

OBITUARY NOTICES.

PRAMOD KRISOR BANERJEE.

1891—1937.

THE teaching of chemistry on modern lines in Bengal has sustained a great loss in the death of P. K. Banerjee, M.Sc., Professor of Chemistry in the Bankura College, Bengal.

Banerjee was born on November 16th, 1891, and came of a high-class family. He studied for his B.Sc. Honours and M.Sc. courses in the Presidency College, Calcutta, under the guidance of the doyen of Indian science, Sir Prafulla Chandra Rây. After serving as a Head Master for nearly four years, Banerjee joined the Bankura College in 1916 as Assistant Professor of Chemistry. He continued to serve in the same college as the Head of the Chemistry Department until, on October 16th, 1937, his promising career was terminated by a heart attack. Banerjee was an excellent teacher with a literary gift, and well acquainted with different Indian languages. He inspired the young men who came under his influence and many of his pupils have done well as chemists.

Notwithstanding his heavy teaching duties, Banerjee found time to carry on research work on oxidation processes and he published a paper (*Z. anorg. Chem.*, 1923, **128**, 343) on the oxidation of ferrous salt solutions under different conditions in air. His work in this line and on the preparation of natural dyes from Indian vegetables was not completed owing to ill-health. Banerjee, although shortsighted, was a keen sportsman. He was a straightforward, open-hearted man, and an excellent companion, always willing to help his students and friends at great personal sacrifice. He is survived by his aged parents, his wife, and seven children.

N. R. DHAR.

PERCIVAL WALTER CLUTTERBUCK.

1897—1938.

PERCIVAL WALTER CLUTTERBUCK was born at Leeds in 1897, and received his early education at the Leeds Central High School. He entered the Honours Chemistry School of the University of Leeds in 1914, being aided by a Board of Education grant. Two years later he joined the Royal Engineers (Gas Warfare Section) and saw active service in France. Having been gassed and rendered unfit for further service abroad, he was transferred to the Gas Warfare Research Section of the Royal Engineers and he remained in this until he was demobilised. For his military services he was awarded the O.B.E. Returning to Leeds in 1919, he completed his B.Sc. course, graduating with 1st Class Honours in 1922. In 1923 he was awarded the M.Sc. degree. He presented a thesis for the degree of Ph.D. in 1924 and in 1930 he received the degree of D.Sc.

In 1922 he commenced research work at Leeds under the late Professor J. B. Cohen. In the following year he went to Manchester, and for several years worked in collaboration with the writer. His first academic appointment was that of Demonstrator in Physiological Chemistry in the University of Manchester in 1924. After four years, having received a Beit Memorial Fellowship for Medical Research, he proceeded to the Lister Institute, where he studied fermentation problems with Sir Arthur Harden. A few months later, however, he was offered and accepted a post as Research Biochemist at Nobel's Explosives factory and went to work at Ardeer under the direction of Dr. H. Raistrick. Following the appointment of Dr. Raistrick to the Chair of Biochemistry at the London School of Tropical Medicine and Hygiene, Clutterbuck went to London to continue the work begun at Ardeer, and remained there until his untimely death on January 1st, 1938. In his first period at the School of Tropical Medicine he was still employed by Imperial Chemical Industries Ltd., but in 1933 he joined the academic staff of the School as Lecturer in Biochemistry. He became a Fellow of the Chemical Society in 1921, an Associate of the Institute of Chemistry in 1922 and a Fellow in 1928. From 1924 he served as Abstractor for the Biochemistry Section of Abstracts and his initials at the foot of Abstracts in this

Section must have become familiar to many Fellows of the Society, for he continued with this valuable work until his death. From 1931 onwards he was also an Abstractor for Nutrition Abstracts and Reviews.

