

come many of the difficulties I encountered while growing the crystals, and gave me much stimulating advice. I am grateful to the Rockefeller Foundation for the grant which makes this research possible.

¹ Bernal, J. D., Fankuchen, I., and Perutz, M. F., *NATURE*, **141**, 523 (1938).

² Bragg, W. L., and West, J., *Phil. Mag.*, **10**, 823 (1930).

³ Polson, A., *Koll. Z.*, **88**, 51 (1939).

⁴ Neurath, H., *J. Amer. Chem. Soc.*, **61**, 1841 (1939).

OBITUARIES

Prof. Jean B. Perrin, For. Mem. R.S.

It was with great regret that I saw the announcement of the death in New York on April 17 of Prof. Jean Perrin. He had many friends in England who will feel that we have lost a staunch ally, for it will be remembered that during the War of 1914-18 he was of the greatest assistance to every one engaged in scientific work for the Government departments. He was himself scientific adviser to the French Government, and was keenly interested not only in what was being done in Paris but also in the work done in England, especially the development of tanks. He disliked the Germans very much, and during the whole of the period 1914-18 and shortly before this War broke out the spirit that animated him was "Il faut écraser les Boches". It was some consolation to know that he and his son had got out of Occupied France and gone to the United States.

Early in his scientific career, more than forty years ago, Perrin was elected professor of physical chemistry at the Sorbonne, and since then he has made many original investigations in atomic physics, for which he will always be remembered, as they are included in all modern treatises on these subjects.

Perrin's earliest experiments were designed to determine the nature of cathode rays and the conductivity of gases produced by the action of Röntgen rays and radioactive substances. At that time Varley and Crookes maintained that the cathode rays were material particles charged with negative electricity, which were repelled from the cathode and acquired large velocities under the action of the electric force. But the early experiments which were made to detect the charge were inconclusive, and other physicists maintained that the rays were a form of undulatory motion of the ether. The problem of determining the nature of the rays was settled by Perrin, by experiments with apparatus which showed conclusively that the rays were charged negatively.

But the work for which Perrin is best known is his experimental investigation of the Brownian motion. This investigation was designed with the object of determining the energy of agitation of molecules, from which it is possible to deduce the number of molecules in a cubic centimetre of a gas. There were several indirect methods of estimating that number but the results varied within wide limits. Perrin in his method of determining the number relied on a general theory of motion of particles, which implied that the mean energy of agitation of small particles suspended in a liquid was the same as that of a molecule of a gas. He succeeded by very remarkable original methods in determining the energy of agitation of the particles and thus deduced the number of molecules in a cubic centimetre of a gas.

Perrin's work "Les Atomes" is one of the most popular scientific publications. It deals with the discoveries made in molecular physics during the

very active period after the discovery of Röntgen rays and radioactive substances. Before the 1936 edition came out, 30,000 copies had been sold. He also wrote a very interesting book in 1935 entitled "Grains de matière et de lumière", where he gave a most vivid account of modern theories of radiation, and discussed several problems which agitate the minds of physicists.

Perrin never seemed to change; he was just as lively and original in his conversation a few years ago as he was when he was first appointed to be professor at the Sorbonne. He took the greatest interest in young people engaged in research, and had a party for them once a week in his laboratory where discussions took place on all sorts of subjects. What was most pleasant about these meetings was the boyish interest Perrin took in experiments, for he always placed more confidence in experimental investigations than in mathematical theories.

When on one occasion another professor, after trying to persuade him to accept a theory he had propounded, said "At least you must admit there is something in it", Perrin replied: "My dear —, it would be difficult to propound a theory that was entirely false."

He will be greatly missed by all French men of science, and also by his friends in England, for nothing added so much to the pleasure of a visit to Paris as a meeting with Perrin.

J. S. TOWNSEND.

Dr. T. B. Macaulay

THOMAS BASSETT MACAULAY, whose generous benefactions made possible the foundation of the Macaulay Institute for Soil Research at Aberdeen, died in Canada on April 3.

Mr. Macaulay who was born at Hamilton, Ontario, on June 6, 1860, was descended from the same family as Macaulay the historian, the Macaulays of Uig in the Island of Lewis. His grandfather migrated to Aberdeenshire and his father, Robertson Macaulay, was born at Fraserburgh in that county, but went to Canada as a young man and later became president of the Sun Life Assurance Company of Canada.

Dr. T. B. Macaulay entered the service of that Company in 1877, and held the posts of actuary, secretary, director and managing director, finally succeeding his father as president. He played a great part in expanding the Company from a very small concern to one of the most important corporations of its kind in the world. He was a fellow of the Institute of Actuaries of Great Britain and a charter member of the Actuarial Society of America of which he was twice president. A leading figure in his profession, he received the honorary degree of LL.D. from the Universities of McGill, Edinburgh and Aberdeen.

