includes such classic works as Prior's classification of meteorites. Prior also put together the first edition of the *Catalogue of Meteorites* which has now gone into a third edition, enlarged and improved by Dr. M. H. Hey. Apart from the catalogue itself the book has a useful summary of the classes of meteorites and an interesting chapter on the history of the British Museum collection. Also included are catalogues of meteorite craters and of tektites in the British Museum collection. A particularly welcome addition to the volume is the summary of minor element determinations. Clearly a summary of major element determinations as well would involve an enormous amount of research, but perhaps it is not too much to hope that future editions will carry such a summary. However, the book is a mine of information as it stands and will be invaluable to those working in the field.

A. M. MARSHALL

Lie Groups for Pedestrians

By Harry J. Lipkin. Second edition. Pp. ix + 182. (Amsterdam: North-Holland Publishing Company, 1966.) 20 guilders; 40s.

THIS book is written for physicists, and will not satisfy those who seek an understanding of the mathematical properties of Lie groups and Lie algebras. The author assumes a previous familiarity with spin and isospin, with creation and annihilation operators and with other quantum mechanical concepts, and he develops the properties of Lie algebras largely by analogy. The book is suitable for those who seek a superficial understanding of the mathematics; it is not recommended for a serious theoretical student, who should have some understanding of the topological background (especially the idea of compactness), and of the relationship between Lie groups and Lie algebras. For an experimental physicist who simply seeks to understand particle classification schemes on a phenomenological basis, the book provides a painless introduction to the subject, working out details of many of the more familiar classification schemes. The author admits that the book is not comprehensive, and this should be borne in mind by the reader.

J. S. R. CHISHOLM

Mixed Boundary Value Problems in Potential Theory

By Ian N. Sneddon. Pp. viii + 283. (Amsterdam: North-Holland Publishing Company; New York: Interscience Publishers, a Division of John Wiley and Sons Inc., 1966.) 40 guilders; 80s.

READERS of this book are impelled along by a number of problems taken from mathematical physics which have the form of boundary value problems of mixed type. Functions, usually harmonic, have to be determined from the specification of the function on parts of the boundary of the domain and of its normal derivative elsewhere on the boundary. There are plane problems and axisymmetric problems including the problems of the charged disk and the charged spherical annulus from electrostatics, punch and crack problems from elastostatics, and slit problems from hydrodynamics. All these are variants on one theme.

Most of the book is devoted to the solution of the harmonic mixed boundary problem by means of dual integral equations and dual series representations. The author is an authority on the subject, and this is reflected in his presentation of the material.

The principal formulae used in the analysis are gathered for easy reference into one chapter, and the basic methods for solving dual integral equations are presented early in the book in connexion with the classical problem of the electrostatic disk.

Most of the dual integral equations studied have Bessel or trigonometrical functions as kernels, whereas the dual series are based on Bessel functions, trigonometrical functions, Legendre polynomials and Jacobi polynomials. Triple integral equations and series representations are

also considered, these arising when different conditions are imposed on three parts of the boundary of the domain.

The power of the methods is evident in the application in Chapter 8 to the electrostatic field effects of electrified disks, strips and spherical caps. Some interesting methods of obtaining bounds to the capacity of condensers formed from circular disks are given here.

This book is to be recommended to all students who wish to become familiar with current methods of research in the title topic.

E. E. JONES

Theory of Automatic Control

By H. Takai. Translated by Scripta Technica, Ltd. Edited by E. J. Feakes. Pp. ix + 315. (London: Iliffe Books, Ltd., 1966.) 75s. net.

CONTROL engineering and control theory have much relevance to other fields, so that it is worthwhile to spread the gospel outside the boundaries to other disciplines. One objects, however, to the fact that it is always the same portion of the Bible which the preachers expound.

