becomes tubular, afterwards vascular, and then takes the form of healthy granulations.

On the Laws of Polarization and Double Refraction in regularly Crystallized Bodies. *By* David Brewster, *LL.D. F.R.S. Lond. and Edin. In a Letter to the Right Hon. Sir* Joseph Banks, *Bart. G.C.B. P.R.S.* Read January 15, 1818. [*Phil. Trans.* 1818, *p.* 199.]

In the different inquiries which the author has already laid before this Society, his attention was often directed to the phenomena of regular crystals; but he only lately succeeded in reducing under a general principle all those complex appearances which result from the combined action of more than one axis of double refraction. In this paper Dr. Brewster gives a general view of the present state of our knowledge respecting the double refraction and polarization of light, and afterwards traces the steps which led him to the discovery of the general law. He began his researches by the examination of 165 crystals, in 145 of which he discovered the property of double refraction. In 80 he was able to ascertain whether they had one or more axes; and by examining the tints which they exhibited at various angular distances from the axes, whence the forces emanate, he has been led to a general principle, which embraces all the phenomena and extends to the most complex as well as to the most simple development of the polarizing forces. This general principle, says Dr. Brewster, is in no respect an empyrical expression of the facts which it represents, nor is it supported by any empyrical data. Founded on the principles of mechanics, it is a law rigorously physical, by which we are enabled to calculate all the tints of the coloured rings, and all the phenomena of double refraction, with as much accuracy as we can compute the motions of the heavenly bodies.

The faculty of depolarization, explained by the author in a former paper, has been considered as sufficient indication of two separate images; and upon this principle it has been stated that all crystals are doubly refractive whose primitive form is neither the cube nor the regular octohedron: but this is incorrect; for some of these crystals possess a doubly refracting structure in a high degree. Admitting the statement, however, it could not have been used as a rule for determining whether a crystal refracts doubly or singly; for it is more difficult to detect the primitive form than to examine the optical properties. Tungstate of lime, for instance, would have been reckoned a crystal without double refraction, when Haüy believed its primitive form to be the cube, although it is highly doubly refractive.

In examining the nature and properties of the coloured rings produced by certain crystals, the author found that the squares of the diameters of the rings were, in every case, proportional to the numbers which represent the corresponding tints in Newton's table.

When a plate of beryl was combined with a plate of calcareous spar, the system of rings was the same as would have been produced by two plates of beryl, one of which was the plate employed, and

the other a plate which gave rings of the same size as the plate of calcareous spar. But when we combine a system of rings produced by a crystal of zircon, with the system produced by calcareous spar, a different effect is produced; and the system, instead of being diminished, is increased, and is equal to that which would have been produced by a thin plate of calcareous spar, whose thickness is equal to the difference of the thicknesses of the plate of calcareous spar employed, and the plate of calcareous spar that would give rings of the same size as those given by the zircon alone. In the section "on crystals with two or more axes of polarization," Dr. Brewster observes that, although M. Biot considered mica as the only mineral possessing the compound structure indicating two axes, he had found the same structure in topaz, nitre, tartrate of potash and soda, sulphate of potash, acetate of lead, and mother-of-pearl, as early as 1813; and he points out the means of deducing the number of axes in crystals from their primitive forms. Dr. Brewster expresses the general law of the tints for crystals with one or more axes in the following manner. *The tint produced at any point of the sphere by the joint action of two axes is equal to the diagonal of a parallelogram whose sides represent the tints, and whose angle is double the angle formed by the directions in which the forces are exerted.*

The fourth and fifth sections of this paper relate to the resolution and combination of polarizing forces, and the reduction of all crystals to those with two or more axes; and to the polarizing structure of crystals that have the cube, the regular octohedron, and the rhomboidal dodecahedron for their primitive form. The sixth and concluding section describes the artificial imitation of all the classes of doubly refracting crystals, by means of plates of glass; in which the author demonstrates that the polarizing structure depends entirely upon the external form of the plate, and on the mode of aggregation of its particles. When its form is circular, it has only one axis of polarization, which is attractive if the density diminishes towards the centre, and repulsive if it increases towards the centre; but when its form is rectangular or elliptical, it then has two axes of polarization, the strongest of which appears to be attractive, and the weakest repulsive. The elementary spheroid of crystals with double axes may be supposed, says the author, to be formed by elliptical plates bent into spheroidal strata; and the spheroid itself may be constructed by spheroidal strata of glass, it then exhibiting all the complicated phenomena produced by the simultaneous actions of two unequal axes.

On the Parallax of certain fixed Stars. By the Rev. John Brinkley, *D.D. F.R.S. and Andrews Professor of Astronomy in the University of Dublin.* Read March 5, 1818. [*Phil. Trans.* 1818, *p.* 275.]

Since the author's former observations on the parallax of α Lyræ, published by the Royal Society in a Letter to Dr. Maskelyne, he (the author) has met with apparent motions in several of the fixed stars,