OBITUARY NOTICES.

GUY DUNSTAN BENGOUGH.

1876—1945.

To many, the name of Guy Dunstan Bengough, who died on January 20th, 1945, is familiar as that of a pioneer worker and a leading authority in the field of metallic corrosion; there can be no doubt, however, that at least equal distinction could have been his in fields other than the one he made so much his own.

The son of the late Major E. B. Bengough of Chislehurst, Bengough was born on February 11th, 1876. He was educated at Malvern and at Selwyn College, Cambridge, where he graduated in 1898. Among the subjects in his School and University curricula were botany and zoology, his mastery of which he displayed many years later when presiding over a Committee dealing with the fouling of ships' hulls by marine organisms. He was attracted at an early date to problems associated with metals, and during 1899—1902 studied metallurgy at the Royal School of Mines, following this up with several months in the research laboratory of the Royal Mint under Sir William Roberts-Austen.

Bengough's first appointment (1902—1903) was that of Lecturer in Chemistry and Metallurgy at the Sir John Cass Technical Institute, London, where he started what was to prove a flourishing Department of Metallurgy; he resigned this post to become metallurgist and assayer to a Burmese tin syndicate. On returning to this country he was appointed Lecturer in Metallurgy at Birmingham University under Professor T. Turner; and in 1907 he took charge of the newly-formed Metallurgy Department at Liverpool University. From this point Bengough's career falls into three phases, very unequal and slightly overlapping chronologically, but each characterised by an enthusiastic devotion to a central theme of research.

The first of these phases covers a period of purely metallurgical research, having special reference to the influence of heat-treatment on the structure and mechanical properties of copper and copper–zinc alloys. This work was published in a series of papers (Bengough and co-authors) the last of which appeared in 1914. Here was a fruitful field for further research holding great academic promise bearing in mind Bengough's background of training and experience.

In 1911, however, an event had occurred that was destined to modify profoundly the whole of his subsequent career. The Institute of Metals had already set up a Committee " for the purpose of furthering the study of the causes and prevention of the corrosion of non-ferrous metals and alloys ", particularly under marine conditions; and in that year, at the invitation of the Committee, Bengough presented a report summing up the existing knowledge and setting out a proposed scheme of research. This task served to reveal the general paucity of information inasmuch as most of the previous corrosion research, *e.g.*, by Friend, by Dunstan, and by Moody in this country had been restricted essentially to ferrous corrosion. Bengough was sufficiently attracted to the subject to commence work upon the experimental scheme, and in 1913, in collaboration with R. M. Jones, the results of a preliminary but comprehensive research were published as the Second Report to the Corrosion Research Committee.

Shortly after the outbreak of war in 1914 Bengough was gazetted to the Royal Garrison Artillery, T.F., and in 1915—1916 he was Captain and Adjutant to the C.R.A. Mersey defences. In the latter year, at the request of the Admiralty, following an epidemic of corrosion troubles in the Navy, he was seconded to the Institute of Metals for the purpose of continuing his corrosion researches, with particular reference to condenser tubes. This was now coupled with a definite appointment, the experimental work being transferred from Liverpool University to the Royal School of Mines in London; from this time onwards Bengough was committed to the full-time investigation of metallic corrosion. Subsequent reports (the late W. E. Gibbs had been mainly responsible for the Third Report in 1916) were published in collaboration with O. F. Hudson, R. M. Jones, Miss R. Pirret, J. M. Stuart, and R. May. The whole seven reports, appearing between 1911 and 1924, are impressive monuments in the history of corrosion research; they contain a wealth of information on immersed corrosion, particularly in respect to the nature of surface films of reaction product, and they have led to material advances in corrosion prevention.

In 1924 a change of direction was effected; a new Committee, under the Chairmanship of Professor (later Sir Harold) Carpenter, was set up by the Department of Scientific and Industrial Research for the express purpose of studying corrosion in its more fundamental aspects. Bengough accepted the appointment as Investigator under this Committee, the experimental work at first continuing at the Royal School of Mines. His immediate assignment was, however, an *ad hoc* and eminently practical one on behalf of the Royal Air Force, namely, the development of an improved method of protecting aluminium alloys against corrosion, particularly in aircraft operating in marine atmospheres. This work, in collaboration with J. M. Stuart, resulted in the well-known process of anodic oxidation associated with the names of these workers. The process, which has come into use all over the world wherever aircraft are made, besides being applied to many other diverse purposes, has been used on an enormous scale during the second world war.

The implementation of the new programme of fundamental research became possible with the building, in 1927, of the Department's Chemical Research Laboratory at Teddington, in which appropriate accommodation and facilities were allocated for this purpose by the Director, Professor G. T. (later Sir Gilbert) Morgan, to whom Bengough, as Principal Scientific Officer, acted as Deputy. The new programme involved no less than a complete change of outlook towards corrosion research. It had become clear to Bengough, as he emphasized on many occasions, that corrosion, hitherto regarded as a matter essentially for the metallurgist, was much more truly the territory of the chemist, and that many of the problems awaiting solution were amenable to the technique of modern physical chemistry. Experimental work was commenced early in 1928, with the support of a team of workers, including J. M. Stuart, A. R. Lee, F. Wormwell, and Miss R. Pirret, all of whom Bengough inspired with his own unbounded enthusiasm. There followed a series of investigations that can truly be said to have raised corrosion research to a level hitherto untouched in respect of accuracy of measurement, degree of control and elegance of detail. Quantitative experiments under strictly defined and reproducible conditions aimed primarily at the discovery of the factors that control corrosion rates under conditions of complete immersion. Especial importance was attached to the establishment of long-continued corrosion/time curves of known reproducibility; such curves, and their response to artificially controlled modifications of environment, supplemented by detailed observations and photographic records of the distribution of corrosion, enabled important conclusions to be reached as to the mechanism of the corrosion process. The accuracy of the control permitted experiments to be repeated, often after long intervals of time, with practical identity of results.

