OBITUARY NOTICES.

HARRY BAKER.

1859—1935.

HARRY BAKER passed away on November 17th, 1935, at his home, Grange Court, Leominster, in his 77th year: his remains rest in the Friends Burial Ground. He was born in Bethnal Green in 1859, the eldest son of Henry Baker and Elizabeth Wright. In 1868 the family moved to Manchester, where Baker was educated at the Manchester Mechanics Institution, and from 1875 at Owens College where in 1878 he was elected Dalton Scholar for an original investigation on the fluorides of vanadium. In 1879 he studied inorganic chemistry under Professor Bunsen at Heidelberg University, also under Professor H. Kopp and Professor H. Rosenbusch. In 1881 he was elected to the Berkeley Fellowship in Chemistry at Manchester, giving special lectures on crystallography, being at the same time private assistant to Professor Sir Henry Roscoe. He was appointed Assistant Lecturer and Demonstrator in Chemistry at Owens College in 1882 and occupied this post until 1888.

The results of his work were published between 1878 and 1888 in the *Memoirs* of the Manchester Literary and Philosophical Society, the *Journal* of the Chemical Society, and Liebig's *Annalen*. His skill as a manipulator was remarkable and he possessed keen powers of observation, attributes which afterwards contributed to his successful work in industry.

The chemical industry claimed him in 1888 when he was appointed chemist to the Aluminium Company, Oldbury, nr. Birmingham, where he began his association with Hamilton Young Castner. He was to remain associated with Sir Henry Roscoe, who was a Director of the Aluminium Company. The Company was formed to work the aluminium process of Castner, who had come over from the United States, being unable to interest commercial men in that country in his new process for the reduction of aluminium chloride with sodium. After a few years this process, though technically successful, could not compete with the electrolytic production of the metal by Hall's process. Castner then turned to electrolytic processes and Baker assisted him in developing the cell for the production of sodium in 1890. In 1891 a process for producing sodium peroxide was devised. In 1892—1894 the Castner rocking cell was evolved for the production of chlorine and pure caustic soda, a soda of high purity being necessary for the electrolytic sodium process. In 1894 a process for producing sodium cyanide was perfected; this process was the basis of the highly successful Cassel Cyanide Company and was transferred to Glasgow on the death of Castner, Baker having by then been appointed chief chemist to the Castner Kellner Company, whose works at Runcorn subsequently became the largest chlorine-producing factory in the world. The process for producing graphite electrodes was evolved in 1896, but was developed by Acheson at Niagara, where ample electric power was available. Baker visited the States, Germany, and Austria in connexion with the installation in those countries of Castner's processes. His pioneer work in collaboration with Castner was necessarily unknown to the scientific world, but its value was immense and it is a tribute to the work of Castner and Baker that the electrolytic processes invented and perfected by them should hold such a prominent position in the chemical industry of to-day. As a colleague both at the University and in industry he inspired affection and his example as a leader was always a stimulus to those who had the good fortune to work under him.

Mary Eccles, whom he married in 1889, survives him. His two sons carry on the scientific tradition, Henry being Lecturer in Engineering at Manchester University and Wilson being Lecturer and Demonstrator in Chemistry in the Dyson Perrins Laboratory, Oxford. His daughters, Margaret and Mary, have achieved distinction as writers and illustrators of children's books.

E. OTHO GLOVER.

KENDALL COLIN BROWNING.

1875—1936.

KENDALL COLIN BROWNING was born at Wimbledon in 1875, the second of three sons of the late Staff Captain G. A. Browning, R.N., and Mary, daughter of Dr. Kendall of King's Lynn. He was educated at Dulwich College, where he studied chemistry under H. Brereton Baker, and gained a leaving scholarship to St. John's College, Cambridge, of which he was senior foundation scholar. At Cambridge his work was originally directed towards obtaining a medical qualification, but he finally decided to take chemistry as his principal subject. In 1896 he obtained a First in Part I of the Natural Science Tripos, his subjects being Chemistry, Physics, Physiology, and Mineralogy, and graduated B.A. in 1897 with a First in Chemistry and Physics in Part II of the same tripos. In this year he was Hughes prizeman, and was appointed demonstrator and assistant lecturer under Adie, occupying this post for three years. In 1899 he was also supervisor of medical students. In 1898 he was awarded a Hutchinson research studentship, which he held for two years, taking his M.A. in 1900.

He rowed for his College, was awarded a half blue for cycling, and was a Captain in the University Volunteers. In his post-graduate period he worked under Ruhemann and Adie, the results of their joint work being published in the *Journal* of the Chemical Society and in the *Berichte*.

In 1904 he was appointed Professor of Chemistry at the Medical College (now University College), Colombo, and public analyst for Ceylon. Owing to pressure of work he relinquished his teaching duties in 1907, and in 1910 he became head of the newly formed Government analysts department. Here his work was of a very varied nature, consisting largely of criminological investigations, in which his early medical training proved of great value, and of work for the Customs, Excise, and public health authorities. He was also responsible for the drafting of a new Food and Drugs Act, which ultimately became law.

In 1916 Browning, having been recommended to the War Office by H. Brereton Baker to carry out special work in connexion with water supplies for the British troops in Mesopotamia, came home to England for preliminary military training. It was then that his health broke down, preventing him from taking up this work. In 1917 he was commissioned in the Royal Engineers, and seconded to the Ministry of Munitions, where he worked with Prof. T. M. Lowry, Technical Director of Gun Ammunition Filling, on problems connected with the high explosive and gas fillings of shell. He was a member of a special mission sent to France to carry out experiments on chemical warfare, and there contracted the bronchial trouble that finally caused his death.

At the end of the War, he was joint author, with Prof. T. M. Lowry and J. W. Farmery, of a paper on the decomposition of nitric esters by lime; this work originated in experiments carried out by the late Prof. W. R. E. Hodgkinson at the Ordnance College (now Military College of Science), Woolwich, and continued by the Waste Explosives Committee under the direction of Prof. T. M. Lowry, with the object of working out methods for usefully disposing of the enormous quantities of cordite and other explosives which were left at the conclusion of the War.

On demobilisation, Browning worked for a short time under his old teacher, H. Brereton Baker, at S. Kensington, and in 1921 he was appointed Professor of Chemistry and Metallurgy at the Artillery College (formerly Ordnance College and now Military College of Science), Woolwich. In the following years he made a special study of problems covering the properties of fuels and lubricants in their relations to the internal combustion engine.

As a teacher, Browning communicated his enthusiasm to his students, and possessed an encyclopædic knowledge of technical literature which was always at the disposal of those who were privileged to work under him. He had great strength of will, which enabled him to continue working in spite of great physical obstacles until within a few months of his death, which occurred very suddenly at Dawlish, on January 26th, in his sixty-first year.

