

and their application to the mass gravific field, the electromagnetic gravific field and their combination, the electromagnetic mass gravific field. A variational method is used throughout, which constitutes a relativistic generalisation of Hamilton's principle of least action, though in a modified form. The mode of presentation adopted in these chapters offers novel features and advantages from the didactic point of view. The ninth chapter gives applications to restricted relativity, including the determination of the mass formula of the electron, the mechanical force due to the electromagnetic field and the stress and momentum components and energy of that field.

In some respects the tenth chapter on relativistic quantisation is the most important in the book in view of the present state of the quantum theory. The author employs a generalised Hamilton-Jacobi characteristic equation together with a transformation of the characteristic function, analogous to that used by Schrödinger, to derive an invariant quadratic function of the derivatives of a wave function, and by applying his variational method to this invariant deduces a wave equation of a very general type consistent with relativity. By specialising this equation he is able to obtain the fundamental quantisation equation of the point electron, and for a Minkowski field this reduces to Schrödinger's equation. The method is extended to continuous systems, and leads to the interesting result that "Relativity is able, not only to furnish quantisation, but even to show that it is a consequence of the condition of *permanence* of statistical ensembles."

The book is clearly printed and commendably free from misprints, and should be read by every serious student of relativity.

Our Bookshelf.

The Determination of Minerals under the Microscope: with Special Reference to the Interpretation of Interference Phenomena. By Dr. John W. Evans. Pp. xii+110. (London: Thomas Murby and Co.; New York: D. Van Nostrand Co., 1928.) 7s. 6d. net.

IN very clear and simple style this book describes the outline to be followed for the complete determination of the optical characters of minerals in thin sections, with some remarks on the application of the same methods to minerals in small grains. The title rightly emphasises the importance attached to the interpretation of interference phenomena, as Chapter vi. on the 'directions image' gives detailed instructions for the determination of optical characters from the interference figures by methods which are neglected altogether in some

schools of petrology. The frontispiece gives a good reproduction of the polarisation colour scale seen when a quartz-wedge is viewed between Nicol prisms, both crossed and parallel, as recently published, by Drs. W. R. Jones and A. Brammall. Chapters vii. and viii., on dispersion and 'other determinations,' are less carefully written than the earlier chapters, and the diagrams illustrating the effects of dispersion on the interference figures are liable to be misleading, as it is not clear which of the two kinds of shading used is meant to represent blue colour and which red.

The book is intended primarily for students, and the author has taken great pains to give the student every assistance. It is even explained that ω is called 'omega,' and that " $V_\rho > V_\upsilon$ may be read V rho greater than V upsilon." One hopes that even in these days of non-compulsory Greek this kind of thing is unnecessary. Another attempt to assist the memory of the reader leads the author to speak of crystals as fast and slow instead of negative and positive. This seems an unnecessary departure from a convention which is universal, and is one of the few points of nomenclature in crystal optics on which there is international agreement. The adoption of an analogous device in France to that suggested by the author would lead them to write of positive and negative crystals as 'grands et petits.' These, however, are trivial points. The student equipped with an efficient microscope will find this an admirable laboratory hand-book, and both author and publishers are to be congratulated on its excellence.

Metaphysics and Modern Research. By I. C. Isbyam. With Introduction and Introductory Essay: The Quest of Spiritual Truth, by Louis Zangwill. Pp. xvi+494. (London: The C. W. Daniel Co., Ltd., 1927.) 15s. net.

THIS book is to be welcomed as a definite attempt to estimate the implications of modern research on philosophy. The author claims that his position rests on Plato, Kant, Leibniz, Bergson, and we are certainly in agreement with him when he maintains that recent advance in physical science has weakened materialistic views to an extent not yet generally appreciated. An introductory essay by Louis Zangwill is of special help to the less experienced student in showing him the unexpected paths that have been traversed in the quest of spiritual truth. This treatment is partly historical and has special reference to the philosophers already mentioned.

The work itself really consists of three books—I. "The Ego and Physical Force"; II. "The Ego and Spiritual Truth"; III. "The Self-Seeker and his Search." The argument is sustained largely by dialogue, and the position of "I" naturally has to be faced; for surely no philosophical system can ignore the problem of solipsism. An interesting development is the idea of orders of ego, in which Mr. Isbyam postulates ego-entities of the first order—physical force; of the second—the impulse to use it; of the third—the emotions which order these impulses; the fourth order—of