OBITUARY NOTICES.

JOHN SAMUEL STAFFORD BRAME.

1871—1953.

WITH the passing of John Samuel Stafford Brame, Petroleum Technology and Chemistry lose a distinguished member of that rapidly diminishing band of pioneers who laid so well and truly the foundations of the first Society concerned with the science and application of mineral oil.

His was the generation of Boverton Redwood, Vivian Lewes, Thomas Holland, Charles Greenway, and John Cadman, all of whom rose to eminence in the service of petroleum science and in the industry. He was president of the Institute of Petroleum in 1921—23. Perhaps his greatest work lay in the direction of standardization. He presided over the meetings of the Standardization Committee of the Institute from 1929 to 1938 and saw it grow in importance year by year, culminating in the friendly co-operation with the American Society for Testing Materials. He contributed many articles to the technical press and wrote a well-known and admirable text-book on Fuel.

He was connected with the Royal Naval College so far back as 1897, when he joined the staff, being promoted to the Chair of Chemistry in 1914—from which he resigned in 1932. In the New Years Honours List in 1930, he was awarded the C.B.E.

He presided with Major Crozier at a Ministry of Transport enquiry into proposals to allow tankers containing motor spirit to pass higher up the river Thames than had hitherto been permitted. In his later years he was on the Board of Alexander Duckham & Co. Ltd. and for many years he conducted evening classes in Petroleum Technology at the Cass Institute.

In all he had an active and vigorous outlook on life. He was invariably cheery and optimistic, a delightful companion and the best of friends.

He was survived by Mrs. Brame for only two days. They were buried together.

A. E. DUNSTAN.

COLIN CAMPBELL.

1888—1953.

COLIN CAMPBELL was born in Manchester on June 26th, 1888, and died at his home there on August 23rd, 1953. At the time of his death he was Dean of the Faculty of Science in the University of Manchester and Assistant Director of the Chemical Laboratories.

Campbell entered the University, where he was to spend his whole career, from William Hulme's Grammar School with a Francis Cartwright scholarship. After graduating with first-class honours in chemistry in 1909, he at once became Schunck research assistant to Professor H. B. Dixon in the field of explosions in gases. His work gained him in 1921 the degree of D.Sc. and he eventually established an international reputation in that field. Some 17 papers, the majority of them published in this *Journal*, describe the results of work over a period of 20 years, at first with Dixon and later with his own post-graduate assistants.

Much of Campbell's research had a distinction that merits a description of it in some detail. In the early period, which covered the First World War when he was a member of Dixon's team of inspectors of explosives under the Ministry of Munitions, his work was related to Dixon's interests as a member of the Home Office Committee on Explosions in Mines. Incombustible dusts were being shown to exert a suppressing action on flames, contradicting the results of Abel 30 years earlier which had seriously delayed the introduction of stone dusting in coal mines; some of Dixon's new experiments were described in Campbell's first paper (*J. Soc. Chem. Ind.*, 1913, **32**, 684). Then followed measurements of the speed of flame in mixtures of coal gas and air ignited by spark in long tubes (with E. L. Sellars, *ibid.*, p. 730), and an account of refinements in the laboratory preparation and analysis of methane (with A. Parker, *J.*, 1913, **103**, 1292). Also in Dixon's laboratory he examined, with negative results, the effect of an intense magnetic field on the progress of the detonation wave in mixtures of various gases with oxygen (with W. E. Slater, *Proc. Roy. Soc.*, 1914, *A*, **90**, 506); he took part in a photographic analysis of the growth of the flame in gases ignited in a tube by adiabatic compression (with L. Bradshaw, *J.*, 1914, **105**, 2027), and in some elaborate direct measurements of the velocity of sound, and hence of the ratio of the specific heats, in various permanent gases (including nitrogen) up to 600° and in some instances up to 1000° (again with A. Parker, *Proc. Roy. Soc.*, 1922, *A*, **100**, 1). Also with Dixon (*Trans. Faraday Soc.*, 1926, **22**, 307) calculations, according to Jouguet's equations, were reported of the specific heats of nitrogen in the range 4650—5900° based on the velocity of the detonation wave in $C_2N_2 + O_2$ diluted with $\frac{1}{2}N_2$, N_2, and $1\frac{1}{2}N_2$. The effect of nitrogen on the rate of the initial spread of flame in mixtures in which the fuel : oxygen ratio was kept constant was to give a speed directly proportional to the calorific value of the total mixture (with O. C. de C. Ellis, *J.*, 1924, **125**, 1957).