The general plan of the Teddington researches was that of beginning with the simplest possible conditions and proceeding systematically to conditions of increasing complexity. For example "conductivity" water was used before solutions of simple salts, and these in turn before sea-water; zinc was investigated before the multivalent iron notwithstanding the greater industrial importance of the latter; conditions of maximum stagnancy were investigated before conditions of movement, and so on. Up to 1933, the results were published mainly in a series of papers in the *Proceedings of the Royal Society* ("Theory of Metallic Corrosion in the Light of Quantitative Measurements, Parts I to VI"), a series no less noteworthy than Bengough's earlier reports to the Institute of Metals. In 1933, Bengough summarised the results to date in the Third Jubilee Memorial Lecture to the Society of Chemical Industry. Later, with F. Wormwell, he published papers elsewhere principally on the design, interpretation and uses of standard corrosion tests in salt solutions and industrial waters. With L. Whitby, he published work on the protection of magnesium by selenium coatings. The last piece of work with which he was associated at Teddington was the development of the "high-speed rotor apparatus," a direct outcome of fundamental research on the influence of movement; publication of this technique, already long delayed, was withheld for security reasons during the war since it was being employed for a very large number of important service tests. In 1936, Bengough retired from his full-time post at Teddington, but for several years held a temporary part-time appointment which enabled him to keep in touch with the progress of the corrosion work. Yet another cognate sphere of interest outside the Department, however, awaited him.

The subject of marine corrosion, with particular reference to ships' hulls and including fouling due to marine organisms as well as deterioration from corrosion, had been engaging the attention of the Joint Corrosion Committee of the Industrial Research Council and the Iron and Steel Institute, of which Bengough had been a member since its inception. In 1938, a Sub-Committee was formed, with Bengough as Chairman, to cover this field and to arrange for the institution of specific investigations. In spite of the immense economic importance of the fouling problem, in terms of reduced ships' speeds and increased fuel consumption, there was then a comparative dearth of published information and a complete absence of systematic research on this subject by any official body in this country. Bengough threw himself into this new task with all his old enthusiasm, and to him undoubtedly is the major credit of getting together not only a committee representative of various technical and shipping interests on which eminent marine biologists gave of their best, but also a brilliant team of research workers. Under Bengough's inspiring leadership many difficulties were overcome; and already a vast amount of invaluable data has been accumulated and substantial progress in the anti-fouling problem has been made. His last two papers, which he read in 1943, gave a general survey of this work and aroused much interest among marine engineers and naval architects.

Bengough was not merely an efficient chairman; by his visits to the Laboratory of the Scottish Marine Biological Association at Millport (Isle of Cumbrae) where the Committee's experimental anti-fouling work was being carried out, to the Committee's experimental raft off Caernarvon and to various docks for the inspection at first hand of ships' hulls (appraising both the nature of the growths and the efficacies of protective treatments), he played an active and material part in facilitating the Committee's experimental work. These visits—at various times of the year, often in bad weather and always under adverse war-time conditions—made demands upon his health that might well have over-taxed a much younger man. Besides all this, it fell to his lot, as Chairman of the Sub-Committee, to make contacts with outside interests that called for considerable tact and diplomacy; before his death he had the satisfaction of knowing that this—in some respects the most difficult—part of his task was yielding tangibly good results. This last phase of Bengough's career was one that he took very seriously and his passing was immediately and acutely felt by all those associated with the work. He missed only one meeting of his Sub-Committee before his death, and at the last meeting over which he presided he was already suffering from the illness that was to prove fatal.

Bengough received the Cambridge M.A. in 1901 and the Liverpool D.Sc. in 1913. He was elected a Fellow of the Royal Society in 1938. His services to corrosion research were recognised by a "Beilby Award" (Sir George Beilby Memorial Fund) in 1930, and by a Jubilee Memorial Lectureship of the Society of Chemical Industry in 1933. In 1928 he gave a special lecture on corrosion before the 8th Congress of Industrial Chemistry at Strasbourg; he also wrote the article on corrosion for the latest edition of the *Encyclopædia Britannica.* He served for some years on the Wire Ropes Committee of the Safety in Mines Research Board, and, from the inception of the work in 1942, he was Chairman of the B.S.I. Technical Committee (also of three Sub-Committees) on Boiler Water Tests. He was elected a Fellow of the Chemical Society in 1902 and published a paper in the *Proceedings* in 1908; another (with Stuart and Lee on the routine preparation of low-conductivity water) appeared in the *Journal* in 1927.