R. C. GALE.

WILLIAM FREDERIC BUTCHER.

1867—1936.

W. F. BUTCHER was born in Woolwich, his father being a registered pharmacist in that town, and was educated at Margate College. Subsequently qualifying as a pharmacist, in 1889 he joined his father's business, which had then been moved to Blackheath.

Butcher was a man of great forcefulness of character, and quickly took a leading part in developing the wholesale side of the business. An enthusiastic amateur photographer, his activities were in a few years diverted to photography. He established a small camera factory, and was a pioneer in the wholesaleing of photographic apparatus and materials amongst retail chemists.

By 1903, the photographic and pharmaceutical aspects of the business were separated, and a private limited company formed with premises at Camera House, Farringdon Avenue, E.C. In 1915, with six of the principal photographic firms in London, he assisted in forming British Photographic Industries, Ltd., employing over 3,000 people. Butcher was Vice-Chairman of this Company: in 1926 the two principal companies, Houghton and Butcher's, were merged into Ensign, Ltd., at Holborn.

Notwithstanding his absorption in business affairs, Butcher found time for outdoor recreations, including golf, tennis, swimming, ski-ing and climbing, taking an active part in such sports until within six months of his death, which occurred on January 12th, 1936. He was much loved by a large circle of friends, and is survived by a daughter and two sons. He was elected a Fellow of the Chemical Society on December 5th, 1889.

ISIDOR JOSEPH.

HAROLD WARD DUDLEY.*

1887—1935.

BY the untimely death of Harold Ward Dudley, before he had completed his 48th year, Science has lost a devoted servant and a distinguished investigator. The wide influence which he had acquired, especially among those concerned with biochemistry, was due to his fine character and his personal charm, as well as to his already distinguished record of research; and his services to the remarkable development of that branch of science in this country, apart from the direct effect of his own investigations, involved a quiet and unselfish devotion of time and work to the interests of his colleagues.

Dudley was born at Derby on October 30th, 1887, as the eldest son of the late Rev. Joshua Dudley, who, as a Methodist minister, was stationed for successive periods in different parts of the country. Harold Dudley's schooling changed with these movements of his home. He was at Truro College, and at the King Edward VI Grammar School, Morpeth, from which he entered Leeds University, taking chemistry as his subject, and specialising in organic chemistry. This brought him under the influence of the late J. B. Cohen, F.R.S., who died earlier in 1935. Cohen was not only a great and inspiring teacher; there must have been something in his teaching of organic chemistry which aroused interest in its biological significance, to account for the number of his pupils who have won success and distinction in biochemistry. It is sufficient to name, in order of seniority, Dakin, Raper, Hartley, Dudley, Woodman, Raistrick, and Wormall, to realise that the teaching of Cohen, himself no biologist, has had, through his pupils, a powerful influence on the development of this relatively young department of science. Dudley, after graduation in chemistry, began research under Cohen's guidance, and proceeded to the higher degree of M.Sc. with a contribution on "The Relation of Position Isomerism to Optical Activity in Certain Menthyl Esters." He was then awarded a Science Research Scholarship by the 1851 Commissioners, and, under Cohen's advice, went to Emil Fischer's famous institute in Berlin. There he worked with Professor Wilhelm Traube on the chemistry of the purines, and took the degree of Ph.D. in 1912.

* Adapted by Dr. H. King from the obituary notice by Sir Henry Dale in the *Proceedings* of the Royal Society.

When Dudley returned to England in 1912, there came to him an opportunity which had a decisive influence on his career. The late Dr. Christian Herter, of New York, had equipped the top floor of his house in Madison Avenue as a laboratory for research in medical and biological chemistry. H. D. Dakin, who had been invited by Herter to work in this private laboratory, had been engaged there since 1905 in fundamental researches in biochemistry, and remained in charge of the laboratory after Herter's early death in 1910. In 1912 he was seeking an assistant and collaborator, and through his old teacher Cohen was brought into touch with Dudley. The appointment was offered and accepted, and Dudley entered upon two years of happy, intimate, and fruitful collaboration with Dakin, who already had problems of great interest awaiting further development. These joint researches belong mainly to two groups. One group was concerned with the function of glyoxals in the metabolism of carbohydrates, and in the intermediary metabolism of carbohydrates and amino-acids. In this connexion Dakin and Dudley discovered the tissue enzyme glyoxalase, and devised a method of measuring its activity by following the conversion of phenylglyoxal into mandelic acid.

The other group was concerned with the partial racemisation of proteins by treatment with warm alkali. When the constituent amino-acids were separated from such racemised proteins by acid hydrolysis, it was found that only some of them had undergone racemisation, and theoretical grounds were given for the views that these were the terminal members of the peptide chains from which the complex molecules were built. A further observation of great interest was that a protein which had been thus treated, until the racemisation process had reached its end point, was completely refractory to digestion by proteolytic enzymes, and behaved in the body like an inert substance, passing rapidly through the kidney into the urine. Experiments made by Ten Broek showed that it had completely lost its antigenic properties.

Dudley's two years in New York had given him a wealth of experience and of ideas, in the subject which was now to be his life's work. He had made many pleasant personal contacts in scientific circles in America; and he had formed an intimate and lasting friendship with Dakin, and with Mrs. Herter (now Mrs. Dakin) and her family. He was ripe for independent activity when he returned to Leeds, in 1914, as Lecturer in Biochemistry in the Animal Nutrition Research Institute. Here he was quickly engaged with problems arising from his work with Dakin, as shown by papers, published in 1915, on the estimation of glyoxalase in blood, and, jointly with H. E. Woodman, on the caseins of cow's and sheep's milk. No difference could be found between these two proteins, as regards the nature of the amino-acids constituting them or the proportions in which these were present. Application of the racemisation method, however, revealed a clear difference between the amino-acids which became racemised in the two cases, indicating a specific difference between patterns of their linkage in the respective molecules.

The outbreak of war soon terminated Dudley's work at Leeds. He obtained a commission in the army, and was detailed for special work on protection against the new chemical weapons of war, which he performed with characteristic thoroughness under the late Professor Starling, and subsequently under the late Brigadier-General Harrison, at the R.A.M. College at Millbank. Early in 1918, having been promoted to the rank of major, he was sent to the United States of America, where his thorough knowledge of the British experience, his acquaintance with American conditions, and his many personal contacts in that country specially qualified him for an advisory mission to the new anti-gas organisation of the American army and its mechanism of supply.

