OBITUARY NOTICES.

MEREDITH GWYNNE EVANS.

1904—1952.

BY the death of Meredith Gwynne Evans on December 25th, 1952, at the early age of 48 physical chemistry has lost an outstanding figure and science one of its most vital personalities.

Evans was born at Atherton, a suburb of Manchester, and was the eldest son in a family of three sons and one daughter. His younger brothers, who, like M. G., were educated at Manchester University, have shown distinction in academic life : A. G. is Professor of Chemistry at Cardiff University, and D. G. is Reader in Bacteriology in the University of Manchester. Evans, after attending the elementary school at which his father was Headmaster, won a County Scholarship to Leigh Grammar School and subsequently entered the University of Manchester to read Chemistry. After a brilliant undergraduate career he was, in 1926, elected a research scholar. His earliest research was on problems of adsorption of gases on chabazite and other zeolites. The taking up of these studies was no doubt influenced by the existence of a group of physical chemists in Manchester—particularly the late F. P. Burt, the late D. H. Bangham, and J. B. M. Herbert—who were then interested in adsorption problems. It was these people and the late Professor Arthur Lapworth who stimulated Evans's interest in theoretical chemistry. His initial publication in this field was a study with G. N. Burkhardt on " unshared electrons and the effects produced by *o*–*p*-directive substituents in organic molecules." In 1929 Evans was appointed Assistant Lecturer in the University and after three years on the staff he accepted the Clement Royde Scholarship, primarily in order that he could devote his whole effort to experimental and theoretical research. About this time far-reaching developments were occurring in chemistry. First, quantum mechanics had progressed to the stage when it became possible to apply these new ideas to chemical problems, and Evans during his period of freedom from other responsibilities devoted himself to perfecting his mathematical techniques, in which he obtained much help and inspiration from Professor D. R. Hartree and the lively group of physicists centred around W. L. (now Sir Lawrence) Bragg. The second important development was that of the discovery and use of deuterium, and when in 1934 Evans was awarded a Rockefeller Scholarship he proceeded to work with H. S. (now Sir Hugh) Taylor at Princeton where he made several experimental studies on the elucidation of the causes of the difference in behaviour of the two hydrogen isotopes. This was a happy period for Evans because Princeton at that time was a centre of discussion of the newer theoretical ideas in chemistry, and he was able to play an active part in the brilliant group, including H. Eyring, which Taylor had gathered around him.

When Evans returned to Manchester two years later, Michael Polanyi, who had already established a world-wide reputation for his work on the theory and study of atom reactions and in the application of quantum theory to chemical reactions, had been appointed to be the first holder of the Chair of Physical Chemistry. Then began that happy association which in the next few years led to the joint publication of a series of papers on the theory of chemical reactivity which have had a profound influence on all subsequent developments in this field. Among these papers was the formulation of a theory of chemical reaction now well known as " the transition-state theory." Parallel developments had been made by Eyring and his collaborators and the researches of the Manchester–Princeton school opened up a new era in the study of rate processes. Evans and Polanyi applied their ideas to the reaction of sodium atoms with a set of alkyl halides, diene-association reactions, chemiluminescence, and other processes. These studies included wide consideration of the nature of the forces of interaction between atoms and molecules and were extended by Evans and his co-workers to the structure and nature of the forces in liquids and solutions, a field to which in later years he was to devote considerable attention.

In 1939 Evans was appointed to the Chair of Physical Chemistry at Leeds. Before he had time to establish his researches there, war had started and he was called upon to undertake other duties as a member of the extra-mural group which Professor R. W. Whytlaw-Gray had previously established there in connection with the work of the Chemical Defence Experimental Establishment of the Ministry of Supply. During the period 1939—1945 he and his colleagues contributed greatly to various problems concerning the break-up of liquids ejected from munitions and the rates and theory of evaporation of small droplets of liquid of low vapour pressure.