In the subsequent period, when his work was independent of Dixon, Campbell's interest was concentrated on the study of the detonation of gaseous mixtures in glass tubes, mainly by the photographic technique of Mallard and Le Chatelier in use at Manchester since about 1895. For this work, quickly to become widely known, the film camera was a simple drum of cast aluminium revolving on pivot bearings and, although capable with safety of a peripheral speed of no more than 40 m./sec. (to be doubled later), Campbell improved its resolution by increasing the slope of the trace through a corresponding sacrifice of magnification. With this intrument, crude and slow by the present standards set by modern fast film in cameras employing a rotating mirror, he at once obtained results of importance to a better understanding of the structure of the detonation wave. By direct photography only (Schlieren photography had not yet come into routine use) Campbell demonstrated the duplex nature of the wave by separating its elements of concussion and combustion at a point where his explosion tube was abruptly enlarged (*J.*, 1922, **121**, 2483); the records yielded values of the velocities of the shock wave (slow in relation to that of the parent detonation wave) and of the slower-moving flame. Similarly, with a flame accelerating in a cylindrical tube during the period immediately preceding detonation, one or more separate points of spreading inflammation appeared in the unburnt gas, presumably as a result of adiabatic heating in shock waves just ahead; it was to be shown later (with C. Whitworth and A. King, *Mem. Manch. Lit. Phil. Soc.*, 1931—32, **76**, 45) that increased pressure existed in that region. Detonation may arise from one or other of the auto-ignitions ahead at a speed temporarily greater than that characteristic of the gas mixture in use (with D. W. Woodhead, *J.*, 1926, 3010).

It was in the last paper that attention was first directed to a striking and regular banded appearance of a photograph of the detonation of moist $2CO + O_2$, a phenomenon in detonation eventually to become well known as "spin." The bands were bright and remarkably regular, and each was associated with an undulation in the wave-front. The general appearance was very different from the uniform illumination of the smoothly progressing flame-front shown in previously published photographs, and hitherto believed to be characteristic of the detonation wave. However, indicative of a uniform mean speed, a straight edge could be placed against the undulations in the front of a wave of the new type. Dixon himself, then Emeritus Professor, visiting Campbell's room to inspect the new records, made the ingenious suggestion that the negatives had been dried whilst in contact with sheets of the departmental notepaper. The notepaper in use at that time bore a barred watermark that fitted exactly the bands on the negatives! They had however been dried innocent of any such or other contacts, and a scrutiny of Dixon's own negatives of more than 20 years earlier (now almost unmanageably curling) disclosed a number of similar examples, but all of them ill-defined and undetected owing to insufficient photographic resolution (for example, *Phil. Trans.*, 1903, **200**, *A*, 315).