Clutterbuck's first published work was on the preparation of the chloroamines of aryl and alkyl sulphonamides. Following this he began a study of the oxidation by hydrogen peroxide of normal fatty acids and, later, of acetoacetic acid. In the course of this work it was shown that in addition to the well-known β -oxidation of fatty acids, γ - and δ -oxidation also occurred. As a further product of oxidation of the γ - and δ -keto-fatty acids, succinic acid was isolated. This led him to examine the conditions under which succinic acid was formed in the body and its mode of conversion into malic acid through fumaric acid by the action of the enzymes succinodehydrogenase and fumarase. At Ardeer he began work on the biochemistry of moulds and bacteria, and throughout the succeeding years he continued almost entirely in this field. His first investigations were on the production of citric acid from sugar by moulds and of glucose from cellulose by certain bacteria. These were followed by a long series of investigations on the metabolic products of species of *Penicillium* and *Aspergillus*. They led to the isolation and characterisation of several new substances of great interest. Amongst these may be mentioned: the lactone of γ -hydroxy- $\beta\delta$ -dicarboxypentadecic acid; chrysogenin, a pigment from *P. chrysogenum* Thom; mycophenolic acid; the closely related carolic, carolinic, carlic and carlosic acids—all from *P. Charlesii* G. Smith; geodin and erdin—two chlorine-containing products of *A. terreus* Thom—and terrein, also from the same organism. The separation of these substances, of which only small amounts are usually available, and the determination of their constitution demanded great skill. Its successful achievement is a testimony to Clutterbuck's powers as a chemist, and it is hardly necessary to emphasise its importance to the science of microbiology. Two years ago, with the clinical collaboration of Drs. Lucy Wills and Barbara Evans, Clutterbuck made an important discovery concerning the nature of the deficiency responsible for the nutritional anæmia of monkeys, which has its counterpart in human tropical anæmia. The hæmopoietic substance from liver, essential for the treatment of this condition, was shown to be different from that which is effective in pernicious anæmia.

Much of Clutterbuck's work was done in collaboration. His character and personal outlook made such co-operation easy, for although rightly proud of what he himself might contribute, he realised the absolute necessity of team work in the special field in which his activities lay. He was if anything over-modest, but this could not hide an enthusiasm for his work which was a delight to encounter. It is deplorable that his labours should be cut off when he had not even reached the height of his powers.

He was a very companionable man and made many friends. Their loss is a sad personal one and they will always hold him in grateful memory for what he achieved, for his simple honesty of purpose and for his gift of friendship.

In 1926 he married Muriel, the daughter of Mr. Barker North of Bradford. She and their two daughters survive him.

H. S. RAPER.

JOHN ALEXANDER DEY.

1868—1937.

DEY was born at Rothiemay in Banffshire and served his apprenticeship there as a pharmaceutical chemist with Messrs. Pirie & Sons. After a short period in Aberdeen he came to Edinburgh in 1887 and continued his studies at the Royal Dispensary School of Chemistry ("Duncan's") and qualified as a pharmaceutical chemist in 1890. In 1892 he joined the staff of Messrs. T. & H. Smith, the well-known manufacturing chemists, becoming Manager in 1899, and a Director in 1904.

He was actively concerned with the development of the firm's business and was responsible for the removal of the Works in 1906 to a much larger site on the outskirts of Edinburgh, the old name of the Blandfield Chemical Works being retained. Since then large additions to the Works have been carried out under his direction.

The War made great demands on the products of the firm, and Dey undoubtedly suffered in health from the strain of these years. He retired in 1935, much to the regret of his colleagues and staff.

Dey was elected a Fellow of the Society in 1925, and was also admitted a Fellow of the Royal Society of Edinburgh in the same year.

In his early days he was much interested in curling and he was also a keen fisherman.

He died in Edinburgh on December 18th, 1937, at the age of 69. His death removes a man of much administrative ability, and his loss is regretted by a large circle of friends.

ALEXANDER LAUDER.

SIR DAVID ORME MASSON.

1858—1937.

