

OBITUARY NOTICES.

SIR SHANTI SWARUP BHATNAGAR.

1894—1954.

THE sudden death of Sir Shanti Bhatnagar removed from the field of Indian science a dynamic personality. The great services he rendered to science in India will be remembered for generations to come. He was born on February 21st, 1894, at Bhera, District Shapur, now in West Pakistan, and when he was only eight months old he lost his father. He had to struggle his way up as a student. After taking the M.Sc. degree of the Punjab University from the Forman Christian College, Lahore, he went to England in 1919 and worked till 1921 in the Physical Chemistry Laboratory of University College, London, under Professor F. G. Donnan. There he met two other young chemists from India, J. C. Ghosh and J. N. Mukherjee. Professor Donnan was very sympathetic and affectionate in his relations with them: in fact, this was characteristic of Professor Donnan in his dealings with all the young men who came to work under him. Bhatnagar, Ghosh, and Mukherjee later came to be known in some scientific circles of England as the "three musketeers" of Donnan. Under Professor Donnan's directions Bhatnagar took up the study of phase inversion in emulsions. The degree of Doctor of Science of London University was awarded to him on the basis of the contributions he made to our knowledge of this subject.

On return to India, Bhatnagar joined the newly established Benares Hindu University as Professor of Chemistry. He was successful in attracting a number of young men for collaboration in his research and soon developed an active centre of research in colloids and other branches of physical chemistry. His zeal and ability as an organizer also made their effect felt in the affairs of the University. In 1920 he joined the Punjab University as a Professor of Physical Chemistry and Director of the University Chemistry Laboratories at Lahore; he held these positions till 1940. His laboratory soon became a prominent centre of scientific research in India. Important contributions were made by Bhatnagar and his co-workers in the fields of colloids, surface chemistry, and magnetochemistry. With Mr. R. N. Mathur, he devised in 1935 a magneto-interference balance which was manufactured by Adam Hilger & Co. In collaboration with Mr. K. N. Mathur he brought out a book entitled "Principles and Application of Magneto Chemistry," published by Macmillan Ltd., probably the first book on the subject in English. While at Lahore he also undertook investigations on some problems of oil technology with the financial support of Messrs. Steel Brothers & Co. Ltd. and made important contributions in this field. He was instrumental in securing donations for chemical research in the laboratories under his charge, and himself contributed to them from the fees he received from commercial firms.

Soon after the outbreak of World War II, the Government of India decided to establish a Directorate of Scientific and Industrial Research and in 1940 a start was made with Bhatnagar as Director. The history of its development, especially in its earlier days, reveals the unique qualities Bhatnagar had of enlisting the active support and co-operation of all persons whose influence counted in the furtherance of projects he had in view. He had the gift of winning over opposition and getting on well with men of diverse types and interests. Socially he was most approachable, warm-hearted, and hospitable. He lived an unostentatious life. He could, however, be pugnacious if the situation required, but mostly kept his own counsel.

Bhatnagar belonged to a generation which witnessed the rapid development of scientific research and scientific institutions in India. The establishment of the University College of Science and Technology in Calcutta and the appointment of (later Sir) P. C. Ray and (later Sir) C. V. Raman as Palit Professors of Chemistry and Physics respectively were instances of the outward expressions of the strong need felt by Indian leaders for the promotion of science and scientific research. In this development quite a number of Indian scientists, including Bhatnagar, played a very active rôle. Honours came to him in due course and he held the offices of the President of the Indian Chemical Society, the President of the Section of Chemistry of the Indian Science Congress Association, and later General President of the Indian Science Congress Association and President of the National Institute of Sciences in India. He was awarded the O.B.E. in 1936 and was knighted in 1941. In 1943 he was elected a Fellow of the Royal Society and also an honorary member of the Society of Chemical Industry. He led a

number of scientific delegations to International Scientific Conferences and was awarded the honorary degree of D.C.L. by the University of Oxford on one of these occasions. Perhaps his greatest claim to be remembered lies in his success in developing the Directorate of Scientific & Industrial Research, culminating in the establishment of twelve National Laboratories and of the Ministry of Natural Resources & Scientific Research of the Government of India. In all these endeavours he was fortunate in having the most active encouragement, help, and fostering care of Mr. Jawaharlal Nehru, Prime Minister of India. In 1954 he was made a Padma Bibhusan, Dusra Varg (Second Order).

He was an indefatigable worker with almost unlimited energy. Insomnia, which he suffered from, never restrained his energy. He was greatly helped by his wife who was a charming host and most unassuming. She quietly looked after all his needs. Her death in 1946 was a great loss to him and he gave vent to his feelings in Urdu verses, an activity of which he was greatly fond but which he could rarely indulge because of pressure of other work. He claimed to be a member of the "Bramho Samaj" known also as "Prarthana Samaj," a reformist group of the Hindu Society who did not believe in caste distinctions and idol worship. All who came to know him will remember him, not only for his striking achievements, but also for his intensely human qualities.

J. N. MUKHERJEE.

JOHN STANLEY HERBERT DAVIES.

1893—1954.