Other experiments were soon described (also with D. W. Woodhead, *J.*, 1927, 1572) showing that the bands were characteristic of the detonation wave in only certain mixtures (sometimes the more dilute ones) of oxygen with CH_4, C_2H_6, C_2H_4, CS_2, and C_2N_2 as well as of all mixtures with CO, although they did not appear in $CO–O_2–H_2$ mixtures that contained more than about 6% of hydrogen. The pitch of the undulations causing the bands was the same in moist $2CO + O_2$ at initial pressures up to 3 atm.; it was however proportional to the diameter of the tube, whilst independent of its length, and an interpretation based on a helical motion of the detonation wave was therefore suggested (at the instance of E. F. Greig). After satisfying himself and many sceptics that the phenomenon was not caused by vibrations of his apparatus Campbell in a third paper of the series (with A. C. Finch. *J.*, 1928, 2094) produced abundant confirmation of a helical motion, either clockwise or anti-clockwise, which applied not only to a luminous head of detonation but also to a long luminous tail lying close to the wall of the tube. Novel techniques were employed in these last experiments, comprising fixed plane mirrors (for rotational phase discrimination) and the directing of the open-ended explosion tube towards the camera, an arrangement which yielded cycloidal traces. A physical demonstration of the helical motion was provided by lightly dusting the interior of the tube with French chalk before firing; a well-defined dark helical track was left in the dust. This last result was promptly repeated, as was the production of banded records, by W. A. Bone and R. P. Fraser (*Phil. Trans.*, 1929, **228**, *A*, 197; 1931, **230**, *A*, 363); these workers concluded by experiment, and by deduction from fluid mechanics, that the spin does not involve rotation of the gas mass as a whole but only of the luminosity of the head and the tail. Confirmation of Campbell's observations came also from P. Laffitte in Paris who affirmed that spin is characteristic of all mixtures near the limits of detonability.

In only two of Campbell's remaining five papers (in all of which C. Whitworth participated) was he concerned directly with spinning waves. He found them to be more prone than non-spinning waves to damping down either at an enlargement in the containing tube (with A. King, *loc. cit.*, and *Trans. Faraday Soc.*, 1932, **28**, 681), or in a non-rigid section of it. Non-spinning waves could pass through considerable lengths of even thin rubber tubing without appreciable loss of speed. With W. B. Littler, in measurements of pressure in a closed cylinder, Campbell and Whitworth observed that the time to reach maximum pressure appeared to be the same for various mixtures of gases with oxygen at the lower limit of detonability (*J.*, 1932, 339). The same group devised an ingenious method of measuring the pressure in the detonation wave by observing the results (with the drum camera) of interposing copper foils in a range of thicknesses clamped across the explosion tube in the path of the wave (*Proc. Roy. Soc.*, 1932, *A*, **137**, 380); there was reasonably good agreement between the observed and the calculated pressures. A last paper with Whitworth and Woodhead (*J.*, 1933, 59) described a re-determination photographically of the velocity of detonation of the range of $CO–O_2$ mixtures; the velocity, as with $H_2–O_2$ mixtures dependent mainly on the density of the mixture and its calorific value, showed a maximum with excess of carbon monoxide (at about the mixture $3CO + O_2$).

The helical interpretation of Campbell's banded type of photograph has not been challenged since the early days after its discovery, when his stone-floored dark room on the basement corridor of the chemistry block in Burlington Street was frequented by the incredulous, staff and students alike. Banded records have been widely obtained and various explanations have been advanced, notably by Bone and Fraser, Becker, Jost, Manson, and Lewis, but no complete theory has even yet been developed. Many questions remain without satisfactory answer: for instance, why do some gas mixtures show bands and others not? More experiments are required on the lines that Campbell himself had begun to work, but with modern high-speed Schlieren and manometric techniques, applying these to the points of incipient and temporary breakdown of a spinning wave, for example, at points of enlargement in the containing tube or of abrupt changes in the composition of the gas mixture (including short lengths of incombustible gas over which Campbell observed that detonation can be transmitted).