WITH the passing of Emeritus Professor Sir David Orme Masson on August 10th, 1937, Australia has lost one who for many years shared with the late Sir Edgeworth David the leadership of his adopted country in scientific effort and achievement. He was born in London on January 13th, 1858, his father, Professor David Masson, then occupying the chair of English Literature at University College. Seven years later his father accepted the Regius Chair of Rhetoric and English Literature in Edinburgh University and from 1893 until his death was Historiographer Royal for Scotland. Except for the early years in London, Masson received his training in Edinburgh, first at the Academy and later at the University, where he graduated in arts and science. Through his mother's family, the Ormes, whose home in Hampstead was a happy meeting ground of many leading figures of the time in literature and art, he made and retained numerous contacts with a life differing in many respects from that in which he later played so great a part on the other side of the world.

Physically strong and well built, a keen golfer and fond of swimming, tennis, and billiards, Masson played a considerable part in the life of his University both in his undergraduate days and later during his years as a research graduate. He was absent for a short time in 1880 when he studied under Wöhler at Göttingen, and shortly afterwards he joined Professor William Ramsay as his first assistant at Bristol, beginning a friendship which lasted until Sir William's death. Incidentally it is of interest to record that Masson was invited to succeed Ramsay when the latter retired from his chair at University College in 1913: but his roots in Australia were too deep by then to permit a return to Britain.

Ramsay was interested at the time in determinations of atomic volumes of elements at their boiling points and Masson joined him in the work on phosphorus (J., 1881, **39**, 50). Their results showed that it was necessary to ascribe two volumes to phosphorus, *viz.*, 20·8 in the free state and in compounds where it was quinquivalent and 25·3 where tervalent. Incidentally this led to $\text{O}=\text{P}\equiv\text{Cl}_3$ as the constitutional formula of the oxychloride instead of the previously accepted $\text{Cl}_2=\text{P}-\text{O}-\text{Cl}$: and it also indicated the untenability of the Schröder theory of "steres" as applied to boiling liquid compounds.

Returning to Edinburgh in 1881, Masson held a research scholarship under Professor Crum Brown for three years, carrying out work which gained him his D.Sc. degree in 1884.

During this time he took a leading part in founding the Students' Representative Council, the first of the kind in any University, and also the Students' Union. The existence of similar flourishing bodies in Melbourne to-day shows that his faith in such organisations was lasting.

The Edinburgh investigations included the preparation of glyceryl trinitrite and an examination of its properties (J., 1883, **43**, 348). This was followed by a study, in association with M. Hay, of the composition and properties of nitroglycerine, confirming its constitution as a trinitrate (*Proc. Roy. Soc. Edin.*, 1885, 87). With L. Dobbin he published in 1885 a study of the action of halogens on salts of trimethylsulphine, producing a number of compounds of the general formula Me_3SX_3 , where X represents Cl, Br, or I, indiscriminately (J., 1885, **47**, 87). The question of the way in which the halogen atoms were linked together led to further work in the following year with tetramethylammonium

salts (J., 1886, **49**, 846), the result being the production of a continuous series of substances which appeared to show atomic-compound characters at one end and molecular-compound characters at the other; which, as the authors say, "appears to us to give some support to the position of those who deny the existence of two modes of combination, distinct in kind from each other." Two other papers in the same year (*ibid.*, pp. 233, 249) described work on sulphine salts containing the ethylene radical and discussed their constitutions.

In the eighties, the University of Melbourne, then some 30 years old, had decided that a single department of Natural Science, even under so omniscient a head as Sir Frederick McCoy, was no longer adequate for the times, and a division was made into the three Schools, Chemistry, Biology, and Physics. For a short time Kirkland was in charge of Chemistry, but in 1886 the chair fell vacant and the choice of a successor lay between Masson and W. H. Perkin, jun. The decision to take the former determined the main line of future development of the new school, since from this time Masson turned steadily towards physico-chemical work rather than organic. Not very long afterwards, Baldwin Spencer was invited to take the chair of Biology and then Thomas Ranken Lyle followed in that of Physics. It is rarely that a Colonial University has been as fortunate as was Melbourne in securing so remarkable a trio of young men for its science schools. Each of them made an international reputation for himself and all three were honoured with knighthood. Between them they created and developed high standards in teaching and research.

