

possibilities of post-treatment have not yet been adequately explored. From a practical point of view, keeping the exposure low by physical protection or avoiding the radiation are the only useful procedures at present. However, if the progress of the past decade were to continue, practical methods for reducing genetic damage in other ways might well become available. Meanwhile, this work is developing a better picture of the events involved in the induction of mutations and chromosomal aberrations by ionizing radiations, and so is providing the basic foundation upon which further developments in this field must rest.

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## OBITUARIES

### Sir Edmund Whittaker, F.R.S.

SIR EDMUND WHITTAKER, emeritus professor of mathematics in the University of Edinburgh, died in Edinburgh on March 24. He had been for some time in failing health; but he retained to the end his mental faculties clear and unimpaired.

Edmund Taylor Whittaker, of a family which he was able to trace back through several generations (the Whittakers of Grindleton, near Clitheroe on the Ribble), was born at Southport on October 24, 1873. He was educated at Manchester Grammar School, and in 1891 went up with an entrance scholarship to Trinity College, Cambridge. In 1895, in a Tripos of great distinction, he was Second Wrangler, bracketed with J. H. Grace and followed by Alfred Young; the Senior Wrangler was T. J. I'A. Bromwich. All four of these men were destined to make a variety of contributions to mathematics. In 1896 Whittaker was elected a Fellow of Trinity College, and in 1897 he was First Smith's Prizeman. His first long paper embodied the results of his thesis, which was on automorphic functions; here, as elsewhere, his inspiration was derived in the first place from Poin-

caré, whom he placed very high in his pantheon of modern mathematicians.

In 1902 he published his first book, "Modern Analysis", destined in its later editions, from the second in 1915, when he had the collaboration of G. N. Watson, to have a wide influence on the teaching of functions of a complex variable and their various expansions, and almost more on the study of special functions and the differential equations associated with them. To the end of his life he preserved the keenest interest in the functions and partial differential equations of mathematical physics. In 1902 he also discovered his well-known general solution of Laplace's equation, and in 1903 he introduced the now very familiar confluent hypergeometric function, about which quite a literature has gathered. During all this time, with characteristic versatility, he had also been writing on problems of dynamics involving periodic orbits. His second book, "Analytical Dynamics", may be called epoch-making in a very precise sense, in that on the very eve of the era of relativity he summed up in rounded chapters the classical dynamics from Lagrange through Hamilton to Poincaré and Levi-Civita. He

had the gratification, and once at least the surprise, of seeing this work translated into other languages.

In 1906 Whittaker was appointed professor of astronomy in the University of Dublin, under the title of Royal Astronomer of Ireland. Though his duties pertained in a general way to astronomy, it was understood that his chief function was the strengthening of the school of mathematical physics. He therefore gave courses of advanced lectures, one of his pupils, whose future career was not to be in mathematics, being Mr. de Valéra. His principal work of these years, a work of piety and one that entailed an immense amount of reading and historical research, was his "History of the Theories of Aether and Electricity, from the Age of Descartes to the Close of the Nineteenth Century", published in 1910. This, together with its revision and amplification of 1951, and a second volume appearing in 1953 (his eightieth year) and bringing the history up to 1926 (thus just entering the Born-Heisenberg-Jordan-Schrödinger-Dirac period), must be regarded as his *magnum opus*. The last sentence of this second volume reserved for a third volume an account of later developments up to 1950; but this, though the mental power remained, the physical strength was not sufficient to carry through.

On the death in 1911 of George Chrystal, professor of mathematics in the University of Edinburgh, Whittaker was elected his successor, entering on his duties in January 1912. He held this post for thirty-five years, retiring in 1946. In Edinburgh he founded a school of research and, guided in part by the example of Runge in Germany on numerical analysis, a mathematical laboratory, at a time when this was an innovation in universities in Britain. With G. Robinson he published in 1924 a book, "The Calculus of Observations", based on the experience of the laboratory and his own knowledge of this field. Some of the incentive, and a certain part of the material, came from his contact with actuaries in Edinburgh, in particular from his close friendship with the very distinguished actuary, the late Dr. G. J. Lidstone. He will, however, be chiefly remembered in Edinburgh for his teaching, full of inspiration and flawless in delivery; he regarded it as incumbent on him to give lectures to classes at every level. At the same time, he took more than a full share in university administration and in membership of outside bodies.