Distinguished in presence and in stature—he was 6 ft. 4 in. in height—and with an erect and military bearing, Bengough made an impressive figure. Quietly dignified in manner, he was withal a charming and brilliant conversationalist and an easy and lucid speaker in public. He possessed in marked degree the capacity of detachment and concentration; he could, for example, turn to some literary task, whatever had previously engaged his attention and become immediately impervious to external distractions. His appearances in public were comparatively rare except only at scientific discussions to which he had something definite to contribute. It was largely his highly developed critical faculty that led him not infrequently into controversy. It can be said of him, quoting the words of Samuel Butler, that he " neither expected nor gave quarter in a philosophical argument "; but his own outlook might truly be described by the further words, " we know well that we score more by retracting after we have been deeply committed, than by keeping to our original course when a new light has been presented to us." Bengough was subject over many years to attacks of sciatica which incapacitated him, sometimes, for long periods; from these prolonged absences he would return with his zeal for research unabated. During the last years he was curiously free from these attacks; but his death was preceded by a most painful illness which he endured with characteristic fortitude.

Bengough married in 1908 Constance Helen, second daughter of the late Lt.-Col. Jelf-Sharp of Kincarrathie, by whom he is survived. In his many activities he had the enthusiastic support of Mrs. Bengough, who acted as his secretary during the later war years.

Chemistry is a catholic subject; and whilst most of Bengough's professional life had been devoted to the study of the reactions of metals with their liquid environment—at one time regarded more especially as the province of the metallurgist—this is now generally accepted as a fruitful branch of chemistry. In G. D. Bengough, a distinguished chemist and a distinguished personality has passed but his work and influence will survive.

W. H. J. Vernon.

IDA SMEDLEY MACLEAN.

1877—1944.

Ida Smedley MacLean was born in Birmingham on June 14th, 1877, the second daughter of William T. Smedley, and died on March 2nd, 1944. In 1913 she married Dr. Hugh MacLean, formerly Professor of Medicine in the University of London at St. Thomas's Hospital, who, with their son and daughter, survives her. Until the age of nine she was taught at her home by her mother and then entered the King Edward's High School, Birmingham, with a scholarship. She took the London Matriculation and Intermediate B.Sc. examinations from school, was awarded a Gilchrist Scholarship for three years for an Honours certificate with four distinctions in the Cambridge University Higher Local Examinations, and also gained the school Exhibition.

Ida Smedley was a student at Newnham College in 1896—1899, taking Parts I and II of the Natural Sciences Tripos. She was awarded a Bathurst Scholarship by the College when she left to take up post-graduate work in London as a Research Student at the Central Technical College, where she worked with Professor H. E. Armstrong. Her work on the *Benzylanilinesulphonic Acids and their Derivatives* formed the subject of the thesis presented to the London University for the Doctorate of Science in 1905.

In 1903 she returned to Newnham College as demonstrator in Chemistry, resigning at the end of 1904 to devote herself entirely to research work in the Davy–Faraday Research Laboratory of the Royal Institution, London. Here she completed a research, begun in the Central Technical College, on *Studies of the Origin of Colour Derivatives of Fluorene* (*J.*, 1905, **87**, 1249—1255).

In 1906 Ida Smedley became an assistant lecturer in the Chemical Department of the University of Manchester, the first woman to be appointed on the staff of that department. During the four years in which she held that post she carried out researches on the refractive power of open-chain hydrocarbons containing contiguous ethenoid groups; on the relation between the chemical constitutions and optical properties of aromatic α- and γ-diketones; and on the relative influence of the ketonic and ethenoid linkages on refractive power. An account of this work was published in a series of papers communicated to the Society during the years 1906—1911.

In 1910 she returned to London, holding a Beit Research Fellowship (1910—1914), and began her biochemical work at the Lister Institute of Preventive Medicine, under Professor (later Sir) Arthur Harden, F.R.S., and remained associated with the Institute for the rest of her life, becoming a member of its staff in 1932. After she retired from her official position at the Lister Institute she continued to work there to within a few months of her death, investigating problems for the Colonial Products Research Council.

During the 1914—18 war Ida Smedley MacLean worked for the Ministry of Munitions and the Admiralty on various problems of national importance, including the large-scale production of acetone from starch by fermentation. In 1918 she became a Fellow of the Institute of Chemistry.

The value of her early work on fat metabolism and fat synthesis was recognised in 1913 by the award of the Ellen Richards Prize, given by the American Association of University Women to the woman making the most outstanding contribution of the year to scientific knowledge. Her final publication appeared as the first of Methuen's Monographs on biochemical subjects, and was entitled "The Metabolism of Fat". Here she summarised, in a succinct manner, her views on a field of work in which she was a recognised master.

(The writer is indebted to one of Dr. Smedley Maclean's chief collaborators, L. C. A. Nunn, for the following brief review of her work on fat metabolism.)