It is by " spin " that Campbell's research will be remembered. He will be remembered also for his many high personal qualities, not only by his own few privileged research assistants but also by many generations of students. He had become a member of the staff of the Chemistry Department in 1914 and Senior Lecturer in 1925. He played an important part in the teaching both in the first-year laboratory and in the theatre, where his characteristic lectures were lucid and precise and pointed by frequent experiments. He had the ability to develop a sense of vocation in his students; he never lost a freshness of approach to his day-by-day problems, displaying a friendly serenity in keeping with his love of the high places in Switzerland and the Lake District, where he spent many of his holidays. With his trim figure and brisk walk he was everywhere welcomed; beneath a high forehead his eyes were kindly and wise, and before the warmth of his voice difficulties quickly melted away. It has been said that he was usually the first to learn of a student's personal problems, and those in need were certain to receive sympathy and encouragement to further effort.

Campbell's research work had come to its close in 1935 when he was appointed Assistant Director of the Chemical Laboratories, his activities then covering a much wider field. The guardian of a great departmental tradition, his long influence both in maintaining a unified department through a period of great change, and as a member of the Board of the Faculty of Science, cannot be overestimated. This aspect of his work culminated in his appointment as Dean in 1952.

The religious life of Manchester has been impoverished by Colin Campbell's death. As a Congregationalist he gave a life-long devotion to his own Cavendish Chapel in which he had filled many offices. He had a special interest in the Manchester and Salford Shaftesbury Society. His deep Christianity, prompt friendliness, and a characteristic combination of modesty, patience, and persistence will long be remembered, both in his university and in walks of life outside its walls, by many who are proud to own their debt to him.

D. W. WOODHEAD.

GERTRUDE MAUD ROBINSON.

1886—1954.

It was with a profound sense of loss that chemists, both in this country and overseas, learnt of the sudden and unexpected death on March 1st of Lady Robinson. Few chemists have been held in greater esteem and affection.

Lady Robinson, *née* Walsh, was born on February 6th, 1886, being the daughter of Thomas Makinson Walsh and Mary Emily Walsh, *née* Crosbie. After attending Verdin Secondary School, Cheshire, she entered Owens College, then a constituent College of the Victoria University of Manchester, in 1904, graduating with the degree of B.Sc. in 1907 and proceeding to M.Sc. in 1908. After graduation she commenced research in organic chemistry with Dr. C. Weizmann, later President of Israel. This was the beginning of a lifelong friendship with Dr. Weizmann and his family. It soon became evident that Miss Walsh, as she then was, had experimental skill of a high order and in collaboration with Dr. Weizmann she published two papers (*J.*, 1910, **97**, 685; 1911, **99**, 448), the former dealing with derivatives of 1 : 4-dichloroanthraquinone and the latter with the preparation and properties of two unsaturated hydrocarbons, 2-methyldodeca-1 : 3-diene and 2-methyldeca-1 : 3-diene. Her work in the Manchester laboratories was however interrupted by her marriage in 1912 to Dr. (now Sir) Robert Robinson, at the time an assistant lecturer and demonstrator in the University, and her departure with him to Australia on his appointment to the Chair of Organic Chemistry in the University of Sydney.

In spite of her numerous preoccupations as a wife and mother, Lady Robinson throughout her life continued to be an indefatigable laboratory worker. She was the author or joint author of some thirty memoirs many of outstanding importance. Thus she suggested (*J.*, 1917, **111**, 109), independently of Angeli, that the aromatic azoxy-compounds had the now accepted asymmetric structure and, in a later paper (*J.*, 1924, **125**, 827) in collaboration with her husband, she provided an interpretation of the mechanism of the Fischer indole synthesis, which followed an earlier paper (*J.*, 1918, **113**, 639) on the synthesis of tetraphenylpyrrole. Subsequently her main interests were largely in the chemistry of the higher fatty acids and the plant pigments. In the former field she was the first to synthesise oleic acid and the 6-oxostearic acid (lactarinic acid), occurring in species of the fungus *Lactarius* (*J.*, 1925, **127**, 175). This important synthesis of oleic acid would appear to have been overlooked in recent reviews. This was followed by the publication (*J.*, 1926, 2204; 1930, 745; 1934, 1543) of an elegant general method for the synthesis of the higher fatty acids, both saturated and unsaturated, culminating in the preparation of tricontanoic acid, $C_{30}H_{60}O_2$, and 13-oxodotetracontanoic acid, $C_{42}H_{82}O_3$, which were at the time probably the fatty acids with the highest molecular weights which had been synthesised. The methods developed by Lady Robinson have been largely used by other investigators.