When the end of the war came, Dudley, whose services were recognised by the award of the O.B.E., was ready and eager to return to his normal activity in research. I was reorganising the Department of Biochemistry and Pharmacology under the Medical Research Council, in preparation for its transfer from war-time quarters in the Lister Institute to its permanent home in the National Institute for Medical Research at Hampstead, which had been occupied throughout the war as a military hospital. My first colleague in the department, George Barger, had already left to take the new Chair of Medical Chemistry in Edinburgh. The needs of the future suggested the appointment of two younger men, one to be concerned mainly with biochemistry in the stricter sense and the

other with the chemistry of drugs and synthetic remedies. I was fortunate in finding Dudley and Harold King ready to accept appointment, and they joined our team together. There was much planning and organisation to be done, in converting rooms which had originally been hospital wards, and in use as such until well into 1919, into experimental laboratories. The most extensive adaptation and installation was required in the case of the chemical laboratories, and for this Dudley, with King's co-operation, made himself responsible. In later years the equipment was much extended and included a laboratory for extracting and concentrating materials on a semi-manufacturing scale, for which Dudley, again, took the chief responsibility.

While the initial minimum of equipment was being installed, up to the spring of 1920, research went on in our temporary quarters, and here Dudley carried out an important part of his work on the hormones of the pituitary posterior lobe. It had long been known that an extract from this organ had powerful stimulant effects on the muscular walls of the arteries and on that of the uterus. These had generally been regarded as two expressions of the activity of one principle. When Dudley, at my request, undertook investigations on its chemical properties, and applied a method, then newly introduced by Dakin, for the separation of amino-acids, in which the watery solution was continuously extracted by butyl alcohol, the substance acting on the uterus was completely extracted, while the pressor principle remained largely in the watery residue. The presence in this extract of two different substances, each responsible for one only of its principal activities, was for the first time made clear. The discovery was not unchallenged, and Dudley was involved with me in further work, some of it giving further information of interest, some of it disappointing; but no published item of Dudley's contribution has to my knowledge needed revision. By methods later found by Kamm and others, the two principles in the extract are now separated on a large scale, and offered in separate solutions for practical use in therapeutics; so the correctness of Dudley's original observation is no longer in question.

During 1922 private information came from Toronto to the Medical Research Council of the rapid development of Banting and Best's discovery that the antidiabetic hormone, insulin, could be obtained by artificial extraction from the pancreas. The Council were invited to send scientific observers to report to them on the progress of this remarkable discovery, and the initial results of its practical application. I was asked to undertake this mission of enquiry, and, at my request, Dudley was sent with me. We arrived at Toronto towards the end of September, 1922, and the evidence put before us carried immediate conviction that a genuine discovery of great potential importance had been made. The late Professor J. J. R. Macleod had organised a team of workers to reinforce the activities of the original discoverers, in work directed to the improvement of methods for estimating the amount of insulin present in extracts, and to the production of purer preparations in a higher yield. The practical production was, indeed, still in its infancy. The Toronto laboratory was working feverishly, with makeshift apparatus installed in a cellar, to keep pace with the demand for insulin for the continued treatment of a few cases already receiving it. Dudley and I visited also the factory of Eli Lilly & Co., at Indianapolis, who had already, with much larger facilities, been co-operating with the Toronto workers in the effort to arrive at a large-scale production of insulin in a suitably pure solution for therapeutic use. Though there was a clear promise of improvement with experience, there was no certainty as to its extent at the time of our visit. A yield of 5 " units " of insulin from a kilogram of pancreas was still regarded as a good result; and the extract containing it was highly impure, of poor stability, and liable to lose a large part of its insulin during passage through a sterilising filter. On our return, Dudley worked, with his usual quiet efficiency, to find a process which could enable manufacturers to produce insulin on a scale and at a price which would bring it within the reach of all who needed it. He found that the conditions for its successful extraction did not depend, as had been supposed, on protecting it from trypsin, but on a reaction sufficiently far, on either side, from the isoelectric point of the hormone; he found that loss in filtration could be eliminated by adjustment of the reaction to an appropriate acidity; and he discovered a method by separation as a picrate and reconversion into a hydrochloride, of purifying crude insulin and obtaining it in a dry stable condition. Within a few months he could give to the manufacturers a process

yielding 500 instead of 5 units of insulin from a kilogram of the raw gland. I do not know to what extent these discoveries of Dudley have survived in modern manufacture. It is certain that others as important were concurrently being made in Canada and America. What is also quite certain, however, is that British manufacture was enabled, by his devoted and concentrated activity, rapidly to overtake the effort on the other side of the Atlantic, so that the solution of the practical problem was in sight as early in this country as in any in the world. When, in 1923, an International Conference decided to adopt a stable standard preparation of insulin for world-wide use, and to define the unit in terms of it, Dudley was charged with the preparation of this first insulin standard.

Dudley now became interested in an entirely different problem. Otto Rosenheim, who had worked with Mrs. Rosenheim many years earlier on the curious base spermine, widely distributed in the tissues and still of unknown function, made contact with the Institute and with Dudley, at a time when the demands of the insulin work were becoming less urgent. They embarked on a co-operative investigation which, with remarkable rapidity, led to the extraction of spermine on a scale enabling them to determine its curious and unexpected constitution—$\alpha\delta$-bis-(γ'-aminopropylamino)butane—and to confirm this by synthesis. A second base, spermidine, which accompanied spermine in tissues in smaller quantity was proved by analysis and synthesis to be α-(γ'-aminopropylamino)-δ-amino-butane.

For many years I had been interested, with a succession of colleagues, in the action of the base histamine, with its remarkably faithful reproduction of a syndrome occurring in various physiological and pathological reactions, and also caused by the injection of extracts from many animal organs and tissues. A second visit of C. H. Best to my laboratory, primarily for further investigation of a liver extract showing this general type of action, led to the association of Dudley and W. V. Thorpe, who had recently joined him, with Best and myself, in an effort to determine the relation between histamine and the substances causing this action. The chemical side of the work, which was Dudley's direct responsibility, led to the isolation of histamine itself, with relatively large amounts of choline, from the liver extract. The investigation was extended to the lung, in extracts from which we had been able to demonstrate a very pure and potent activity of the histamine type, and again histamine was obtained by Dudley and Thorpe, in a yield sufficient to account for all the activity of this type, and under conditions which precluded post-mortem development or artificial production by the chemical procedures used in its isolation. For the first time we had evidence that this powerful base is a normal constituent of the living cells, and the evidence was extended to other tissues by Thorpe, working by Dudley's methods and with his advice.