> "The problem of fat synthesis from carbohydrates first attracted her attention, and in 1911 she investigated the auto-condensation of crotonaldehyde and proved that a compound containing an unbranched chain of eight carbon atoms was formed. The result of this investigation gave support to the idea that long unbranched fatty-acid chains could be built up by two, or even four, carbon atoms at a time, from such simple molecules as the two-carbon compound, acetaldehyde. This was important, because earlier work had resulted in the formation of branched carbon chains, which are only of rare occurrence in the natural fats. The work was extended to the pyruvic acid series in 1913, in co-operation with Eva Lubrzynska, and led to the building up of fatty acids containing unbranched chains of eight or more carbon atoms. It was probably the general interest in the work of Robison and Harden on the problem of yeast fermentation involving the study of the complex interactions between phosphate and carbohydrate, that led Ida Smedley MacLean to the study of carbohydrate and fat metabolism in yeast, a fruitful research on which she published some 14 papers in the *Biochemical Journal* (1920—1938), in collaboration with E. M. Thomas, D. Hoffert, E. M. Luce, C. G. Daubeney, R. A. McAnally, and L. D. MacLeod.
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> During the period 1929—1935, in collaboration with M. A. Battie, M. B. S. Pearce, A. P. Ponsford, R. O. Jones, and L. C. A. Nunn, she carried out researches on the oxidation *in vitro* by hydrogen peroxide of long-chain fatty acids (published in 7 papers in the *Biochemical Journal*). The results of this work, whilst confirming that at least some β-oxidation occurred, were of a more far-reaching importance, as they showed that the addition of a cupric catalyst to the mixture of the fatty-acid soap and hydrogen peroxide increased the rate of oxidation to such an extent that, in certain cases, the fatty acid was degraded in the course of a few minutes to the highest state of oxidation, carbon dioxide. The investigation of the intermediates of this action, which it was hoped would be a laboratory model for gaining some knowledge of the biological oxidation of fat, presented great difficulties, and she was occupied with this work almost to the time of her death.
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> In a later series of researches, published in 7 papers of the *Biochemical Journal* (1938—1941), in collaboration with L. C. A. Nunn, and with E. M. Hume and H. Henderson-Smith on the biological side, Ida Smedley MacLean followed up, on a more biochemical basis, the classical work of G. O. and M. M. Burr on *Fat Deficiency of Rats.* These investigations proved conclusively the earlier work of the Burrs, but extended it in new directions, including the relative effect of many unsaturated acids, together with that of many of their oxidation products; the places of storage and relative concentration in the various organs of the rat, and their effect on the synthesis and storage of the ordinary depot fat. These comprehensive experiments have added in a striking degree to our knowledge of the function of the highly unsaturated fatty acids in the animal body. Among the important conclusions, the essential nature of arachidonic acid and the necessity of linoleic acid in the diet as the possible starting material for the synthesis of this acid were established. Finally, the chemical constitution of arachidonic acid was determined with an extremely small quantity of material. In the later stages of the final work D. E. Dolby and C. L. Arcus were also contributors.
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> In addition to her many papers in the *Biochemical Journal*, Ida Smedley MacLean published an article in the *Annual Review of Biochemistry* on the 'Phospholipins' and one on 'Fat Synthesis' in the *Ergebnisse der Enzymforschung*."

Chief among her other interests, and second only to her work in biochemistry, the many friends of Ida Smedley MacLean will place the important part she played in the advancement of the professional status of University women. The British Federation of University Women was inaugurated in 1909 during her residence in Manchester, and has owed very much to her as its first secretary and subsequent holder of the offices of treasurer and president. Among the objects of this body were the encouragement of original research by women, better facilities for professional women, the opening of membership of the learned societies to qualified women, and the extension of the franchise to women. In this last connection she stated clearly in her Presidential Address to the Federation:

> "We are banded together as a body of women graduates and, as such, the special quality we have to contribute is not impetuous action, but balanced judgment: to weigh carefully conditions and circumstances, and to think clearly before taking action is a much needed quality in the social life of today."

In 1919 the British Federation and a similar organisation in the United States co-operated in drawing up a constitution for an International Federation of University Women. During the period between the world wars this was extended and included Federations in all the Dominions, and in the majority of the European countries.

Ida Smedley MacLean took a leading part in this wider activity and was one of the chief promoters of that most constructive piece of work of the Federation, the endowment of International Fellowships for original research. During the period 1924—1935, more than £12,000 was paid to holders of these Fellowships by the International Federation and its constituent National Federations.

Among the other objects of the B.F.U.W. in which Ida Smedley MacLean played an active part was the opening of the learned societies to women members. The election of Madame Marie Curie, in 1904, as an Honorary and Foreign Member of the Chemical Society, encouraged women chemists to petition the Council of the Chemical Society for the admission of women to the Fellowship, and a memoral to this effect, signed by nineteen women chemists, was presented to the Council in October of that year by Ida Smedley and the writer.

This was not the first time that the question of admitting women as Fellows had come under the consideration of the Council, for in 1880 Counsel's opinion was taken on the question.*

> Does the Charter of the Society contemplate or permit of the admission of women as Fellows and if so what alteration, if any, is required in the Bye-Laws? The Council were advised that under the Charter women are admissible as Fellows, but when on three occasions (1880, 1888, and 1892) proposals were made to put it into effect no action was taken, the general feeling being that, although there was no objection in principle to the admission of women as Fellows, the case in their favour was not clearly established by any considerable number of applications for the Fellowship and that a change involving so radical an alteration in the policy of the Society, should be recommended by a maximum vote.

In their consideration of the Memorial the Council were advised that

> married women are not eligible for election as Fellows of the Society; that it is extremely doubtful whether the Charter admits of the election of unmarried women as Fellows; that it would not be wise to elect even unmarried women without first applying for a Supplemental Charter, and that the election of women as Associates would be legal after a modification of the Bye-Laws expressly authorising their election. †

An alteration in Bye-Law III extending the privileges of the Associateship to women was proposed by the Council, but rejected by the Fellows.‡

