and of the Royal College of Physicians in 1937, and received the honour of knighthood in 1947.

In the period from about 1910 to 1920, Kennaway was the author of a whole series of papers, on a great diversity of topics, which unmistakably revealed the breadth of his knowledge and interests in chemistry, physiology and pathology, and gave a taste of things to come. Certainly, however, it is upon his massive achievements in the sphere of malignant disease that his name and fame are based and will endure. In the early 'twenties, great efforts were under way to elucidate the nature of the cancer-producing agent in tar and pitch, following the successful induction of cancer through application of coal-tar to the rabbit skin by Yamagiwa and Ichikawa (1915), and in the mouse by Tsutsui (1918). Between 1921 and 1926, Bloch in Zurich had found that the active substance was concentrated in the higher boiling fractions as a neutral compound probably belonging to the class of cyclic hydrocarbons. In 1924–25, Kennaway succeeded in producing carcinogenic tars by the pyrolysis of many organic materials, and by leading acetylene and isoprene with hydrogen through heated tubes. The tars obtained at successively higher temperatures showed an ascending potency, and the results could be explained by assuming that acetylene was a common decomposition product, and that the carcinogenic material was built up from it. In all this work, Kennaway ever acknowledged the value of Berthelot's classical paper of 1866, describing for the first time the production from acetylene of these very kinds of molecule.

We are fortunate, indeed, that he left his own characteristic account of these and later developments (*Brit. Med. J.*, 2, 749; 1955), setting forth their history, and making clear the essential part played by others at the Cancer Hospital—W. V. Mayneord's examination of the fluorescence spectra of the carcinogenic tars, and the discovery of their special qualities (1927); the development of this clue by I. Hieger; the discovery that 1 : 2-benzanthracene gave a spectrum similar to that of the carcinogenic mixtures; and J. W. Cook's studies of the benzanthracene homologues. About this time, Clar had just published methods for the synthesis of certain benzanthracene hydrocarbons. These compounds were tested by Kennaway and Hieger (1929–30), who soon observed positive results with 1 : 2 : 5 : 6-dibenzanthracene: this was the first pure compound manifesting pronounced carcinogenic properties, and one cannot forget the satisfaction and modest pride which Kennaway obtained from the fact. The fluorescence spectrum—in Kennaway's words "the single thread that led all through this labyrinth"—was also used in the concentration of the agent from coal-tar pitch, culminating in the isolation of a hydrocarbon which showed the characteristic spectrum and which proved to be highly carcinogenic. Its properties suggested one of the two benzpyrenes, and these were synthesized by J. W. Cook and C. L. Hewett, who were then able to prove the identity of one of the compounds (3 : 4-benzpyrene), and the substance from pitch. All these, and many other results which Kennaway alone inspired, are embodied in numerous papers (many of them classics) in the scientific literature at home and abroad, and, most notably, in a celebrated series which appeared in the *Proceedings of the Royal Society* during 1932–42. What undoubtedly emerged from almost thirty years of brilliant work was a satisfying and indeed beautiful correlation between chemical constitution and biological action, whereby the carcinogenic sub-classes of polynuclear hydrocarbons could clearly be related to the parent substance phenanthrene, in a system suggesting dependence upon certain optimal features of molecular size, shape, substitution and reactivity. But we must not minimize another result—namely, the profound practical influence which was exerted upon the whole of cancer research, and indeed biology at large, from the mere availability of these potent carcinogens, so rendering possible, and catalysing, numerous other investigations, and additions to knowledge, which could not have been attained without them.

No imagination is needed to see how this career demanded a patient sense of purpose over so many years. In certain ways Kennaway possessed a unique combination of qualities—in his intellectual aptitudes, his chemical sympathy and knowledge, and in his unrivalled skill in applying them to physiology and pathology. Apart from his modern scientific bent, he was also a true naturalist, believing greatly in field work and epidemiology. His standards of scientific evidence were rigorous and severe, to the point of austerity. His experimental methods were simple, practical and decisive, and a delight to watch in execution. He was much less interested in hypotheses and explanations, and although his own work had lain almost entirely in the chemistry of carcinogenesis, he remained completely open and free to accept any other mechanism or interpretation—provided only that the facts were ascertained, and not an instant before. Added to all these gifts, he was a master of scientific expression, and of English construction.

We have lost a great discoverer and scientific worthy. Among his personal attributes two things prevailed. First, his profound agnosticism. Secondly, a superb fortitude, which enabled him to triumph over disability, illness and accident, and to continue his researches long after his official retirement and almost to the day of his death. Of course, he had many other interests, and many human concerns which he did not parade and which, contrariwise, he often tried to conceal. It is idle to pretend that Kennaway was easy, or that he could readily apply to ordinary judgments the quality of detachment he brought to his special field. But for how many can anything of the kind be claimed? Although he could be subjective and quixotic even more than most of us, these foibles were mere additions—often endearing—to the fascination of an already complex human character, and had no real bearing on the solid worth of his permanent achievement.

No appreciation could be complete which failed to refer to a factor at all times apparent to those who worked with him—the part played by Lady Kennaway in every aspect of his life and contribution. Not in any small measure due to his helpmeet, he wrote a vast chapter in cancer research and chemical pathology, which nothing can diminish, or take away.

A. HADDOW

Dr. A. J. Ewins, F.R.S.