One organ had been omitted from this survey of the tissues for histamine, namely, the spleen. When Dudley and I proceeded to fill this gap, he obtained the histamine without difficulty from extracts of the spleens of oxen and horses, by the methods which he had already used with other tissues. We were early met, however, by evidence of an intense action of the choline type, disappearing very readily if the extract was made alkaline and left to stand. The presence of an unstable choline ester in these spleen extracts seemed to be indicated, and it was natural to think of the interesting possibility that it might be acetylcholine. Its great instability made the attempt to separate it from the extract, with the methods then available, a rather uncertain enterprise. Dudley tackled the problem with his usual quiet efficiency, and in due course isolated acetylcholine as the gold and platinum salts in quantities sufficient for complete chemical identification; so that acetylcholine, the possible occurrence of which in the body was the subject of much speculative physiological interest, was demonstrated, beyond question, to be a natural constituent of an animal organ. Incidentally to this investigation, Dudley observed that the chloroplatinate which crystallises easily from solutions containing both choline and acetylcholine is not, as had been supposed, the chloroplatinate of acetylcholine, but a double salt of both bases. He also devised a characteristically elegant method of recovering delicate and unstable bases from their gold and platinum salts, in the form of their neutral hydrochlorides, by the addition of metallic silver.

This discovery of acetylcholine in the animal body, with its physiological implications,

aroused wide interest. It was not long before claims were put forward, from a continental laboratory, for the isolation of acetylcholine, in some cases in very large quantities, from practically every organ of the body. Dudley and I eagerly took up the question again, but, at the cost of much fruitless labour, he found himself entirely unable to confirm these findings. The mystery was only deepened when he visited the laboratory of their origin, confirmed them there, and again consistently failed to reproduce them by exactly the same methods in his own. His gentle nature disliked and shrank from controversy; and, even by those who would regard the scientific point at issue as still undecided, I believe that his statement of his observations under these different conditions would be accepted as perfect in its courtesy and its quiet candour.

The last research which Dudley brought to the point of publication was that which resulted in the isolation and description of a new alkaloid from ergot, "ergometrine," the properties of which indicate that it is likely to be accepted as the essential active principle of that remarkable drug, in relation to its principal and traditional use in obstetrics and gynæcology. The clinical experiments of Chassar Moir had given clear evidence of the existence, in watery extracts of ergot, of a substance having a very prompt and powerful stimulant action on the uterus when administered by the mouth. This did not correspond with any of the alkaloids or other active substances which ergot had hitherto yielded; and Dudley, in 1932, embarked upon an attempt to isolate the substance responsible for this action, with the close co-operation of Chassar Moir, who submitted Dudley's preparations to a clinical test at every stage. Various circumstances delayed progress, and by the time Dudley had the alkaloid in his hands, with clear evidence that it was the substance for which they were seeking, workers in other centres were hot on the trail. His publication in March, 1935, in which he gave a preliminary description of the alkaloid and named it ergometrine, was quickly followed by other claims to its discovery and to the right to name it. The discovery and its sequel came at a time when Dudley was suffering from the deepest of personal tragedies. Marred though it was by his dread of controversy, the refuge from sorrow which he found in the interest of his new discovery, and in the work still needed to bring it to his own high standard of perfection, enabled him to keep his outward placidity and to finish what he had in hand. His completed description of ergometrine was sent for publication shortly before his fatal illness, and was published in the *Proceedings* of the Royal Society on October 3rd, the day of his death.

Apart from his services to biochemistry through his own researches, Dudley did a great deal of quiet and effective work for his colleagues in that branch of science, as Secretary of the Biochemical Society (1922—1924), as co-editor, with Sir Arthur Harden, of the Biochemical Journal (1924—1930), and as editor of the biochemical section of Chemical Abstracts for the Chemical Society. He was elected F.R.S. in 1930.

Ever ready to spend his time and his knowledge in helping others, Dudley was an ideal collaborator. Inspection of a list of the writings to which his name is attached, will show how preponderantly he worked with others. In some cases he worked with junior colleagues, who found him an effective and encouraging teacher and leader. A good deal, however, ever in his maturity, was done with senior co-workers. I think it would be true to say that Dudley, sure of his technique and always interested in finding methods for tackling problems which had baffled others, was diffident of his own initiative, and worked more happily and with greater confidence when others had taken the responsibility of suggesting a main objective.

Even those who did not know Dudley personally might have been able to form a partial, but not inaccurate, conception of the man from his work. There was a modest elegance and a feeling for perfection in all that he did, which matched with, and indeed formed part of a fine character and personality. Tall and graceful, with a ready and charming smile, Dudley was shy of pretention, of volubility, of exaggeration of any kind, and of any display of emotion. He found his recreation in the gentle sport of fly-fishing. I do not remember to have seen him show anger; a half-humorous annoyance was normally his nearest approach to it. Yet his friends knew that he was a man of very deep feeling, and of warm and loyal affections. His marriage to Miss Mary Nettleship in 1921 brought him great happiness, though the shadow of a coming tragedy was early cast by her illness in 1922.

In the years that followed, her frequent failures of health were faced with a buoyant courage, and a perfect devotion to one another. Her death in April, 1935, after a long illness, plunged Dudley into a grief which he could not share; but the bravely hidden sorrow had left him too little reserve to meet his own illness, entailing a serious operation, six months later.

H. H. DALE.

CHARLES RICHMOND FEATHERSTONE.

1885—1936.

CHARLES RICHMOND FEATHERSTONE, who died on January 23rd, 1936, was born in 1885 at Bishop Auckland. He was educated at the Grammar School, Stockton-on-Tees, and won an open scholarship in Natural Science to Lincoln College, Oxford, where he obtained an Honours Degree in chemistry in 1908.

His first post on leaving Oxford was at Greenock Academy and from there he went as Second Science Master to King Edward's Grammar School, Aston, Birmingham, becoming Senior Science Master the following year.

He was appointed Senior Science Master at St. Peter's School, York, in 1915, where he remained until his death. He became House Master of Clifton Rise in 1918.

At St. Peter's he reorganised the Science side, introducing improvements in the laboratories, starting a course in biology in 1922, and giving to the school a well-designed post-certificate course in science.

One of the features of which he was justly proud was the Scientific Society which he founded and led with great wisdom until it became a strong influence amongst the boys. His underlying motive was to make the Science side useful to all the boys and not merely to the specialists, by discovering and fostering their native interests. Almost my last recollection of him was as we walked round the Members' Exhibition at the Science Masters' Association in London a week or two before he died, taking notes of what he saw and murmuring " That's good—the boys will appreciate this."