Nine of the ten chapters in *Theory of Automatic Control*, translated from the Japanese, deal with the well worn topic of continuous linear systems. Some of the standard sub-topics are discussed and treated quite competently as well, but no more thoroughly or more topically than any number of well established texts which already exist in English and which do not need translation. The tenth chapter is entitled "Nonlinear Automatic Control" but, along with a superficial treatment of non-linear systems, it discusses sampled data systems as if the phenomenon of sampling made it fit into this chapter.

In short, the necessity of translating in 1966 this text, published in Japanese in 1961, is not readily obvious.

PAUL ALPER

The World of Learning

1966–67. Seventeenth edition. Pp. xiv + 1578. (London: Europa Publications, Ltd., 1967.) 150s. net

THE seventeenth edition of *The World of Learning* differs from the sixteenth in that it is even larger and contains more detail on universities and academies in a number of countries which were covered only sketchily in the previous volume. The information on the Soviet Union has been expanded, and the learned societies and research institutes of Argentina, Austria, Japan, Mexico and Holland are now classified systematically. One new feature of the book is the additional information on the chief language of instruction where this is not at once obvious, and on the length of the academic year. More than 150 countries are dealt with in more or less detail: their universities and colleges, libraries, museums and art galleries, and their learned societies and research institutes are listed, as are the names of their leading scholars. The book also contains an international section on the aims and functions of Unesco, and on the various world scientific and cultural organizations. Anyone who deals with scientists outside his own country will find this book a valuable guide to the proliferating network of international science.

JOHN SPENCER

OBITUARIES

Professor C. F. A. Pantin

CARL FREDERICK ABEL PANTIN, who died on January 14, at the age of 67, made many distinguished contributions to invertebrate physiology.

After Tonbridge and Christ's College, Cambridge, he went to the Marine Biological Laboratory, Plymouth, in 1922, where he investigated the physiology of amoeboid movement. In 1929 he returned to Cambridge as lecturer

and fellow of Trinity College. He was then concerned with the physiology of the crustacean muscular system; he wrote a series of papers on the mechanism of excitation and inhibition. Later he made a very precise investigation of the mode of action of the nerve net and muscular system of Coelenterates, in particular in sea anemones. He discovered that the nerve net will only respond to a series of shocks, each of which elicits a single impulse in the net. Each group of muscles responds to a series of shocks of characteristic number and time interval. This enabled Pantin to explain the mechanism by which the animal's behaviour is controlled. He later investigated the functional anatomy of the nemertines, which were then little known in Britain. During this time he became reader in zoology, and succeeded Sir James Gray as professor in 1959.

Among his many general writings was a paper on identification and recognition, which was a presidential address to the British Association. Pantin was also active in the Royal Society, to which he was elected in 1937, and which awarded him a Royal Medal in 1950; he had been president of the Linnean Society, and in 1963 became chairman of the Trustees of the British Museum (Natural History). He was always interested in marine biology overseas, and was recently a very active chairman of the Nuffield Unit of Tropical Animal Ecology in Uganda. Zoology at Cambridge has benefited much from his great interest and experience in the teaching of science.

Professor R. M. Sievert

ROLF MAXIMILIAN SIEVERT died in Stockholm on December 3, aged seventy. He had been director of the Institute of Radiophysics of the Karolinska Institutet since 1937.

When Gösta Forsell, the founder of Swedish radiology, met Sievert, a physicist, in the United States, he persuaded him to start work in radiation physics and build up a hospital organization. In the early twenties hospitals did not standardize the amount of radiation which they administered to patients, and so Sievert and his assistants developed the Sievert condenser chambers to measure dosage. These were soon in use throughout the world. Dosage for the treatment of tumours was based on detailed measurements made on wax phantoms. Sievert was also keenly interested in radiation protection, and this resulted in his work on radiation biology, on which he became an authority.

