On the Multiplication of Images, and the Colours which accompany them in some Specimens of calcareous Spar. By David Brewster, *LL.D. F.R.S. Lond. and Edin. In a Letter addressed to the Right Hon. Sir* Joseph Banks, *Bart. G.C.B. P.R.S.* Read June 8, 1815. [*Phil. Trans.* 1815, *p.* 270.]

The phenomena which the author here endeavours to explain, he says, were first noticed by Prof. Robinson of Edinburgh, and published by Mr. Benjamin Martin in his Treatise on Iceland Crystal. It would not be easy to describe the appearances without reference to the figures that accompany the paper. The peculiar specimens of calcareous spar in which they occur, have been supposed to have fissures, with a disposition to split in the direction of the longer diagonal of the rhomboid. But the author considers it as an interrupting stratum, since it appears to him not to bear the most remote resemblance to a fissure, but resembles a vein or film uniting the two prismatic portions of a rhomboid. Neither are the phenomena produced, when two surfaces artificially polished in the direction of the supposed plane are applied to each other; but they *are* produced when a thin film of sulphate of lime is interposed as a vein between two such portions of Iceland spar, and the surfaces are closely united by a cement of strong refractive power.

The supposition of such a crystallized vein, serves also to explain the varieties observable in the characters of the phenomena in different instances, which must vary according to the thickness of the vein, and according to the position of its polarizing axis.

The author also describes certain new instruments for exhibiting complementary colours produced by polarized light; but the descriptions require the aid of his figures to render them intelligible.

A Series of Observations of the Satellites of the Georgian Planet, including a Passage through the Node of their Orbits; with an introductory Account of the telescopic Apparatus that has been used on this Occasion; and a final Exposition of some calculated Particulars deduced from the Observations. By William Herschel, *LL.D. F.R.S.* Read June 8, 1815. [*Phil. Trans.* 1815, *p.* 293.]

Since in the examination of objects so minute and so distant as these satellites, it is necessary not only to magnify for the purpose of removing them from the body of the planet itself, but also to collect as much of their light as may be, in order to render the impression they make on the eye sensible, no instrument less than a 20-feet telescope is sufficient for discerning them; and even with an instrument of this description it is but with a favourable atmosphere, and through a small part of their orbit round the primary, that Dr. Herschel has been able to make his observations; and he has also occasionally availed himself of the greater light that is to be obtained by concave eye-glasses, notwithstanding the smallness of the field of view, and other objections to their use. The magnifying powers employed on

these occasions have been from 300 to 800 times; sometimes one, and sometimes another being used, according to the states of the air or moon, or other circumstances.

The observations here recorded, were made principally from the year 1787 to 1798 inclusive, and they are given in the order in which they occurred with all the phenomena noticed each time, and notes of correction added from subsequent observations respecting stars mistaken for satellites, or satellites wrongly numbered. For Dr. Herschel always added a configuration to his descriptions, in order to avoid mistakes, and in general made, by previous estimate, a sketch of the places where known satellites might be expected; some misconceptions were unavoidable, in consequence of the interruptions to his observations from cloudy or moon-light nights, as well as from small stars that unexpectedly interfered.

From all the observations thus made, and from accurate measures taken by different micrometers, the author infers the nodes of the two first satellites to have nearly the same longitude of $165\frac{1}{2}°$; that their inclination is also the same, $78° 58'$; and the motion of both, from their ascending node to the greatest elongation, retrograde. The periodic time of the first is found to be $8^d\ 16^h\ 56^m\ 5^s$; and that of the second $13^d\ 11^h\ 8^m\ 19^s$; their distances at greatest elongation $36''$ and $48''$ respectively.

To these determinations respecting the orbits of the satellites, Dr. Herschel adds his estimate of the distances to which they must move from the body of the planet before they become visible by his 20-feet telescope. The first requires to be at more than half its greatest elongation. The second also becomes invisible when it is within half its greatest elongation. If there be an interior satellite, as large as the first, he imagines it would be visible through so small a part of its orbit, as not to be seen for two nights together.

Notwithstanding this difficulty, the author thinks he has seen an interior satellite. And with regard to exterior satellites, though nothing has been correctly ascertained, the number and positions of different objects recorded is such, that the author enumerates as far as a supposed sixth satellite.

An Account of some Experiments with a large Voltaic Battery. By J. G. Children, *Esq. F.R.S.* Read June 15, 1815. [*Phil. Trans.* 1815, *p.* 363.]

The battery with which these experiments were made, has 21 cells, each containing about 40 gallons of water, to which was added a mixture of nitric and sulphuric acids, at various intervals, beginning with $\frac{1}{40}$th, and ending with $\frac{1}{20}$th part of the water. Into each cell was immersed a zinc plate, with a pair of copper plates, one on each side, but connected together at the bottom, and also duly connected to the zinc in the cell adjacent. Each plate had 16 square feet of surface.

The first series of experiments were on the comparative liability of