

CHAPTER XVII.

TYCHO.

It was now exactly six o'clock in the evening. The Sun, completely clear of all contact with the lunar disc, steeped the whole Projectile in his golden rays. The travellers, vertically over the Moon's south pole, were, as Barbican soon ascertained, about 30 miles distant from it, the exact distance they had been from the north pole--a proof that the elliptic curve still maintained itself with mathematical rigor.

For some time, the travellers' whole attention was concentrated on the glorious Sun. His light was inexpressibly cheering; and his heat, soon penetrating the walls of the Projectile, infused a new and sweet life into their chilled and exhausted frames. The ice rapidly disappeared, and the windows soon resumed their former perfect transparency.

"Oh! how good the pleasant sunlight is!" cried the Captain, sinking on a seat in a quiet ecstasy of enjoyment. "How I pity Ardan's poor friends the Selenites during that night so long and so icy! How impatient they must be to see the Sun back again!"

"Yes," said Ardan, also sitting down the better to bask in the vivifying rays, "his light no doubt brings them to life and keeps them alive. Without light or heat during all that dreary winter, they must freeze stiff like the frogs or become torpid like the bears. I can't imagine

how they could get through it otherwise."

"I'm glad we're through it anyhow," observed M'Nicholl. "I may at once acknowledge that I felt perfectly miserable as long as it lasted. I can now easily understand how the combined cold and darkness killed Doctor Kane's Esquimaux dogs. It was near killing me. I was so miserable that at last I could neither talk myself nor bear to hear others talk."

"My own case exactly," said Barbican--"that is," he added hastily, correcting himself, "I tried to talk because I found Ardan so interested, but in spite of all we said, and saw, and had to think of, Byron's terrible dream would continually rise up before me:

"The bright Sun was extinguished, and the Stars
Wandered all darkling in the eternal space,
Rayless and pathless, and the icy Earth
Swung blind and blackening in the Moonless air.
Morn came and went, and came and brought no day!
And men forgot their passions in the dread
Of this their desolation, and all hearts
Were chilled into a selfish prayer for light!"

As he pronounced these words in accents at once monotonous and melancholy, Ardan, fully appreciative, quietly gesticulated in perfect cadence with the rhythm. Then the three men remained completely silent for several minutes. Buried in recollection, or lost in thought, or magnetized by the bright Sun, they seemed to be half asleep while

steeping their limbs in his vitalizing beams.

Barbican was the first to dissolve the reverie by jumping up. His sharp eye had noticed that the base of the Projectile, instead of keeping rigidly perpendicular to the lunar surface, turned away a little, so as to render the elliptical orbit somewhat elongated. This he made his companions immediately observe, and also called their attention to the fact that from this point they could easily have seen the Earth had it been Full, but that now, drowned in the Sun's beams, it was quite invisible. A more attractive spectacle, however, soon engaged their undivided attention--that of the Moon's southern regions, now brought within about the third of a mile by their telescopes. Immediately resuming their posts by the windows, they carefully noted every feature presented by the fantastic panorama that stretched itself out in endless lengths beneath their wondering eyes.

Mount Leibnitz and Mount Doerfel form two separate groups developed in the regions of the extreme south. The first extends westwardly from the pole to the 84th parallel; the second, on the southeastern border, starting from the pole, reaches the neighborhood of the 65th. In the entangled valleys of their clustered peaks, appeared the dazzling sheets of white, noted by Father Secchi, but their peculiar nature Barbican could now examine with a greater prospect of certainty than the illustrious Roman astronomer had ever enjoyed.

"They're beds of snow," he said at last in a decided tone.

"Snow!" exclaimed M'Nicholl.

"Yes, snow, or rather glaciers heavily coated with glittering ice. See how vividly they reflect the Sun's rays. Consolidated beds of lava could never shine with such dazzling uniformity. Therefore there must be both water and air on the Moon's surface. Not much--perhaps very little if you insist on it--but the fact that there is some can now no longer be questioned."

This assertion of Barbican's, made so positively by a man who never decided unless when thoroughly convinced, was a great triumph for Ardan, who, as the gracious reader doubtless remembers, had had a famous dispute with M'Nicholl on that very subject at Tampa.[D] His eyes brightened and a smile of pleasure played around his lips, but, with a great effort at self-restraint, he kept perfectly silent and would not permit himself even to look in the direction of the Captain. As for M'Nicholl, he was apparently too much absorbed in Doerfel and Leibnitz to mind anything else.

