OBITUARY NOTICE.

JACK CECIL DRUMMOND.

1891—1952.

DURING the night of August 4th—5th, 1952, Sir Jack Drummond, his wife, and their ten-year-old daughter Elizabeth were savagely murdered while camping near Lurs in the Basses Alpes. At the time of writing this notice neither the identity of the assassin nor the motive for this monstrous crime is known. It is particularly poignant that he should have met his death in such a manner in a country which he loved so well and in which he was so highly respected both as a scientist and as a man.

Jack Cecil Drummond, only child of Major John Drummond of the Royal Artillery, was born on January 12th, 1891. Both of his parents died during his early childhood and he was brought up by an uncle, a Crimean War veteran. He received his school education at Roan School, Greenwich, and at King's College School in the Strand. As a boy he was not robust and was unable to take much part in school sports. From an early age, however, he was keenly interested in nature study and photography, and there is little doubt that his interest in the latter hobby marked the beginnings of his interest in chemistry. His uncle was an enthusiastic gardener, and it seems probable that it was from him that Drummond first acquired the great love for gardening which remained with him all his life.

In 1909 he entered East London College (now Queen Mary College) and graduated three years later with a First Class Honours degree in Chemistry of the University of London. With his family background it is not surprising that he was interested in military matters, and while at college he became an enthusiastic member of the Officers' Training Corps. It was not long, however, before ill-health compelled him to resign from the Corps, and for the same reason he was later prevented from serving in the armed forces during the 1914—18 war. His inability to serve in the war was a source of deep and lasting regret to him.

For a few months after graduating Drummond carried out research at East London College under Professor J. T. Hewitt, and then the opportunity to embark on a career in biochemistry was provided when he was appointed to a research assistantship in the Department of Physiology at King's College, London. He remained in this post for a short period only; but it was an important period in determining his subsequent career, since he came into contact with two men, Dr. Otto Rosenheim and the late Professor W. D. Halliburton, who exerted a profound and lasting influence upon him. There is no doubt that it was Rosenheim who first awakened Drummond's interest in the then-embryonic subject of biochemistry, and who taught him the value of the organic chemist's approach to biochemical and physiological problems—a lesson which he learned well and passed on in due course to his own pupils—while his subsequent interest in food chemistry and nutrition was to a considerable extent due to Halliburton's influence. His association with Rosenheim and Halliburton continued for many years after he had left King's College, and during the later years of his life he often spoke of both in terms of affection, gratitude, and respect.

The first task assigned to Drummond at King's College was that of assisting Dr. William Bain in an investigation of the pressor bases in normal urine, in the course of which *iso*-amylamine was successfully isolated. Bain's indebtedness to his young assistant was acknowledged in the following words: " I owe a great deal to his knowledge of chemical technique, without which my results would have been impossible " (*Quart. J. Exp. Physiol.*, 1914, **8**, 229). Also during his short stay at King's College Drummond collaborated with Rosenheim in devising the well-known volumetric benzidine method for the determination of sulphates in urine (*Biochem. J.*, 1914, **8**, 143), a method which Drummond later adapted to a micro-scale (*ibid.*, 1915, **9**, 492).

After leaving King's College Drummond worked for a few months as an Assistant Analyst in the Government Laboratory, and then in 1914 was appointed as assistant to Dr. Casimir Funk at the Research Institute of the Cancer Hospital in Fulham Road. His association with Funk, who at that time was attempting to isolate the " antineuritic vitamine " from rice polishings, was one of the several influences which were responsible for his subsequent interest in nutritional problems. At that time the importance in animal nutrition of the amino-acid make-up of dietary proteins and of certain so-called " accessory growth-promoting substances " had only recently been revealed, and in the circumstances, therefore, it was natural that Drummond should have decided to investigate the possible effects of amino-acid and accessory-food-factor