On the cessation of hostilities Evans started a series of experimental studies of far-reaching practical and theoretical importance. He and his colleagues in Leeds elucidated the mechanism of the ferrous ion–hydrogen peroxide reaction (Fenton's reagent) and the nature of the initiation of vinyl polymerisation by this reagent. The proof of the formation of the hydroxyl radical in aqueous solution, which was produced by the electron-transfer reaction $Fe^{2+} + H_2O_2 \longrightarrow Fe^{3+} + OH + OH^-$, opened up the fields of study of the nature of redox initiation of polymerisation and electron-transfer reactions in solution. He established the method of the use of the polymerisation reaction as a quantitative detector of free radicals and showed that a number of ion pairs such as $Fe^{3+} OH^-$, $Fe^{3+} N_3^-$ with light of the appropriate wavelength produced free radicals by an internal electron-transfer process and that these ion pairs were effective photosensitisers of polymerisation.

It was not unexpected when the Manchester Chair of Physical Chemistry became vacant in 1948 that Evans would return to his Alma Mater. Here he not only continued his investigations of electron-transfer and polymerisation reactions but widened his interests in theoretical chemistry. He rapidly collected around him in Manchester a host of enthusiastic researchers who looked upon M. G. as their inspirer, adviser, and leader. It was whilst at the peak of his career, and when he had become recognised as one of the leaders of physical chemistry in this country, that in June 1952 he underwent what his friends thought would be a successful operation. Although he was able to return to his Department during September, his health rapidly deteriorated and it was with quiet courage and fortitude that he faced the effects of his advancing illness. Even when his reserves of strength were fading he enjoyed the discussion of some theoretical concept with his visiting friends and was as ever very warm in his greeting.

Evans was a man of charm and kindness who won the affection and admiration of all who came into contact with him. He was a man of prodigious energy and was always ready with encouragement, advice, and assistance to his students or anyone interested in science. His interests were wide; he was fond of music, had a critical appreciation of art, and was outspoken in defence of modernistic developments. He had a keen interest in the art and technique of the film and I have often known him, when some problem he was wrestling with was causing difficulty, to leave the laboratory quietly to spend an hour or so at the cinema and then return refreshed to his work. On his return to Manchester in 1948, he bought a house with a well-planned garden and he soon became a most enthusiastic gardener. It was a great thrill for him to win a prize for a display of sweet peas at the local show and I well remember a very happy day spent with him at the Chelsea Show. This hobby was a great comfort to him during the later stages of illness. Above all things his real interest was his scientific studies and no man was ever more enthusiastic about his work. He was a fluent lecturer with a remarkable ability to stimulate young students. To Leeds and Manchester he attracted postgraduate students from many British universities and from abroad. These students and his staff colleagues will always remember his love for a discussion around the blackboard and his power of grasping the essentials of a problem presented to him and of re-stating it in an exact and elegant form. Although not a practical man he was interested in developing new experimental methods, but his main concern was with the results and their theoretical significance and the fundamental generalisations which followed. He was a familiar figure at scientific gatherings and was at his best in presenting a new theory or abstract theoretical development in a clear and illuminating manner. Scientific societies and Government committees made great calls upon him. He served as a member of the Council of the Royal Society and of the Faraday Society. He was a member of the Scientific Advisory Council of the Ministry of Supply and of many of its committees and was also a member of the Advisory Council on Scientific Policy. He was elected Fellow of the Royal Society in 1947 and was Tilden Lecturer of the Chemical Society in 1951. He was also well known abroad: he was a guest lecturer in Holland (1948), and Reilly Lecturer in the University of Notre Dame, Indiana (1951), and also lectured at scientific gatherings in Italy and France. He was happily married and is survived by his wife, one son, and one daughter.

C. E. H. BAWN.

JAMES WILLIAM McBAIN.

1882—1953.

THE story of James William McBain spreads across the pages of physicochemical science from the beginning of the 20th century to his death in Stanford, California, on March 12th, 1953. The story is international, covering extensive experiences on four continents. It began with his birth on March 22nd, 1882, the elder son in a family of five, three sisters and one brother, Clifford, in Chatham in the maritime province of New Brunswick in Canada. He was the son of a Presbyterian minister, James Affleck Frazer McBain, who was married to Mary Morrison Quin; he was a great-grandson of a former Principal of St. Andrews University, James Hunter. He seems to have had a satisfying Canadian boyhood, leading his two younger sisters and brother into one adventure after another on Silver Lake and at Port Dover. A part of his school years was passed in Rhode Island, U.S.A.

