are mixed together, a small portion of the latter salt adheres tenaciously to the sulphate of baryta, which is precipitated, and escapes decomposition. By employing different processes the author avoids this source of fallacy; first, from the chloride of barium, previously dissolved in water, he throws down sulphate of baryta by adding sulphuric acid; and, secondly, he effects a precipitation from a similar solution of the chloride, by nitrate of silver, and infers the quantity of chloride from that of the fused horn-silver obtained, having previously determined, by a separate series of experiments, the exact composition of horn-silver. The conclusion he draws from his researches is, that 100 parts of chloride of barium correspond to 137·63 parts of the chloride of silver, which latter substance contains 34·016 parts of chlorine, and therefore leaves for the proportion of barium 65·984 parts. The real equivalent of barium, however, will depend upon that of chlorine, which is itself not yet satisfactorily determined.

On a new Series of periodical Colours produced by the grooved Surfaces of Metallic and Transparent Bodies. *By* David Brewster, *LL.D. F.R.S. L. & E.* Read May 21, 1829. [*Phil. Trans.* 1829, *p.* 301.]

The author, having received from Mr. Barton in the year 1822 some fine specimens of his Iris ornaments, undertook a series of experiments on the action of grooved surfaces upon light, of which he communicated an account to the Royal Society of Edinburgh in the following year. The investigation having since been taken up by Mr. Fraunhofer, the author had desisted from pursuing it until lately, when he learned that the phenomena which had principally occupied his attention had escaped the notice of this philosopher. The image of a candle seen by reflexion, from a flat and polished metallic surface, covered with equal and equidistant grooves, the plane of reflexion being parallel to the grooves, is accompanied with a row of prismatic images, arranged in a line perpendicular to the grooves. The colourless image of the candle is formed by the original portions of the metallic surface, which have been left between the grooves, while the prismatic images are formed by the sides of the grooves themselves. This is rendered evident to the eye by varying the proportion between these two parts of the surface. The general phenomena of the prismatic images, such as their distance from the ordinary image, and the dispersion of their colours, depend entirely on the number of grooves and intervals which occupy a given breadth; and the laws of these phenomena have been accurately determined by Mr. Fraunhofer. Dr. Brewster, by examining the appearances with more attention, observed in some specimens a remarkable defalcation of particular colours, varying with the angle of incidence, and sometimes affecting one of the images and not the others; in some cases even the image reflected from the original surface of the steel was slightly coloured, its tint having a

relation to the defalcation of colour in the prismatic images. In order to observe these phenomena through a great range of incidence, he employed a long narrow rectangular aperture, which gave a convergent beam of 30° or 40°. Under these circumstances, the ordinary image of the aperture, as formed by the original surfaces, was crossed, in a direction at right angles to its length, with broad coloured fringes, varying in their tints according to the angle of incidence. In a specimen having 1000 grooves in an inch, no less than four complete orders of colours are developed, corresponding to those of the reflected rings of thin plates. By turning the steel plate round in azimuth, the same colours are seen at the same angles of incidence, and they undergo no change by varying the distance of the luminous aperture, or of the eye of the observer.

The analysis of these curious and apparently complicated phenomena is much simplified by the employment of homogeneous light. The author pursues this analysis with red and with violet light respectively, and explains the obliteration of the colours by the aid of diagrams, giving also various tables of the angles of incidence at which the several deficiencies occur in the reflected colours. These angles are rendered different by covering the steel plate with water and oil of cassia in succession. Phenomena analogous to those above described take place on the grooved surfaces of gold, silver, calcareous spar, and other substances. Similar grooves impressed upon tin, realgar, and also upon isinglass, exhibited phenomena diversified according to the respective refractive powers of these substances. The almost perfect transparency of isinglass enabled the author to examine the transmitted tints, which in the ordinary image he found were extremely brilliant, but had no relation whatsoever, either in number or in quality, to the reflected tints. The transmitted tints of the ordinary prismatic images always increase in brightness as the angle of incidence diminishes; while the reflected tints become fainter.

The new class of periodical colours described in this paper cannot, in the opinion of the author, be referred to the diffraction and interference of the rays reflected from two or more of the portions of the original surface of the metal, considered as narrow slits or apertures; because they would in that case be affected by the distance both of the luminous object and of the eye, and the colours would form bands parallel to the direction of the grooves. But if we suppose that the parts of the original surface are smaller than the distance to which the reflecting force extends, the removal of the metal from the adjacent grooves must diminish the reflecting force of these parts of the surface; and he infers, from direct experiment, that this is the case.

On the hypothesis of emission, this abstraction of reflecting matter may be regarded as equivalent to a diminution of the density of the surface; while on the undulatory hypothesis, the effect may be ascribed to the condition of the ether arising from a variation in its intensity or elasticity towards the surface of a number of salient points.