The electromagnetic field is thus obtained by superposing on the usual electromagnetic field of a moving electric pole a field derived from a type of field, which I have considered elsewhere,[3] by writing **H** for **E** and $-\mathbf{E}$ for **H.** The properties of this additional field may be derived at once from the properties of the field described previously by simply interchanging the words magnetism and electricity.

If (f, g, h) are no longer restricted to be the components of the acceleration and k is no longer restricted to be $c^2-u^2-v^2-w^2$, the formulae (3), (4) still specify an electromagnetic field in which a line of force is the locus of points moving with velocity c in directions specified by a set of equations of type (1) and these equations can still be reduced to Riccatian equations by means of the substitution (2).

In a field of this more general type both electricity and magnetism travel away from the electric pole with the velocity of light while in the case of a field of Page's type there is an emission of magnetism but no emission of electricity. There is, however, no magnetic charge associate with the moving electric pole.

In a field of this general type it is possible when $f = g = h = p = q = r = 0$ for the points which trace out a line of force to move in one constant direction which is the same for all and for there to be no radiation of energy even through the electric pole has an acceleration.[3] It is possible, then, for an electric pole of this more general type to describe a circular orbit without radiating energy, as in Bohr's theory of the hydrogen atom. In the transition from one circular orbit to another the angular velocity (p, q, r) may be different from zero and there may be radiation of the type described by Page.

The weak point of the present theory is that it requires the presence of electric and magnetic currents in the space surrounding the electric pole. This space in fact contains a continuous distribution of electric and magnetic particles which have been emitted from the moving pole and are travelling along straight lines with the velocity of light.

[1] *Proc. Nat. Acad. Sci.*, **6**, March, 1920 (115).

[2] *Amer. J. Math.*, **37**, 1915 (192); see also Murnaghan, F. D., *Ibid.*, **39**, 1917; and *Johns Hopkins Circular*, July, 1915.

[3] *Proc. London Math. Soc.*, (Ser. 2) **18**, 1919 (95), paragraph 10.

A NEW PROOF OF A THEOREM DUE TO SCHOENFLIES

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In a paper recently published in the Transactions of the American Mathematical Society, Professor Robert L. Moore[1] proved the following theorem: If $ABCDA$ is a closed curve, then there exist two sets of arcs α_1 and α_2 such that (1) each arc of α_1 lies wholly within $ABCDA$ except that its end-points are in AB and CD, (2) each arc of α_2 lies wholly within $ABCDA$ except that its end-points are on BC and DA, (3) each point of $ABCDA$, except A, B, C, and D, is an end-point of just one arc of α_1 or of just one arc of α_2, (4) through each point within $ABCDA$ there is just one arc of α_1 and just one arc of α_2, (5) each arc of α_1 has just one point in common with each arc of α_2. It is the purpose of the present note to show how this theorem may be used to establish the following theorem due to Schoenflies[2]—*Suppose the closed curves J_1 and J_2 are in continuous one-to-one correspondence under a transformation π. Let R_i ($i = 1, 2$) denote the point set $J_i + I_i$, the interior of J_i. Then there exists a continuous one-to-one correspondence π' between the points of R_1 and R_2, such that points of J_1 and J_2 correspond as under the transformation π.*

Proof.—Let A_1, B_1, C_1 and D_1 be four points on the closed curve J_1 such that A_1 and C_1 separate B_1 and D_1 on J_1. Let $\pi(A_1) = A_2$, $\pi(B_1) = B_2$, $\pi(C_1) = C_2$ and $\pi(D_1) = D_2$. It may easily be proved, with the use of the definition of a simple closed curve and the properties of continuous one-to-one correspondences, that A_2 and C_2 separate B_2 and D_2 on J_2. Cover R_i ($i = 1, 2$) with sets of arcs $(\alpha_{i,1})$ and $(\alpha_{i,2})$ having the properties described in Professor Moore's theorem. Consider the square whose vertices are A (0, 0), B (0, 1), C (1, 1) and D (1, 0). There exists a continuous one-to-one correspondence Σ between the points of that arc of J_1 from A_1 to B_1 which does not contain C_1 and the points of the interval AB of the Y axis, such that $\Sigma(A_1) = A$ and $\Sigma(B_1) = B$. Likewise there exists a continuous one-to-one correspondence Σ' between the points of that arc of J_1 from A_1 to D_1, which does not contain B_1, and the interval AD of the X-axis such that $\Sigma'(A_1) = A$ and $\Sigma'(D_1) = D$. Let us assign to every point P_1 of R_1 coördinates (x'_{P_1}, y'_{P_1}) in the following manner: Suppose P_1 is a point of R_1 lying neither on the interval A_1B_1 nor on the interval C_1D_1 of J_1. Let x_1 denote the end-point on A_1D_1 of that arc of $(\alpha_{1,2})$ which contains P_1. Then x'_{P_1} shall be the abscissa of $\Sigma'(X_1)$. If H_1 is a point of R_1 on the interval A_1B_1 of J_1, then x'_{H_1} is zero, while, if K_1 is a point of R_1 on the interval C_1D_1 of J_1, x'_{K_1} is one. Suppose Q_1 is a point of R_1 lying neither on the interval A_1D_1 nor on the interval B_1C_1 of J_1. Let Y_1 denote the end-point on A_1B_1 of that arc of $(\alpha_{1,1})$ which contains Q_1. Then y'_{Q_1} shall be the ordinate of $\Sigma(Y_1)$. If M_1 is a point of R_1 lying on the interval A_1D_1 of J_1, then y'_{M_1} is zero; while, if M_1 is on the interval B_1C_1 of J_1, then y'_{M_1} is one. We shall say that the point P_1 of R_1 corresponds to the point P of R, if and only if, $x'_{P_1} = x_P$ and $y'_{P_1} = y_P$. In this manner, a continuous one-to-one correspondence Γ is defined transforming the points of R into the points of R_1.

If H_2 is a point of the interval A_2B_2 of J_2, then we shall say that H_2 corresponds to the same point of AB as $\pi^{-1}(H_2)$ corresponds to under Σ^{-1}, while M_2, a point of A_2D_2, corresponds to the same point of AD as $\pi^{-1}(M_2)$ corresponds to under $(\Sigma')^{-1}$. In this manner, we define con-