

message was given, is the fitting centre of a movement of the religions for assuring peace between the spiritual forces.'

This is, indeed, a great ideal, towards the realisation of which only the very first steps have yet been taken. There have been many mistakes. Progress, rapid in some directions, has been painfully slow in others. But for those who have the courage to think in terms of the underlying principles which Professor Bentwich has so well expounded in this most stimulating book, the future is not without hope.

WILLIAM W. SIMPSON.

EXPERIMENT AND THEORY IN PHYSICS. By Max Born, F.R.S.
(Cambridge University Press; 2s.)

This is a lecture on the philosophy of discovery in physics, read before the University of Durham a year ago; it will be studied with keen interest not only on account of its author's reputation as one of the greatest of living men of science, but also because it deals with questions that are now being hotly debated.

Fifty years ago there was nothing in the principles of physics to debate about, for there were no opposing views. The corpus of knowledge in the subject seemed to have almost the same degree of certitude as mathematics, and everyone agreed that the method of increasing it was by quantitative observation. As a matter of history, Professor Born remarks that this state of things began at the Renaissance: 'the essential distinction,' he writes, 'between our time and the middle ages consists in the renunciation of tradition and the establishment of experience as the true source of knowledge'; 'the stagnation of science in the middle ages,' he says in another place, 'was due to an excessive veneration for the mind as opposed to material phenomena, leading to a preference for theoretical speculation rather than experiment.' These statements are no doubt in the main correct, although in justice it must be said that Aristotle and St. Thomas themselves held perfectly enlightened views on this point, and the fault lay wholly with their degenerate successors.

Within recent years heterodox doctrines have appeared, which at first sight seem to have an affinity for the late-mediaeval ideas, since they assert, as Professor Born puts it, that 'to the mind well trained in mathematics and epistemology the laws of Nature are manifest without appeal to experiment.' Two distinguished astronomers, Sir Arthur Eddington of Cambridge and Professor E. A. Milne of Oxford, follow this philosophy, though it leads them to divergent conclusions. The present discourse is occupied chiefly with a criticism of their position.

The stimulus to the growth of the new opinions may be found in the great success of Einstein's theory of General Relativity: for Einstein performed no experiments, but worked entirely in his study with mathematical theories, and this is precisely what Milne and Eddington do.

As Born points out, however, it is a fallacy to imagine that, given the knowledge and the penetrating brain of the mathematician, the equations of physics can be obtained as a result of pure thinking, and the toil of experimenters made superfluous. For none of the notions used by the mathematicians, such as mass, electric charge, electric and gravitational field, energy, momentum, vector-potential, Hamilton's Principle, are evident or given *à priori*. 'Even if an extremely gifted mathematician had constructed them to describe the properties of a possible world, neither he nor anybody else would have had the slightest idea how to apply them to the real world. The problem of physics is how the actual phenomena, as observed with the help of our sense organs aided by instruments, can be reduced to simple notions which are suited for precise measurement and used for the formulation of quantitative laws.' Thus the whole set of concepts used by the theorists come only at the end of three centuries of experiment: they are the culmination of a long inductive process, in which flashes of imagination have alternated with diligent observation and interpretation of facts. There is therefore in Milne and Eddington no resemblance to the late-mediaeval attitude, as represented e.g. by the adversaries of Galileo: for these latter had no contact with Nature, and derived their notions entirely from tradition and metaphysics.

The actual assumptions and epistemological principles of Milne and Eddington are briefly described and examined. Their work is certainly of extraordinary interest and wonderful power; but the lack of accord in their results has caused most physicists to hesitate as yet to accept either theory as part of the established order of science.

E. T. WHITTAKER.

A BLUEPRINT FOR LAY ACTION. By Rev. F. J. Ripley. (Paternoster Publications; 4d.)

One opens that sixteen-page pamphlet with high hopes. At last the laity are to be told what to do to play their full part in the apostolate of the Church. Enthusiasm prevails for the first ten pages where, by an intricate mosaic of quotations, the author from a consideration of the doctrine of the Mystical Body shows 'that the apostolate is one of the duties inherent in the Christian life.' The reader is convinced that every Catholic must be an apostle, and he is ready for action. Alas, here a note of vagueness is struck. Reference is made to 'the lay apostolate' and to the need for organisation. Obviously, to anybody with even a nodding acquaintance with Papal teaching the next step must be Catholic Action, and one hastens on to be told just what organisation to join and how it may best be deployed in the field of apostolic work.

The author, while modestly pointing to the Saint Vincent de Paul Society (in Papal terminology an 'auxiliary' to the lay apostolate) and the Legion of Mary, disclaims all intention of making propaganda