These mountains rose from plains of moderate extent, bounded by an indefinite succession of walled hollows and ring ramparts. They are the only chains met in this region of ridge-brimmed craters and circles; distinguished by no particular feature, they project a few pointed peaks here and there, some of which exceed four miles and a half in height. This altitude, however, foreshortened as it was by the vertical position of the Projectile, could not be noticed just then, even if correct observation had been permitted by the dazzling surface.

Once more again before the travellers' eyes the Moon's disc revealed itself in all the old familiar features so characteristic of lunar landscapes--no blending of tones, no softening of colors, no graduation of shadows, every line glaring in white or black by reason of the total absence of refracted light. And yet the wonderfully peculiar character of this desolate world imparted to it a weird attraction as strangely fascinating as ever.

Over this chaotic region the travellers were now sweeping, as if borne on the wings of a storm; the peaks defiled beneath them; the yawning chasms revealed their ruin-strewn floors; the fissured cracks untwisted themselves; the ramparts showed all their sides; the mysterious holes presented their impenetrable depths; the clustered mountain summits and rings rapidly decomposed themselves: but in a moment again all had become more inextricably entangled than ever. Everything appeared to be the finished handiwork of volcanic agency, in the utmost purity and highest perfection. None of the mollifying effects of air or water could here be noticed. No smooth-capped mountains, no gently winding river channels, no vast prairie-lands of deposited sediment, no traces of vegetation, no signs of agriculture, no vestiges of a great city.

Nothing but vast beds of glistening lava, now rough like immense piles of scoriae and clinker, now smooth like crystal mirrors, and reflecting the Sun's rays with the same intolerable glare. Not the faintest speck of life. A world absolutely and completely dead, fixed, still, motionless--save when a gigantic land-slide, breaking off the vertical wall of a crater, plunged down into the soundless depths, with all the

fury too of a crashing avalanche, with all the speed of a Niagara, but, in the total absence of atmosphere, noiseless as a feather, as a snow flake, as a grain of impalpable dust.

Careful observations, taken by Barbican and repeated by his companions, soon satisfied them that the ridgy outline of the mountains on the Moon's border, though perhaps due to different forces from those acting in the centre, still presented a character generally uniform. The same bulwark-surrounded hollows, the same abrupt projections of surface. Yet a different arrangement, as Barbican pointed out to his companions, might be naturally expected. In the central portion of the disc, the Moon's crust, before solidification, must have been subjected to two attractions--that of the Moon herself and that of the Earth--acting, however, in contrary directions and therefore, in a certain sense, serving to neutralize each other. Towards the border of her disc, on the contrary, the terrestrial attraction, having acted in a direction perpendicular to that of the lunar, should have exerted greater power, and therefore given a different shape to the general contour. But no remarkable difference had so far been perceived by terrestrial observers; and none could now be detected by our travellers. Therefore the Moon must have found in herself alone the principle of her shape and of her superficial development--that is, she owed nothing to external influences. "Arago was perfectly right, therefore," concluded Barbican, "in the remarkable opinion to which he gave expression thirty years ago:

'No external action whatever has contributed to the formation of the Moon's diversified surface.'"

"But don't you think, Barbican," asked the Captain, "that every force, internal or external, that might modify the Moon's shape, has ceased long ago?"

"I am rather inclined to that opinion," said Barbican; "it is not, however, a new one. Descartes maintained that as the Earth is an extinct Sun, so is the Moon an extinct Earth. My own opinion at present is that the Moon is now the image of death, but I can't say if she has ever been the abode of life."

"The abode of life!" cried Ardan, who had great repugnance in accepting the idea that the Moon was no better than a heap of cinders and ashes; "why, look there! If those are not as neat a set of the ruins of an abandoned city as ever I saw, I should like to know what they are!"

He pointed to some very remarkable rocky formations in the neighborhood of Short, a ring mountain rising to an altitude considerably higher than that of Mont Blanc. Even Barbican and M'Nicholl could detect some regularity and semblance of order in the arrangement of these rocks, but this, of course, they looked on as a mere freak of nature, like the Lurlei Rock, the Giant's Causeway, or the Old Man of the Franconia Mountains. Ardan, however, would not accept such an easy mode of getting rid of a difficulty.