He was a science teacher of considerable inspiration, combining an intense love of his subject with a breadth of view quite unusual, and with a meticulous care in preparation. He read widely and gave freely of his time and energy to all who came under his care. His study in his House was a haven for boy or colleague, and all he possessed was freely at their disposal. With great courage he bore an affliction which precluded him from active participation in school games, but he never failed, by his presence and encouragement, to demonstrate his interest in all school activities.

He was one of the older members of the S.M.A. and was one of the Committee of the young branch of that Association in Yorkshire. He was for many years a keen member of the York and District Field Naturalists' Society, being their President in 1928, taking as the subject of his Presidential address, " Plant Life in the Past." The members of that Society " remember him gratefully for the unassuming and friendly way in which he was always willing to place his services at their disposal." One of his great interests was the study of trees, but in addition he was a student of geology and astronomy. At the last meeting of the British Association in York, 1932, he was the local Secretary for the Mathematical and Physical Section.

Of no man could it be more truly said that " his work was his hobby." His first and last thoughts were for his boys. He attracted and held others by his obvious sincerity; his gentleness was not softness, but carried with it the austerity of conviction. He was modest of demeanour, upright in character, generous in thought and word, kindly considerate of others; he was respected by all and beloved by those who were privileged to know him intimately.

Thus has passed a loyal and devoted servant of his age who was not without reward during his lifetime in the affection he inspired, just as he himself never failed to pay tribute to the inspiration and influence on his life of the present President of the Chemical Society.

He was a keen Churchman and it is fitting that an oft-expressed wish to see the Sanctuary in the School Chapel panelled should be fulfilled as a memorial to him.

C. E. L. LIVESEY.

GEORGE ALECK CROCKER GOUGH.

1902—1935.

GEORGE ALECK CROCKER GOUGH, born on April 23rd, 1902, was educated at Battersea Secondary School from 1917 to 1919 and at Battersea Polytechnic from 1919 to 1926. He was a brilliant student and in 1922 took the degree of B.Sc. (Lond.) with first-class honours in chemistry and in 1925 was awarded the degree of Ph.D. for a contribution to the stereochemistry of the methyl*cyclo*hexanols (J., 1926, 2052). Gough was a product of the remarkable school of chemistry at Battersea represented by Pickard, Kenyon, Hunter, and Phillips at the zenith of its activity.

In September, 1926, Gough joined the author on the staff of the chemical laboratory at the National Institute for Medical Research at Hampstead. I soon discovered that he had a remarkable aptitude for experiment, which received full play in the difficult unexplored field of amphoteric aliphatic arsonic acids (J., 1928, 2426) and again in aromatic acids containing amide groups (J., 1930, 669). A laboratory bench with half a dozen operations proceeding at once was characteristic of Gough. During the last-named investigation the preparation of nicotinic acid was undertaken and this led to the strange discovery of a nitropyridylpyrazole as an oxidation product of nicotine (J., 1931, 2968; 1933, 350).

In 1929 Gough was awarded a Rockefeller Travelling Fellowship for research in biochemistry. Full of enthusiasm he proceeded to Münich, where for a year he worked in Wieland's laboratory on some subsidiary sterols of yeast (*Annalen*, 1930, **482**, 36). On the completion of his studies in Münich he proceeded to Graz, where he took a course of microchemical analysis under Pregl.

On his return to Hampstead, Gough took up the chemistry of bacterial products. A great fillip had been given to bacterial chemistry by the work of Heidelberger and his colleagues on the isolation of complex specific polysaccharides from cultures of various types of pneumococci and it was a possibility that similar progress could be made with tubercle bacilli. Just at this time R. J. Anderson in the United States was embarking on an examination of the fats and waxes of tubercle bacilli, and Gough, on the suggestion of the late Dr. H. W. Dudley, took up the complementary investigation of the carbohydrates and proteins.

From tubercle bacilli grown on a synthetic medium, a specific carbohydrate, with a precipitating power against immune serum at a dilution of 1 in 5 millions, was isolated. On gentle hydrolysis it yielded mannose, *d*-arabinose, galactose, and an acidic fraction which on more prolonged hydrolysis gave more mannose (*Biochem. J.*, 1932, **26**, 248). Incidentally an investigation was made of the polysaccharide fraction isolated from the pollen of Timothy grass (*Phleum pratense*), since pollen are known to be associated with allergic conditions in man. This polysaccharide displayed some similarity to the specific carbohydrate of the tubercle bacillus and on hydrolysis gave *l*-arabinose, galactose, and a non-reducing acid (*ibid.*, p. 1291). Then followed a research into the water-soluble proteins of tubercle bacilli, whereby an albumin and a globulin were isolated, without denaturation, showing different chemical and immunological properties (*ibid.*, 1933, **27**, 1049).

It was but natural that the tubercular diagnostic agent tuberculin should be examined, and Gough showed how a highly active tuberculin could be obtained from a fresh culture medium by adsorption on benzoic acid. Such a tuberculin consisted essentially of large protein molecules, but from an old tuberculin two different fractions of widely differing molecular size were prepared, both, however, possessing skin activity (*Brit. J. Exp. Path.*, 1934, **15**, 237).

Gough's last contribution to chemical bacteriology was in collaboration with Dr. F. M. Burnet, on the chemical nature of the bacteriophage-inactivating agent in bacterial extracts.

This substance was polysaccharide in nature and on graded chemical treatment it lost in a step-wise fashion its ability to inactivate different phages (*J. Path. Bact.*, 1934, **38**, 301).

Gough was elected a Fellow of the Chemical Society in 1926 and an Associate of the Institute of Chemistry in 1924. He was a member of the Biochemical Society and of the Microchemical Club. For three winter sessions he gave an evening course in microchemical methods at the Sir John Cass Technical Institute. Late in 1934 Gough developed a mysterious illness, which ended fatally on November 8th, 1935. He was laid to rest in beautiful surroundings among the magnificent wych-elms in the grounds of the old parish church at Ashtead.

Gough had a strong affection for his garden and for the beautiful woodlands and commons of his native Surrey and for their fauna. He was keenly interested in art-photography, and was a skilled glass-worker. On chemical matters I invariably found him a sound critic, and all laboratory hypotheses in their embryonic or mature stages were tried on Gough with beneficial results. Calm, patient and unperturbed, Gough pursued his daily round with a devotion to duty only exceeded by his attachment to his widowed mother, who survives him.

HAROLD KING.

MAX HENIUS.

1859—1935.

MAX HENIUS, who was well known in both Denmark and the United States of America, was born at Aalborg, Jutland, where he received his early education. His training in chemistry was at the Polytechnic High School, Hanover, and the University of Marburg, where he graduated Ph.D. in 1881. In the same year he emigrated to the United States, where he and Dr. Robert Wahl in 1886 established the firm of Wahl and Henius, analytical and consulting chemists, at Chicago. The Wahl–Henius Institute, which included the American brewing school, came into being in 1891, Dr. Henius being director and later President.