That this early education made him sound in body and mind is shown by his lifelong interest and excellence in sports and by his entry into the University of Toronto at the age of 17. At 20 years he had attained a first-class honours B.A. degree, and the M.A. degree followed in 1904. Chemistry and mineralogy were his principal concern. His orientation to physical chemistry was determined by his professors, W. Lash Miller and F. B. Kenrick, who had brought to Toronto at the close of the 19th century the new physicochemical tradition from Berlin, Göttingen, Munich, and Leipzig. It was therefore natural that McBain himself should journey, late in 1904, to the University of Leipzig where Wilhelm Ostwald was fashioning the new science with a corps of distinguished assistants including Luther, Freundlich, and Drucker. He proceeded thence, in 1905, to Heidelberg where in three semesters he achieved the Ph.D. degree in physical chemistry with G. Bredig as his professor.

From student years he passed to his first academic appointment in 1906 as lecturer in physical chemistry at the University of Bristol. It is typical of the state of physical chemical science of those years in England that, in spite of the high quality of his research achievements, it was not until 1919 that he attained a Chair, becoming the first Leverhulme Professor of Physical Chemistry in Bristol University. Already at that time he had established his leadership in the physical chemistry of soaps, detergents, and colloidal electrolytes, and had foreshadowed his important contributions to the phenomenon of " sorption " by charcoal. His scientific interests were joined with an active participation in student activities, in alumni and in adult education, in physical training and sports for the students, and in their training for future war service in the Officers Training Corps. Already he had revealed the breadth of his international interests. As a student in Europe he toured Germany and Italy in pursuit of knowledge in music and the arts. Early in 1914 he was back in Leipzig bringing to the Bunsen Gesellschaft news of Soddy's recently announced determinations of the atomic weight of thorium-lead, hearing of comparable researches by Hönigschmidt and Fajans on radio-lead. The concept of radioisotopes was established in the early days of that fateful year. We toasted the new era together in excellent Rhine wine. Twelve years later we met again at a symphony concert in Boston, Mass. McBain had decided to accept a call to Stanford University where he remained from 1927 until his retirement as Emeritus Professor in 1947. For two years longer he engaged in researches for the U.S. Office of Naval Research and then, on the invitation of Prime Minister Nehru, he accepted the position of Director, to complete and staff the Indian National Chemical Laboratory, at Poona, India. He came back to the U.S.A. on leave in 1951, and returned finally to Stanford a few months before his death in 1953.

Australasia was included in these round-the-world excursions of the Indian period. His knowledge of Russia stemmed from three visits : as a representative of the Royal Society and the American Chemical Society at the Mendelejeff Celebrations in Moscow and Leningrad in 1934; as lecturer at the Physical Chemistry Institute in Moscow in 1937; and in 1945 as one of fifteen representatives of the U.S.A. at the post-war celebration of the 220th Anniversary of the Russian Academy of Sciences. These several occasions permitted tours through Russia, the Ukraine, and Georgia, and an air-flight across Siberia.

McBain's first marriage to Anna Roeder of Karlsruhe did not survive the Anglo-German tensions of World War I. Their daughter, Janet Quin McBain, came with her father to the University of California as a visiting professor in 1926. His second marriage, on New Year's day 1929, to Mary Evelyn Laing, a scientific collaborator, member of the Science Faculty at Bristol, and Research Associate in Chemistry in the earliest years at Stanford, was a model of scientific and social harmony. Together they fashioned a beautiful home and an incredibly lovely garden in the arid hills above Palo Alto. They had one son, John Keith McBain, the surnames recalling Miss Laing's Scottish ancestry and an uncle, John Laing, who fared forth from Scotland to South Africa in the late 19th century.

McBain's honours and services to mankind were many. Elected to the Royal Society in 1923 he became the Davy Medallist for 1939. His honorary degrees included doctorates from Brown and Bristol Universities. He was Vice-President of the Faraday Society and active in the organization of "Tables Annuelles" of physicochemical data. He was cited by the British Government for services in the Ministry of Munitions in World War I and received the Order of Merit for services to the Naval Research Board of U.S.A. in World War II. His war and post-war duties in U.S.A. were for the Office of Scientific Research and Development, the National Advisory Council for Aeronautics, and the Rubber Research Board. He was an active member and officer of Rotary International at Bristol, Palo Alto, and Poona. The guest of honour at the 1926 Fourth National Colloid Symposium in U.S.A., he was host at Stanford to the 21st Symposium, the "McBain Colloid Symposium." His Fellowship of the Chemical Society dated from 1911.

