coveries in nature causing continual occasion for amended translations of various texts; whereas, should the view which has been advocated in this chapter be found correct, instead of fearing that the future progress of science may raise additional difficulties in the way of revealed religion, we are at once relieved from all doubt on that subject.—*Babbage's Bridgewater Treatise*, p. 63.

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The November-Asteroids.

Notice of a recent Communication relating to them, by Dr. OLBERS.

Those who take an interest in physical sciences have, within these few years, had their attention directed to the periodical return of shooting-stars; and recent observations go far to subvert the opinions formerly held with respect to them—namely, that they originated within the limits of our atmosphere. On the contrary, it is now looked upon as an established fact, that they are heavenly bodies of inconsiderable dimensions, but which, in common with all others of a similar nature, have, of course, a regular motion. They are, in short, supposed to represent, in the solar system, the animacules of the animal kingdom.

Olbers, in the *Jahrbuch für 1837*, brings forward, with irresistible force and clearness, numerous proofs in favour of this supposition; and the following general sketch will, it is hoped, give a faithful abstract of the arguments to which he therein has recourse, in favour of the new theory.

On the 12th of November, 1793, before sun-rise, Humboldt and Bonpland, on the coast of Mexico, observed, during four hours, a succession of many thousand shooting-stars and small fire-balls. The part of the heavens whence they emanated lay due east, and they extended over a space of 30° to the right and left of that point. They rose above the horizon in an east-north-east direction, and fell towards the south, describing unequal arcs in their course. Some attained an altitude of 40° , and there were none that did not rise to between 25° and 30° . Several appeared to burst; the largest, however, disappeared, without throwing out any coruscations. Some had a large nucleus equal to Jupiter in brightness, and all, or nearly so, had tails.

This remarkable phenomenon was also simultaneously observed from various distant points of the earth. A similar display was again witnessed on the night of the 13th of November, 1831, on the night of the 12th of November, 1832, on the same night in 1833, and on the night of the 13th of November, 1834.

This periodical return induced many persons, where the cloudy state of the weather did not altogether put a stop to their observations, to keep a good look out on the nights between the 11th and 14th of November, 1836; nor was the trouble they thus took thrown away, for it appears that a vast number of shooting-stars were actually at that time observed from the most distant points of the globe.

The periodical return of these bodies would thus seem to be established, but this is not sufficient for us to form any just notions as to their nature. The first step to be taken to that end is to discover what their elevation above the earth's surface may be.

In order to arrive at this, two observers in concert determine the angle under which they see a shooting-star, indicating likewise the time of its appearance, and noting the star near which it came into sight. Now, if two such observers remark at the same instant, and in the same direction and

position, any shooting-star, it may fairly enough be assumed that they are looking at one and the same object. A triangle is thus obtained; the base—that is to say the distance between the observers, and two angles of which, are approximately known, so that the calculation of the distance presents no difficulties whatever.

Simple as these observations are, it is evident that they cannot pretend to any thing like exactness; as they are, however, very numerous, their errors are thereby eliminated, and approximate results, at least, are arrived at; and the distance being thus ascertained, their real velocity may be deduced from the apparent.

Olbers conveys his opinions respecting these bodies in the following terms. The remarkable and very unequal distribution of those small bodies revolving round the sun, which form the fire-balls and shooting-stars of our planetary system, as well as the general resemblance, and nearly similar nature, of all the meteoric stones which fall from time to time, (taking into consideration both their external characters, and also their chemical composition,) seem to indicate not only that they have one common origin, but also that it was one common cause which has thus hurled them into space.

One cannot help reverting, involuntarily, to the hypothesis which holds the four new planets, Vesta, Juno, Pallas, and Ceres, to be but fragments of a larger planet, formerly revolving round the sun between Mars and Jupiter, but which has been shattered to pieces by some violent catastrophe. On such a planet as this exploding, and being scattered about in all directions there would also be, independent of the larger fragments, innumerable much smaller, indeed minute pieces, hurled into space, and these would now circulate about the sun in ellipses of various degrees of eccentricity.