His publications were limited mainly to articles on fermentation and its technology, patents in connection with brewing, its plant and equipment, and in particular, he and his partner were co-authors of the well-known text book, "Wahl-Henius Handy Book of the Brewing, Malting and Auxiliary Trades." He also wrote a number of pamphlets during 1931—34 advocating temperance (in the strict meaning of that word), such as "Modern Liquor Legislation in Finland, Norway, Denmark and Sweden."

Henius frequently served in such capacities as delegate, secretary or judge at various international congresses and exhibitions associated with the fermentation industries. He was a member of many British Societies, including the Chemical Society. Outside his professional activities, he did much to establish good relations between the countries of his birth and adoption, particular examples being in connection with the Rebild National Park in Denmark, which was provided by Americans of Danish descent, and an American Reference Library at Aalborg. Denmark honoured him by making him a Knight of the Order of Dannebrog, and awarding him the Gold Medal of Merit.

The outstanding feature of the life work of Henius is, however, that he was conspicuous as a pioneer of science in an industry which was an empirical handicraft in America when he first came into association with it.

R. H. HOPKINS.

FRANCIS RANSOM.

1859—1935.

FRANCIS RANSOM, the only son of William Ransom, was born at Fairfield (now known as Little Benslow Hills) on May 18th, 1859. In 1882 he entered the School of the Pharmaceutical Society, and after passing the Minor and Major Examinations continued as a

research student under Professor W. R. Dunstan (now Sir Wyndham Dunstan). He carried out researches on belladonna and published several papers in the *Pharmaceutical Journal*. After leaving the School, he gained experience in the works of Messrs. Southall Bros. and Barclay, and at Queen's Hospital, Birmingham. In 1884, he became a partner in the firm of Messrs. William Ransom and Son, at Hitchin, widely known for the cultivation of medicinal plants and the distillation of essential oils, and on its formation as a private limited company in 1913, was elected Chairman of the Board, a position he held until his death.

From 1886, for nearly 12 years, Ransom served on the Board of Examiners of the Pharmaceutical Society; he was Honorary Secretary of the Pharmaceutical Conference from 1890 to 1903 and President of the Conference held at Cambridge in 1910. As a result of his generosity, in 1916, the Ransom Fellowship for research in pharmacy was founded by the Pharmaceutical Society for the purpose of promoting work in the investigation of crude drugs and the solution of problems having a purely pharmaceutical bearing.

A man of great business acumen, Ransom had wide interests and devoted much time to public service in Hitchin. He was a vice-president of the local hospital, a member of the Hitchin Guardians for many years and chairman from 1926 until ill-health rendered his retirement necessary in 1930. He also had many other interests in the town, and was a Justice of the Peace for Hertfordshire.

For him pharmacy had pride of place and in the manufacture of its finer products he met the demands as they arose for improved appliances and experimental technique. His knowledge of crude drugs and their adulterants was wide and exact and extended to their assay where chemical methods were applicable, and to the isolation of their active principles. As a landowner he allocated an extensive acreage to the growing of plants that long have received official recognition by their inclusion in British and foreign Pharmacopœias, notably those of belladonna, henbane, digitalis, chamomile, and peppermint.

His recreative hobbies were the collection of prints and etchings, and especially of Japanese knife handles, of which his cabinet included some of the finest specimens to be found in this country. Of philately he made a life-long and careful study and was an unwearied enthusiast; his select and costly collection contained many stamps of exceptionally great value and variety. Out of his abundance he gave freely, cheerfully, and discriminatingly, and he generously supported local charities, in most cases anonymously. By temperament he was shy and retiring, as modest as he was capable, and to his intimates charming.

His death on December 19th, 1935, was a severe loss to British pharmacy, and at Hitchin he will ever be remembered with gratitude by his fellow citizens.

He was elected a Fellow of the Chemical Society on May 16th, 1889.

W. A. H. Naylor.

WILLIAM CHARLES YOUNG.

1849—1935.

William Charles Young, born in 1849, at Peckham, then a pleasant suburb of London, died at Ealing 11th October last, aged 86 years.

Young received his early scientific education from G. B. Buckton, F.R.S., and at the Royal College of Chemistry, where he became lecture assistant to Hofmann, and assisted Bunsen in his lectures delivered at the College. Then he worked under Mathiessen at St. Mary's Hospital on the zinc ethyl synthesis, followed by three years as assistant and demonstrator under Odling at St. Bartholomew's Hospital.

On Odling's appointment to the Waynflete Chair at Oxford, Young went to Attfield at the Pharmaceutical Society as his chief assistant, and then to Heisch, Middlesex Hospital, in the same capacity for three years.

At this point, attracted to the new field of work which recent legislation for the public health had opened for professional chemists in controlling the quality of food, drugs, water and coal gas, Young abandoned academic chemistry as a professional career and started practice in the year 1871, as analyst and consultant. His first official appointment, as Gas

Examiner at Beckton, jointly for the Corporation of London and the Metropolitan Board of Works, was followed by those of Public Analyst for the Poplar, Whitechapel, St. George-in-the-East, West Ham and other municipal areas, Consulting Chemist to the River Lee Conservancy (in which capacity he served for more than fifty years), Official Gas Examiner for West Ham, Leyton, Woolwich, Northfleet, Hastings, Littlehampton, Bognor, and for several other local authorities.

Young had for many years a wide and diverse private practice as consultant and adviser in the gas industry and in sewage and water pollution questions. Nevertheless, he made time concurrently for research, chiefly directed to improvement in analytical methods, of which records are to be found in the contemporary journals.

He was a Fellow of the Chemical Society (1873), the Institute of Chemistry (1878), the Society of Public Analysts, the Society of Chemical Industry (founder member), and the Imperial Institute.

W. M. GATHORNE YOUNG.

SAMUEL COX HOOKER.*

1864—1935.

THE death of Dr. Samuel Cox Hooker at his home in Brooklyn, N.Y., on October 12th, 1935, removed from the ranks of American chemists one of its most remarkable figures. He was born on April 19th, 1864, at Brenchley, in the County of Kent, England. His father, John Marshall Hooker, an architect, was the son of Stephen Hooker, a country gentleman, who, like his immediate ancestors for several generations, had lived and died at Brenchley. The family tombs in and outside Brenchley Parish Church record much family history. His mother was Ellen Cox, daughter of Samuel Cox of St. Heliers, Jersey, and also of Demerara, British Guiana, where he owned sugar plantations.