On the Continent of Europe and in the United States Whittaker was very well known, and indeed kept up an extensive correspondence with mathematicians all over the globe. The mere enumeration of his honorary doctorates, fellowships, visiting lectureships or professorships, presidentships, foreign memberships and other distinctions would exceed the limits of space, and is available in any event in works of reference; much as he valued his well-deserved medals, the Sylvester, the De Morgan, the Copley and others, he appeared to be specially touched and warmed by the honorary fellowship of Trinity College, bestowed on him in his later years and reminding him of his earlier. He was knighted in 1945.

After 1930, when he was received into the Roman Catholic Church, Whittaker's interests turned to natural theology; several of his essays and books of this period, such as "Space and Spirit", have as their explicit aim the reconciliation of modern natural and cosmological science with religion. These pre-occupations are a mark of the underlying seriousness of his character. In mind he was clear and rapid to a quite exceptional degree; his capacity for industry

was equally beyond the normal; not least he possessed a Roman *pietas*, exercised not only in seeing justice done to the most obscure of his remote precursors in natural philosophy, but also to those close at hand, as when—to choose but one instance—he took up and edited the posthumous manuscripts of Eddington, thus producing the book, "Fundamental Theory". In manner he was unfailingly courteous, yet not formal; entirely accessible and sympathetic.

He is survived by Lady Whittaker, daughter of the Rev. Thomas Boyd and granddaughter of Sir Thomas Jamieson Boyd, of Edinburgh, and by three sons and two daughters. His second son, Dr. J. M. Whittaker, formerly professor of mathematics in the University of Liverpool, is now vice-chancellor of the University of Sheffield. A. C. AITKEN

### Prof. A. M. Blackman, F.B.A.

PROF. A. M. BLACKMAN, who died at Abergele on March 9 at the age of seventy-three, was almost the last surviving member of the older generation of British Egyptologists whose researches and publications during the past sixty years have so widely extended our knowledge of Ancient Egypt and early man.

Aylward Manley Blackman was born on January 30, 1883, the eldest son of the Rev. J. H. Blackman, and until he was sixteen was educated privately. He then entered St. Paul's School, whence he obtained a scholarship to Queen's College, Oxford. Under the influence of his father, a keen amateur archaeologist, Blackman had at a very early age acquired an abiding interest in Egypt and in archaeology, and hence on going to Oxford it was not surprising that he should have read Egyptian, Coptic and Arabic. In 1906, he obtained a first class in Oriental studies.

Blackman's first few years after graduation were busily spent in Nubia and Egypt. During 1907-8 he was one of the assistants of the late Prof. G. A. Reisner on the first of the great expeditions of the Archaeological Survey of Nubia and thus obtained practical field-experience in a very hard school. During 1909-10 he helped in the excavations by the University of Pennsylvania at Buhen, slightly to the south of Wadi Halfa, and was solely responsible for the inscriptional work of the expedition. 1910, in fact, was an intensely busy year for him. In that year he was elected Oxford University Nubian Research Scholar and participated in the Oxford Excavations at Faras, a few miles north of Wadi Halfa on the Egypto-Sudan frontier. Almost simultaneously he became one of the international team of scholars engaged in recording those of the Nubian temples that the building of the Assuan Dam threatened to submerge. Between January and May, 1910, by dint of prodigious physical effort and at the cost of sickness the effects of which never left him for the rest of his life, he recorded all the scenes and inscriptions in the temples of Bigeh, Dendur and Derr (all published between 1911 and 1915), and began but never completed the record of the temple of Gerf Hussein.

In 1912, he was elected Laycock Student of Egyptology at Worcester College, Oxford, and in the same year he began, on behalf of the Egypt Exploration Society, the copying of the inscriptions of the important group of rock tombs at Meir in Middle Egypt. His work at Meir occupied the seasons 1912-14,