His scientific contributions are embodied in upwards of four hundred papers and two text-books dealing respectively with "Sorption of Gases and Vapours by Solids" and "Colloid Science." His earliest field of research was the physical chemistry of simple soaps, their electrical conductance, extent of hydrolysis, diffusion, transport numbers, and thermodynamic properties. Out of these researches emerged the concept of the "ionic micelle" as well as of neutral micellar units. The phase relationships of soap-rich aqueous systems form another group of his studies of soaps in which he correlated the practical conclusions of the soap-boiler with the scientific demands of Gibbs's phase rule.

His formulation of micellar structure called for an external sheath of polar groups, with the interior non-polar when present in aqueous phase. In non-aqueous non-polar media an inversion of the structure would occur with polar groups oriented to the interior of the micelle. Such inverted micelles should dissolve non-polar solvents such as hydrocarbons. In this way McBain uncovered by extensive researches the phenomenon of "solubilization." This and the complementary concept of "co-solvency," increase of solubility by the use of two or more components in the solvent medium, were the objectives of much collaborative research with his students in the final phases of the Stanford period.

Another phase of McBain's work was concerned with the surface layer of capillary active soap solutions. As is well known, Gibbs established that there should be a surface excess, Γ, of a capillary active component in a solution related to the surface tension, γ, and the chemical potential μ of the solvent by the relation $\Gamma = d\gamma/d\mu$. Langmuir's work had indicated that the surface layer was actually a monolayer, in solutions of the lower fatty acids for example. McBain applied much experimental research and considerable ingenuity in testing the properties of surface layers, devising a moving-microtome method coupled with an interferometer to determine the composition of such surface layers. His conclusions from these experiments, as well as his studies on adhesives and adhesive action, led him to agreement with Sir William Hardy that structure existed over considerable molecular layers below the monolayer.

An experimental technique comparable to that of the moving microtome and of wide subsequent utilization was his development of the McBain–Bakr spring balance. This permitted measurements of sorption, within an entirely sealed system, by the extension of a helical spring of fused silica, the extension being determined by the weight of sorbed material on a sorbent in a bucket hanging from the helical spring. With Britton he studied the sorption of nitrogen, nitrous oxide, and ethylene on charcoal at pressures of up to 60 atmospheres, indicating their conformity to the Langmuir formulation of adsorption. The balance has proved a most valuable tool applicable even to mono-layers adsorbed on single crystal faces. McBain's use of the term "sorption" dates from 1909 to cover a complex of processes which might include adsorption, diffusion, absorption, and solid solution. The particularized names such as "adsorption," etc., "should be restricted to cases in which it has been proven to consist of only one of these." Phenomena in sorption which proceeded progressively through long periods, even years, he labelled "persorption."

A further illustration of the elegance of his experimental achievements is to be found in a series of studies between 1935 and 1941 of air-driven centrifuges which he utilized for colloid problems and sedimentation equilibrium measurements. The simplicity of the centrifuges was coupled with their inexpensiveness.

Quiet, kindly, sympathetic, meticulously honest in scientific and personal relations, he endeared himself to a large host of students and scientific colleagues. Across wide areas of the British Commonwealth he left the enduring mark of his presence and, in his adopted country, he achieved the opportunity to exercise, with full scope, the great gifts for science which were so abundantly his.

HUGH TAYLOR.

SYDNEY GLENN PRESTON PLANT.

1896—1955.

SYDNEY GLENN PRESTON PLANT, the only son of Alfred Glenn Plant, was born at Leicester on November 5th, 1896, and he died in Oxford on September 10th, 1955, after a short illness and an operation. He was educated at Wyggeston Grammar School, Leicester, while Canon James Went was Headmaster, and he received his early scientific training under E. J. H. Eames who was Science-master at Wyggeston in his day. He won an Open Scholarship in Natural Science to St. John's College, Oxford, in March 1915, and, as he was not accepted for military service, he went up to Oxford in the following October. He obtained a First Class in the Final Honour School of Chemistry and took his B.A. degree on July 6th, 1918. At St. John's he was a pupil of M. P. Applebey.

