approach the regions of space through which the earth is moving, they enter the atmosphere with great velocity, and in consequence of the great resistance and friction which follow, are rendered incandescent, and emit a light as long as they remain in it. As there have thus been believers in the planetary origin of meteorites, so some of the Greek philosophers thought they came from the sun. This was the opinion of Diogenes Laertius regarding the origin of the Aegos Potamos stone, about which Aristotle held such an absurd idea.

### COSMICAL ORIGIN OF AEROLITES, ETC.

The more general opinion now is that the greater portion of meteors are of *cosmical* origin—that is, bodies revolving in space, independent of the earth's rotation, and subject to the same laws as the other celestial bodies. "Shooting-stars, fire-balls, and meteoric stones are," says Humboldt, "with great probability, regarded as small bodies moving with planetary velocity, and revolving, in obedience to the laws of general gravity, in conic sections round the sun. When these masses meet the earth in their course, and are attracted by it, they enter within the limits of our atmosphere in a luminous condition, and frequently let fall more or less strongly heated stony fragments, covered with a shining black crust; but the formative power, and the nature of the physical and chemical processes involved in these phenomena, are questions all equally shrouded in mystery."

The great argument in favor of this view of the character of these bodies is derived from the divergence or point of departure being generally stationary, and secondly, from their entirely planetary velocity. These facts led Sir John Herschell to decide "that a zone or zones of these bodies revolve about the sun, and are intersected by the earth in its annual revolution." Capocci, of Naples, regards the Aurora Borealis, shooting-stars, aerolites, and comets as all having the same origin, and as resulting from the aggregation of cosmical atoms, brought into union by magnetic attraction. He supposes that in the planetary spaces there exist bands or zones of nebulous particles, more or less fine, and endued with magnetic forces, which the earth traverses in its annual revolution; that the smallest and most impalpable of these particles are occasionally precipitated on the magnetic poles of our globe, and form polar Auroras; that the particles a degree larger, in which the force of gravitation begins to be manifested, are attracted by the earth, and appear as shooting-stars; that the particles in a more advanced state of concretion give rise in like manner to the phenomena of fire balls, aerolites, etc.; that the comets which are known to have very small masses are nothing else than the largest of the aerolites, or rather uranolites, which, in course of time, collect a sufficient quantity of matter to be visible from the earth.

After the great shower of stars in 1833, and the observed periodicity of its character, Professor Olmsted, collecting all the facts within reach, deduced from them the existence of a nebulous cloud or mass of meteoric stars, approaching the earth at particular periods of its revolution, under conditions as to time, direction, and physical changes from proximity, which he has fully detailed in Silliman's *Journal of Science* for 1834 and 1836. His speculation that this meteoric cloud might be part of the solar nebula known as the Zodiacal Light, was taken up and enlarged upon by Biot in a Memoir read by him in 1836. He shows that on the 13th November the earth is in such a relative position that it must necessarily act by attraction or contact upon the material particles of which this nebula is composed, producing phenomena which we may reasonably consider to be represented by these meteoric showers. He brings the same theory to explain the sporadic shooting-stars of ordinary nights. He supposes that the habitual passage of Mercury and Venus across the more central regions of this nebula must have dispersed innumerable particles in orbits very little inclined to the ecliptic, and so variously directed that the earth may encumber, attract, and render them luminous in every part of its revolution. Supposing, then, we admit that these meteors compose a closed ring or zone, within which they all pursue one common orbit, how is it that we so seldom witness such splendid spectacles as those exhibited in the November showers of 1799 and 1833? "If," says Humboldt, "in one of these rings, which we regard as the orbit of a periodical stream, the asteroids should be so irregularly distributed as to consist of but few groups sufficiently dense to give rise to these phenomena, we may easily account for the unfrequency of such glorious sights." Olbers has predicted, but I know not upon what data, that the next appearance of the phenomenon of shooting stars and fire-balls intermixed, falling like flakes of snow, will not occur until between the 12th and 14th November, 1867.—(*Cosmos*, vol. i., p. 127.) Again: the enormous swarm of falling-stars in November, 1799, was almost exclusively seen in America—the swarms of 1831 and 1832 were visible only in Europe, and those of 1833 and 1834 only in the United States, and occasionally the November stream has been visible in but a small portion of the earth. A very splendid meteoric shower was seen in England in 1837, while a most attentive and skillful observer at Braunzberg, in Prussia, only saw on the same night, which was uninterruptedly clear, a few sporadic shooting-stars, between 7 o'clock p. m. and sunrise the next morning. Bessel explains, "that a dense group of the bodies comprising the great ring may have reached that part of the earth in which England is situated, while the more eastern districts of the earth might be passing at the time through a part of the meteoric ring proportionally less densely studded with bodies." In the same way Humboldt accounts for the non-appearance, during certain years, in any portion of the earth, of the two great streams of August and November, to intervals occurring between the asteroid groups. Poisson's account of this is somewhat different. "If," says he, "the group of falling-stars form an annulus around the sun, its velocity of circulation may be very different from that of our earth; and the displacements it may experience in space, in consequence of the actions of the various planets, may render the phenomenon of its intersecting the planes of the ecliptic possible at some epochs, and altogether impossible at others." The latest form of this hypothesis is that adopted by M.M. Saigney and Gravier, in France, viz., that meteors and their substances have their original abode in infinite space; that large groups of shooting-stars are situated in portions of the heavens visited by our earth; that, when our globe arrives in the vicinity of these corpuscules, they are attracted by the earth, and, bursting, leave the material of which they are composed to fall upon the surface of our globe.

Whilst this is now generally regarded as the most probable hypothesis yet framed to account for the origin of these mysterious appearances, still, even by it, many things regarding meteors are left unsolved. Many questions there are yet awaiting the possible solution of the future, and this solution can only be the result of more extended observation and experiment. It is the duty, therefore, of all who desire the advancement of science, to aid in adding at least to the number of recorded observations, and thus to broaden the basis on which the astronomer and the man of science are to build their hypotheses and their theories.

In conclusion, it is remarkable to find that the opinions of some of the Greek natural philosophers, particularly those of the Ionian school, early assumed the *cosmical* origin of meteoric stones.