Having received no satisfactory reply to the Memorial, the signatories canvassed personally a number of Fellows of the Chemical Society to obtain their view on the question of the admission of women as Fellows. So large a number of Fellows expressed a favourable opinion, and signed a statement to that effect, that in May 1908 Professor Tilden presented to the Council a petition signed by 312 Fellows, requesting that steps be taken to ascertain the wishes of the Society as a whole regarding the admission of women to the Fellowship of the Society. Acceding to the request of the memorialists, the Council directed the Secretaries to issue a letter, drawn up by the Council, in which arguments on both sides were set forth, requesting each Fellow to consider these, and to express his opinion, on the ballot paper enclosed therewith. 1,758 Papers were returned, of which 1,094 were in favour of admitting women, and 642 against the proposal, whilst 22 were neutral. Two Extraordinary Meetings of Council were devoted solely to the consideration of this report, and it was resolved, by a considerable majority,

> "That in the opinion of this Council it is desirable that at any time, on recommendation of three Fellows of the Society, women be accepted as Subscribers to the Society. Such women Subscribers shall pay an annual fee of 30*s*., they shall be admitted to all ordinary Meetings of the Society, they shall have the same use of the library as the Fellows, and they shall be supplied with the "Proceedings," "Transactions," and "Annual Reports" of the Society as these are issued." §

This side-door entry for women into the Society did not meet with the approval of the Signatories of the petition, or of the women chemists,|| only eleven of whom became Subscribers to the Chemical Society during the subsequent eleven years.

In 1920 the Chemical Society obtained a Supplemental Charter giving the power to make certain necessary changes in the Bye-Laws; among the main changes thus effected was the admission of women to the Fellowship, and in view of this fact the Council decided to abolish the class of Lady Subscribers as from December 31st, 1920.¶

At the ordinary scientific meeting of the Society on December 2nd, 1920, Ida Smedley MacLean was the first woman to be formally admitted to the Fellowship; and she was a member of the Council during the period 1931—1934.

M. A. WHITELEY.

ALEXANDER KENNETH MILLER

1856—1945.

DR. ALEXANDER KENNETH MILLER died at his home in Manchester on June 19th, 1945, in his 90th year.

In 1876 Miller commenced the study of chemistry under Professor (later Sir) Edward Frankland and later acted as research assistant to Professor (later Sir) Norman Lockyer. Proceeding to Germany in 1880, he spent about two and a half years at the University of Würzburg and continued his studies under such famous men as Wislicenus, Kohlrausch, and Sandberger, and eventually took the degree of Doctor of Philosophy.

On coming back to this country in 1882 Miller was appointed assistant to Professor H. E. Armstrong, and in 1884 was appointed Senior Demonstrator in the Chemical Department of the Central Institution of the City and Guilds of London Technical Institute. During this period he devoted much of his spare time to various aspects of chemical investigation in collaboration with Armstrong and published the results in the Society's *Journal* and in the *Berichte*. Shortly after this, Miller became associated with the well-known firm of F. Bayer & Co., at their branch works near Glasgow, a position which he held until the works were closed in 1890. Later in that year he carried out some important work with Professor T. E. Thorpe, on the colouring matter of alder-bark.

* Council of the Chemical Society, Minutes of the Meetings, 1880, IV, 215, 219; 1881, IV, 221; 1888, V, 103; 1892, V, 212, 226; *P.*, 1893, **9**, 84.

† Council of the Chemical Society, Minutes of the Meetings, VIII, April 21st, 1904; *J.*, 1905, **87**, 538.

‡ *P.*, 1905, **21**, 41—59.

§ *J.*, 1909, **95**, 614; *P.*, 1908, **24**, 203, 277.

|| *Nature*, 1908, **78**, 226; 1908, **79**, 37, 399, 429, 488; **80**, 67.

¶ *J.*, 1919, **115**, 388; 1920, **117**, 419; 1921, **119**, 515.

Miller was a Fellow of the Royal Institute of Chemistry, a Fellow of the Chemical Societies of London and Berlin, a member of the Society of Public Analysts, and an original member of the Institute of Brewing. Amongst his published works are studies on dihydroxybenzoic acid, camphor, *m-iso*propyltoluenesulphonic acid, *p*-toluenesulphonic acid, the constitution of benzene, the composition of shale spirit, and Guthrie's compound of amylene with nitrogen peroxide.

Shortly after leaving Thorpe, Miller took the unusual course of abandoning pure organic chemistry for the study of fermentation and became chemist to Messrs. Chester's Brewery, Ltd., of Ardwick, Manchester, who sent him to Copenhagen to study the subject of pure yeast culture under Professor Jörgensen. On his return from Denmark he introduced the use of Hansen's pure culture yeast into the brewery in conjunction with C. F. Hyde and later published his results in the Transactions of the North of England Section of the Institute of Technical Brewing. This is a paper of considerable merit and a very valuable contribution to the technique of top fermentation. Eventually he forsook the purely brewing side and started in practice as a Brewer's Consultant in Manchester, later to join forces with Dr. Hiepe. After the decease of his partner, Miller carried on alone at City Road, Manchester, until he retired in 1934. He was called as an expert witness before the Royal Commission on Arsenical Poisoning and rendered very valuable service.

In addition to being a competent chemist Miller was a man of very modest character and a conscientious, painstaking worker. He was well known in the North of England where his easy personality and charm of manner gained him many friends. As a hobby, he collected clocks and musical boxes of all kinds and had a considerable collection which he was always delighted to show to an interested visitor. His City Road laboratory, now occupied by the writer of this note, contains his comprehensive library and many of his notes and papers which are of absorbing interest.

Miller was the fifth of the six sons of John Miller, the artist (1818—1871); one brother was Keeper of Printed Books at the British Museum, another a portrait painter, while yet another was a well known mezzotint engraver. One of the brothers took a degree at Würzburg University and subsequently worked for some 30 years at the Rothamstead Experimental Station at Harpenden.

