SHORTER NOTICES

The Mathematical Theory of Electricity and Magnetism. By J. H. Jeans. Fourth Edition. Cambridge, University Press, 1920. vi + 627 pp.

Jeans's text, first printed while he was at Princeton fifteen years ago, has ever since been one of the very few standard texts in its particular field. Some substantial rearrangements and additions were made in the second edition (1911), and more are now found in the fourth, especially with reference to relativity. Nothing is offered on quantum theory or on the modern electrical theory of matter. Though there is some account of electron theory (of the Lorentz-Drude type), the book is essentially an introduction to the Maxwell theory with the additions of those parts of electromagnetic theory most naturally flowing out of Maxwell's point of view. The reason might not be far to seek: the work is, as it states, on the mathematical theory of electricity and magnetism, written by one who revels in the mathematical treatment of nature's problems, and the most recent developments of physical hypothesis relative to the electrical and quantum theories of matter are hardly yet emerging into a mathematical theory of sufficient completeness and elegance to rejoice the heart.

I have read Jeans's book more than once with classes of students who had had a good training in calculus and in the elements of electricity and magnetism; we have found in the text and problems excellent and practicable material for a full year's course with plenty to spare. It is good for young people who plan to be physicists or higher engineers to study the text and to work the problems. A facility is thereby gained in the application of analytic processes to nature. Better headway could be made if students had a better training in analytic mechanics. Greater interest could be more readily maintained if the book were more physical, if more problems were stated in terms of volts, ampères, ohms, etc., and if a greater emphasis were laid on checking the results against experiment. A student may do excellent work upon this text without gaining at all in his sense of contact with nature,—this is often the case with mathematical physics.

Pedagogically the text is very uneven, now easy, now difficult; some of the exercises are almost trivial, others exceed the ability of the best students. The teacher must be wary. Inasmuch as we are offered ample material for two years of study and in view of the real teaching difficulty of developing in a student at one time both the physical and the analytic sense, I incline to the belief that the text would be greatly improved by a major rearrangement of the material, including the exercises, so that first one might have the physical developments and those exercises in which the difficulties are the physical statement and the analysis of the problem, and second the mathematical elaboration and the exercises in which the tricks of mathematical analysis offer the obstacles to be overcome. It is not easy for the teacher to work out this assortment from the text as now composed. However, I do not know whither I should turn for a book that would work out any better for my course on the mathematical theory of electricity and magnetism.

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