physical theory. The necessary physical theory may be regarded as afforded by the mechanism which thus forms an essential part of Lord Kelvin's mode of accounting for magneto-optic effects.

Lord Kelvin, in his Baltimore Lectures, has suggested for magneto-optic rotation a form of gyrostatic molecule consisting, as shown in the figure, of a spherical sheath enclosing two equal gyrostats. These are connected with each other and with the case by ball-and-socket joints at the extremities of their axes, as shown in Fig. 15. If the spherical case were turned round any axis through the centre no disalignment of the gyrostats contained in it would take place, and it would act just like a simple gyrostat. If, however, the case were to undergo translation in any direction except along the axis, the gyrostats would lag behind, and the two-link chain which they form would bend at the centre. This bending would be resisted by the quasi-rigidity of the chain produced by the rotation, and the gyrostats would react on the sheath at the joints with forces as before at right angles to the plane in which the change of direction of the axis takes place.

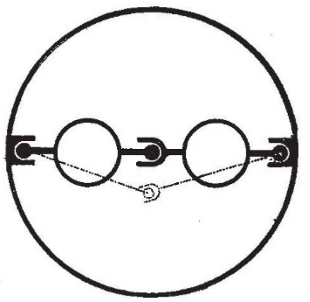

FIG. 15.

The general result is, that if the centre of this molecule be carried with uniform velocity in a circle in a plane at right angles to the line of axes, the force required for the acceleration towards the centre, and which is applied to it by the medium, is greater or less according as the direction in which the molecule is carried round is with or against the direction of rotation of the gyrostats. That is, the effect of the rotation is to virtually increase the inertia of the molecule in the one case and diminish it in the other.

These molecules embedded in the medium are supposed to be exceedingly small, and to be so distributed that the medium may, in the consideration of light propagation, be regarded as of uniform quality. Lord Kelvin's last form of molecule, it may be pointed out, if the surface of its sheath adheres to the medium, will have efficiency as an ordinary single gyrostat as regards rotations of the molecule, and efficiency likewise as regards translational motion of the centre of the molecule. The former efficiency can be made as small as may be desired by making the molecule sufficiently small; the latter may be maintained at the same value under certain conditions, however small the molecule be made.

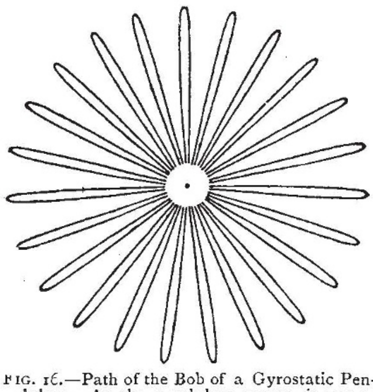

FIG. 16.—Path of the Bob of a Gyrostatic Pendulum. As the pendulum moves, it passes from one ray to another on the opposite side, and the direction of motion at each swing alters through the angle between two rays. The central parts of the rays are left out. The marking point does not pass exactly through the centre.

The lately discovered effect of a magnetic field in giving one period of circular oscillation of a particle or another according as the particle is revolving in one direction or the other about the direction of the magnetic force, is connected with magneto-optic rotation. There is a connection between velocity of propagation and frequency of vibration, which is exemplified by the phenomena of dispersion. In the Faraday effect, the two modes of vibration, if of the same period, have different velocities of vibration, consequently these two modes of vibration must have different frequencies for the same velocity of propagation.

The vibrations of the molecules of a gas in which the Zeeman effect is produced by a magnetic field may be represented by the motion of a pendulum the bob of which contains a rapidly rotating gyrostat with its axis in the direction of the supporting wire of the pendulum. The period of revolution of the bob when moving as a conical pendulum is greater or less than the period when the gyrostat is not spinning according as the direction of revolution is against or with the direction of rotation.

The bob when deflected and let go moves in a path which constantly changes its direction, so that if a point attached to the bob writes the path on a piece of paper, a star-shaped figure is obtained. I cause the gyrostatic pendulum here suspended to draw its path by a stream of white sand on the black board placed below it, and you see the result.

I must here leave the subject, and may venture to express the hope that on some other occasion some one more specially acquainted with the electromagnetic aspects of the phenomenon may be induced to place the latest results of that theory before you.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

MR. JAMES BROWN THOMSON, of Kinning Park, Glasgow, who died ten months ago, left 80,000*l.* to Glasgow institutions—mostly educational and benevolent. The Glasgow University will receive 10,000*l.*

THE recent discussion in NATURE on "The Duties of Provincial Professors" forms the subject of a short critique in the August number of the *Educational Review.* While fully endorsing the general views expressed in our columns, the *Review* remarks: "There is only one flaw in the indictment—the insinuation, namely, that university professors should take no part in the social life and physical activities, the general discipline, the corporate existence of the university or university college." But where does this flaw exist? No such insinuation is made in the article in NATURE.

THE Department of Science and Art has issued the following list of successful candidates for Royal Exhibitions, National Scholarships, and Free Studentships (Science) awarded this year:—Royal Exhibitions: William M. Selvey, Edward C. Moyle, Archibald D. Alexander, Charles W. Price, George F. A. Cowley, Edgar Sutcliffe, Sydney A. Edmonds. National Scholarships for Mechanics: Francis P. Johns, George F. Turner, Walter A. Scoble, Arthur J. Spencer, William H. Adams. Free Studentships for Mechanics: R. Borlase Matthews, William H. Outfin. National Scholarships for Physics: William R. Daniel, William J. Lyons, James Lord, William M. Varley, Wilfred H. Clarke. Free Studentships for Physics: John H. Shaxby, Gerald Henniker. National Scholarships for Chemistry: William D. Rogers, John H. Crabtree, Howard E. Goodson, Arthur H. Higgins, Montague W. Stevens. Free Studentships for Chemistry: John R. Horsley, Arthur C. Nicholson. National Scholarships for Biology: Eric Drabble, Louis E. Robinson, Ernest A. Wraight, Reginald F. G. Bayley, Harold B. Fantham. National Scholarships for Geology: William H. Goodchild, Thomas Thornton.

THE following list of candidates, successful in this year's competition for the Whitworth Scholarships and Exhibitions, has been received from the Department of Science and Art:—Scholarships, tenable for three years, 125*l.* a year each: Alec W. Quennell, London; Hanson Topham, Great Horton, Bradford; William V. Shearer, Langside, Glasgow; George Wall, Oldham. Exhibitions, tenable for one year, value 50*l.* each: Arthur J. Spencer, Portsmouth; George F. Turner, Sheffield; Harold P. Philpot, London; William H. Adams, Devonport; Edward C. Moyle, Devonport; Walter A. Scoble, E. Stonehouse, Devon; Archibald D. Alexander, Portsmouth; Sydney A. Edmonds, Devonport; George F. A. Cowley, Portsmouth; Albert Wilson, Leeds; Edwin J. Britton, Portsmouth; Harry Duncan, Plumstead; Samuel C. Rhodes, Morley, Leeds; Harry M. Andrew, Manchester; Alexander P. Traill, North Shields; Leonard Bairstow, Halifax; William T. S. Butlin, Bristol; Albert E. Dodridge, Devonport; James Lowe, Alloa; William J. Rodd, Plumstead; Francis C. Rendle, Plymouth; Thomas E. Heywood, Cardiff; James Paul, Woolwich; Charles P. Raitt, Portsmouth; Charles H. Booth, Bolton; Edward Howarth, Oldham; Percy Down, London; Marshall H. Straw, Sneinton, Nottingham; R. Borlase Matthews, Swansea; Samuel Crossley, Oldham.