that in both sets of tertiaries (right and left) there is a tendency to curve downward—and this is well known to occur in normal secondary roots exposed to light, and is another instance of the assumption by the tertiaries of characters hitherto associated only with secondary roots.

The facts above given prove that when the primary root is removed and a secondary root assumes its place, the tertiary roots take on the character of normal secondaries. It may be believed, therefore, that the existence of statoliths in normal tertiary roots is a provision enabling them to assume diageotropic growth in case of injury to the primary root. This, though appearing a bold conclusion, does not involve an adaptive action different in principle from the well-known assumption by secondary roots of the characters of the primary root.

We desire to express our thanks to Mr. T. Elborn, Assistant in the Cambridge Botanical Laboratory, for the help he has given us during the course of our research.

"On the Electric Effect of Rotating a Dielectric in a Magnetic Field." By Harold A. Wilson, M.A., D.Sc., Fellow of Trinity College, Cambridge. Communicated by Professor J. J. Thomson, F.R.S. Received May 18,—Read June 2, 1904.

(Abstract.)

It was shown by Faraday in 1831 that an electromotive force is induced in a conductor when it moves in a magnetic field so as to cut the lines of force. The object of the experiments described in this paper was to see if a similar electromotive force is induced in a dielectric when it moves in a magnetic field.

According to Maxwell's electromagnetic theory, as developed by H. A. Lorentz and Larmor, such an electromotive force should be induced in a dielectric, and should be equal to that in a conductor multiplied by the factor $1-K^{-1}$, where K is the specific inductive capacity of the dielectric.

The method employed was to rotate a hollow cylinder of ebonite in a magnetic field parallel to the axis of the cylinder. The inside and outside surfaces of the cylinder were provided with metal coatings with which electrical contact was made by sliding brushes. The inside coating was connected to earth, and the outside coating to one pair of the quadrants of a sensitive quadrant electrometer, the other pair of quadrants being connected to earth. The magnetic field was then reversed, so reversing the induced electromotive force in the ebonite. The resulting electric displacement was measured by means of the

electrometer; the quantity of electricity required to produce a given deflection of the electrometer needle being determined by means of a small parallel plate guard ring condenser.

It is shown that if E is the induced E.M.F. in the ebonite, and V the potential difference indicated by the electrometer, then

$$2E = V\frac{c+c'}{c}$$

where c is the capacity of the ebonite cylinder and c' the capacity of the electrometer. If the electrometer gives a deflection D due to V, and a deflection d due to a known quantity of electricity q, then $2Ec = V(c+c') = Dq/d$. Consequently E can be determined in terms of c, D, d and q.

If the outside radius of the ebonite cylinder is r_2, and the inside radius r_1, then according to the electromagnetic theory $E = n\pi H(r_2^2 - r_1^2)(1 - K^{-1})$ where H is the strength of the magnetic field and n the number of revolutions per second.

The cylinder used was 10 cm. long, and $2r_2 = 4{\cdot}15$ cm., $2r_1 = 2{\cdot}01$ cm. It was mounted in a solenoid having 95 turns per cm., by which a magnetic field of strength 1500 could be produced. The cylinder was driven by a $\frac{1}{2}$ horse-power motor, and could be run at 200 revolutions per second. The following table contains the results obtained with various rates of revolution and magnetic fields.

Revolutions per second.	Magnetic field reversed.	Deflection of Electrometer due to one E.S. unit. (Millimetres.)	Deflection. (Millimetres observed.)	Deflection. (Calculated).
192	1480	6015	26·2	26·0
192	750	6015	13·6	13·2
192	380	6015	6·8	6·7
192	320	6015	5·3	5·6
183	1420	4780	18·0	18·9
182	710	4780	9·2	9·4
182	1160	6040	19·9	19 4
100	1400	6320	14·0	13·5
100	1100	6320	10·5	10·6
100	670	6320	7·0	6·4
100	540	6320	5·0	5·2
93	1100	6100	9·5	9·5
92	1460	4770	10·0	9·7
92	1260	4770	8·0	8·4
92	650	4770	4·5	4·3
49·2	1200	6320	6·0	5·7
49·2	600	6320	3·0	2·8

The mean result obtained for the quantity of electricity set free on the outside coating of the cylinder, on reversing the magnetic field, only differs from the amount calculated theoretically by 1 per cent. The specific inductive capacity of the ebonite, as determined by measuring the capacity of the cylinder, was 3·54, while the value calculated from the results obtained, using the formula $E = n\pi H (r_2^2 - r_1^2)(1 - K^{-1})$, was 3·64. As the result of these experiments, it may be concluded that—

1. A radial electric displacement is produced in a dielectric, such as ebonite, when it is rotated in a magnetic field parallel to the axis of revolution.

2. The direction of the displacement is the same as is produced in a conductor.

3. The displacement is proportional to the magnetic field, and to the rate of revolution.

4. The amount of the displacement agrees with that calculated on the assumption that the induced E.M.F. in the dielectric is equal to that in a conductor multiplied by $1 - K^{-1}$.

The results obtained are thus in complete agreement with the theories of Lorentz and Larmor, and may be regarded as a confirmation of these theories.

The experiments were done in the Cavendish Laboratory, and the cost of the special apparatus used has been defrayed by a grant from the Royal Society.