At first the number of students in the Chemistry School was small: but growth was steady and soon became rapid. In later years the first-year classes alone sometimes rose to 250. As a lecturer, Masson has become almost a tradition for his clarity of thought, logical array of facts, perfect diction and, combined with these, remarkable facility in bench experiments and demonstrations. He laboured under difficulties only appreciated by those who have worked in distant parts of the Empire. Teaching duties were very heavy; the supporting staff was inadequate in number, and funds for apparatus and chemicals were scanty. Often enough the line of investigation followed was determined by its relative cost.

There was little opportunity in the early years in Melbourne for laboratory work, though with J. B. Kirkland, the son of his predecessor, Masson continued his work on reactions of halogens on salts of tetraethylphosphonium and on the preparation of salts of triethylsulphine, tetraethylphosphonium and analogous bases (J., 1889, **55**, 126, 135). Two years later, with one of his earliest students, N. T. M. Wilmshire, he published a paper entitled "Does magnesium form compounds with hydrocarbon radicals?" (Proc., 1891, 16). This describes unsuccessful experiments aiming at the production of magnesium ethide and methide by interaction of magnesium and ethyl iodide. There is no doubt that these workers came very close to, but just missed, the formation of Grignard's reagent which later played an important rôle in organic synthesis.

At this time Masson returned to his earlier work on molecular volumes and published a discussion of the relation in liquids between these, the boiling points and chemical characters (*Phil. Mag.*, 1891, **30**, 412). The law was formulated that for liquids of the same type (such as alkyl halides) the volumes of unit mass are inversely proportional to the molecular weights and directly proportional to the absolute temperatures when compared at temperatures at which the vapour pressures are equal; thus V_T/T is constant, where T is the absolute temperature of boiling and V_T the molecular volume at it. From this it may be deduced that the molecular heat of vaporisation is directly proportional to the absolute boiling point; a useful generalisation, the applicability of which, however, is limited.

In these years Masson became deeply interested in the development of the theory of solutions as propounded by van 't Hoff, Arrhenius, Ostwald and their school. In his presidential address to Section B of the Australasian Association for the Advancement of Science in 1891, published in part in *Nature* (**43**, 345), he drew attention to the essential similarity of the processes of solution and evaporation, pointing out that in the case of a system of solid and solvent, the solid would have a solution melting point lower than its true melting point. Above this temperature two liquid phases, each a saturated solution,

would occur. With rise of temperature these two liquids would become homogeneous at a temperature depending on the original composition. To the highest attainable temperature, at which both layers became identical, and above which each component is infinitely soluble in the other, he gave the name "critical solution temperature", which has been retained ever since.

Very little came from his laboratory for the next few years, but in 1896 he published a note in the *Chemical News* (72, 283) discussing the question of whether hydrogen should be placed at the head of Group I or at the head of Group VII in the Periodic Classification. There was no hesitation in placing it in the latter position. It was in the previous year that Masson had produced his modification of Mendeléef's periodic classification of the elements using the now familiar folder with a flap on which all sub-group elements appeared. When Ramsay discovered helium, Masson immediately placed it with argon in a new Group VIII, leaving room for the other undiscovered elements of zero valency. It is curious that this very satisfactory folder arrangement, though adopted in his class rooms at University College by Ramsay, was not more generally used. It broke down, of course, with the rare-earth metals, but otherwise was very similar to Bohr's grouping of later times.

From now on Masson's laboratory work dealt mainly with ionisation in aqueous solutions and with problems in chemical dynamics. With B. D. Steele, then a student, he investigated the blue salt of Fehling's solution and other cuprotartrates (J., 1899, 75, 725) as a side study associated with his development of a new method for the direct comparison of ionic velocities. They readily proved that the kations were colourless and that the copper was present in the anions: and from that proceeded to the preparation of a number of other cuprotartrates of varying solubility and stability.