It is probable, however, that Lady Robinson found her greatest interest in the study of the plant pigments. This was due, not only to the fact that they exercised to the full her great experimental skill, but also because of the pleasure which she found in her garden. Ample evidence of the latter interest was to be seen in her beautiful Oxford garden. The impetus to the study of the plant pigments was doubtless Sir Robert Robinson's syntheses of the anthocyanins. Space will not permit of a detailed account of this work, which appeared in five long memoirs (*Biochem. J.*, 1931, **25**, 1687; 1932, **26**, 1647; 1933, **27**, 206; 1934, **28**, 1714; 1938, **32**, 1667) and reference can only be made to the more salient features; it is however likely to have a marked influence on plant genetics (*J. Genetics*, 1939, **37**, 378). Lady Robinson was the first to observe that the colour of the flowers did *not* indicate the pH of the cell sap. Thus, for example, the sap of the blue cornflower was, contrary to expectation, acid, a very significant observation in a heterogeneous system. She discovered also that the so-called co-pigments, which are tannins and flavonols, exercised a marked influence on the pigments' colours (*J. Amer. Chem. Soc.*, 1939, **61**, 1605, 1606). Perhaps her most important contribution was her proof of the wide distribution of the leucoanthocyanins which she found to be present in the lignins. This is still largely an unexplored field. Sir Robert Robinson has mentioned to me in conversation that Lady Robinson was especially interested in the leucoanthocyanins because it was entirely her personal contribution and she was convinced that they played an important part in vegetable physiology.

During the course of these investigations use was made of partially miscible solvents for the separation of the various plant constituents. This was actually an anticipation of modern partition separation methods.

After the outbreak of war the resources of the Dyson Perrins Laboratory were devoted to a study of the penicillin problem. Lady Robinson was actively associated with this work and I recollect learning during a visit to Oxford that she had prepared for the first time a synthetic material with penicillin-like antibiotic properties. This was a notable contribution. She had been previously investigating a problem of biochemical importance and for the last 10—15 years she was engaged, in association with Dr. T. B. Heaton, in the attempted isolation of a substance having growth-inhibiting properties. Unfortunately this work has not been completed and only very brief accounts have been published (*Nature*, **1943**, **151**, 195; **1948**, **162**, 570).

It might be thought that this intense scientific activity, which has been presented in brief outline, would have fully occupied Lady Robinson's time. This was however far from being the case. She shared to the full her husband's scientific and other interests. She was a skilled climber and travelled widely with him. Only a few months before her death she had visited the United States, Japan, and Israel. Any account of her life would be incomplete without a reference to her social gifts. She was a born hostess. Those who had the privilege of being her fellow students in Manchester will still recall with pleasure her invitations to dances at Ashburne Hall, the Women's Hall of residence. Later in the succession of universities in which her husband was professor she took the deepest interest in the welfare of the wives and children of his staff. She seemed never to forget a name or a face. In association with her friend, the late Dr. Ida Smedley Maclean, she took an active part in the affairs of the University Womens Federation.

The full opportunity for her to exercise her great gifts came however in Oxford. There in her beautiful home or at Magdalen College she showed gracious hospitality both to Oxford friends and to the numerous visitors from home or overseas. No scientific conference in Oxford was complete without one of her delightful parties. Her unique qualities were recognised last year by the University of Oxford when they conferred upon her the Honorary Degree of Master of Arts. Her undoubted pleasure in receiving this degree was more than shared by her innumerable friends. She will be very widely missed and our deepest sympathy goes out to her husband and her daughter, Dr. Marion Robinson.

J. L. SIMONSEN.