JOHN STANLEY HERBERT DAVIES was born in Kingsland, near Hereford, on June 27th, 1893, and was educated at Abertillery County School and Llandovery College. Proceeding to Emmanuel College, Cambridge, he obtained his B.A. in the Natural Science Tripos in 1916, having studied chemistry, physics, and zoology. During the war Davies was with the Royal Engineers but returned to post-graduate research at Manchester College of Technology and obtained the M.Sc. (Tech.) and later the Ph.D. degree (1924). With the aid of a D.S.I.R. maintenance award, the period of training under Professor F. M. Rowe led to several very interesting publications (*J.*, 1920, 117, 1344; 1922, 121, 1000) and in particular to a paper (*J. Soc. Dyers and Col.*, 1926, 42, 242) which was awarded the Gold Medal for the year by the Dyers' Company. This work described the preparation of phthalazine, phthalazone, and phthalimidine derivatives by a new reaction of diazosulphonates from 2-naphthol-1-sulphonic acid.

Davies was engaged on research work with "mustard gas" at the War Office Establishment, Sutton Oak, St. Helens, from 1925 to 1930 and the results have been published in two papers (with Phillips and Mumford, *J.*, 1929, 535; with Oxford, *J.*, 1931, 224). The greater part of his career was spent as a research chemist in the Dyestuffs Division of Imperial Chemical Industries Limited, Blackley. He was concerned with problems connected with the development of phthalocyanines and the eventual launching of Monastral Blue. On transferring to the Medicinals Section he worked at first on synthetic oestrogens of the tri-*p*-methoxyphenyl-ethylene type, on quaternary ammonium bactericides, and on X-ray contrast agents. In September, 1941, he was seconded to Oxford to work with Sir Robert Robinson on synthetic problems related to the steroids, but returned to Blackley in December 1943 to join the research team on penicillin. Davies was associated with several reports to the "Committee on Penicillin Synthesis" and details are given in "The Chemistry of Penicillin," Princeton University Press, 1949.

His appointment as Director of Research to British Schering Research Laboratories Limited, at Alderley Edge, allowed considerable scope for work on compounds of chemotherapeutic interest. In particular two fields were specially covered and led to an examination of oxazolidones and furanochromones. The alkylation of oxazolid-2:4-diones and 2-thio-analogues was accomplished in collaboration with Hook and led to improved methods for the preparation of 3:5:5-trimethyloxazolid-2:4-dione, of importance in the treatment of "petit mal" (*J.*, 1950, 30, 34, 36). In the furanochromone field there were many developments, including the synthesis of visnagin and related compounds (with Norris *et al.*, *J.*, 1950, 3195, 3202, 3206), after kellin had been synthesised in the same laboratories (*J.*, 1949, 530). There was also collaboration with Professor J. M. Robson of Guy's Hospital Medical School in the examination

of some analogues of triphenylethylene in relation to sex-hormone activity (*Brit. J. Pharmacol.*, 1950, 5, 376).

From December 1950 Davies was a lecturer at the Royal Technical College, Salford, in the Department of Chemistry and Applied Chemistry. Here he was associated with the teaching of organic chemistry and began the first research work at the College in synthetic organic chemistry. This was concerned with a continuation of furanochromone chemistry and culminated in the award of the first Ph.D. to a student of the College by London University. Davies also had his influence on the laboratory work and made an excellent selection of special preparations for advanced work. He was elected to the Fellowship of the Royal Institute of Chemistry in 1952.

In his own experimental work Davies showed great patience and was keen and methodical. He certainly excelled in the production of first-class specimens of his various products although the procedure was most time-consuming. His useful books of collected references, on lines of special interest, were often consulted.

After going to Wilmslow in 1945 Davies had very little by way of outside activities, but maintained his garden in its lovely condition. He died suddenly at his home on July 26th, 1954, and is survived by his widow, with whom great sympathy is felt by all who knew them.

G. R. RAMAGE.

HENRY STANLEY RAPER.

1882—1951.

WHEN Henry Stanley Raper died unexpectedly on December 12th, 1951, chemical physiology lost an outstanding worker with unusual qualities of scientific insight allied to patient thoroughness—not to speak of a degree of genuine modesty which is possessed only by the truly great—and the cause of medical education a devoted and well-loved servant. I use the term “chemical physiology” advisedly, for it means something a little different from the fashionable word “biochemistry” and it is the term that he himself always used.