In a family in which science and the arts were uniquely blended, Miller was a worthy exponent of the sciences. He lived a full life and enjoyed good health almost to the end which came after a brief illness. He left a widow, two sons, and a daughter.

A. J. CURTIN COSBIE.

CLARENCE SMITH.

1875—1945.

CLARENCE SMITH, son of Arthur and Kate Smith (née Carden), was born at Brighton 9th November, 1875, and died at Handcross, Sussex, 28th June, 1945. He was educated at Brighton Grammar School and later at the Royal College of Science, South Kensington, as a Royal Exhibitioner, taking the Associateship with a First Class in Chemistry in 1897 and graduating B.Sc. at London University.

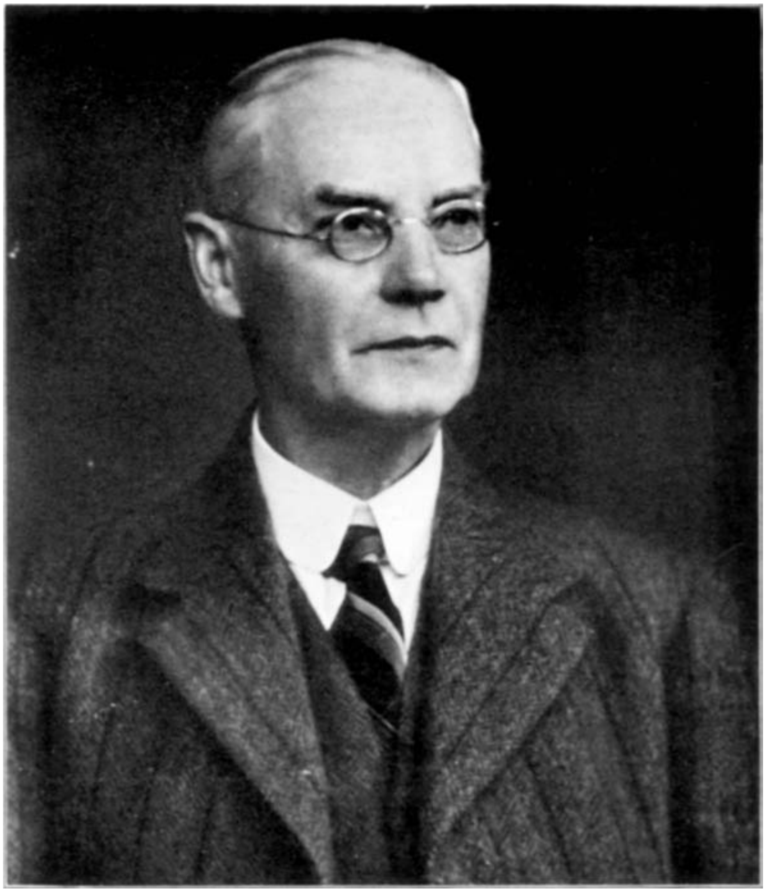
From 1897 to 1899, Smith assisted in teaching Practical Chemistry at the Royal College and then spent two years in school teaching, but returned to the College in 1901 in order to pursue research on certain naphthalene derivatives which gained him the D.Sc. degree in 1903. In writing a testimonial for him at this time, Sir William Tilden remarked that he had " from the first exhibited an excellent combination of ability and industry " and further " he performed all his duties to my entire satisfaction and to the benefit of the students with whom he was brought into contact."

Smith acted as Assistant in the Organic Chemical Laboratory of University College, London, for three months in the Spring of 1903, filling the place of Dr. Smiles who had fallen ill. This entailed giving some lectures on advanced organic chemistry, and Professor Collie remarked that all his work " was done in a most satisfactory manner and he was always ready to help in every way possible."

The present writer became acquainted with Smith in 1903 when he was appointed to the lectureship in Chemistry at East London Technical (now Queen Mary) College; he worked there until 1915. In addition to his teaching duties and research work, he entered into the social life of the College and was always to the fore in helping students in arranging entertainments. In giving Smith a testimonial Principal Hatton wrote " He is possessed of tact and good judgment, which should largely assist him in the discharge of such duties. He has proved himself to be an agreeable colleague and one always willing to take part in the social life of the College." The present writer found a very good friend in Smith and the relationships of the chemical staff were excellent.

The Department of Explosives Supply applied for Smith's services in 1915, whereupon he went to Storey's Gate. The present writer was put in charge of the D.E.S. Laboratory at Chiswick in 1916 and Smith joined him there soon afterwards, acting as deputy when the principal was away. Those were strenuous times, long hours in the laboratory or alternatively travelling about the country visiting factories. Most of Smith's work at Chiswick dealt with high explosives, but he was also called in to test out on pilot-plant scale the manufacture of one of the substances suggested as sternutatory agents. The process, as handed over, was most unpleasant and gave rise to several fires; the use of the particular substance was fortunately abandoned.

From 1919 Smith was engaged with the present writer in managing a small chemical works, and from 1924 he devoted his whole time to the Chemical Society, becoming the Editor of the *Journal* after the death of Dr.



Dr. CLARENCE SMITH.

[To face p. 68.

J. C. Cain. After the war of 1914—1918, the conditions of the publication of chemical work had undergone a considerable change. The importance of chemistry had received forcible recognition, the number of research workers had largely increased, whilst the costs of publication had gone up. The Chemical Society had " to cut its coat according to its cloth " and steps were taken to keep the length of papers within reasonable bounds.

