

VII.—NEW BOOKS.

La Déduction Relativiste. BY ÉMILE MEYERSON. Payot. Pp. xvi, 396.

M. MEYERSON is already well known in England as the author of two books on the fundamental principles of scientific thought, viz: *Identité et Réalité* and *De l'Explication dans les Sciences*. He has a profound knowledge of the history of science, and he combines this with very wide reading in general philosophy and theology. His method is to consider the historical development of scientific thought; to compare and contrast this with contemporary systems of metaphysics; and to disengage what is permanent and essential to scientific procedure as such from what is temporary and adventitious. In the present book he takes the General Theory of Relativity as the subject to which he applies this method. The result is an extremely interesting work, which is altogether unlike most treatises on Relativity.

M. Meyerson makes no attempt to state the theory in popular terms for non-mathematicians. He sees clearly that this cannot be done. And, on the other hand, there is not a single mathematical formula in the book. He modestly counts himself among 'the profane'; but it is quite evident that he has read very widely and deeply in the works of Einstein, Weyl, Eddington, Planck, and other masters. And he has read with understanding; for wherever there is a pitfall M. Meyerson sees it and avoids it. I do not know whether M. Meyerson's book would be of much use to readers who are not already tolerably familiar with the conceptions of the Special and General Theories of Relativity; but to those who are it will set these theories in a new light and reveal historical affinities which have been ignored before.

The author regards the General Theory of Relativity as the latest step in the attempt to explain nature geometrically, which has been going on since the time of Plato. In this connexion he draws a very interesting parallel between the theory and that of Descartes, and a very interesting contrast between it and the *Naturphilosophie* of Hegel and his immediate followers. The Cartesian and the Hegelian theories of nature agree in wishing to deduce as much and to have as few brute facts as possible. They agree in the immense vogue which they enjoyed for some time; and they agree in now being as dead as mutton. They differ profoundly in that the former is a theory stated in terms of space and geometry and using nothing but mathematical reasoning; whilst the latter uses predominantly qualitative conceptions and eschews mathematical deductions. In these respects we may regard the General Theory of Relativity as a continuation of the Cartesian scheme, based on a much wider and more accurate knowledge of the facts and endowed with much more powerful mathematical apparatus. It bears no resemblance to the Hegelian *Naturphilosophie* except in its claim to be as all-embracing and as deductive as possible. Hence the downfall of the *Naturphilosophie* after its immense popularity is not necessarily ominous for the General Theory of Relativity. But the downfall of the Cartesian physics, and its replacement for so many years by the Newtonian physics, has its lessons for the General

Theory of Relativity. In spite of our natural tendency to seek for geometrical explanations of nature, and in spite of the success with which the Cartesian physics supplied these, it was stopped in mid-career and replaced by the Newtonian conception of central forces, which is a decline from the ideal of geometrical explanation. And it is only in the General Theory of Relativity, by means of the conception of variable spatio-temporal 'curvature', that a return to the geometrical ideal has become possible. It is obvious that the General Theory of Relativity might meet with a check of this kind even if it were fully accepted for a while. M. Meyerson specially remarks three points at which there still lurks contingency which the General Theory has not rationalised; viz.: (1) The apparent asymmetry of the time-series, which manifests itself in physics as Carnot's principle; (2) certain discontinuities in space and time, such as atoms, electrons, quanta, etc.; and (3) the fact that the symbols in any mathematical equation must be interpreted to mean such and such *physical* magnitudes before the theory gets any purchase on reality.

M. Meyerson is extremely good on the claim that the General Theory of Relativity is a kind of 'return to Kant,' in that it makes space and time to be forms which are imposed by each observer on nature. I am glad to see that he entirely rejects this extraordinarily silly mistake. He says (p. 212), 'from the beginning the relativists have devoted themselves to putting everything that has to do with spatial and temporal determinations in a form which shall be valid for *all* observers whatever. It is evident that this can be done only by detaching them from the observing subject and giving them an existence independent of the Ego, i.e., by putting them into the Thing-in-itself.' This seems to me to be exactly correct. Closely connected with this is M. Meyerson's constant protest against the Positivism of Comte and the Phenomenalism of Mach. Science, according to him, is essentially realistic. It cannot and will not regard its atoms and electrons as mere convenient conceptual machinery; and it refuses to be confined to stating the *de facto* connexions between one sensation and another. He has very little difficulty in showing from the history of science that positivism and phenomenalism are travesties of the actual course which science has followed; and that many discoveries would have been missed if scientists had paid too much attention to the commands of Comte and of Mach.

It is difficult to give an adequate summary of this very interesting book, which consists of a series of essays about Relativity and its connexions with other subjects, strung on a single thread. I will confine myself to one remark in conclusion. M. Meyerson, as we have seen, regards the General Theory as making a great step towards the 'geometrisation' of physics; though he admits that this is done only by introducing into Space-Time itself particularities (such as variable curvature) which would ordinarily be ascribed to matter in space. No doubt this is the interpretation which most of the masters of the subject do put on the theory, and no doubt great weight should be attached to this fact. But it seems to me that some weight should also be attached to the contention of Whitehead in his latest book on the subject, viz., that the really essential feature of the Theory of Relativity is that the laws of nature must be expressible in tensor form. These tensors must then be interpreted; and it is *possible*, though not necessary, and (in Whitehead's view) mistaken, to interpret them in terms of spatio-temporal curvature. I mention this, not in criticism of M. Meyerson, whose book remains an admirable account of the predominant view of the subject, but to show that another interpretation is possible.

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