Born on March 5th, 1882, at Bradford in Yorkshire, the last but one of a large family, he first studied chemistry with the object of qualifying himself as a dye-works chemist, but becoming aware that he suffered from partial colour blindness his interests as a student of chemistry naturally turned away from dyes. After some time spent at Bradford Technical College, he entered Yorkshire College, Leeds, then a constituent college of the old Victoria University, and obtained the degree of B.Sc. in 1903. Later he carried out organic chemical research under Julius B. Cohen with whom his first three papers were published in this *Journal*. In Cohen's department he met H. D. Dakin—afterwards to become a famous investigator of intermediary metabolism—and it was probably the influence of these two men which aroused Raper's interest in what was to be his life's work, the application of chemistry to physiological studies. The award of an 1851 Exhibition enabled him to go to the Lister Institute in 1904 where with J. B. Leathes he began work on one of the two main topics of his working life, the metabolism of fats. A year spent in Hofmeister's laboratory in Strasbourg introduced him to the complexities of the chemistry of proteins and their breakdown products, thus awakening an interest which was still apparent twenty-three years later when he asked the present writer to undertake, as a Ph.D. topic under his direction, a study of plastein formation, then believed to be an example of enzymic protein synthesis. After another year with Leathes he studied for a medical qualification which he obtained at Leeds University in 1910, and then joined Leathes in Toronto, where the latter had gone to found a Department of Pathological Chemistry. After three years there as Lecturer in Pathological Chemistry, during which time he also taught chemistry in the Ontario Dental School, he returned to Leeds to a post in the Physiology Department, where he was subsequently appointed Professor. This period was broken by service, during the first World War, in the Anti-Gas Department of which he eventually became head and for which work he was awarded the C.B.E. in 1918.

In 1923 came his last move, when he was invited to succeed A. V. Hill as Brackenbury Professor of Physiology in the University of Manchester. He occupied this Chair with great distinction until he retired from it and from the administrative burden associated with the Directorship of the Physiology Laboratories in 1946, to become Dean of the Manchester University Medical School with the title of Professor of Chemical Physiology. In this capacity he was

able to continue to render the great services to medical education and to the University of Manchester which had occupied him along with his scientific researches during his years as holder of the Brackenbury Chair. He died a few months before he was due to retire from the University he had served so well for twenty-eight years, just when he could look forward to more leisure to enjoy those pursuits which he loved—the cultivation of his lovely garden at Prestbury in Cheshire and the water-colour drawing at which he was no mean executant despite his defect in colour vision.

His two main fields of interest as a chemical physiologist were fat metabolism and the mode of formation of melanin. Upon the former of these subjects he first worked with Leathes and later published papers with H. D. Kay, P. W. Clutterbuck, and others. With B. Cavanagh he was the first in this country to use deuterium as an indicator in studies of fatty acid metabolism, being anticipated in this by Schoenheimer and Rittenberg in the United States by only a few months. His interest in fat metabolism was maintained for the rest of his life, as is evident from the fact, that, shortly before he died, he gladly accepted, to the general delight, an invitation from the Biochemical Society to preside at their 1952 Symposium on Lipid Metabolism. He took much trouble over the preparation of his opening address and though his death deprived the meeting of the privilege of hearing him deliver it in person its preparation was sufficiently advanced for it to be appropriately read to the meeting from the Chair.

The main work for which H. S. Raper was known, and upon which his reputation in the history of chemical physiology will securely rest, is his outstanding feat in elucidating the sequence of reactions by which tyrosine under the influence of the enzyme tyrosinase is transformed into the black pigment, melanin. In this work, in which A. Wormald, F. C. Happold, and others participated over the years, a complicated series of changes was unravelled step by step and it will always rank as a classic piece of work on the mode of action of an enzyme carried out before the introduction of isotopic tracers made such achievements relatively easy. It was in this work especially that his early training as a chemist stood him in good stead; he had the ideal equipment for a chemical physiologist, a flair for chemistry founded on a sound chemical training combined with an essentially physiological outlook.

By any reckoning H. S. Raper must be counted among the great physiological chemists which Britain has so far produced and a fair share of worth-while honours came his way. He was elected to the Royal Society in 1929 and served as a member of its Council from 1939–41 and as a Vice-President from 1940–41. In 1947 his old University, Leeds, conferred upon him the degree of LL.D. *honoris causa*. His papers were of a consistently high standard, though not numerous in comparison with the output of many men more prone to seek the limelight or more assiduous in taking steps to advance themselves. The reason for this is partly that during his later life he freely sacrificed his own personal interests in favour of devoting himself to furthering the interests of the University and of the Medical School. It mainly, however, resided in his own character and personality. His standards as a man of science were unusually high. One could not for one moment connect Raper with anything smacking the least bit of the meretricious. He was the last man to rush into print until he was sure of his ground and had done a thorough and honest craftsman's job. Moreover, his principles would not let him build a reputation as a prolific genius by making use, as he so easily could have done, of the labours of large numbers of eager young research workers as was the fashion at the time in many continental Institutes. He once told the writer that he regarded this sort of thing as amounting to exploitation—a thing of which he did not in the least approve. Nevertheless, he trained and inspired by his example a good number of men who later came to occupy, with distinction, Chairs of biochemistry or physiology or other posts of similar standing, all of whom would gladly testify to his outstanding qualities as a kindly, modest man of unusual integrity, a truly great man under whom it was a unique privilege to work. Indeed, his former pupils and associates had planned to do honour to him on the occasion of his retirement by entertaining him to dinner on the evening of the aforementioned Biochemical Society Symposium and presenting him with a specially bound volume made up of one reprint each from all those of his former collaborators who could be reached. Unhappily his death robbed them of the opportunity of showing their affection for, and gratitude to, him in a way which would surely have given him great pleasure; but it is certain that none of them will forget the happy and fruitful years spent in the laboratory of "The Great White Chief."

S. J. FOLLEY.