Plant was appointed Demonstrator in Organic Chemistry in the University of Oxford in July 1919 and elected to a Senior Demyship at Magdalen College in December of the same year. He became a University Lecturer in Organic Chemistry in 1924 and, at the time of his death, he was senior Lecturer and Demonstrator in the Dyson Perrins Laboratory. In 1920 he gave his first lectures in the Chemistry School at Oxford, and from that time until he died, he lectured regularly, never missing a year. At the beginning of his career he gave the fundamental lectures on general organic chemistry, and he will no doubt be best remembered, by many generations of undergraduates, for his lectures on Stereochemistry and on Sugars and Polysaccharides. He was a most gifted lecturer with great ability to select and condense the essentials of complex and difficult subjects, and few who heard him will forget the impact of his lectures which were quite outstanding, even in Oxford where good lecturers are not rare. As a demonstrator, too, he was unfailingly helpful and stimulating, especially to the undergraduate struggling with his first attempts at practical organic chemistry.

Plant's earliest researches were on the absorption of ethylene and propene by sulphuric acid and were of a semiphysical nature, carried out under N. V. Sidgwick. This work earned him the degree of B.Sc. in 1920. Then he turned to pure organic chemistry and worked under W. H. Perkin, junior, for the degree of D.Phil., which he received in 1923. It was at this time that he began his work on tetrahydrocarbazole * (I), his interest in this substance having arisen from its possible relation to strychnine and its structural similarity to tetrahydroharmine.

He began by investigating its nitration and found that, whereas tetrahydrocarbazole itself is nitrated in sulphuric acid to the 6-nitro-compound, its 9-acyl derivatives are nitrated in acetic acid to give 9-acyltetrahydro-7-nitrocarbazoles, together with substances that have been formed by addition to the 10 : 11-double bond.[1, 2, 3] 9-Benzoyltetrahydrocarbazole thus afforded 9-benzoyl-1 : 2 : 3 : 4 : 10 : 11-hexahydro-10-hydroxy-11-nitrocarbazole which was converted, by alkali, into δ-*o*-benzamidobenzoylvaleric acid. 9-Acetyltetrahydrocarbazole, on the other hand, afforded the 9-acetylhexahydro-10 : 11-dihydroxycarbazole (II). This substance was also obtained later[4] by bromination of 9-acetyltetrahydrocarbazole. The compound (II) was found to undergo interesting rearrangements with acetic anhydride and with alkali and afforded two isomeric compounds, $C_{12}H_{13}ON$ (III and IV), both of which were different from two further isomerides, $C_{12}H_{13}ON$ (V and VI), obtained by bromination of tetrahydrocarbazole itself and its 9-benzoyl derivative respectively.[4, 5]. The compounds tetrahydro-11-hydroxycarbazolenine (V) and tetrahydro-1-hydroxycarbazole (VI) were both found to dimerise with loss of water, in