DR. ARTHUR JAMES EWINS died after a long illness on December 24, aged seventy-five. He will long be remembered for his discovery of several important chemotherapeutic remedies.

Ewins was born in 1882 at Norwood, the son of Joseph Ewins, who was a signalman on the London and South-Eastern Railway. A scholarship took him to Alleyn's School, Dulwich. Leaving at the age of

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seventeen, he obtained a position as technician at the Wellcome Laboratories, Herne Hill, working under Dr. (later Prof.) G. Barger. By evening studies at Chelsea Polytechnic, he graduated with honours in 1906, and was promoted to the staff of the Wellcome Laboratories. Soon he began to co-operate with Dr. (later Sir) Henry Dale in work on acetylcholine, other choline esters, and the ergot alkaloids, and this formed the basis of a long and valued friendship between them. When Dale entered the service of the Medical Research Committee (later Council) in 1914, Ewins did the same, and worked with him in the production of 'Salvarsan' and other drugs formerly made in Germany and by then no longer available. Early in 1917 he was offered an attractive appointment with May and Baker, Ltd., which he accepted; and he continued with this firm for the rest of his scientific life, becoming the head of its chemical research department and director of research.

Ewins's main interest was in chemotherapy. After much work on the organic arsenicals, he turned his attention to other fields. In the middle 1930's Dr. E. M. Lourie and Prof. Warrington Yorke, of Liverpool, had discovered that synthalin was very active in killing trypanosomes *in vitro*. Following development work by the late Dr. Harold King at the National Institute for Medical Research, Ewins took up this lead and synthesized a long series of diamidine compounds, of which the most active, pentamidine, has proved of great value in combating sleeping sickness in Africa. One intramuscular injection is enough to protect a man against this infection for six months, and this procedure has been applied to millions of people in tropical Africa to safeguard them against this dangerous disease. Another member of the same series—phenamidine—is widely used for curing babesiasis (redwater) of cattle and dogs. These drugs are also active against kala-azar.

The work for which Ewins is best known was his discovery of the famous '*M & B* 693', or sulphapyridine as it was later named. After prontosil had been prepared by Domagk and Mietsch in 1933 as a cure for streptococcal infections, the French workers, Trefouel and Bovet, showed that the antibacterial activity resided in the simple structure—*p*-aminobenzene sulphonamide, or sulphanilamide. The early attempts to obtain greater and wider activity by modification of this structure were not very successful until in 1937 Ewins and Phillips inserted a pyridine group in the sulphonamide radical. This compound was tested by Sir Lionel Whitby and found to be very active in curing mice experimentally infected with pneumococci. The new compound was quickly applied to human infections and proved to be brilliantly successful, and for the first time in medical history lobar pneumonia could be cured by a simple drug. Later, sulphapyridine was supplanted by other more active and less toxic compounds (including sulphathiazole synthesized by Ewins and Newbery), but the inspiration of its discovery will long be remembered. In 1943, Ewins was elected to the Royal Society. He continued to direct the research organization which he had built up until his retirement in March 1952.

Ewins was a simple and modest man, but he knew his own mind, and once he had made a decision he persevered with determination. He was well liked and well respected. Besides his scientific work, his chief pleasures were working in his garden, reading and motoring. He leaves a son and a daughter.

F. HAWKING

NEWS and VIEWS

The United Kingdom Atomic Energy Authority

MR. W. R. J. COOK, deputy director of the Atomic Weapons Research Establishment, Aldermaston, has been made a full-time member of the Atomic Energy Authority. This new appointment makes it possible to progress towards certain alterations in the structure of the Authority. Three full-time members of the Authority have hitherto each had three types of responsibility. First, they have had executive control of one or more of the Authority's establishments. Second, they have been responsible for formulating policy on, and for broad oversight of, the subjects constituting their own special fields (research, production and engineering, and weapons). Third, they have had to join with their colleagues in considering and deciding jointly on the general policies to be pursued by the Authority. The purpose of the alterations which are being made is to free these members from their executive duties, and thus enable them to devote more time to their other responsibilities. Sir John Cockcroft, who has since the setting up of the Authority held the posts of member for scientific research and director of the Atomic Energy Research Establishment, Harwell, will be succeeded in the latter post by Dr. B. F. J. Schonland (the present deputy director).

Mr. Cook will be responsible at Board-level for policy questions concerning the Authority's production factories and the engineering aspects of the Authority's work. Since Sir Leonard Owen was appointed managing director of the Industrial Group in September 1957, he has had executive charge of the establishments in that Group. Sir William Penney will continue to be member for weapons research and development and, pending the appointment of a new director of the Atomic Weapons Research Establishment, he will continue to hold that post also. The duties of Sir Donald Perrott, member for finance and administration, and of Mr. W. Strath, member for external relations and commercial policy, are unchanged. Mr. Cook and Dr. Schonland will take up their new appointments on February 17.

National Research Council of Canada: Dr. J. B. Collip, C.B.E., F.R.S.

THE retirement is announced of Dr. J. B. Collip from the directorship of the Division of Medical Research of the National Research Council of Canada. He has held this appointment since 1947 when the new Division of Medical Research superseded the old Advisory Committee on Medical Research, of which Dr. Collip had also been chairman since 1941. Dr. Collip, of course, is best known for his work in purifying the early preparations of insulin and thus playing a leading part in making this hormone available for general clinical use. Dr.

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