

On the Clearness of the Atmosphere in Oroomiah, in Persia.

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Presuming that a letter written to you from ancient Media, and relating to your favorite science, will not be unacceptable, I shall make no apology for the liberty I take in addressing you. My home is in Northern Persia, where I have resided for the last nine years, as an American Missionary to the Nestorian Christians. To give you an idea of our geographical position, I have noted, above, our latitude and approximate longitude. As I wish also to give you a glance at the physical features of this region, let me invite you to come with me upon the flat, terraced roof of my house, where I am sure you will be delighted with the scene before you. Standing at an elevation of more than a mile above the ocean, and a thousand feet above the adjoining country, you may look down upon one of the loveliest and most fertile plains in all the East. Extending for forty miles in length, and from twelve to fifteen in breadth, the district of Oroomiah smiles with hundreds of villages, is verdant with thousands of orchards, and rows of poplars, willows and sycamores by the water-courses, and in the early summer waves with innumerable fields of golden grain. Here the peach, the nectarine, the apricot, the quince, the cherry, the pear, the apple, and the vine, flourish in luxuriance, and give the appearance of a variegated forest. Beyond the plain, you see the lake of Oroomiah, reflecting the purest azure, and studded over with numerous islands, while further on rise distant and lofty mountains, their outlines projected on the cloudless Italian sky, and forming a beautiful contrast with the plain before you. The city of Oroomiah, about six miles distant, which is so embosomed in trees as almost to be hidden from view, is the probable birth-place of Zoroaster; and the mounds which are so conspicuous in different parts of the plain, and which are formed entirely of ashes with a scanty soil upon them, are supposed to be the places where the sacred fire was ever kept burning, and the Persian priests bowed in adoration to the rising sun.

The temperature of this elevated region is very uniform, and the greater part of the year very delightful. During the months of June, July, August, September, and sometimes October, there is little rain, and the sky is rarely overcast. Indeed, I may say that often for weeks together not a cloud is to be seen. As a specimen of the climate in summer, I send accompanying this my meteorological register for the month of August last. The observations were taken at our house on Mt. Seir, but do not differ essentially from those taken on the plain at the same season, except that the thermometer is here a few degrees lower, and the air somewhat drier, especially at night.

No one has ever travelled in this country, without being surprised at the distinctness with which distant objects are to be seen. Mountains fifty, sixty, and even a hundred miles off, are projected with great sharpness of outline on the blue sky; and the snow peak of Ararat, the venerable father of mountains, is just as bright and beautiful when two hundred miles distant, as when we stand near its base. This wonderful transparency of the atmosphere frequently deceives the inexperienced traveller; and the clump of trees indicating a village, which seems to rise only two or three miles before him, he will be often as many hours in reaching.

In this connection, you will be interested to know that the apparent convergence of the sun's rays, at a point diametrically opposite its disc, which, if I mistake not, Sir D. Brewster speaks of as a very rare phenomenon, is here so common that not a week passes in summer when the whole sky at sunset is not striped with ribbons, very much like meridians on an artificial globe.

But it is after nightfall that our sky appears in its highest brilliancy and beauty. Though accustomed to watch the heavens in different parts of the world, I have never seen anything like the splendour of a Persian summer evening. It is not too much to say that, were it not for the interference of the moon, we should have seventy-five nights in the three summer months, superior for purposes of observation to the very finest nights which favour the astronomer in the New World. When I first came here, I brought with me a six-foot Newtonian telescope, of five inches aperture, of my own manufacture; and though the mirrors have since been much tarnished, and the instrument otherwise injured, its performance is incomparably superior to what it was in America. Venus sometimes shines with a light so dazzling

that at a distance of *thirteen feet* from the window I have distinguished the hands of a watch, and even the letters of a book.

Some few months since, having met with the statement that the satellites of Jupiter had been seen without a glass, by a traveller on Mt. Etna, it occurred to me that I was in the most favourable circumstances possible for testing the power of the unassisted eye, and I determined at once to make some experiments on the subject. My attention was, of course, first turned to Jupiter, but for a considerable time, with no success. It was always so bright, and shot out so many rays, that it seemed quite impossible to detect any of its moons, even at their greatest elongation from the planet. I varied the experiment in several ways, by looking through the tube of a small telescope, from which the lenses had been taken, and also by placing my eye near the corner of a building, so as to cut off the most brilliant rays of the planet, and yet leave the view unobstructed to the right hand or the left; but in neither cases could I find any satellite. Some time after, I was sitting on the terrace as daylight was fading into darkness, and thought I would watch Jupiter from its first distinct appearance, till it shone out in its full splendour. This time I was exceedingly gratified, just as stars of the first and second magnitude were beginning to appear, to see two extremely faint points of light near the planet, which I felt sure were satellites. On pointing my telescope towards them, my first impressions were confirmed, and I almost leaped for joy at my success. Since that night, I have many times, at the same hour of the evening had a similar view of these telescopic objects, and think I can not be mistaken as to the fact of their visibility. I must, however, add that none of my associates, who at my request have attended to the subject, are *sure* that they detect them, though the most sharp-sighted individual feels some confidence that he can do so. As these friends, however, are not practical observers, their failure to see the satellites does not shake at all my belief that I have seen them myself.

The time during which these satellites are visible is hardly more than ten minutes. The planet itself soon becomes so bright that they are lost in its rays. I will not stop to discuss the question, in itself a most interesting one, why they are visible at all, when stars of the third and fourth magnitudes are not distinguishable, but merely give you the facts in the case, knowing that you will reason on them much better than I can. Both the fixed stars and the planets shine here with a beautifully steady light, and there is very little twinkling when they are forty degrees above the horizon.

Having come to a satisfactory conclusion about the satellites of Jupiter, I turned next to Saturn. This planet rose so late in the night that I had not seen it while watching Jupiter, and I was curious to know whether any traces of a ring could be detected by the naked eye. To my surprise and delight, the moment I fixed my eye steadily upon it, the elongation was very apparent, not like the satellites of Jupiter, at first suspected, guessed at, and then clearly discernible, but such a view as was most convincing, and made me wonder that I had never made the discovery before. I can only account for it from the fact that, though I have looked at the planet here with the telescope many times, I have never scrutinized it carefully with the naked eye. Several of my associates, whose attention I have since called to the planet, at once told me in which direction the longer axis of the ring lay, and that too without any previous knowledge of its position, or acquaintance with each other's opinion. This is very satisfactory to me, as independent collateral testimony.

I have somewhere seen it stated, that in ancient works on astronomy, written long before the discovery of the telescope, Saturn is represented as of an oblong shape, and that it has puzzled astronomers much to account for it. Am I not correct in this impression? and, if so, is it not possible that here, on these elevated and ancient plains, where shepherds thousands of years ago watched their flocks by night, and studied the wonders of the glorious canopy over their heads, I have found a solution of the question?

After examining Saturn, I turned to Venus. The most I could determine with my naked eye, was, that it shot out rays unequally, and appeared not to be round; but, on taking a dark glass, of just the right opacity, I saw the planet as a very minute, but beautifully defined, crescent. To guard against deception, I turned the glass in different ways, and used different glasses, and always with the same pleasing result. It may be that Venus can be seen thus in England, and elsewhere, but I have never heard of the experiment being tried.

Let me say here, that I find the naked eye superior for these purposes to a telescope formed of spectacle glasses, of six or eight magnifying power. This is not, perhaps, very wonderful, considering that

* From a letter addressed to Sir John F. W. Herschel, dated Oroomiah, Persia, N. Lat. $37^{\circ}28'18''$, Long. E. from Greenwich $45^{\circ}1'$, November 23d. 1852.