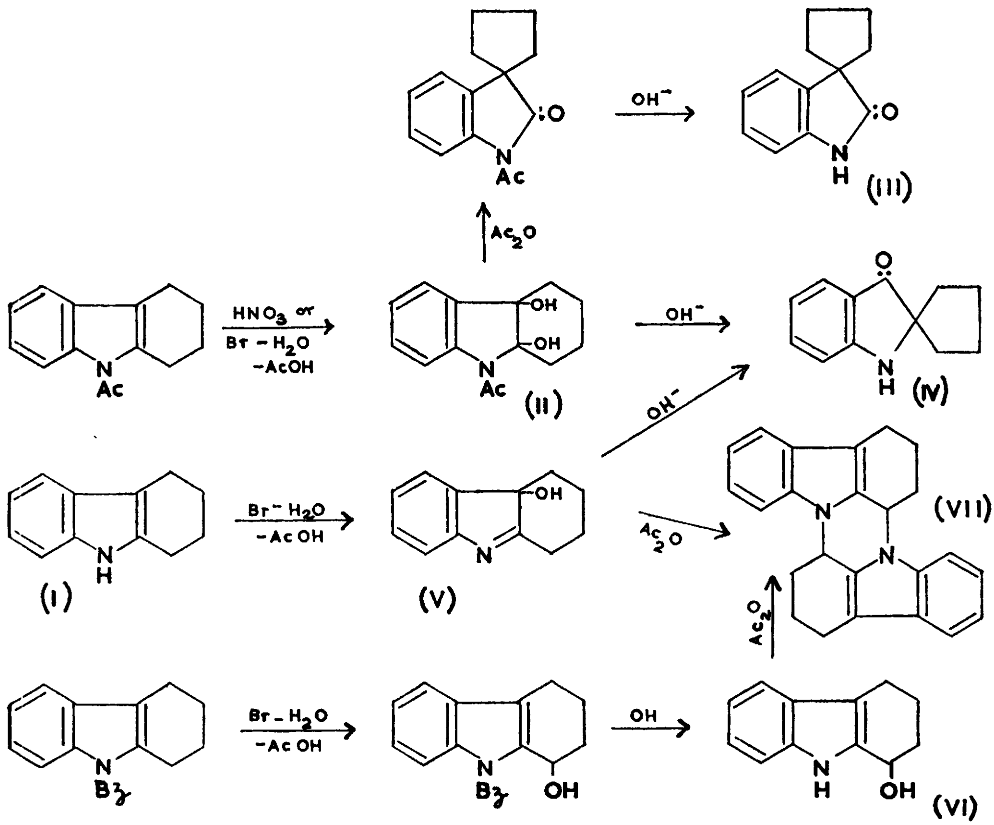
* In this Notice tetrahydrocarbazole refers to 1 : 2 : 3 : 4-tetrahydrocarbazole and hexahydrocarbazole to 1 : 2 : 3 : 4 : 10 : 11-hexahydrocarbazole.

1 Perkin and Plant, *J.*, 1921, **119**, 1825.
2 *Idem*, *J.*, 1923, **123**, 676.
3 Plant, *J.*, 1936, 899.
4 Plant and Tomlinson, *J.*, 1931, 3325.
5 *Idem*, *J.*, 1933, 298.

the presence of acetic anhydride, thus affording 1 : 2 : 3 : 4 : 1′ : 2′ : 3′ : 4′-octahydro-1 : 9-9′ : 1′-dicarbazolylene (VII). The constitutions of these substances were finally elucidated in collaboration with Sir Robert Robinson,[6,7,8] and these complex reactions can most easily be summarized in the annexed chart.

It is interesting that Plant's discovery [9] in 1925 of the toluene-soluble covalent sodium and potassium compounds of *cyclo*pentane*spiro*oxindole (III) [at that time considered to be the indoxyl (IV)] was of great interest to Sidgwick because these substances were the first co-ordination compounds of sodium and potassium to be recognised.

Plant's life-long interest in indoles and carbazoles grew out of his early work on tetrahydrocarbazole : with his pupils he has published some eighty papers on researches mainly in this field. Nitration, bromination, and the Friedel–Crafts substitution of many simple and complex indoles and carbazoles were investigated, and the constitutions of the products of these reactions



elucidated. In many instances it was necessary to develop unambiguous methods to settle the structures of compounds which were formed by application of the Fischer reaction to *meta*-substituted phenylhydrazones. Plant and his pupils have established that in general only the simpler indoles (tetrahydrocarbazole, dihydropentindole, dimethylindole, etc.) form addition products and that *N*-acylated indoles normally undergo substitution *meta* to the >N·COR group, *i.e.*, the orientation is not controlled by the nitrogen atom of the indole nucleus. The main point of attack is generally at a *meta*-position furthest from the ring-junction when two *meta*-positions are present.

The reductions of many heterocyclic compounds were investigated by Plant and his collaborators and they have isolated *cis*- and *trans*-hydro-derivatives in a number of cases. During

[6] Plant and Robinson, *Nature*, 1950, **165**, 36.
[7] Plant, Robinson, and Tomlinson, *ibid.*, p. 928.
[8] Plant and Tomlinson, *J.*, 1950, 2127.
[9] Plant and Sidgwick, *J.*, 1925, **127**, 209.

the war Plant worked with a team at the Dyson Perrins Laboratory investigating vesicant substances, and the results of these researches were published in a series of papers in the *Journal* in 1948. Since then he had become interested in the preparation and investigation of the five possible isomeric indolocarbazoles and a series of papers on these and related topics has appeared in the past six or seven years.