His work on the velocity of migration of ions is perhaps that for which Masson was best known: in fact the use of his simple experimental apparatus came to be very general as a laboratory exercise (*Phil. Trans.*, 1899, A, 192, 33). Besides a battery, resistance, voltmeter, etc., it consisted of two flasks with side necks into which fitted tightly the ends of a straight, horizontal, narrow glass tube about 12 cm. long. Glass-blowing was not a well-developed art in Melbourne in those days and the glass-bottle works which undertook the production of the double-necked flasks would not consider an output of fewer than a gross. For years afterwards there was never a shortage of this particular item in the students' store-room!

It having been shown that only a slight reduction in mobility of ions was brought about in a 12% gelatin "gel" as compared with a free solution, Masson used this to give stability to the solutions examined, which to begin with were of alkali chlorides. Platinum electrodes were placed in the flasks, which contained salts with coloured kation (*e.g.*, Cu⁺⁺) and anion (such as CrO₄^{''}) respectively, each being less mobile under like conditions than the positive and negative ions of the solute in the jelly. With an application of about 40 volts the experiment proceeds readily, with sharp boundaries between the coloured and the colourless portions at either end. In his analysis of the results Masson showed that the progress of the coloured ions is determined by the velocity of the colourless ions which they follow. The relative rates of movement of the boundaries give the ratio of the mobilities of the colourless ions which are at any moment under equal potential slope, and not of the coloured ions themselves which are not under like gradient; and hence are obtained the transport numbers for the solute in the tube. For salts of sodium, potassium and ammonium, the anionic migration numbers were rather lower than those found by Hittorf's method: the relative velocities directly measured agreed well with those deduced from Kohlrausch's conductivity figures.

Later this method was carried further by Steele, who showed that it was possible by simple devices to do without the gelatin and the coloured ions thus greatly extending the range of applicability of the direct measurement.

About the same time Masson and his colleague in the physiology department, C. J. Martin, made some measurements of conductivity, of considerable accuracy for those days, to determine the effect of varying viscosity on conductivity. The alteration of viscosity was brought about by addition of sucrose in increasing amount; and incidentally

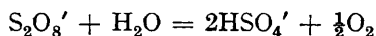
proof was obtained of a reaction between caustic alkalis and the sugar. This work was later carried much further by W. Heber Green.

A useful laboratory note on Iceland spar as a standard in volumetric analysis was published in 1900 (*Chem. News*, 1900, **81**, 73). The method is now standard laboratory practice and is thoroughly satisfactory provided that no opportunity is given for the formation of calcium bicarbonate during the reaction with hydrochloric acid. Shortly afterwards, Masson began an investigation into the hygroscopic character of cellulose, in which he sought exact information as to the absorption of moisture by cellulose and the laws governing it. This was expanded later in association with one of his senior students, E. S. Richards (*Proc. Roy. Soc.*, 1906, **78**, 412), their paper being published just a little later than one on similar lines by Trouton and Pool.

A dynamical study in 1907 (*J.*, 1907, **91**, 1449) of the highly exothermic action of hydrogen peroxide on potassium cyanide in aqueous solution was prompted by some observations made earlier by C. J. Martin which seemed irreconcilable with any simple theory of oxidation. From analyses of the finished products and by titration of residual cyanide and peroxide during the course of the action, it was shown that the products of oxidation are potassium cyanate and potassium and ammonium carbonates. Cyanate is first formed and is then hydrolysed to carbonate through the catalytic agency of the peroxide. At the same time a part of the cyanide is converted by hydrolysis, but without oxidation, into formate and ammonia, and here too the peroxide acts as catalyst. About four-fifths of the original cyanide is converted by oxidation into cyanate and carbonate while the remaining one-fifth is hydrolysed to formate. Alkali retards the action and so does acid: only with sufficient sulphuric acid to convert all the cyanide into hydrogen cyanide is oxamide (formerly assumed to be the main product) formed. A note with A. C. Cumming (*Chem. News*, 1906, **93**, 5, 17) dealt with incidental problems in the volumetric estimation of cyanates and carbonates.