"See the ruins on that bluff," he exclaimed; "those steep sides must have been washed by a great river in the prehistoric times. That was the

fortress. Farther down lay the city. There are the dismantled ramparts; why, there's the very coping of a portico still intact! Don't you see three broken pillars lying beside their pedestals? There! a little to the left of those arches that evidently once bore the pipes of an aqueduct! You don't see them? Well, look a little to the right, and there is something that you can see! As I'm a living man I have no difficulty in discerning the gigantic butments of a great bridge that formerly spanned that immense river!"

Did he really see all this? To this day he affirms stoutly that he did, and even greater wonders besides. His companions, however, without denying that he had good grounds for his assertion on this subject or questioning the general accuracy of his observations, content themselves with saying that the reason why they had failed to discover the wonderful city, was that Ardan's telescope was of a strange and peculiar construction. Being somewhat short-sighted, he had had it manufactured expressly for his own use, but it was of such singular power that his companions could not use it without hurting their eyes.

But, whether the ruins were real or not, the moments were evidently too precious to be lost in idle discussion. The great city of the Selenites soon disappeared on the remote horizon, and, what was of far greater importance, the distance of the Projectile from the Moon's disc began to increase so sensibly that the smaller details of the surface were soon lost in a confused mass, and it was only the lofty heights, the wide craters, the great ring mountains, and the vast plains that still continued to give sharp, distinctive outlines.

A little to their left, the travellers could now plainly distinguish one of the most remarkable of the Moon's craters, Newton, so well known to all lunar astronomers. Its ramparts, forming a perfect circle, rise to such a height, at least 22,000 feet, as to seem insurmountable.

"You can, no doubt, notice for yourselves," said Barbican, "that the external height of this mountain is far from being equal to the depth of its crater. The enormous pit, in fact, seems to be a soundless sea of pitchy black, the bottom of which the Sun's rays have never reached. There, as Humboldt says, reigns eternal darkness, so absolute that Earth-shine or even Sunlight is never able to dispel it. Had Michael's friends the old mythologists ever known anything about it, they would doubtless have made it the entrance to the infernal regions. On the whole surface of our Earth, there is no mountain even remotely resembling it. It is a perfect type of the lunar crater. Like most of them, it shows that the peculiar formation of the Moon's surface is due, first, to the cooling of the lunar crust; secondly, to the cracking from internal pressure; and, thirdly, to the violent volcanic action in consequence. This must have been of a far fiercer nature than it has ever been with us. The matter was ejected to a vast height till great mountains were formed; and still the action went on, until at last the floor of the crater sank to a depth far lower than the level of the external plain."

"You may be right," said Ardan by way of reply; "as for me, I'm looking out for another city. But I'm sorry to say that our Projectile is

increasing its distance so fast that, even if one lay at my feet at this moment, I doubt very much if I could see it a bit better than either you or the Captain."

Newton was soon passed, and the Projectile followed a course that took it directly over the ring mountain Moretus. A little to the west the travellers could easily distinguish the summits of Blancanus, 7,000 feet high, and, towards seven o'clock in the evening, they were approaching the neighborhood of Clavius.

This walled-plain, one of the most remarkable on the Moon, lies 55° S. by 15° E. Its height is estimated at 16,000 feet, but it is considered to be about a hundred and fifty miles in diameter. Of this vast crater, the travellers now at a distance of 250 miles, reduced to 2-1/2 by their telescopes, had a magnificent bird's-eye view.

"Our terrestrial volcanoes," said Barbican, "as you can now readily judge for yourselves, are no more than molehills when compared with those of the Moon. Measure the old craters formed by the early eruptions of Vesuvius and Ætna, and you will find them little more than three miles in diameter. The crater of Cantal in central France is only about six miles in width; the famous valley in Ceylon, called the Crater, though not at all due to volcanic action, is 44 miles across and is considered to be the greatest in the world. But even this is very little in comparison to the diameter of Clavius lying beneath us at the present moment."

"How much is its diameter?" asked the Captain.

"At least one hundred and forty-two miles," replied Barbican; "it is probably the greatest in the Moon, but many others measure more than a hundred miles across."

