rapidly" or "Even more fundamental than the speed of light is energy". (What exactly can that mean?). More serious a criticism is the worry that in spite of his best efforts the reader may fail to grasp the logic of the theory rather than be convinced by evidence in its favour. But Mr Calder has made a valuable contribution to the demystification of relativity, and one which is most worthy to appear in this year of Einstein's centenary. □

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Einstein's charisma

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Einstein: A Centenary Volume. Edited by A. P. French. Pp. 332. (Heinemann: London; Harvard University Press: Cambridge, Massachusetts, 1979.) £10.50; $25.

THE personality of an intellectual giant like Einstein exerts special fascination. How far is his genius apparent in everyday behaviour? Does he have special insight into non-scientific matters? How does he get on with his ordinary fellows? It is fortunate from this point of view that Einstein's life and opinions have been so well documented: indeed so much has been written about him that it is quite hard to say anything new.

Einstein: A Centenary Volume was written at the instigation of the International Commission on Physics Education, bearing especially in mind teachers and students of physics at secondary and undergraduate levels. It consists of four parts. Part I contains 18 reminiscences and reflections on Einstein, half of them reprinted from elsewhere. Part II is the main part of the book containing thirteen articles on Einstein's scientific work and political and social ideas. Twelve of these seem to be new, and specially commissioned for the book. Part III contains a number of letters from and to Einstein: it is not made clear which (if any) of these are being published for the first time. In Part IV a number of Einstein's writings are reprinted and a pitifully inadequate bibliography is given. The book contains many interesting photographs and drawings and is lavishly produced. However, it certainly does not offer a rounded account of Eintein's work or his personality, and the statement on the dust-cover that the book is "a total assessment of the life and works of one of the intellectual giants of our age" is unjustified. To mention one important omission, there is no description of Einstein's work on cosmology.

In the commissioned essays there are several worthy of serious attention. Silvio Bergia gives a scholarly history of the discovery of special relativity, starting from the relativity of Newtonian physics. His article contains a careful judgement of the parts played in the discovery by Lorentz, Poincaré and Einstein, with special reference to the assessment of E. T. Whittaker, who called special relativity "the theory of Poincaré and Lorentz". Bergia concludes that Whittaker's view cannot be sustained, and that the credit usually given to Einstein is justified. There are competent accounts of Einstein and the quantum theory by Martin J. Klein, and of the observational verification of general relativity by A. P. French.

The highlight of the book for me was the article, "Relativity theory and gravitation", by Hermann Bondi. Bondi presents a derivation of general relativity which differs from that of Einstein, and which he attributes to Fock. He starts with the notion of gravitation as a tidal force only, so that a uniform gravitational field is a zero gravitational field; and he discusses the nature of mass, describing the three different sorts and commenting on the non-existence of negative mass (of the reason for which relativity gives no clue). A somewhat sophisticated treatment of Newtonian gravitation theory is set up for later generalisation. Gravitation is introduced into special relativity by a thought-experiment using the gravitational red shift. A simple introduction to non-euclidean geometry leads painlessly to the Riemann tensor and the equation of geodesic deviation, which is neatly tied up with the Newtonian treatment and the tidal approach. It is beautifully done and should be read by all those interested in general relativity. One feels that Einstein, with his eagerness to explain relativity to the man in the street, would have enjoyed this article.

Among the essays on social and political matters are "Einstein and world affairs" by A. P. French and "Einstein and Zionism" by Gerald E. Tauber. Here Einstein emerges as the idealist, working to put the world right, but almost as much at sea as the rest of us. He espouses utopian ideas such as world government, disarmament and democratic communism; he writes to Roosevelt in 1939 calling attention to the possibility of building an atomic bomb, but later he is horrified when one is dropped; he writes to the President of the USSR Academy of Sciences asking for contributions to a book *One World or None*, and gets a dusty answer. All this was well meant, of course, but how naive and ineffective compared with the majesty of his achievements in physics!

In this field there emerges too a side to Einstein somewhat at variance with the saintliness which his reputation usually enjoys. Although he wrote that he passionately hated "all the loathsome nonsense that goes by the name of patriotism", yet, unable to detach himself emotionally from his Jewish origin, he became a Zionist. He went on fund-raising tours and let himself "be exhibited like a prize ox". Even before the Nazi era, Einstein disliked the Germans and after World War II he developed a pathological hatred of them, calling them mass-murderers. This attitude contrasts ill with that of his Jewish colleague Max Born who showed a gentle forgiveness for Germany after World War II.

Although, as we ought to expect, Einstein had his weaknesses, the book brings out many of his fine qualities. One is his modesty and unpretentiousness—illustrated by the story of how, at a dinner in his honour at which a too fulsome speech was being made about him, he whispered to his neighbour, referring to himself, "But he doesn't wear any socks! ". □

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