This work with cyanates led Masson to a fuller study of the decomposition of metallic cyanates by water (*Z. physikal. Chem.*, 1910, **70**, 290) in association with his son Irvine, now professor of Chemistry at Durham. With cyanates of metals which form insoluble carbonates there are two consecutive reactions, the first being a slow hydrolysis of cyanate to carbonate, which is precipitated, and to ammonium ions, and the second a relatively rapid reaction between ammonium and cyanate ions to form carbamide. The cyanates of sodium and potassium decomposed to give the corresponding carbonates, ammonium carbonate and carbamide. Any reverse change of the carbamide is inappreciable. The products, especially ammonium carbonate, accelerate the reaction.

In the same year he completed with Miss Green a study of the dynamics of the decomposition of persulphuric acid and its salts in aqueous solution. They confirmed the accepted view that potassium and sodium persulphates decompose unimolecularly and that acids accelerate the action. As acid sulphate is produced, it was necessary to explain why the action was not autocatalytic rather than simple unimolecular. This they did by formulating the change by the ionic equation:



there being practically no hydrogen ions produced, since under the conditions of the experiments sulphuric acid could be regarded as monobasic. The courses of the action differed markedly in the three cases of (i) neutral sodium, potassium and ammonium persulphates, convertible into acid sulphates, (ii) persulphuric acid itself, which doubles its acidity by conversion into sulphuric acid, and (iii) barium persulphate, which produces persulphuric acid and barium sulphate. The influence of various additional solutes was carefully examined.

From this time onwards Masson became steadily more absorbed in administrative work within and without the University with the result that his opportunities for personal laboratory work were greatly lessened. He took a keen interest always in the development of ideas on the constitution of atoms and in a paper in 1921 (*Phil. Mag.*, 1921, **41**, 281) he pointed out that if N is the atomic number, and p and e represent proton and electron respectively, all nuclei from He to U can be expressed by the formula $(p_2e)_N(p_e)_n$.

where n has any appropriate value from 0 to 54. To include hydrogen n must equal -1 . Emission of α - and β -particles can be represented by simple equations. A chart of radio-active transmutations for the radium, actinium, and thorium series was constructed in which isobares were along horizontal isotopes on vertical, and isoclines (with the same n) on diagonal lines. This made an interesting supplement to the Periodic Classification Chart of 1895.

After his retirement from active teaching at the end of 1923, Masson's interest in the progress of chemical theory continued unabated. In particular he attacked the problem presented by strong electrolytes at all concentrations, being dissatisfied with the current view of complete dissociation. The results of this work were given to the Sydney meeting of the Australian and New Zealand Association for the Advancement of Science in a noteworthy paper, which was his last. The basis of this study of conductivity-concentration relations was a recognition of the fact that neither Arrhenius's assumption of constant ionic mobility with variation of degree of ionic dissociation, nor Debye and Hückel's assumption of constant (total) dissociation with varying mobility, leads to conclusions sufficiently in accordance with facts in other than very dilute solutions. The discussion led to a purely empirical equation which covered the best available experimental conductivities up to high concentrations and permitted certain interesting speculation as to its precise theoretical significance.

When Masson arrived in Melbourne its population was under 400,000: in 1937 it reached 1,025,000. In such a rapidly growing community there were many public activities demanding the best effort that men of his type could offer, and throughout his life he was intimately identified with many civic and national movements of the times. In public and social work he was ever admirably supported by Lady Masson, C.B.E., a daughter of the late Professor Sir John Struthers, of Aberdeen and Edinburgh.

Shortly after his arrival in Melbourne, Masson was appointed to membership of the Victorian Board of Public Health, which was superseded by a new organisation in 1890. In that year he acted on a royal commission charged with an examination of the problem presented by the sanitation needs of Melbourne, a problem very satisfactorily dealt with in the succeeding years. He was chairman of a board appointed in the early days of Federation by the Commonwealth Government to report on silver coinage.