deficiencies on the growth rate of tumours in experimental animals. The results of this work (*ibid.*, 1917, **11**, 325) were negative in so far as he showed that tumours may continue to grow at the expense of the host, even though the growth of the latter is entirely inhibited by dietary restrictions. However, in the course of this and preceding work he had made himself master of the animal-feeding technique, and accordingly, when Halliburton, as a member of the Food (War) Committee of the Royal Society, required assistance in *ad hoc* investigations of the nutritional value of various fats, he invited Drummond to collaborate with him. These investigations (*J. Physiol.*, 1917, **51**, 235; 1919, **52**, 95, 328) marked the beginning of Drummond's long-maintained interest in the " fat-soluble A " accessory food factor. Subsequently, while still at the Cancer Hospital, he independently carried out preliminary investigations on the nature of the " fat-soluble A " factor (*Biochem. J.*, 1919, **13**, 81), and was one of the first workers to show that a deficiency of this factor results in a marked lowering of the resistance of experimental animals to bacterial infections (*ibid.*, p. 95). During the same period he also carried out a very painstaking and laborious investigation of the amino-acids in tumours (*ibid.*, 1916, **10**, 473), and made some preliminary studies on what was then known as the " water-soluble B " accessory food factor (*ibid.*, 1917, **11**, 255; 1918, **12**, 25).

In 1918 he was awarded the degree of Doctor of Science by the University of London for a thesis on " A Comparative Study of Tumour and Normal Tissue Growth," and in the same year he was appointed to succeed Funk as Director of Biochemical Research at the Cancer Hospital. By this time his reputation as one of the most talented and energetic young biochemists in the country was securely established, and in the following year, when R. H. A. Plimmer resigned his Readership in Physiological Chemistry at University College on being appointed to the Chair of Chemistry at St. Thomas's Hospital, Drummond was the obvious choice to succeed him. Three years later, at the early age of thirty-one, he was appointed to the newly-created Chair of Biochemistry at University College.

The Department which Drummond created at University College, although small and never in his own time an independent autonomous one, soon became recognized as one of the most important centres of biochemical teaching and research in the country and exerted an influence on the development of biochemistry out of all proportion to its size. At first much of the work was concerned with nutrition, but Drummond's policy was to encourage his more senior colleagues and pupils to develop independent lines of research of their own, and thus the interests of the Department rapidly broadened. Drummond believed that it was an important part of his duties as a professor to train men for senior posts elsewhere, and so successful was he in doing this that no fewer than nine of those who were his colleagues or pupils now hold or have held chairs. The secret of Drummond's success as a professor lay not only in his personal qualities as a teacher and research worker, but also in his happy knack of being able to inspire those who worked with him with something of his own attitude towards teaching and research. He himself was a brilliant lecturer, and it is no coincidence that many of those who were his pupils at University College later established reputations for themselves as good teachers.

Throughout his University College days Drummond's own research interests were largely, but by no means exclusively, centred around vitamin A. His work in this field was carried out not only in collaboration with assistants in his own Department, but also with workers from elsewhere including his old friend Rosenheim, S. S. Zilva of the Lister Institute, J. Golding of the Research Institute for Dairying at Reading, and I. M. Heilbron, R. A. Morton, and T. P. Hilditch of Liverpool University. Drummond always appreciated the practical importance of the distribution of the vitamin in animal and vegetable fats, and over the years he published a large number of papers on this topic. His joint monograph with Professor Hilditch on " The Relative Values of Cod-liver Oils from Various Sources " (H.M.S.O., 1930) published on behalf of the Empire Marketing Board contains a wealth of data, the value of which to the cod-liver oil industry can hardly be overestimated.

Drummond and Rosenheim were among the earliest workers to suggest that vitamin A might be related to the carotenoid pigments (*Lancet*, 1920, I, 862), but in his own subsequent work in this field he was the victim of circumstances and misfortune. His early feeding experiments with carotene were carried out at a time before vitamins A and D had been clearly differentiated and before it was known that both factors are necessary for normal growth in young rats; and in his later experiments (*J. Soc. Chem. Ind.*, 1929, **48**, 316T; 1930, **49**, 291T) he was unfortunate enough to select ethyl oleate as a vehicle for the administration of the carotene, a solvent in which the latter is rapidly autoxidized.