It must be borne in mind that Olbers treats this, however, as a mere hypothesis and distinctly says he by no means adopts the language of Professor Wildt, who, as may be seen by referring to the 9th Volume, p. 408, of *Voigt's Magazin für den neuesten Stand der Naturkunde*, unreservedly asserts, the stones which have fallen on the earth to be “the ruins of some globe which has been destroyed, and which revolve round the sun till, sooner or later, they fall in with a planet.

“They without doubt, he continues, belong to the group of Ceres, Pallas, &c., and thus we see how it is that their appearance and composition bear such general resemblance to each other.”

What we really know of shooting-stars, of those, at least, which are allied to fire-balls, if not actually identical with them, may be summed up in the following words:—

1st. They move at considerable elevations above the earth, their distances from it ranging from between 140 to 190 miles.

2ndly. Their velocity is equal to that of several of the planets; and their relative velocity, compared with the earth, may vary from 37 to 42 miles in a second.*

3rdly. Hence it is from without the regions of space that they enter our atmosphere, and it is not within the limits of the latter that they originally take their rise.

4thly. They are not ejected into the earth from the moon.

Much that is connected with these interesting meteors, it is, however, quite out of our power to explain. For instance, how is it they become ignited? How is it that, in the extremely rare medium in which they move,

* Littrow gives the mean velocity of Mercury only at 30 miles per second, that of the earth at 19 miles, and the mean of the four new planets at 12.

they continue glowing, or, indeed, burning with such brilliancy? How can the comparatively small mass of the meteoric stones which falls to the earth expand in those elevated regions to bodies several hundred feet in diameter?

Must we not suppose, with the acute Von Hoff, of Gotha, that the materials of which shooting-stars originally consist are submitted to a peculiar chemical process upon entering into our atmosphere, the result of which is the formation of the substance we see fall as meteoric stones,—a process which surely cannot consist merely of fusion?

All these questions, and many others of a similar nature, will possibly remain for ever unanswered, or be, at least, but unsatisfactorily solved; for it scarcely appears probable that time can give us a deeper insight into the circumstances connected with this subject. How can we, indeed, even hope to arrive at a satisfactory knowledge of processes carried on at altitudes where the air is far rarer than in the most perfect vacuum we can produce, and where, moreover, the atmosphere possibly consists of gases of which we know nothing, and all carried on at a temperature of absolute cold. What powers, affinity, electricity, and magnetism are there invested with, will always remain a mystery to us.

Munich, 10th July, 1837.

Mag. Pop. Sci.

St. Elmo's Fire seen in Orkney.

During last February, 1837. (Sunday 19,) in a tremendous gale, my large boat sunk, and it was late on Tuesday night before we could get her up and drawn to the shore, after which we had to wait till three o'clock next morning till the tide ebbed from her; she was during this time attached to the shore by an iron chain, about 30 fathoms long, which did not touch the water, when, to my astonishment, I beheld a sheet of blood-red flame, extending along the shore for about 30 fathoms broad and 100 fathoms long, commencing at the chain and stretching along the shore and sea in the direction of the shore which was E. S. E., the wind being N. N. W. at the time. The flame remained about ten seconds, and occurred four times in about two minutes. Whilst I was wondering not a little, the boatmen, who, to the number of twenty-five or thirty, were sheltering themselves from the weather, came running down apparently alarmed, and asked me if I had ever seen anything like this before. I was about to reply, when I observed their eyes directed upwards, and found they were attracted by a most splendid appearance at the boat. The whole mast was illuminated, and from the iron spike at the summit, a flame of one foot long was pointed to the N. N. W., from which a thunder-cloud was rapidly coming. The cloud approached, which was accompanied by thunder and hail; the flame increased and followed the course of the cloud till it was immediately above, when it arrived at the length of nearly three feet, after which it rapidly diminished, still pointing to the cloud, as it was borne rapidly on to S. S. E. The whole lasted about four minutes, and had a most splendid appearance. I regretted afterwards that I was so occupied with the flame at the mast head that I did not observe whether the red flame on the ground continued during the time the cloud was passing.—*Extract of a Letter from William Traill, Esq., Kirkwall, to Professor Traill, dated May 16, 1837.*

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