The organisation of Antarctic exploration was always one of his keen interests. He was a very active member of the committee which organised Mawson's first expedition in 1911—14: he was also on the committee appointed by the Commonwealth Government to organise the expedition for the relief of Sir E. Shackleton's Antarctic (Ross Sea) party. In 1911—13 he was President of the Australasian Association for the Advancement of Science and was the leader in the project for bringing the British Association to Australia in 1914, and chairman of the organising committee.

These were busy years, for from 1912 to 1916 he was president of the professorial board of the University and a member of its Council. During the war he served on certain special committees dealing with munitions and naval matters: but possibly his chief work of that time commenced in 1915 when the then Prime Minister, Mr. W. M. Hughes, invited him to act as chairman of a committee to draft a scheme for a Commonwealth Institute of Science and Industry. Political support failed at the crucial time, but the determination of Masson was chiefly responsible for the initiation of much valuable national research and, in 1920, for the establishment of an institute. In 1926 this was reorganised and became the present Council for Scientific and Industrial Research, on which Masson was an invaluable member until his death.

As founder of the Melbourne University Chemical Society, the Society of Chemical Industry of Victoria and, with others, of the Australian Chemical Institute and its first President (1917—20), Masson has left behind him very flourishing institutions in which his name is held in reverent esteem. With Sir Edgeworth David he was mainly responsible for founding the Australian National Research Council in 1921 and was its president in 1922—23. In the latter year he was also president of the second Pan-Pacific Science Congress held in Melbourne and Sydney. He was elected to the Royal Society in 1903; created C.B.E. in 1918 and K.B.E. in 1923. His old University of Edinburgh conferred

an LL.D. degree upon him in 1924, *honoris causa*. A Masson Lectureship was established in his honour by the Australian National Research Council a few years ago.

It is given to few men to combine such academic brilliance and personal charm as distinguished Sir David Masson, with so marked a capacity for practical achievement in the development of national life in a young British community. He was a great Empire builder, inspired by, and inspiring, the highest ideals of service. He will ever be remembered with pride and deep affection by students and colleagues and by a very wide circle of friends.

A. C. D. RIVETT.

JOHN JAMES MORGAN.

1865—1937.

JOHN J. MORGAN, whose death took place on October 30th, 1937, was born at Tredegar in 1865 and was educated at Abergavenny Grammar School. On leaving school he became a pupil under Mr. A. E. Tucker, and was appointed later as Head Assistant Analyst to the Rhymney Iron and Steel Co. After three years, he joined the Ebbw Vale Iron, Steel and Coal Co. as Chemist, subsequently becoming head Assistant Analyst to the Blaenavon Iron, Steel and Coal Co., and later Chief Chemist to Messrs. Cammell, Laird and Co., Ltd., at Workington. Subsequently he went into practice as a Consulting Analyst, Assayer and Sampler in Manchester.

At the time of the Russian Revolution in 1917 Morgan was in the Caucasus district, examining ore mines; on his return, he worked with the Admiralty until the end of the war, and then resumed his private practice until his retirement owing to ill-health. He had a wide and detailed knowledge of his work, and specialised particularly in ores. He was the author of "Aids to Analysis and Assay of Ores, Metals, Fuels, etc.," "Blast Furnace Practice," "Notes on Foundry Practice," and of other books on various branches of his work. He also contributed to various technical journals.

Morgan was elected a Fellow in 1888.

CHARLES WATSON.

1861—1937.

CHARLES WATSON died very suddenly on September 9th, 1937. He was one of the oldest Fellows of the Society, having been a Fellow for 52 years.