"Dear boys," said Ardan, half to himself, half to the others, "only imagine the delicious state of things on the surface of the gentle Moon when these craters, brimming over with hissing lava, were vomiting forth, all at the same time, showers of melted stones, clouds of blinding smoke, and sheets of blasting flame! What an intensely overpowering spectacle was here presented once, but now, how are the mighty fallen! Our Moon, as at present beheld, seems to be nothing more than the skinny spectre left after a brilliant display of fireworks, when the spluttering crackers, the glittering wheels, the hissing serpents, the revolving suns, and the dazzling stars, are all 'played out', and nothing remains to tell of the gorgeous spectacle but a few blackened sticks and half a dozen half burned bits of pasteboard. I should like to hear one of you trying to explain the cause, the reason, the principle, the philosophy of such tremendous cataclysms!"

Barbican's only reply was a series of nods, for in truth he had not heard a single word of Ardan's philosophic explosion. His ears were with his eyes, and these were obstinately bent on the gigantic ramparts of Clavius, formed of concentric mountain ridges, which were actually leagues in depth. On the floor of the vast cavity, could be seen hundreds of smaller craters, mottling it like a skimming dish, and

pierced here and there by sharp peaks, one of which could hardly be less than 15,000 feet high.

All around, the plain was desolate in the extreme. You could not conceive how anything could be barrenner than these serrated outlines, or gloomier than these shattered mountains--until you looked at the plain that encircled them. Ardan hardly exaggerated when he called it the scene of a battle fought thousands of years ago but still white with the hideous bones of overthrown peaks, slaughtered mountains and mutilated precipices!

"Hills amid the air encountered hills,
Hurled to and fro in jaculation dire,"

murmured M'Nicholl, who could quote you Milton quite as readily as the Bible.

"This must have been the spot," muttered Barbican to himself, "where the brittle shell of the cooling sphere, being thicker than usual, offered greater resistance to an eruption of the red-hot nucleus. Hence these piled up buttresses, and these orderless heaps of consolidated lava and ejected scoriæ."

The Projectile advanced, but the scene of desolation seemed to remain unchanged. Craters, ring mountains, pitted plateaus dotted with shapeless wrecks, succeeded each other without interruption. For level plain, for dark "sea," for smooth plateau, the eye here sought in vain.

It was a Swiss Greenland, an Icelandic Norway, a Sahara of shattered crust studded with countless hills of glassy lava.

At last, in the very centre of this blistered region, right too at its very culmination, the travellers came on the brightest and most remarkable mountain of the Moon. In the dazzling Tycho they found it an easy matter to recognize the famous lunar point, which the world will for ever designate by the name of the distinguished astronomer of Denmark.

This brilliant luminosity of the southern hemisphere, no one that ever gazes at the Full Moon in a cloudless sky, can help noticing. Ardan, who had always particularly admired it, now hailed it as an old friend, and almost exhausted breath, imagination and vocabulary in the epithets with which he greeted this cynosure of the lunar mountains.

"Hail!" he cried, "thou blazing focus of glittering streaks, thou coruscating nucleus of irradiation, thou starting point of rays divergent, thou egress of meteoric flashes! Hub of the silver wheel that ever rolls in silent majesty over the starry plains of Night! Paragon of jewels enchased in a carcanet of dazzling brilliants! Eye of the universe, beaming with heavenly resplendescence!

"Who shall say what thou art? Diana's nimbus? The golden clasp of her floating robes? The blazing head of the great bolt that rivets the lunar hemispheres in union inseverable? Or cans't thou have been some errant bolide, which missing its way, butted blindly against the lunar face,

and there stuck fast, like a Minie ball mashed against a cast-iron target? Alas! nobody knows. Not even Barbican is able to penetrate thy mystery. But one thing I know. Thy dazzling glare so sore my eyes hath made that longer on thy light to gaze I do not dare. Captain, have you any smoked glass?"

In spite of this anti-climax, Ardan's companions could hardly consider his utterings either as ridiculous or over enthusiastic. They could easily excuse his excitement on the subject. And so could we, if we only remember that Tycho, though nearly a quarter of a million miles distant, is such a luminous point on the lunar disc, that almost any moonlit night it can be easily perceived by the unaided terrestrial eye. What then must have been its splendor in the eyes of our travellers whose telescopes brought it actually four thousand times nearer! No wonder that with smoked glasses, they endeavored to soften off its effulgent glare! Then in hushed silence, or at most uttering at intervals a few interjections expressive of their intense admiration, they remained for some time completely engrossed in the overwhelming spectacle. For the time being, every sentiment, impression, thought, feeling on their part, was concentrated in the eye, just as at other times under violent excitement every throb of our life is concentrated in the heart.