Plant probably rose to his greatest heights as a supervisor and director of research. His own work provided a steady flow of research problems not too difficult for the beginner, yet admirable for the training of the young worker : he selected topics for his pupils with unfailing good judgment and invariably guided their work to successful conclusions. Those who came under his influence are the better chemists for the excellent training they received under his keen and kindly supervision : they owed him a great debt and they have repaid it by the good use they have made of his inspiration.

In 1928 Plant was appointed Secretary to the Delegates of the University Museum at Oxford and he held this office, together with his University Lectureship and Demonstratorship, until his death. He had a real flair for organisation and at the Museum he displayed it to the full. At the Museum too, no less than at the laboratory, his unfailing good judgment, his tolerance, and his delightful sense of humour stood him in good stead. He was as adept at dealing with the gratuitous communications of the discoverers of perpetual motion, as with the every-day business of the Museum. The success of the 1954 meeting of the British Association at Oxford owed much to his untiring efforts at the Museum, and he wrote an admirable article on " The Oxford Science Area " for the British Association publication " The Oxford Region."

He served on the Council of the Chemical Society and was a member of its Publication Committee for some years. He wrote the sections on heterocyclic chemistry for the *Annual Reports* from 1928 to 1931 and, with the exception of two letters to *Nature*, all his scientific work has been published in the *Journal of the Chemical Society*.

He married, in 1924, Winifred, daughter of William Crawford of Leicester, and he is survived by her and by their two daughters, both of whom are now married. He was a keen Freemason and was twice Master of his Lodge. A quiet and kindly man, he was liked and respected by all who knew him. Sydney Plant will be long remembered in Oxford, especially by everyone at the Dyson Perrins Laboratory and the University Museum, to both of which he gave so many years of devoted service, and by the countless Oxford chemists who were his pupils and whom he and Mrs. Plant entertained so hospitably at their home in Farndon Road.

MURIEL TOMLINSON.

HUMPHREY RIVAZ RAIKES.

1891—1955.

HUMPHREY RAIKES was born at Ide Hill in Kent on July 14th, 1891. His father, Canon Raikes, was a famous Rugby footballer and his grandfather on his mother's side, William Oswell, was a great African hunter who accompanied Livingstone on his first journey (which he had financed) to Lake Ngami. Raikes was at school first at Tonbridge and later at Dulwich where he learnt to use tools and machines on the Engineering side. He went to Balliol in 1910 as a Williams Exhibitioner to read Chemistry, and gained the Abbott Scholarship in 1911 and a first class in the Final Honour School of Chemistry in 1914. Raikes was a keen soldier (his grandfather had served as a civilian in the Crimean War) and while an undergraduate he held a Special Reserve Commission in the Buffs and he went with them to France in the autumn of 1914. He was severely wounded in the shoulder in May 1915 and after his recovery transferred to the Royal Flying Corps, in which he took a leading part in the development of the early bombing techniques and became chief experimental officer. He was a member of the Royal Air Force Mission to the United States in 1918 and for his services to flying he received the Air Force Cross in that year.

He returned to Oxford as Lecturer in Chemistry at Balliol and in 1919 was elected to a Fellowship at Exeter College where he later became Sub-Rector. The school of Physical Chemistry was just beginning to grow and Raikes's contribution as Treasurer of the Balliol and Trinity laboratories was invaluable. His unselfish and tidy housekeeping saved his colleagues from so many headaches and he always found means of providing the space and the apparatus we needed. His own interest was in electrochemistry and those of us who were working in that field owed much to his constructive suggestions and help, so that his own contribution must not be measured by the small number of papers he published. He rejoined the R.A.F. in 1935 as Chief Instructor to the Oxford University Air Squadron with the rank of Wing Commander.

Raikes's striking personality and breadth of interests had marked him out for action in a wider sphere and in 1927 he was appointed Principal of the Witwatersrand University of Johannesburg. From his grandfather he had inherited an interest in the African continent and his grandfather's sketch map of his journeys used to hang in his study. Those who had the perspicacity to appoint him could not have made a wiser choice. The University with 1500 students had just moved to an almost empty site at Milner Park, and the Medical School at Hospital Hill was housed in the unfinished fragment of the final building. Raikes saw a great opportunity, and his constructive mind, his care for detail, his æsthetic sense of fitness, his determination, and his untiring energy, found expression in the fine group of buildings which the University and the Medical School now enjoy. When he retired in 1954 the number of students had trebled.

