and misleading statements were detected in the brief references to the British project. As examples, no distinction is made between R. W. Spence (of Los Alamos) and R. Spence (of Harwell) on p. 73 and in the index, and the work of Welch and collaborators on plutonium compounds (pp. 87–88) is erroneously quoted as having taken place at Harwell rather than at Windscale. The brief description of the Chalk River Laboratories (p. 73) does not mention the important laboratory-scale development of the Windscale plutonium separation plant during the period 1945–48.

The second section of the book, in which the chemical properties of the actinide elements are discussed briefly in a correlative manner, is more digestible. Although one must agree with the author that the main points of the actinide concept are now well established, there will still be many chemists reluctant to see the undiscovered element 104, instead of thorium, taking the eka-hafnium position in the periodic table. At the end of the book there is a shorter fourth section in which Prof. Seaborg attempts to extrapolate the generalizations he has derived to predict the chemical and nuclear properties of elements well beyond those which have yet been successfully synthesized. The magnitude of the experimental problem of isolating such elements is illustrated by a detailed description of the discovery of element 101. Since an average of only one atom of element 101 was expected to be produced in each experiment, the subsequent separation and identification must rank as one of the most outstanding feats in the history of chemistry.

The most valuable part of this book is the third section, which deals systematically with the nuclear properties of the trans-uranium elements. However, there is here, as in the rest of the book, a complete lack of detailed reference to sources of information.

In summary, the book, though containing much material of interest, is written in such a way as to fall rather awkwardly between two stools. Specialists in the field will prefer other expositions on the subject by the same author, while the layman interested in scientific matters will find difficulty in following the book, as a considerable background of scientific knowledge is required for a full understanding of even the historical sections.

The book is well produced, with a commendable lack of typographical errors. J. K. DAWSON

SCIENCE EDUCATION

The Challenge of Science Education

Edited by Joseph S. Roucek. Pp. xiii + 491. (New York: Philosophical Library, 1959.) 10 dollars.

WHEN *Sputnik* was announced to a startled world in October 1957, the reaction in the United States was immediate and vigorous, but nowhere was it more unsettling than in certain radical proposals for revolutionizing the American educational system by copying that of the U.S.S.R. This book is an attempt to make a first systematic survey of the post-*Sputnik* educational practices in the field of science in the United States, the U.S.S.R. and Britain. The work is edited by a former Czech, who commences with a brilliant, short historical account of the impact of science upon human thought and behaviour. More than thirty collaborators are each responsible for a chapter, and these include Dr. James R. Killian,

lately consultant to President Eisenhower, and Dr. Werner Heisenberg. The contributions differ in size and value as is to be expected, and the treatment of the subject is generally diagnostic and experimental rather than conclusive. Standards and content in American science education vary more by reason of geographical location, religious and political factors than they do in Britain, though so far as the last is concerned, even here it still remains to be seen whether politics, which has invaded the field of secondary education, as in Derbyshire, will prove harmful to science teaching at a high level in the grammar schools. The salary-levels, which affect the recruitment of suitable men and women to teach science, operate in the United States more forcibly than in Britain, and there is the added difficulty of the lower rating in social status. "Don't become a teacher," said the head of one science college in the United States, "we want to be proud of all our men."

Werner Heisenberg's defence of a background education in the classics in relation to his own mental development as a theoretical physicist is most interesting and suggestive; and so are the chapters on new approaches to mathematics teaching by using the theories of sets and probability. The underlying tone of the book is by no means optimistic. There is a quotation from Don K. Price ("Government and Science"), who concludes that "The role of world leadership is an uncomfortable one; it requires a steadiness of purpose, an economy of our energies and a breadth of philosophy that have never been characteristic of American temper".

The short account of science education in Great Britain (though it might have been more accurate to say England) by Dr. Kenneth Laybourn of Bristol and the longer account of the U.S.S.R. by L. A. D. Dellin of Vermont are very useful summaries.

The documentation at the end of each chapter is excellent. Every chapter is worth reading and pondering on, particularly by those who are interested in science and mathematics teaching, but generally by those who have any interest in maintaining the free world. W. L. SUMNER

SIR CHARLES HASTINGS

The Life and Times of Sir Charles Hastings, Founder of the British Medical Association

By William H. McMenemey. Pp. xii + 516 + 32 plates. (Edinburgh and London: E. and S. Livingstone, Ltd., 1959.) 50s. net.

IN 1951, Dr. W. H. McMenemey was invited by the Council of the British Medical Association to deliver the first Sir Charles Hastings memorial oration, for which task he was singularly well equipped, for he had worked for several years as pathologist at Hastings's own hospital, and in 1947 had made a name for himself with his scholarly and charmingly written "History of the Worcester Royal Infirmary". An elaboration of this oration, "The Life and Times of Sir Charles Hastings" is a huge tome, to which the hackneyed phrase "labour of love" may unhesitatingly be applied. It will for long remain the standard biography of the founder of the British Medical Association and of the architect of the Medical Act of 1858. Dr. McMenemey possesses a scholar's conscience in consulting original sources, and he quotes extensively and happily from con-