The part played by Drummond in the development of the invaluable antimony chloride colour reaction for vitamin A never received the recognition which it deserved. As early as

1920 he and Rosenheim suggested that the chromogen responsible for the well-known transient purple colour given by cod-liver oil on treatment with sulphuric acid might be related to the vitamin (*Lancet*, 1920, I, 862), and later work with A. F. Watson indicated that this suggestion was well founded (*Analyst*, 1922, **47**, 341). In 1925 he and Rosenheim described the more sensitive and less transient colour reaction given by liver-oils with arsenic trichloride and provided strong evidence indicating a relation between the chromogen and the vitamin (*Biochem. J.*, 1925, **19**, 753). The following year the procedure was improved by Carr and Price (*ibid.*, 1926, **20**, 497) who substituted antimony trichloride for arsenic trichloride. In the circumstances it seems less than just that this colour reaction should have become generally known as the " Carr–Price " reaction rather than as the " Rosenheim–Drummond " reaction, particularly since Drummond himself in collaboration with R. A. Morton provided the first satisfactory evidence that the colorimetric method is a reliable means of determining the vitamin A potency of cod-liver oils (*ibid.*, 1929, **23**, 785).

Over the years Drummond and his colleagues made repeated attempts to isolate pure vitamin A from fish-liver oils and, although the distinction of being the first to achieve this was denied to him, it is probable that had it not been for his earlier work the final isolation of the pure vitamin would have been delayed for many years; and in this connection the value of his work on the colour reactions can hardly be overestimated. After two unsuccessful attempts to isolate the vitamin from fish-liver oils (*ibid.*, 1925, **19**, 1047; 1929, **23**, 274), Drummond made a third attempt in collaboration with Heilbron and Morton of Liverpool and a highly concentrated oily product was obtained which was approximately ten times more potent as a source of the vitamin than the purest carotene then available (*ibid.*, 1932, **26**, 1178). However, while this work was still in progress the isolation by Karrer and his co-workers (*Helv. Chim. Acta*, 1931, **14**, 1036, 1431) of a similar product, which they regarded as being approximately homogeneous, was announced. Although subsequent work was to indicate that neither product was absolutely pure, that fact in no way detracts from the magnitude and importance of the achievements of both groups of workers.

Next in importance to his work in the vitamin A field is, perhaps, Drummond's work on vitamin E. After preliminary work (*Biochem. J.*, 1935, **29**, 456) the preparation of an oily product from wheat-germ oil was reported, which, although not demonstrably homogeneous, appeared to be considerably more active than any that had hitherto been obtained (*ibid.*, p. 2510). The following year, after the isolation of α-tocopherol from wheat-germ oil as a crystalline allophanate by H. M. Evans and his co-workers (*J. Biol. Chem.*, 1936, **113**, 319) it was apparent that Drummond's product, unknown to him at the time, must have been the vitamin in a state approximating to purity.

From the mid 1930's onwards Drummond's interests tended to turn more and more towards problems of human nutrition. On the one hand he turned his attention towards various practical present-day nutritional problems (cf. Bull. Health Organ., League of Nations, Vol. VI, Ext. No. 11; *Lancet*, 1934, I, 757; *J. Soc. Chem. Ind.*, 1937, **56**, 191T), and on the other he became interested in the history of the changing dietary habits of the British people over the centuries. This latter interest culminated in 1939 in the publication, with Anne Wilbraham, of " The Englishman's Food " (Cape, London, 1939)—a scholarly and absorbingly interesting history of English diet from medieval times until the present day which some rate as his finest achievement.