He was born on March 10th, 1861, at Hamilton, Ontario, and came to Stockton-on-Tees at the age of five. He was educated at the King James I Grammar School at Bishop Auckland. His training as an analytical chemist was received in the laboratory of Messrs. Sadler and Co.'s works at Middlesbrough. Afterwards, in conjunction with the late Mr. H. Peile, he carried on a chemical works at Walsden, near Todmorden, for the manufacture of soap, sheep dip, etc. Subsequently he obtained an appointment in Buenos Aires and after a short period there he returned in 1903 to become Works Manager of the Dawsholm Tar and Ammonia works, Glasgow. He left Glasgow in 1906 for Birmingham, where he was Works Manager at Messrs. Josiah Hardman and Co. until 1909. He then retired from active chemical work, but continued to live at Moseley, Birmingham, for a number of years and later came to Devonshire to reside, first at Ottery St. Mary and in 1935 at Exeter.

He was twice married. His first wife, whom he married in 1906, was a daughter of Alderman E. Henderson of Stockton-on-Tees. She died in 1929 at Ottery St. Mary. In 1934 he married Mrs. Edith Fawcye.

Watson was a man of quiet and genial disposition and, as one of his former assistants describes him, "a thorough gentleman who was esteemed and appreciated by every employee with whom he had to deal."

Although he retained an interest in chemistry up to the end (he was often present at public lectures on chemical subjects given at University College, Exeter), he had many

other interests, particularly those of the mechanical type. During the War he put one of these interests into practical form in manufacturing tools required by munition workers. During his stay in Devonshire he interested himself in bee-keeping and in metal and wood-work, and among other things constructed several electric clocks. H. T. S. BRITTON.

ALFRED EDWARD WILLIAMSON.

1878—1937.

ALFRED EDWARD WILLIAMSON, who died on October 7th, 1937, was born in Liverpool on November 6th, 1878. Leaving school at an early age, he entered the drug trade with Messrs. Evans, Sons, and Co. (now Evans, Sons, Lescher, and Webb, Ltd.) at Liverpool.

In 1900 he qualified as an accountant; later he became manager of Messrs. Clay, Dodd, and Co., Liverpool, and in 1911 joined Messrs. John Thompson, Ltd., Wholesale Chemists, Liverpool.

In 1921 Williamson became a director of Messrs. John Thompson (Wholesale Druggists, 1921), Ltd., and in 1929 he was appointed Joint Managing Director and Secretary, which position he held until his death.

He was elected a Fellow of the Chemical Society in 1931. H. HUMPHREYS JONES.

ANDREW YOUNG.

1873—1937.

ANDREW YOUNG, whose death took place at Cape Town on November 7th, 1937, was born in Perth, Scotland, in 1873. He was educated at Perth and at Edinburgh University, where, as a pupil of Professor James Geikie and Sir John Flett, he obtained honours in Geology.

After undergoing a course of training at the Church of Scotland Training College for Teachers, Young occupied several educational posts, including those of Organiser of Technical Education in Gloucestershire, and Lecturer in Geology at the Heriot Watt College, Edinburgh.

In 1902, at the age of 29, he was appointed to the Chair of Geology at the South African College, Cape Town, and continued to hold this Chair when the College was incorporated as the University of Cape Town in 1918 until the time of his death. He took an active part in the administrative and other activities of the University.

Among the well-known men who studied geology under his tuition were the late Dr. Percy Wagner, whose books on diamond and platinum occurrences in South Africa are standard works, and Dr. J. W. Gevers, Professor of Geology at the University of the Witwatersrand.

The study of underground water conditions in South Africa absorbed much of Young's attention. In recognition of his discovery and investigation of tidal phenomena in the subterranean waters of the Karroo, the University of Edinburgh conferred on him the degree of D.Sc.

Young travelled extensively in the prosecution of his work, visiting among other countries Algeria and Namaqualand to examine the geology of these countries. He also made a close study of petroleum throughout the world and was considered an authority on the subject.

A man of wide intellectual interests, Young also had an extensive and detailed knowledge of a great variety of other subjects. His hobby was the collection of Eastern carpets and rugs. He was an expert on this subject and his own collection is a very fine one.

Young was elected a Fellow of the Chemical Society in 1903.