Sievert realized the importance of international co-operation in the establishment of dose units and protection rules which were generally accepted in all countries. In 1928 he was one of the founders of the International Radiation Protection Committee, and he was later on the United Nations Scientific Commission on Radiological Protection; he was chairman in 1963–66. He was the first member with a natural science degree to be appointed professor of radiation physics at the Karolinska Institutet, which is a medical institute. In 1944 Sievert became a member of the Royal Swedish Academy of Sciences, and in 1959 of the Academy of Engineering Sciences. During the Second World War he had taken the initiative in the formation of a research institute for defence, and he was a member of the board until 1945. His administrative talent was also used in the planning of the Geophysical Research Institute in northern Sweden. His last years were occupied with plans for the National Institute of Radiation Protection, which was ready in 1965. Sievert remained active until the last days before his death, as a chairman of committees, and he continued to take an interest in the work of his institutions.

ARNE FORSSBERG

Dr. Paul White

PAUL WHITE, senior lecturer in applied mathematics in the University of Reading, died on January 7, aged sixty-two.

He was born and grew up in Lewisham, where he attended Colfe's Grammar School, and he went to Clare College, Cambridge, in 1922 as an Entrance Scholar. He gained a double first in mathematics and then a first in physics, and went on to undertake research in the Cavendish Laboratory under Lord Rutherford, working on the properties of β-particles and their passage through thin films. A contemporary of this time refers to "a great personal impression of brilliance". After obtaining a Ph.D., he went to Aberdeen as a Carnegie Teaching Fellow, where with G. P. Thomson he continued and extended his work to consider cathode rays.

In 1933 he went to the University of Reading. Work with Crowther and Liebmann on the interaction of X-radiation with biological colloids and on electro-osmotic effects stimulated an interest in statistics. This led to a lengthy and fruitful period of collaboration with a number of workers, particularly at the National Institute for Research in Dairying, where he provided the statistical basis for the biological work. He also worked with Bond on precise measurements of gas viscosity, and was a founder member of the British Rheologists Club. The demands of war-time teaching developed an unexpected competence in astrophysics and meteorology. After the Second World War, expansion of the University and the shortage of mathematicians led Paul White to transfer to the Department of Mathematics, with special responsibility for the development and teaching of applied mathematics. This marked the end of direct personal and individual research, but he continued to help many people in other disciplines with the mathematical aspects of their work.

White led a very full life in the University; he lived in St. Patrick's Hall, of which he was Senior Resident, sang in the Choral Society and coached an eight on the river—he always undertook the timekeeping of the Head of the River race with enthusiasm and meticulous attention. No account of Paul White's life could be complete without reference to his Christian faith and work. He was a truly devout man, an ardent and active Congregationalist and a staunch supporter of the Student Christian Movement. A lay preacher from his Cambridge days, he was always a welcome preacher in Congregational pulpits over a wide area.

K. W. ALLEN

Dr. C. W. Farstad

CHRISTIAN W. FARSTAD, who was awarded the Gold Medal of the Entomological Society of Canada last year, died at the age of sixty, on November 18, after an operation in a Toronto hospital. He had made many contributions to the control of insect pests; his sawfly resistant variety of wheat has been of particular value.

Born in Norway, Farstad went, with his family, to America, where he was educated. He obtained his B.Sc. and M.Sc. from the University of Saskatchewan and his Ph.D. from Iowa State College. During this time he began his career as an entomologist in 1929, when he became an assistant in field investigations of grasshopper and cutworms at the Dominion Entomological Laboratory at Lethbridge; in 1945 he became the laboratory's chief. In 1935 he took charge of the work on the control of wheat stem sawfly. By 1946 the first solid stemmed spring wheat variety resistant to sawfly, named "Rescue", was available to farmers. This came out of an accumulation of knowledge and experience built up by Farstad with his assistants; his expertise was recognized when he was made director of the Plant Protection Service in 1959. Here he led the organization which was able to identify the golden nematode on Vancouver Island and introduce control measures very rapidly in 1965.

Farstad further contributed to entomology with his activities in the Entomological Society of Canada, of which he had been president. He was also a Fellow of the American Society for the Advancement of Science.