Shortly after Hooker's birth his parents moved to South Kent, and then after a brief interval to Sevenoaks. It was here that he spent most of his childhood and received his preliminary education, chiefly at Queen Elizabeth's Grammar School. At the age of 17 he was at the head of his classes.

In early boyhood Hooker became much interested in photography at a time when the wet collodion process was in general use. In this, and the succeeding period, when dry plates were being introduced, Hooker kept in close touch with developments in the art. He prepared his own plates and evinced that same mastery of detail and resourcefulness which characterised all his later work in chemistry and technology. The operations involved in these photographic pursuits naturally turned the boy's attention to chemistry, and so it came about that young Hooker in 1881 entered the Government Science School at South Kensington, London, of which Professor Huxley was then the head. He made rapid progress in his scientific studies and after two years was awarded a prize for advanced scholarship in chemistry. During this period he worked with Professor F. R. Japp, and the article by Japp and Hooker "On the Action of Aldehydes and Ammonia on Benzil" (J., 1884, **45**, 672) marks the first appearance of the junior author's name in chemical literature. This paper, published when Hooker was only 20 years of age, gave promise of future attainments in the field of organic chemistry.

In 1884 young Hooker left London to continue his chemical studies at Munich, where he worked under Bamberger in continuation of the latter's investigations upon retene, $C_{18}H_{18}$, the compound detected in the tar of coniferous woods by Knauss in 1858 and characterised chemically by Fritzsche and by Fehling in 1860. Little progress had been made up to 1884 in establishing the structure and relationships of the various derivatives of retene. In reviewing the work of previous investigators Hooker suspected, because of

* In the preparation of this sketch the author has been greatly aided by a member of Dr. Hooker's family, Mr. Louis A. Wills of the American Sugar Refining Company, Mr. Sidney J. Osborn of the Great Western Sugar Co., Dr. Louis F. Fieser of Harvard University, and Mr. William W. Shirley of the Pratt Institute Free Library in Brooklyn.

difficulties in combustion, that the reported analytical results were in some cases erroneous. He therefore modified the method of operation by conducting the combustion upon a small sample in the presence of lead chromate: accurate results were secured and progress towards unravelling the structure of retene was thus rapidly advanced. The four articles published by Bamberger and Hooker in 1885 (*Annalen*, **229**, 102; *Ber.*, **18**, 1024, 1030, 1750) described a large number of new derivatives of retene and established the fact that this compound is a phenanthrene derivative with one methyl and one *iso*propyl group, the authors suggesting 8-methyl-5-*iso*propylphenanthrene as a conjectural structure. Subsequent work on retene has been largely in the direction of establishing the exact placement of the two groups indicated by the basic work of Bamberger and Hooker. In 1910 Bucher (*J. Amer. Chem. Soc.*, **32**, 374) proved the structure of retene to be 8-methyl-2-*iso*propylphenanthrene, which corresponds to the 1-methyl-7-*iso*propylphenanthrene of the present scheme of notation. This work upon retene was subsequently of particular value in helping to elucidate the structure of abietic acid.

Hooker's excellent preparation in chemistry and his brilliant research upon retene enabled him to obtain his Ph.D. degree at Munich in the remarkably short period of one year. He had meanwhile come to the conclusion that America offered the best opportunity for his chemical future and immediately after taking his degree came to the United States in the hope of being able to continue his organic research work at one of its universities. Being unsuccessful in this, he obtained a position as chief chemist with the Franklin Sugar Refining Co. in Philadelphia, in the latter part of 1885. This was the beginning of his association with the sugar industry of the United States, a connection which he maintained with great advantage, both to the industry and to himself, during the next 30 years. No evidence of this activity appears, however, in Hooker's publications, as he held that, for competitive reasons, research work done for private industrial enterprises should not be published. He maintained this policy throughout the entire period of his commercial relations and for this reason many improvements in sugar technology which he introduced have been wrongly accredited to others. This restriction of publication did not apply, however, to other subjects and many pieces of research, unrelated to sugar technology and conducted in Hooker's leisure moments, appeared during the years 1887—1896 in the *Berichte*, the *Journal* of the Franklin Institute, the *American Chemical Journal*, and the *Journal* of the London Chemical Society.

Passing over Hooker's minor contributions upon purpurogallin (*Ber.*, 1887, **20**, 3259), reactions of carbazole and pyrrole (*Ber.*, 1888, **21**, 3299), detection of saccharin (*ibid.*, p. 3395), determination of nitrates in potable waters (*ibid.*, p. 3302), and a compound of pyrrole with picric acid (*J. Franklin Inst.*, 1891, **131**, 69), which were presented before the meetings of the Franklin Institute in Philadelphia, we would mention two investigations of major importance which he conducted during this period. The first of these was Hooker's very careful chemical examination of the Philadelphia water supply, the results of which were presented in four reports before the Chemical Section of the Franklin Institute and published in the *Journal* of the Institute for 1889 and 1890 (*J. Franklin Inst.*, **127**, 390, 474; **128**, 66; **129**, 411). The neglect of the Water and Health Departments of Philadelphia in supplying chemical analyses of the municipal water induced Hooker to make this important investigation on his own initiative. His analyses revealed a considerable degree of pollution in the water being pumped from the Delaware River to make up the deficiency in the Schuylkill and Wentz Farm basin supplies for the Kensington district. "What wonder, then," he asks, "that the Kensington district is a very hot-bed of disease in this city?" Hooker's report and recommendations played an important part in rectifying the long-standing evils to which he called the city's attention.

The second chemical research of importance which Hooker conducted during this productive Philadelphia period was his investigation upon lapachol, the first results of which were presented by him and his collaborator, W. H. Greene, before the Chemical Section of the Franklin Institute on April 16th and May 21st, 1889. Hooker's attention had been called to the occurrence of a yellow substance in the pores of Bethabara wood and his examination of its properties proved it to be Paterno's lapacic acid (lapachol). His numerous articles upon the derivatives and constitution of lapachol were published in

the *Journal* of the Franklin Institute (1889, **127**, 387; **128**, 142; 1891, **131**, 56, 61), the *American Chemical Journal* (1889, **11**, 267, 393), the *Berichte* (1889, **22**, 1723), and more exhaustively in the *Journal* of the Chemical Society (1892, **61**, 611; 1893, **63**, 424, 1376; 1894, **65**, 15; 1896, **69**, 1355, 1381). Hooker's investigations caused him to modify the structural formula for lapachol proposed by Paterno, *viz.*, 3-hydroxy-2-Δ^{α}-*iso*pentenyl-1 : 4-naphthaquinone, by shifting the double carbon linkage of the *iso*pentenyl side chain from the Δ^{α}- to the Δ^{β}-position [*i.e.*, to $R{\cdot}CH_2{\cdot}CH{:}C(CH_3)_2$]. The structure assigned to lapachol by Hooker in 1896 was confirmed 30 years later by Fieser's synthesis of this compound (*J. Amer. Chem. Soc.*, 1927, **49**, 857).