Soon after the outbreak of the 1939–45 war Drummond was seconded from University College to act as Scientific Adviser to the Ministry of Food. He was uniquely well-suited for this post, not only by reason of his wide knowledge of the scientific aspects of human nutrition, but also because of his considerable experience with food manufacturers and his own personal qualities—in particular his tireless energy and ability to " get along " with people. Those who knew him well realised that this opportunity of serving his country in a capacity for which he was so well fitted afforded him deep personal satisfaction.

The burden of responsibility carried by the Minister and by his Scientific Adviser was a heavy one, and decisions affecting the health of the whole nation, and perhaps even the course of the war, had to be taken by the one on the advice of the other. It cannot be doubted that these decisions were wise ones when it is remembered that in spite of the greatly restricted importation of foods from abroad there was little or no malnutrition during the war; indeed in the opinion of many of those competent to judge, the nation as a whole, particularly the children and expectant and nursing mothers, had a more balanced diet during the war than before it. Many of the measures introduced during the war by the Ministry of Food, and for which Drummond was partly responsible, were of lasting benefit to the country; and among these should be

mentioned the improvement in the nutritional value of white bread, the fortification of margarine with vitamins A and D, and the extension of the milk and meals service in schools. On learning of his death on August 5th, Lord Woolton paid tribute to Drummond's work at the Ministry of Food during the war in the following words: " I shall ever be grateful to him for the knowledgeable and enthusiastic co-operation that he gave me. The nation is in his debt " (*The Scotsman*, August 6th, 1952).

During 1944—45 Drummond was Adviser on Nutrition, Allied Post-War Requirements Bureau and S.H.A.E.F., and Adviser on Nutrition, Control Commissions for Germany and Austria (British Element) during 1945—46. His war-time duties took him to Malta and to North Africa to study dietary conditions, and shortly before the cease-fire in Western Europe he headed a special Red Cross relief team which was given protected passage through the enemy lines to make a survey of the conditions amongst the starving inhabitants of Western Holland.

In recognition of his war services Drummond was knighted in 1944, made a Commander of the Order of Orange Nassau in 1947 and in the same year was awarded the U.S. Medal of Freedom with Silver Palm. In 1948 he was given the degree of Docteur (*honoris causa*) by the University of Paris. These honours possibly gave more pleasure and satisfaction to his many friends and admirers than to Drummond himself, since he was essentially a modest man with no particular ambitions for such distinctions.

Drummond's decision to resign from his chair at University College after the war to take up the appointment of Director of Research of Boots Pure Drug Company at Nottingham came as no surprise to those who knew him well. For some years before the war he had been unable to carry out as much laboratory research as he would have liked owing to lack of adequate financial support (cf. *Biochem. J.*, 1937, **31**, 1852), and there is no doubt that he welcomed the opportunity to direct research on a large scale which this post provided.

Drummond was a member of many scientific societies, including the Chemical, Biochemical, and Physiological Societies and the Society of Chemical Industry. He served on the Committee of the Biochemical Society from 1922 to 1927 and from 1939 to 1942, and was secretary from 1919 to 1922; at the time of his death he was one of the six trustees of this Society. In 1919 he was elected to a Fellowship of the Institute of Chemistry; he served on the Council of that body from 1926 to 1929 and from 1940 to 1943, and acted as an examiner for the fellowship continuously from 1929 to 1935. He was elected to a Fellowship of the Royal Society in 1944, and in 1946 he was made an honorary member of the New York Academy of Science.

It is not easy to write of Drummond the man at this time when the memory of the tragedy of his death is still fresh. Impulsive by nature and often outspoken, he had absolute intellectual integrity and never compromised on matters of principle when he knew he was right. He was a man of catholic tastes and interests; a talented amateur painter and sketcher himself, he was interested in art, music, books, the drama, the open air, good food and wine, and above all in his fellow men. Those who had the privilege of working under him at University College will remember him always as a well-loved chief and friend to whom it was the natural thing to give complete loyalty.

I am greatly indebted to the old friends and colleagues of the late Sir Jack who provided me with information about his early life and scientific career.

G. F. MARRIAN.