Tycho belongs to the system of lunar craters that is called radiating, like Aristarchus or Copernicus, which had been already seen and highly admired by our travellers at their first approach to the Moon. But it is decidedly the most remarkable and conspicuous of them

all. It occupies the great focus of disruption, whence it sends out great streaks thousands of miles in length; and it gives the most unmistakable evidence of the terribly eruptive nature of those forces that once shattered the Moon's solidified shell in this portion of the lunar surface.

Situated in the southern latitude of 43° by an eastern longitude of 12° , Tycho's crater, somewhat elliptical in shape, is 54 miles in diameter and upwards of 16,000 feet in depth. Its lofty ramparts are buttressed by other mountains, Mont Blancs in size, all grouped around it, and all streaked with the great divergent fissures that radiate from it as a centre.

Of what this incomparable mountain really is, with all these lines of projections converging towards it and with all these prominent points of relief protruding within its crater, photography has, so far, been able to give us only a very unsatisfactory idea. The reason too is very simple: it is only at Full Moon that Tycho reveals himself in all his splendor. The shadows therefore vanishing, the perspective foreshortenings disappear and the views become little better than a dead blank. This is the more to be regretted as this wonderful region is well worthy of being represented with the greatest possible photographic accuracy. It is a vast agglomeration of holes, craters, ring formations, a complicated intersection of crests--in short, a distracting volcanic network flung over the blistered soil. The ebullitions of the central eruption still evidently preserve their original form. As they first appeared, so they lie. Crystallizing as they cooled, they have

stereotyped in imperishable characters the aspect formerly presented by the whole Moon's surface under the influences of recent plutonic upheaval.

Our travellers were far more fortunate than the photographers. The distance separating them from the peaks of Tycho's concentric terraces was not so considerable as to conceal the principal details from a very satisfactory view. They could easily distinguish the annular ramparts of the external circumvallation, the mountains buttressing the gigantic walls internally as well as externally, the vast esplanades descending irregularly and abruptly to the sunken plains all around. They could even detect a difference of a few hundred feet in altitude in favor of the western or right hand side over the eastern. They could also see that these dividing ridges were actually inaccessible and completely unsurmountable, at least by ordinary terrestrial efforts. No system of castrametation ever devised by Polybius or Vauban could bear the slightest comparison with such vast fortifications, A city built on the floor of the circular cavity could be no more reached by the outside Lunarians than if it had been built in the planet Mars.

This idea set Ardan off again. "Yes," said he, "such a city would be at once completely inaccessible, and still not inconveniently situated in a plateau full of aspects decidedly picturesque. Even in the depths of this immense crater, Nature, as you can see, has left no flat and empty void. You can easily trace its special oreography, its various mountain systems which turn it into a regular world on a small scale. Notice its cones, its central hills, its valleys, its substructures already cut and

dry and therefore quietly prepared to receive the masterpieces of Selenite architecture. Down there to the left is a lovely spot for a Saint Peter's; to the right, a magnificent site for a Forum; here a Louvre could be built capable of entrancing Michael Angelo himself; there a citadel could be raised to which even Gibraltar would be a molehill! In the middle rises a sharp peak which can hardly be less than a mile in height--a grand pedestal for the statue of some Selenite Vincent de Paul or George Washington. And around them all is a mighty mountain-ring at least 3 miles high, but which, to an eye looking from the centre of our vast city, could not appear to be more than five or six hundred feet. Enormous circus, where mighty Rome herself in her palmyest days, though increased tenfold, would have no reason to complain for want of room!"

He stopped for a few seconds, perhaps to take breath, and then resumed:

"Oh what an abode of serene happiness could be constructed within this shadow-fringed ring of the mighty mountains! O blessed refuge, unassailable by aught of human ills! What a calm unruffled life could be enjoyed within thy hallowed precincts, even by those cynics, those haters of humanity, those disgusted reconstructors of society, those misanthropes and misogynists old and young, who are continually writing whining verses in odd corners of the newspapers!"

"Right at last, Ardan, my boy!" cried M'Nicholl, quietly rubbing the glass of his spectacles; "I should like to see the whole lot of them carted in there without a moment's delay!"

"It couldn't hold the half of them!" observed Barbican drily.