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ELECTRONS AND THE ELECTROMAGNETIC FIELD.

Electromagnetic Radiation and the Mechanical Reactions arising from it. Being an Adams Prize Essay in the University of Cambridge. By Dr. G. A. Schott. Pp. xxii + 330. (Cambridge: University Press, 1912.) Price 18*s.* net.

PROF. SCHOTT'S original essay is, in this book, supplemented by a series of valuable appendices, which amply justify the delay in its publication. The work is deductive in plan; its foundations are the electromagnetic equations of Maxwell and Hertz, together with the Larmor-Lorentz expression for the mechanical force on a moving charge. The "retarded potentials" of the electromagnetic field are transformed so as to yield Schott's solutions, in the form of "modified Fourier integrals," and most of the calculations are performed from these as starting point. They lead simply, and with considerable mathematical rigour, to many results obtained by other writers; in particular, the "point laws" of Liénard and Wiechert are deduced, and are used to illustrate the general features of the electromagnetic field in a number of special cases. The exact calculations, however, are more readily executed with Schott's expressions, and various simple cases of motion of electrons are thus dealt with, as, *e.g.*, uniform or uniformly accelerated rectilinear motion. Periodic motions, such as uniform circular motion of a single electron, or of a ring of electrons, are also discussed. More complex cases, like pseudo-periodic or aperiodic motions, cannot be solved completely, but the distant field is approximated to. Specially interesting are the problems relating to the pulse theory of the X-rays, and the precessional motion of a ring of electrons, as applied to Ritz's theory of the Zeeman effect.

The velocities of the electrons are not restricted to be less than the velocity of light, chiefly because the mathematical expressions require no such condition (though the work is far simpler in the restricted case). It is pointed out that no experimental evidence, either way, has been brought to settle the question of the possibility of velocities exceeding that of light; if the Lorentz mass-formula were universally true, indeed, the question would be decided in the negative, but this formula has been verified (by Bucherer) only for velocities considerably less than that of light. Moreover, the theory of relativity, which is based on this formula and has proved useful in explaining aberration phenomena and the behaviour of moving optical systems, neglects the loss of energy by radiation from accelerated charges; this, however, becomes very important for velocities approaching that of light.

In the appendices several theorems are proved which lead up to an interesting discussion of the possible mechanical explanations of the electron. It is shown that the Lorentz deformable electron is more easily explained mechanically than the electrons of Abraham and others, as it only requires an invariable hydrostatic pressure of the æther over its surface to enable it to subsist. This pressure is estimated (p. 269) as 10^{25} atmospheres. Moreover, the mass-formula for such an electron is practically the only one which can be applied in the mathematical theory of the mechanical forces and the radiation.

For the mathematician the book abounds in problems and suggestions of interest and importance; especially does it clearly display the need for the cooperation of the pure analyst in the study of the summation and convergence of the difficult series and integrals which occur in its investigations. The physicist will, perhaps, find it rather tedious to unearth the physical conclusions (which are pointed out from time to time in the course of the work) from the mass of complicated mathematics in which these remarks are involved. The great value of the book would have been increased if the physical bearing of the results had been summarised in an extra chapter; this is done to a slight extent in the preface. A greater number of numerical calculations would also have been advantageous in giving a clearer grasp of the results, but the great labour required for such an undertaking sufficiently explains the omission.

THE LAND AND ITS LORE.

(1) *Common Land and Inclosure.* By Prof. E. C. K. Gonner. Pp. xxx + 461 + 5 maps. (London: Macmillan and Co., Ltd., 1912.) Price 12*s.* net.

(2) *Byways in British Archaeology.* By Walter Johnson. Pp. xii + 529. (Cambridge: University Press, 1912.) Price 10*s.* 6*d.* net.

(1) SCIENTIFIC studies of the history of land-holding have a peculiar importance at the present moment, when legislative innovations in ownership are so widely mooted on *a priori* grounds. By supplying valid inductions from the past, science here, as in other spheres, provides the statesman with a solid foundation for political principles, and a sure test for fallacious schemes.

The entire history of English agriculture, so far as it is connected with national progress and advance in civilisation, is bound up with "common" and inclosure, and the passage from the