

BOOK REVIEWS

KILMISTER ON EDDINGTON

Sir Arthur Eddington

By C. W. Kilmister. The Commonwealth and International Library of Science, Technology, Engineering and Liberal Studies: Selected Readings in Physics. Pp. vi+279. (London and New York: Pergamon Press, Ltd., 1966.) 21s. net.

SIR ARTHUR EDDINGTON was born in 1882 and died in 1944. Thus, he lies in the middle distance historically, a man of the age of relativity and quantum theory, but unaware of modern developments in those fields. For him there were two elementary particles, the proton and the electron. How are we to classify him, as ancient or modern? Has the acceptable part of his contribution been absorbed into the stream of science, and the unacceptable part put away in storage for historians of science to mull over as the freakish product of a freakish mind? If Eddington had been dead for a hundred years, one might attempt some such dogmatic classification, but he is too recent for that, and so one welcomes this book by Professor Kilmister as of great assistance in the assessment of Eddington.

The general title of the series to which this book belongs is *Selected Readings in Physics*, and so it is appropriate that more than two-thirds of the book consists of excerpts from Eddington's writings, selected to cover his wide range of interests. There are four extracts from *Internal Constitution of the Stars*, one from *Mathematical Theory of Relativity* (a long extract giving Eddington's generalized theory), one from *Relativity Theory of Protons and Electrons* (here the Riemann-Christoffel tensor plays a central part), and one from *Fundamental Theory*. Three papers are reproduced: *On the Derivation of Planck's Law from Einstein's Equation*, *The Factorization of E-Numbers*, and *The Pressure of a Degenerate Electron Gas and Related Problems*. Finally, there is a *Manuscript on the Transfer Problem*.

Most of these extracts are prefaced with explanatory remarks by Professor Kilmister, but his real task of explanation is undertaken in the first third of the book. This consists of a number of chapters referring to the extracts already mentioned, but tied rather loosely to them. This provides a very happy arrangement. Had Professor Kilmister tied his remarks closely to the text of Eddington, elucidating this point or that, the result might well have been extremely dull. He elected, however, to dig a little deeper and lay the foundations in his own way. As his ideas about groups and algebra are clearer and more sophisticated than Eddington's, he is able to illustrate complicated situations by simple but pertinent examples. Further, he rivals Eddington in directness and vividness of style. If I were a student, coerced into reading this book for the good of my (scientific) soul, I would spend my time on Kilmister and skim through Eddington. It is not that what Kilmister says is always transparently clear. One feels, however, that there is bedrock somewhere, and from that bedrock argument can be maintained. With Eddington, one is in danger of being swept into a whirlpool of confusion with no rational bottom, or, if there is one, my toes are unable to reach it.

In thinking about Eddington, my mind goes back to the two occasions on which I met him. The first was in Dublin in 1929 or 1930, when we were guests at dinner in the house of Professor John Joly. In the course of conversation, I expressed contempt for Williamson's *Differential Calculus*, long the text-book recommended to students in Trinity

College, Dublin, but sadly lacking in mathematical rigour. Eddington disagreed; he had been reared on Williamson and found no fault with it. I understand better now what he meant. He was an intuitionist. He felt things in his bones, and was impatient of delta and epsilon. Unfortunately, tedious as logically precise discourse may seem, it is the only universal language, and it may be that Williamson is to blame for those obscurities which, as Professor Kilmister very readily admits, render some of Eddington's ideas almost impossible to understand.

A chapter is devoted to *The Gulf between Relativity Theory and Quantum Theory*. Having shown how Eddington proposed to bridge the gulf by means of the Riemann tensor, the 256-fold algebra and linear tensor identities, Professor Kilmister ends the chapter as follows: "The next task was to find a problem which could be treated by these methods. The Einstein universe was selected because it was simple in both theories. The puzzling thing for the reader, however, is that Eddington never gives any straightforward prescription of exactly how the analysis is to be carried out. Even when we have progressed as far as this, we have still not formulated any comprehensive theory in terms of which to do the calculations. These calculations still rely on the art and intuition of the theorist, and it is not easy for others than Eddington to provide this intuition".

The second occasion on which I saw Eddington was some years later in Toronto. He gave a popular lecture on cosmology to a large audience. It was, of course, an excellent lecture, but I was puzzled by the fact that he lectured with one hand behind his back. Then, at the appropriate moment, the hand came forward and raised into the air an orange, illustrating excellently a manifold of constant mean curvature but with many minor corrugations.

The only criticism I have of the extracts selected by Professor Kilmister is that there is none to illustrate the playboy in Eddington. The cover of this book shows a grim-faced Eddington and inside there is reproduced a chalk drawing by Augustus John, less grim but sadder. In the Kingdom of Heaven there is no laughter, and little among scientists, for laughter is caused by the juxtaposition of irreconcilables. In Eddington we find the irreconcilables—the showman's flair on the one hand, as evinced by the orange, or, more generally, by his popular writing, and, on the other hand, his lonely quest into the deepest secrets of nature. I like to think of him now resting on some cloud and shaking with quiet laughter. Eddington was a man who could talk low and talk high, but eschewed the middle-talk which is the currency of most scientists.

Professor Kilmister is to be congratulated on a most interesting book. It contains, I should add, a bibliography of works by Eddington and about him. J. L. SYNGE

EARLY TYPE STARS

The Early Type Stars

By Anne B. Underhill. (Astrophysics and Space Science Library, Vol. 6.) Pp. xiii+282. (Dordrecht: D. Reidel Publishing Company, 1966.) 52 D. florins.

As a comprehensive review of the present state of knowledge regarding early type stars, both observationally and theoretically, this volume will be essential for many more astronomers than those working directly in the field. Indeed, there need be no restriction to astronomers only, for Miss Underhill briefly but efficiently sketches in the basis of each aspect of the study of these stars without presupposing expert knowledge of astronomy, before going into great detail concerning the observational material in particular.

The study of early type stars is very important because, as the most massive ordinary stars known, they are at the