

obituary

Professor W. Ehrenberg, who died on November 19, 1975 at the age of 74, was born and brought up in Berlin. When a boy, he fell a victim to poliomyelitis which left him severely handicapped, but he never allowed this to impede his work in experimental physics, to which he transferred his main interest immediately after gaining his Ph.D. from Heidelberg in 1924. In 1926 he published with H. Mark and G. von Susich some now classic papers in which the natural width of the K X-ray lines was demonstrated and the two-crystal X-ray spectrometer proposed and analysed. With Ewald he conducted an experimental verification of the predictions of the latter's dynamical theory of X-ray diffraction. This and other X-ray experiments were carried out first in Berlin and later at the Technische Hochschule in Stuttgart, where he also made contributions on the diffraction of low-energy electrons and on the wave-mechanical theory of electrical contacts.

In 1933, with other refugees from the Nazis, he joined Professor Blackett's group at Birkbeck College, University of London, where he published papers on cosmic rays and neutron physics. Between 1936 and 1945 Ehrenberg worked at the EMI research laboratories, mainly on problems concerned with radar and the development of television tubes. Although possibly not so fruitful from a scientific point of view, this period of industrial research nevertheless gave him wide experience of electron beam devices and related techniques, which were to prove of considerable value in his later work. During this period he privately embarked on new studies; a paper on entropy and irreversible processes dates from this time, and thermodynamics became an abiding interest.

In 1945 Ehrenberg returned to Birkbeck as one of Professor Bernal's six

Nuffield research fellows: his rôle was to apply electron optical and X-ray optical techniques to problems of crystallographic instrumentation, while remaining free to supervise research in other fields. During the next decade he built up a flourishing research group at Birkbeck College. For him and his students it was a period of intense and exciting activity. In 1949 he published, with R. E. Siday, a theoretical paper on electron optics in which they reached the surprising conclusion that electron interference can be affected by the presence of a magnetic flux even if the electron paths do not pass through a magnetic field. This idea was independently put forward ten years later by Aharonov and Bohm and was then verified experimentally by R. G. Chambers.

On the experimental side he contributed during these years to X-ray optics, particularly to the focussing of X-rays by total reflection at glancing angle from slightly curved surfaces, a development from his experiments in Berlin some 20 years before; but he found the usefulness of the technique to be limited by the excessively stringent requirements for smoothness, a difficulty that has recently been overcome by a group at the National Physical Laboratory, including his former student A. Franks. Another interesting development was the fine focus X-ray tube, devised by him in collaboration with W. E. Spear. The instrument was subsequently marketed by Hilger and Watts and found application in X-ray crystallography. It was characteristic of Ehrenberg that the royalties were assigned to a fund for the development of scientific instruments.

The immediate post-war years also marked the beginning of Ehrenberg's pioneering studies on the conductivity induced in insulating solids under

electron bombardment, which eventually was to become his major concern. His 1951 paper with F. Ansbacher is still widely quoted and was one of the first detailed investigations in this field, which he and his collaborators continued to develop in subsequent years. His major work *Electronic Conduction in Semiconductors and Metals* was published in 1958 by Oxford University Press and contains the fruit of much original thought on the subject.

His appointment in 1951 to a Readership at Birkbeck College was followed in 1962 by a Chair of Experimental Physics; two years later, Ehrenberg became head of the Physics Department. Administrative responsibility thus came late in his career, but he applied to its problems the same penetrating and flexible mind that had enabled him to redirect his interests first from philosophy to physics and then successively between several fields of specialisation. After retirement in 1968 he continued to examine, to supervise research and to participate actively in colloquia. In his final years he brought to bear on the preparation of a book on *Cause, Necessity and Chance* his combined knowledge of three classical philosophy, science and languages.

Werner Ehrenberg was a remarkable man, who showed great courage in facing and overcoming the many difficulties caused by his physical disability. His humanity, enthusiasm, experimental ingenuity and physical insight were an inspiration to all, and especially to his research students, who held him in deep affection for his total devotion to the search for truth and for the generosity and imagination with which he would enter, often at a moment's notice, into a discussion of almost any problem on the enquirer's terms. His friendship was as unforgettable as it will be irreplaceable.

Reports and publications

Philosophical Transactions of the Royal Society of London. A: Mathematical and Physical Sciences. Vol. 280, No. 1298: A Discussion on Global Tectonics in Proterozoic Times. Organised by J. Sutton, FRS, R. M. Shackleton, FRS, and J. C. Briden. Pp. 397-667 + plate 14. (London: The Royal Society, 1976.) UK £12; Overseas £12.50. [221]
 The Abortion Hurdle Race: The Role of the Doctor as a Taker of Abortion Decisions. By Francois Lafitte. Pp. 10. (Solihull, West Midlands: British Pregnancy Advisory Service, Austy Manor, Wootton Waven, 1975.) [261]
 Bulletin of the British Museum (Natural History). Zoology. Vol. 29, No. 1: A Review of the Family Centropomidae (Pisces, Perciformes). By P. H. Greenwood. Pp. 1-81. (London: British Museum (Natural History, 1976.) £5.85. [261]
 Physics and Ethics: The Influence of Newton on

Person to person

Three-bedroom furnished home available from September '76-Aug. '77. Similar accommodations required in Paris for 8 months, beginning Sept. '76. Please contact Dr B. Sarkar, Hospital for Sick Children, Toronto, Ontario, Canada, for further details.

Moral Philosophy. By Professor D. D. Raphael. (Inaugural Lecture, 11 March, 1975.) Pp. 17-23. 50p. Bonds and Bands. By Professor N. H. March. Pp. 25-35. (Inaugural Lecture, 29 April, 1975.) Pp. 25-35. 80p. (London: Imperial College of Science and Technology, 1975.) [261]

University of London. University College Annual Report, 1974/1975. Pp. 156. (London: University College, 1976.) [281]

Philosophical Transactions of the Royal Society of London. A: Mathematical and Physical Sciences. Vol. 281, No. 1299: Free Surface Oscillations and Tides of Lakes Michigan and Superior. By C. H. Mortimer and E. J. Fee. Two Dimensional Normal Modes in Arbitrary Enclosed Basins on a Rotating Earth: Application to Lakes Ontario and Superior. By D. B. Rao and D. J. Schwab. A Theory of Short Period Tides in a Rotating Basin. By P. F. Hamblin. Pp. 1-111. (London: The Royal Society, 1976.) UK £6; Overseas £6.15. [291]