In 1931 the University library was destroyed by fire. Raikes was undaunted by the loss and used it as a stepping stone towards the new and finer library that was built. His appeal aroused interest in the University and brought contributions of books from universities in many countries.

He never lost his love for scientific work and he did much to encourage the development of post-graduate studies in pure and applied sciences. For some years after he came to Johannesburg he took an active part in the teaching of chemistry and one of his first tasks was the re-organization of the University laboratories. When war came in 1939 he advised the older men to finish their courses and the younger to join up at once. He served as O.C. of the Rand University Training Corps and his work as Chairman of the Aptitude Tests Board, which was responsible for the methods of personnel selection for the South African Air Force, was the major influence in establishing the National Institute for Personnel Research under the South African Council for Scientific and Industrial Research.

After the war he felt very keenly the debt that society owed to the young men and women who had contributed to the war effort and he did his best to ensure that those who could profit by a University education should not suffer for their devotion to duty. Nearly 3000 ex-soldiers entered the University, and its numbers rose from 3000 to 5000. Thanks largely to Raikes's skilful improvisation the University was equal to the task, and the ex-Service men were deeply grateful to him for his care and solicitude for them.

In 1932 Raikes was elected President of the South African Chemical Institute and in 1947 President of the Associated Scientific and Technical Societies of South Africa. In his Presidential Address on " Liquid Fuel from Coal " he showed foresight in drawing attention to the limits which coal and water supplies place on the development of the Vaal basin, and to the great possibilities of industrial development in the Eastern Transvaal.

Raikes took a very broad progressive view of the place of a university in modern life and under his guidance Witwatersrand developed on lines which enabled it to meet the varied needs of commerce and industry as well as to strengthen its position as a centre of academic studies and research. His great services to education were recognized by Honorary Degrees from the Universities of Bristol, Cambridge, Cape Town, and Toronto, and only a fortnight before his death by Witwatersrand University.

I was very proud of him as he had been my pupil, from whom I had learnt many lessons. The days I spent with him going round the Witwatersrand University were a great education. The design of the Great Hall in which he had overcome the acoustic problems, the grouping of the buildings round the quadrangle, the keen schools of research in so many departments, the collection of Africana, the lay-out and equipment of the dental hospital equal to anything in the world, are all a monument to Raikes's taste and judgment. But his influence went far beyond buildings and research. He was loved by his students for whom he did so much. In his final charge to them he spoke of " the divine gift of statesmanship." This he himself possessed. It was this quality, together with his modesty, that won the respect and confidence of those he did not hesitate to criticize if he felt it necessary. He had studied the political problems of the Union, he had learnt Afrikaans, and his wise counsels will be sorely missed in South Africa.

HAROLD HARTLEY.

RALPH WILLIAM EWART STICKINGS

1895—1955.

R. W. E. Stickings, who was born in Mitcham on March 20th, 1895, was a science graduate of London University. During the 1914—18 war he saw active service with the R.A.M.C. in France and was awarded the O.B.E.

In 1919 he came to May & Baker Ltd. at Wandsworth as a research chemist. For some years he was engaged in the preparation of heterocyclic compounds containing arsenic for the evaluation of their trypanocidal properties. In 1927—28 he was either sole or joint author of a series of three publications thereon in the *Journal*, his name figuring in relevant patent literature.

In 1924 he migrated from research to production within the May & Baker organisation, becoming Works Manager first at the Wandsworth factory and subsequently at both Wandsworth and Battersea; and a " production man " he remained until the end of his days. The year 1934 saw the transference of the firm to its present site in Dagenham. In 1940 Mr. Stickings became the first Director of Production.

The years between his appointment to the Board and his nomination in 1952 as Deputy Managing Director were for Mr. Stickings a period of increasing activity in the interests, not only of the parent company, but of its subsidiaries at home and overseas. The number of his directorships within the organisation and the extent of his travels on its behalf are indicative of his wide powers of leadership and of the high esteem in which he was held.

Business apart, he was a man of wide interests. He had a kindly disposition as befitted one who was a Deacon of the Congregational Church.

He died in Brentwood District Hospital, Brentwood, Essex, on December 3rd, 1955, leaving a widow, two sons, and a married daughter. A third son lost his life in the advance towards Arnhem.

Anon.