon hinges. They can be let down. We will open one of them, and throw the body into space."

The president reflected for a few minutes, and then said--

"Yes, that is what we must do, but we must take the most minute precautions."

"Why?" asked Michel.

"For two reasons that I will explain to you," answered Barbicane. "The first has reference to the air in the projectile, of which we must lose as little as possible."

"But we can renew the air!"

"Not entirely. We can only renew the oxygen, Michel; and, by-the-bye, we must be careful that the apparatus do not furnish us with this oxygen in an immoderate quantity, for an excess of it would cause grave physiological consequences. But although we can renew the oxygen we cannot renew the azote, that medium which the lungs do not absorb, and which ought to remain intact. Now the azote would rapidly escape if the port-lights were opened."

"Not just the time necessary to throw poor Satellite out."

"Agreed; but we must do it quickly."

"And what is the second reason?" asked Michel.

"The second reason is that we must not allow the exterior cold, which is excessive, to penetrate into our projectile lest we should be frozen alive."

"Still the sun--"

"The sun warms our projectile because it absorbs its rays, but it does not warm the void we are in now. When there is no air there is no more heat than there is diffused light, and where the sun's rays do not reach directly it is both dark and cold. The temperature outside is only that produced by the radiation of the stars--that is to say, the same as the temperature of the terrestrial globe would be if one day the sun were to be extinguished."

"No fear of that," answered Nicholl.

"Who knows?" said Michel Ardan. "And even supposing that the sun be not extinguished, it might happen that the earth will move farther away from it."

"Good!" said Nicholl; "that's one of Michel's ideas!"

"Well," resumed Michel, "it is well known that in 1861 the earth went through the tail of a comet. Now suppose there was a comet with a power of attraction greater than that of the sun, the terrestrial globe might make a curve towards the wandering star, and the earth would become its satellite, and would be dragged away to such a distance that the rays of the sun would have no action on its surface."

"That might happen certainly," answered Barbicane, "but the consequences would not be so redoubtable as you would suppose."

"How so?"

"Because heat and cold would still be pretty well balanced upon our globe. It has been calculated that if the earth had been carried away by the comet of 1861, it would only have felt, when at its greatest distance from the sun, a heat sixteen times greater than that sent to us by the moon--a heat which, when focussed by the strongest lens, produces no appreciable effect."

"Well?" said Michel.

"Wait a little," answered Barbicane. "It has been calculated that at its perihelion, when nearest to the sun, the earth would have borne a heat equal to 28,000 times that of summer. But this heat, capable of

vitrifying terrestrial matters, and of evaporating water, would have formed a thick circle of clouds which would have lessened the excessive heat, hence there would be compensation between the cold of the aphelion and the heat of the perihelion, and an average probably supportable."

"At what number of degrees do they estimate the temperature of the planetary space?"

"Formerly," answered Barbicane, "it was believed that this temperature was exceedingly low. By calculating its thermometric diminution it was fixed at millions of degrees below zero. It was Fourier, one of Michel's countrymen, an illustrious savant of the Académie des Sciences, who reduced these numbers to a juster estimation. According to him, the temperature of space does not get lower than 60° Centigrade."

Michel whistled.

"It is about the temperature of the polar regions," answered Barbicane, "at Melville Island or Fort Reliance--about 56° Centigrade below zero."

"It remains to be proved," said Nicholl, "that Fourier was not mistaken in his calculations. If I am not mistaken, another Frenchman, M. Pouillet, estimates the temperature of space at 160° below zero. We shall be able to verify that."

"Not now," answered Barbicane, "for the solar rays striking directly

upon our thermometer would give us, on the contrary, a very elevated temperature. But when we get upon the moon, during the nights, a fortnight long, which each of its faces endures alternately, we shall have leisure to make the experiment, for our satellite moves in the void."

"What do you mean by the void?" asked Michel; "is it absolute void?"

"It is absolutely void of air."

"Is there nothing in its place?"

"Yes, ether," answered Barbicane.

"Ah! and what is ether?"

"Ether, my friend, is an agglomeration of imponderable particles, which, relatively to their dimensions, are as far removed from each other as the celestial bodies are in space, so say works on molecular physics. It is these atoms that by their vibrating movement produce light and heat by making four hundred and thirty billions of oscillations a second."

"Millions of millions!" exclaimed Michel Ardan; "then savants have measured and counted these oscillations! All these figures, friend Barbicane, are savants' figures, which reach the ear but say nothing to the mind."

"But they are obliged to have recourse to figures."

"No. It would be much better to compare. A billion signifies nothing. An object of comparison explains everything. Example--When you tell me that Uranus is 76 times larger than the earth, Saturn 900 times larger, Jupiter 1,300 times larger, the sun 1,300,000 times larger, I am not much wiser. So I much prefer the old comparisons of the Double Liégoise that simply tells you, 'The sun is a pumpkin two feet in diameter, Jupiter an orange, Saturn a Blenheim apple, Neptune a large cherry, Uranus a smaller cherry, the earth a pea, Venus a green pea, Mars the head of a large pin, Mercury a grain of mustard, and Juno, Ceres, Vesta, and Pallas fine grains of sand!' Then I know what it means!"

After this tirade of Michel Ardan's against savants and their billions, which he delivered without stopping to take breath, they set about burying Satellite. He was to be thrown into space like sailors throw a corpse into the sea.

As President Barbicane had recommended, they had to act quickly so as to lose as little air as possible. The bolts upon the right-hand port-hole were carefully unscrewed, and an opening of about half a yard made, whilst Michel prepared to hurl his dog into space. The window, worked by a powerful lever, which conquered the pressure of air in the interior upon the sides of the projectile, moved upon its hinges, and Satellite

was thrown out. Scarcely a particle of air escaped, and the operation succeeded so well that later on Barbicane did not fear to get rid of all the useless rubbish that encumbered the vehicle in the same way.