Under these conditions the work of an Editor was far from easy. The writer of an obituary notice in *Chemistry and Industry* (18th August, 1945) has stated the position very clearly.

" In editing the *Journal of the Chemical Society*, Smith's task, apart from the routine of publication, was to reconcile the policy laid down by the Publication Committee and the advice of referees with the interests of authors, a task frequently difficult, but specially so during several years of financial stringency and recently on account of the meagre allocation of paper for scientific publications. At the meetings of the Committee, Smith was consistently careful to protect the interests of authors and he took endless pains in helping them to meet the requirements of publication; even to the extent of re-writing papers for those who could not or would not reduce them to a length which would allow of their being printed. His ' editorial revision ' was at times the subject of criticism, but it is certain that authors as a body owe much to Clarence Smith, for, of the letters he received after papers had been published, a large majority—90% if memory serves—thanked him for the improvements his help had effected."

Dr. A. D. Mitchell, writing to me after Smith's death, refers to his imperturbability and remarks on his editorial work as follows :

" For nearly 25 years he had to cut papers rigorously owing to pressure on finance. If he slightly over-cut there was at once an indignant protest from the author, whereas if he grossly under-cut nobody would ever have realised it unless it had become flagrant. Yet with this ever-present incentive to take the easy course, he conscientiously slaved to do justice to both authors and the Society, and neither complaints nor hard work ever rattled him."

Dr. Mitchell refers to his " great respect and admiration " for Smith, whilst the notice in Chemistry and Industry concludes with :

" Those who knew him will mourn the passing of a modest, sincere and upright man who commanded their affection and respect."

Smith's own contributions to scientific literature were terminated by the outbreak of war in 1914. Whilst his first work was purely organic, he showed a distinct leaning later to physical chemistry.

Smith's earliest paper (*J.*, 1902, **81**, 900) dealt with the diazoamino-compounds of *ar.*-tetrahydro-β-naphthylamine, the work being carried out at the Royal College of Science. The reduction of β-naphthylamine had been studied by Bamberger and his co-workers (*Ber.*, 1887, **20**, 2195; 1888, **21**, 847, 1112; 1889, **22**, 625; 1890, **23**, 876) and it was stated that the *ar.*-tetrahydro-compound yielded azo-colouring matters if coupled with diazonium salts, though no evidence was adduced. If no diazoamines were formed as intermediate products, it would mean that the *ar.*-base retained its naphthalenoid character, which would be surprising. Smith showed conclusively that diazoamines were the first products of reaction; they were isolated, and decomposed into amines and diazonium salts by cold hydrochloric acid (cf. Meldola and Streatfeild, *J.*, 1887, **51**, 438).

In a later paper (*J.*, 1904, **85**, 728) the bromination of acetyl-*ar.*-tetrahydro-β-naphthylamine was recorded. Two monobromo-derivatives were isolated; on hydrolysis and elimination of the amino-group, each yielded 1-bromotetrahydronaphthalene. Thus the bromine had entered the benzenoid nucleus in ortho- and meta-positions to the acetamido-group.

The action of formaldehyde on the tetrahydro-base was also studied (*ibid.*, p. 732) and a methylene compound, $C_{10}H_{11}N{:}CH_2$, obtained. No tendency to formation of an acridine was observed, the substance again exhibiting benzenoid character.

After appointment at East London College, Smith discovered an interesting case of steric hindrance amongst naphthalene derivatives (*J.*, 1906, **89**, 1505). Naphthylamines usually couple with diazonium salts to give aminoazo-colouring matters directly, but Witt (*Ber.*, 1888, **21**, 3483) had found an exception in the case of 2-naphthylamine-8-sulphonic acid. Smith thought this might be due to steric hindrance and confirmed his supposition by showing that, though isomerisation was impossible when position 8 was occupied by a sulphonic group, the smaller nitro-group allowed the diazoamine first produced to be isomerised. Correspondingly, 2-dimethylaminonaphthalene-8-sulphonic acid does not react with diazonium salts, and whilst 1-bromo-β-naphthol couples with diazonium salts with elimination of halogen (Hewitt and H. V. Mitchell), yet 1-bromo-β-naphthol-8-sulphonic acid is unreactive.

In order to throw light on the structure of the hydroxyazo-compounds, Smith and A. D. Mitchell examined their behaviour towards diazomethane and mercuric acetate. With compounds of the benzene series, results were obtained consistent with the hydroxyazo- (not quinonehydrazone) structure for compounds of the para-series; in the ortho-series the results were in some cases negative but not inconsistent with hydroxyazo-structure, and evidence in favour of quinonehydrazones was not obtained (*J.*, 1908, **93**, 842).

The work was extended to the naphthalene series (*J.*, 1909, **95**, 1430) and the compounds obtained by coupling diazotised aniline with α-naphthol and its 2- and 4-nitro-derivatives as well as β-benzeneazo-α-naphthol were examined. With unsubstituted benzeneazo-α-naphthol, only oxidation was observed, but the other compounds gave monomercuri-acetate derivatives. Attempts at determining the orientation of the entrant groups were unsuccessful and azo-compounds from 2 : 4 : 6-tribromoaniline were not subjected to mercuration.

