

found them consisting of the same elements as the earthy globules of the stone from Benares.

From a collective view of the contents of this paper, we may now reasonably infer, that all the substances here mentioned, not excepting the native irons from Siberia and South America, and some from Bohemia and Senegal, have a manifest relation with each other. Mr. Howard recapitulates these analogies; and, with a view to the further investigation of the subject, closes his paper with the following queries:—1st. Have not all fallen stones, and what are called Native Irons, the same origin?—2nd. Are all or any the produce of meteors?—and 3dly. Adverting to the circumstance of the Yorkshire stone having fallen during a serene sky, might not this stone have formed a meteor in regions too elevated to be within the reach of our observation?

Observations on the two lately discovered celestial Bodies. By William Herschel, LL.D. F.R.S. Read May 6, 1802. [*Phil. Trans.* 1802, p. 213.]

The observations described in the first part of this paper relate to the magnitude, the colour, the disc, and the atmosphere of the two moving stars lately discovered by Mr. Piazzi and Dr. Olbers, to which they have assigned the names of Ceres and Pallas; and also to the question, whether they be attended by any satellites. Their magnitudes were determined by means of a comparison of their reflected images with a lucid spot of a disc micrometer placed at considerable distances. The results of many observations were, that the diameter of Ceres does not subtend an angle of more than $0''\cdot40$, or in actual length only $162\frac{1}{4}$ miles; and that the diameter of Pallas can hardly measure more than between 71 and 72 miles. The colour of these bodies was ruddy, and in one instance Pallas was of a dusky white. Their discs were never of a well defined planetary appearance; and as to their atmospheres or comas, the greatest extent of that attending Ceres was in one instance about two diameters beyond its disc; in another instance the whole had a cometary appearance; or when viewed most accurately, it bore a great resemblance to a small, much compressed, but ill-defined planetary nebula. Pallas never exhibited more than a faint haziness. As to satellites, it was inferred previous to the observations, that bodies of such very small dimensions could hardly contain a quantity of matter sufficient for the retention of secondary bodies; and in fact the several appearances that seemed to denote the existence of such attendants, were on more careful inspection found to be fallacious.

In the second part of the paper Dr. Herschel enters into an inquiry concerning the nature of these new stars, particularly as to the question whether they be planets or comets. And in order to proceed upon certain grounds, he previously enumerates certain criteria by which the heavenly bodies may be properly distinguished. These, as to the planets, are seven in number, 1. Those till lately discovered are all

of a considerable size ; 2. They move in not very excentric ellipses round the sun ; 3. The planes of their orbits do not deviate many degrees from the plane of the earth's orbit ; 4. Their motion is direct ; 5. They may have satellites or rings ; 6. They have an atmosphere of considerable extent, which, however, bears hardly any sensible proportion to their diameters ; and lastly, Their orbits are at certain considerable distances from each other.

These characters being next applied to the new stars, we find, in the first place, that as to the magnitude, they can certainly not be classed among planets ; since the least of these (Mercury) is no less than 73,839 times larger than Pallas ; 2. Their motions may perhaps agree sufficiently ; but 3. The planes of the orbits of the new stars appear to deviate so much from that of the earth, that, were they admitted into the number of planets, we should have to extend the zodiac far beyond its present limits ; and as it is not improbable that more of these bodies will be hereafter discovered, we shall perhaps end in having no zodiac at all. As to the 4th article, The motion of the new stars appears to be direct, like that of the planets. 5. Besides that no satellites have as yet been discovered belonging to these new stars, it may be inferred *à priori* that they have not a sufficient mass of matter to retain any. 6. The new stars, with respect to the small comas they exhibit, differ widely from planets, and might rather be classed among the comets, did not other circumstances militate against this opinion ; and lastly, The orbits of the new stars are so near each other, that the admitting them as planets would materially affect the general harmony that takes place among the rest. As to their being comets, the five following criteria are here given, by which those desultory bodies have hitherto been distinguished :— 1. They are generally of a very small size ; 2. They move in very excentric ellipses, or apparently parabolic arches round the sun ; 3. The direction of their motion is totally undetermined ; 4. The planes of their orbits admit of the greatest variety in their situation ; and 5. They have atmospheres of very great extent, which show themselves in various forms of tails, comas, haziness, &c. On applying these distinguishing characters to the new stars, we find, that as to size, they might perhaps be classed with comets ; but that, as to the nature of the curve in which they move, the direction of their motion, and the planes of their orbits, they deviate still more from comets than they do from planets ; and that, as to their atmosphere, though they bear in this respect a greater resemblance to comets than to planets, yet, upon a careful comparison with the appearances of several comets observed of late years, it seems evident that they are not entitled to a place among them ; the most considerable of their comas being barely one-fiftieth part of the smallest that has ever been observed to attend a comet.

Thus it appears, that neither the appellation of planet nor comet can be assigned to these newly discovered bodies. And it remains, therefore, to find out some new term by which they may be distinguished. Previously to this, the author thinks it necessary to fix

upon an accurate definition, with a view to facilitate an appropriate denomination. According to this definition they are "Celestial bodies of a small or a very small size, which move in orbits of no very great excentricity round the sun, the planes of which may be inclined to the ecliptic in any angle whatsoever: their motion may be direct or retrograde; and they may or may not have very considerable atmospheres, or very small comas or nuclei."

Description of the Corundum Stone, and its Varieties, commonly known by the Names of Oriental Ruby, Sapphire, &c.; with Observations on some other Mineral Substances. By the Count de Bournon, F.R.S.
Read March 25, 1802. [*Phil. Trans.* 1802, p. 233.]

In a former paper, printed in the Philosophical Transactions for the year 1798, Count de Bournon gave an analytical description of the crystalline forms of corundum from the East Indies and from China. From a note inserted at the beginning of the present communication, we learn, that the great number of specimens of that substance, since collected from different parts, chiefly of the East, have added so considerably to our knowledge relating to that subject, as to render it necessary not only to correct, but even, in many respects, to alter our opinion concerning it: and that hence, rather than create intricacy by introducing this additional knowledge in the form of a supplement, he had thought it expedient to collect all the information that could be obtained into one point of view, in hopes of delivering, in the present paper, with the addition of a chemical analysis which we are taught to expect from Mr. Chenevix, a complete mineralogical history of this curious substance.

The paper is prefaced by a short historical account of the opinions of former naturalists concerning the corundum stone, and its classification in the mineral system. The first of these, who derived their knowledge chiefly from lapidaries, had no hesitation in placing it among the gems, the hardest of which they distinguished by the epithet Oriental, and subdivided them according to their colours. Romé de Lisle was the first who deduced distinctive characters from the crystalline forms of the different sorts, rejecting the colour as a fallacious character. The first chemists who undertook to analyse this stone, thought themselves authorized to consider it as consisting of new elementary earths; but afterwards it was thought, and it appears now with much reason, to belong to the class of those stones which are chiefly, if not entirely, composed of argill. Werner at length also undertook the analysis; but he retrograded somewhat from what has been since found to be the truth, by placing it between pitch-stone and felspar. Abbé Haüy at length, recurring again to the crystalline form, placed it immediately after felspar, and before the Ceylonite; from both which, however, it differs widely, both by its hardness and specific gravity.

We are greatly indebted to the zeal and perseverance of our honourable member, Mr. Charles Greville, for a very ample collec-