Hooker's lapachol investigation led into many ramifications not only upon lapachol itself but upon *iso*lapachol, *iso*-β-lapachol, and lomatiol, and the interesting subject of converting *o*- into *p*- and *p*- into *o*-quinone derivatives (Hooker and Carnell, J., 1894, **65**, 76; Hooker and Walsh, *ibid.*, p. 321). The series of papers upon these subjects show Hooker as a masterful manipulator and endowed with great patience, resourcefulness, and powers of observation.

The lapachol investigation was just opening up a vast field of interesting problems when changes in Hooker's professional connections with the Franklin Sugar Refinery obliged him to suspend for a long time all further research work in organic chemistry. The Franklin Sugar Refining Company was purchased by the American Sugar Refining Company, and it was to this corporation that Hooker's allegiance was transferred in 1892. Hooker, with not a few pangs of regret, packed away his lapachol preparations in order to devote all his thoughts and energies to the work of his new position.

His technological ability is best illustrated by the work which he did for the American beet-sugar industry. When the American Sugar Refining Company acquired a controlling financial interest in many Western beet-sugar factories, Hooker was assigned the important task of organising the technical work of these establishments upon a more efficient basis. The American beet-sugar industry at that time was new and inexperienced. Great difficulties were encountered in operating the Steffen lime saccharate process for recovering sugar from beet-molasses and this was one of the principal problems to which Hooker gave attention. He solved the difficulty by requiring the factories to adopt a finer grinding of the lime. He sought the best mill for this purpose and then by his own improvements perfected it so that it gave the desired results. The elimination of bluing for enhancing the brilliancy of beet-sugars was another reform which Hooker introduced.

In his connection with the beet-sugar industry Hooker manifested rare business ability in contributing to the organisation of the Great Western Sugar Company, of which he was a director from 1909 to 1913. He located several of the important plants of this company and these locations in each instance have proved sound and successful. He showed fine judgment also in the organisation of personnel and of his system of management, which is still largely retained by the company to-day. Hooker is often mentioned as the one who saved the American beet-sugar industry from its previous state of disorganisation and placed it upon a high level of efficiency.

In 1909 Hooker was appointed to the board of directors of the American Sugar Refining Co. and shortly thereafter moved his residence from Philadelphia to Remsen Street, Brooklyn, where he spent his remaining days. It is impossible in this sketch to indicate all that Hooker accomplished in this new position of responsibility. Reference will only be made to his remarkable organising ability, which is shown by the fact that at least seven of the men occupying the highest positions on the technical staff of the American Sugar Refining Company to-day were either originally engaged by him or were selected by him from young men employed by the company. These include three of the superintendents and two of the plant engineers of the Company's five refineries, and two of the five men that comprise the Company's central operating staff in New York.

Hooker had long cherished the plan of retiring from business, as soon as he had acquired a competency, in order to enjoy a well-earned leisure and to realise the fulfilment of certain long-deferred plans. He therefore resigned from the directorship of his company in 1915, thus closing his long productive connection of thirty years with the American sugar industry.

Unlike most men, Hooker was successful in shaping his career almost exactly according to a definite scheme which he had long carried in mind. Having shaken off all business cares and responsibilities, he was ready at the age of 51 to take up with characteristic zest and thoroughness three separate lines of activity in which he had long maintained an interest. The first of these was the resumption of the organic research work upon lapachol which circumstances had caused him to lay aside twenty years before. In the rear of his Brooklyn residence he transformed a former stable into a very complete private laboratory with an electrically operated mill for grinding tropical woods, extraction apparatus, and other equipment necessary for conducting the investigations which he had planned. In visiting Hooker in this laboratory the author was impressed by the quiet satisfaction which he derived from the resumption of his organic research work and also by the pleasure which he manifested in showing to friends his beautiful many-coloured specimens of lapachol derivatives. In contrast, however, with the series of frequent articles that were published in his early period of lapachol research, Hooker adopted in his later period the policy of publishing nothing until the whole investigation was as well finished and accurate as his own high conceptions of completeness and perfection could justify. It is tragic in a way that because of ill health he did not live to see the ultimate realisation of this plan, although he died with the satisfaction of knowing that all the experimental work upon lapachol and lomatiol which he had in mind had been completed and that the work of editing and publishing his results had been left in competent hands. Dr. Louis F. Fieser of Harvard University, whose own researches in this field together with his close associations with Hooker and knowledge of his work render him admirably qualified for the task, has been entrusted with the final preparation of the material for publication. Hooker's final researches upon lapachol will probably be sent to the printer sometime in the present year. In this connection Dr. Fieser writes, " It is remarkable that Dr. Hooker was able to take up his work where he had left off so many years ago and to fulfill the promises implied in his earlier publications; it is still more remarkable that the later work is perhaps even more striking and important than that completed while he enjoyed the full health and vigor of youth."

Another pursuit which engaged much of Hooker's time in this period of business retirement was the building up of his magnificent scientific library. He commenced the accumulation of scientific books early in life and was constantly adding to his collections, even during his period of industrial activity. The enlargement of this library, especially in the acquisition of rare sets of journals, was pursued very energetically by Hooker in his later years, with the result that he finally possessed one of the most complete chemical libraries in the world. It comprises a collection of over 21,000 books, 18,820 of which are volumes of journals.

A third major avocation of Hooker's later years was his interest in magic. It is related that his interest in this subject was first awakened while still a boy in school at Sevenoaks when his father took him to see the performances of Maskelyne and Cooke. He began to give amateur performances in legerdemain at the age of sixteen, but his interest in this field eventually became so strong that he had to put it resolutely aside in order that nothing might interfere with the work in chemistry which he had mapped out for a career. After his retirement, however, Hooker resumed the cultivation of his old hobby with renewed zeal and application. He was no longer content to remain an amateur and with the same thoroughness and attention to detail which he displayed in his chemical and technological work he soon acquired the high degree of proficiency in magic which was his standard in other pursuits. He became a member of the American Society of Magicians and on rare occasions gave private exhibitions before his fellow craftsmen in which feats of levitation and other illusions of his own invention were performed that completely baffled the professional magicians in his audience.

In 1887 Hooker married Mary Elizabeth Owens of Cincinnati, whom he first met in the laboratories of the Royal College of Science at South Kensington where they were fellow students. He is survived by his widow and four children.

C. A. BROWNE.