The structure of the diazoamines has been the subject of several researches. As is well known, if a mixed compound is prepared from two different amines by diazotising one of them and coupling with the other, the order in which they are taken is indifferent, the same compound resulting in each case. Further, if decomposed by warming with acids, two phenols and two bases are generally obtained. Explanations have been sought on two hypotheses : (*a*) two structurally possible diazoamines unite to form a compound, (*b*) the diazoamine has a structure intermediate between the two " canonical " forms. Smith and Miss C. H. Watts (*J.*, 1910, **97**, 562) prepared ethyl derivatives by diazotising *m*- and *p*-nitroanilines and coupling with *p*- and *m*-nitroethylanilines respectively. Two distinct compounds were obtained; their absorption spectra were measured, and a melting-point curve showed that no combination took place when they were mixed.

The subject of pyrogenic decomposition was taken up by Smith and Lewcock; interesting results were obtained with benzene, but the work had to be broken off (*J.*, 1912, **101**, 1061).

The last-named authors (*Ber.*, 1912, **45**, 2358) gave an ingenious confirmation of Aschan's interpretation of the Hell-Volhard reaction, *viz.*, that enolisation precedes bromination (*ibid.*, 1913). Whilst *iso*butyryl chloride should give bromo*iso*butyryl bromide, chloro*iso*butyryl chloride should not react. This was found to be the case.

Two papers (J. C. Cain, J. L. Simonsen, and C. Smith, *J.*, 1913, **103**, 1035; 1914, **105**, 1335) were occasioned by a continuation of the research of the first two authors on the constitution of santalin.

Most of Smith's work dealt with organic chemical problems; but he also branched out in other directions. With A. D. Mitchell (*J.*, 1909, **95**, 2198) a method was given for the volumetric estimation of sulphates with use of ammonium dichromate in place of the procedure described by Precht.

The same authors also dealt with the question of the possible existence of racemic compounds in the liquid state (*J.*, 1913, **103**, 489). The Eotvös–Ramsay–Shields constant (2·12) was measured for *d*-pinene (2·36), *l*-pinene (2·32), *i*-pinene (2·35), and a mixture of *d*- and *l*-pinenes (2·33). Similar results were obtained with the limonenes and methyl *d*-tartrate and racemate. The work was subsequently extended to include aliphatic alcohols, but again no evidence of liquid racemic compounds was obtained (*J.*, 1914, **105**, 1073).

In an interesting paper (*Proc. Roy. Soc.*, 1912, *A*, **87**, 366), Smith stated that all substances should have the same refractive indexes at their respective critical points. Guye (*Ann. Chim. Phys.*, 1906, **21**, 206) showed that for any substance $b(n^2 + 2)d/(n^2 - 1)M = \text{const.}$ (b is Van der Waals's constant). From Traube's calculations this constant has the value 4·03, and assuming that the specific refractivity is constant for all temperatures up to the critical point, then elimination of d_c (critical density $= \frac{1}{8}b$) gives $n_c = 1{\cdot}126$. It was found that the difference from the experimental results was under 1% for most substances; greater differences were not numerous but occurred mostly amongst aromatic compounds and halogen-containing substances.

It was hoped to go into this subject more thoroughly, but the trouble of 1914 intervened. It may be added that the relationship has twice since been rediscovered—once in France and once in Germany if the present writer's memory is not at fault.

Smith also interested himself in several industrial questions, but details are not available.

In 1936, Smith gave a lecture to the Chemical Society on " Modern Chemical Nomenclature " (see *J.*, 1936, 1067). This was in response to a request from the Institute of Chemistry, and a large number of chemists from many societies attended. In his usual clear-minded manner, Smith gave a reasoned statement of the fundamental principles of this difficult subject and, in the opinion of at least one distinguished chemist, it constituted an outstanding contribution to the *Journal*.

In 1906 Smith married Winifred Emma, daughter of James Hobbs of Brighton; she died in 1940 after several years of ill-health which (to quote from a letter) " never drew a complaint from her." He is survived by a daughter, who acted (and still acts) as Editor's Secretary. His son, a Chartered Surveyor by profession, greatly over-worked for the Ministry of Works during the war, besides doing much in the way of Home Guard and fire-watching duties; he was in a sanatorium at the time of Smith's death, and died on October 27th, 1945.

Smith enjoyed society, games, the open air, and the country. He was in his earlier days a fine player at most forms of ball games, " particularly tennis, which he played very well at the age of 60 ! " (A. D. M.)—in fact for the First Team of his Club. He also was a great chess player.

As a student at the Royal College of Science, Smith made the daily journey between Brighton and Victoria, and after his appointment at East London College he spent most week-ends at Brighton, using a motor-bicycle; this ceased when he married and became a householder.

For some years he lived in Croydon but moved to Staplefield just before the outbreak of war in 1939. His mother and two sisters lived there; the former died early in 1944 at the age of 94.

Recently Smith and his daughter found a house (dated 1676) near Handcross, Sussex, in a remote spot where they got dwelling and garden " in fine condition " (A. D. M.) and were living very happily. Smith enjoyed extremely good health, never having had a doctor in his life, although I believe he did find the extra responsibility of carrying on the work of the *Journal* during this war, without the assistance of the Publication Committee, rather a strain—perhaps more than even he realised. A few days before he died he complained of very bad indigestion and spent the week-end in bed. On the morning of the 28th June, he thought he had a touch of lumbago. In the evening he felt much better and went for a short walk. His daughter found him a few yards from their gate; the cause of his death was angina.

The Chemical Society has lost a most efficient editor and those who knew him a good friend, whilst he will be gratefully remembered by many of his old students.

J. T. HEWITT.