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Please write to Mr. S. Douglas Steacy, Engineering Personnel Administrator, Minneapolis-Honeywell, Boston Division, 40 Life Street, Boston 35, Mass.

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SINCE 1885

Lehrbuch der Theoretischen Physik (10th Revised Ed.). By Georg Joos. 842 pp. Akademische Verlagsgesellschaft mbH, Frankfurt am Main, Germany, 1959. DM 38.00. *Reviewed by Jacques Romain, Brussels, Belgium.*

SINCE no single-volume manual of theoretical physics can be complete, the main feature of such a work is the choice of topics made by the author. Dr. Joos' book can be fairly well characterized by noting that the greater part of its contents is classical physics.

The basic mathematical methods are dealt with in some 50 pages. A good exposition of vector calculus is included, but matrices are only briefly mentioned, and tensors even less (no effective use is made of them throughout the book); spinors are completely ignored. About one fifth of the book is devoted to mechanics, including the main points of special relativity. (General relativity is discussed in less than three pages.) The next 200 pages contain a substantial account of electromagnetic phenomena, from the field and from the atomistic points of view, including optics. A good account is given of phenomenological and statistical thermodynamics. The last part is a survey of atomic and nuclear physics, including the general principles of wave mechanics and a few applications. Neither classical nor quantum field theory is broached outside classical electromagnetism. There are additional chapters on optics, piezoelectricity, gas discharges, rubber elasticity, a few mathematical functions, numerical appendixes, and a glossary of technical words.

The exposition is clear and thorough, and the book is attractive. A good many exercises are offered, with fairly detailed solutions. As compared with the third English edition (1958), this last German edition (prepared by the author just before his death) contains a few additions, namely on atomic electron gas, the extension of Schrödinger's equation to forces without a potential and Zeeman effect, semiconductors, and elementary particles. The vector cross product is adopted instead of the old square-bracket notation.

Electromagnetism and Relativity: with particular reference to moving media and electromagnetic induction (2nd Revised Ed.). By E. G. Cullwick. 291 pp. Longmans, Green & Co., Inc., New York, 1959. \$12.50. *Reviewed by T. Teichmann, Lockheed Missiles and Space Division.*

THE classical theory of electromagnetism is among the most thoroughly developed and expounded branches of physics, and the ready practical application of its many results has undoubtedly been a strong impetus to this development. Basic problems in the foundations of the theory resulted in the investigations that led to the theory of relativity, and as a result, relativistic electromagnetism too has received complete and elegant mathematical treatment. Its significance, however, has been mainly in application to the fundamental but relatively simple problems of nuclear and



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Electronics

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atomic particle research. Recent interest in moving conductive media and problems of high-speed space flight have brought to the fore more "practical" questions in relativistic electromagnetic theory, and it is with the elucidation of some of these that this book is concerned.

The point of view adopted is that the comprehensive mathematical theory, while capable of handling all relevant problems, is not always well adapted to their solution in easily understandable physical terms, and that there is in any case a tendency to lose sight of the "physical significance" of the results by a formal treatment. Prof. Cullwick has thus described a physical reference frame (in terms of external and polarization or magnetization field components) and has discussed a great variety of first- and second-order problems involving moving sources, bodies, and media, in these terms. Though the treatment is elementary from the mathematical point of view, it is somewhat sophisticated physically, and requires (and repays) careful study. The author devotes some pains to the careful discussion of the problems treated for he recognizes the somewhat paradoxical situation that the "direct" physical approach is more susceptible to misinterpretation than the physically more obscure formal treatment. His extended discussion of field components and apparent and true charges and polarization is designed to avoid such eventual errors. Among the features worthy of note are careful discussions and interpretations of many of the significant classical experiments of electrodynamics including those of Roentgen, Eichenwald, and M. and H. A. Wilson, as well as Bullard's theory of the magnetic field of the earth.

In his discussion of relativity theory per se the author is insistent, almost to the point of contentiousness, on the view that relativity is a specification of electromagnetic phenomena and not necessarily valid for or relevant to the general theory of space-time. Since, in the opinion of this reviewer, at least, electromagnetism is part of the basic fabric of all matter (even though the underlying unified field is not presently known) this point of view is not convincing, though some narrow justification can perhaps be provided for it.

In the final section, the author presents his ideas on the inertia of current-carrying electrons, on the assumption that the mass is electromagnetic in nature. A discussion of the experiments of Barnett, Einstein and de Haas, and Tolman and Stewart is given in these terms and application made to certain problems of superconductivity.

This work is thus a mixture of valuable physical exposition and somewhat controversial argument. It has been many years since controversial ideas have been presented in a book of this kind (O'Rahilly being the last that comes to mind), and this work should therefore be welcomed for its stimulus to thinking out the basic fundamentals, as well as for its utility in the handling of important practical problems.

PHYSICS TODAY