Dr. Macaulay's interests outside insurance were widespread and ranged from the development of trade between Canada and the West Indies to medical research and agriculture. During the War of 1914-18 he was Canadian chairman of the National Committee on Food Resources. He had the experimenting instinct highly developed. On his own farms at Hudson Heights near Montreal he built up one of the finest Friesian herds in North America, and for many years carried out experiments on the development of strains of maize and soya beans with the view of obtaining early varieties of good quality suitable for Canadian conditions. The work was not delegated to others

but was carried out personally by this busy business man in his limited leisure. The success which he achieved in his experimental work showed that had he elected to become a professional scientist he would have been as eminent as he was in his chosen profession.

Dr. Macaulay contributed generously to numerous causes both in Canada and Great Britain. In memory of his forebears he gave many thousands of pounds for educational, hospital, welfare and other purposes in Lewis and in Fraserburgh, but his benefactions were national as well as local. He was interested in genetics and in research on the endocrine glands, and contributed large sums to the Animal Breeding Research Department of the University of Edinburgh. Probably he will be remembered best as the founder of the Soil Research Institute at Aberdeen which bears his name. The buildings and equipment, including a demonstration farm on peatland in Lewis, were provided by Dr. Macaulay on the understanding that the Government would meet the cost of maintenance. He possessed tireless energy and unbounded enthusiasm. One of his ambitions was to bring about an improvement of the poorer classes of land in Scotland and during his visits to the country much of his time was spent in furthering this object. His influence with the crofters in Lewis was very great and he succeeded in bringing about many improvements where others had failed. The results of peat reclamation experiments carried out in Lewis were later applied by the Macaulay Institute in the successful reclamation of peatland in Lanarkshire on behalf of the Commissioner for the Special Areas.

It was my privilege to become one of Dr. Macaulay's friends and to stay with him several times in Canada, where I saw something of his happy home circle and of his scientific pursuits. He was a man of great sincerity and strength of character, kindly and always anxious to help his fellows. He lived simply and gave generously.

It was a source of great satisfaction to him during his last visit to Great Britain four years ago to stay at the Institute which he was instrumental in founding and to see the realization of some of his cherished ambitions.

W. G. Ogg.

Mr. F. J. Selby, C.B.E.

MR. FRANCIS JAMES SELBY, C.B.E., one of the small band of workers who formed the staff of the National Physical Laboratory in its early days and helped to develop it from small beginnings to an institution of world-wide renown, died on March 5. He joined the staff in 1903 to take charge of the prediction of tides which the Laboratory was about to carry out for the Indian Government, and to establish a Division for Optics to supplement the work of the Observatory Department at Kew. Selby was also secretary to the Director, an office which, if the range of his activities were considered, would have been better described as secretary of the Laboratory. In this position, which he made one of great importance in the Laboratory organization, he took a large share of administrative responsibility. His sympathy with the policy of Sir Richard Glazebrook particularly fitted him for this work, and those who knew the Laboratory well realized that it was no less fortunate in its secretary than in its first director. Everyone trusted him and valued his judgment and advice.

In 1909 Glazebrook was appointed chairman of the newly formed Advisory Committee for Aeronautics; Selby was chosen and continued as secretary until 1919, when the committee was replaced by the Aeronautical Research Committee. His services were recognized by the award of the C.B.E.

In 1918, shortly before the Government accepted financial responsibility for the Laboratory in place of the Royal Society, the office of Secretary of the Laboratory was formally established, with Selby as the first holder. In the following year Sir Joseph Petavel became director, and Selby continued to give most loyal service. He retired in 1932 on reaching the age of sixty-five.

Selby's special training was in mathematics, first at University College, London, where he greatly appreciated the teaching of Karl Pearson, and afterwards at Trinity College, Cambridge. He graduated as sixth wrangler in 1891 and later became mathematical master first at Bristol Grammar School and then at Repton. At the Laboratory, Selby retained a keen interest both in mathematics and in education. There was probably no important paper on relativity or the quantum theory that he did not read critically. He took an active interest in the further education of junior members of the Laboratory staff.

On his retirement, Selby intended to write a history of the early days of the National Physical Laboratory, a task for which he had unique qualifications. Unfortunately, little more than two years after his retirement, when the work was only partly done, he had a stroke and his memory was affected to an extent which made the completion of the history impossible.

Selby was twice married, and is survived by a daughter.

T. SMITH.

Mr. C. Oldham

CHARLES OLDHAM was born at Lincoln on April 16, 1865, but at the age of six the family went to live at Sale in Cheshire. It was at the preparatory school there that began the life-long friendship with T. A. Coward that was later to bear fruit in the classical account of the "Birds of Cheshire".

Until his retirement in 1927, the claims of his professional duties as assistant manager of the Manchester office and later of the London office of the Commercial Union Insurance Company, permitted him little leisure to pursue his scientific studies. Despite this temporal handicap, he became an acknowledged authority on British malacology and ornithology. He it was who contributed the field notes for the first edition of Witherby's "Handbook of British Birds", and he made notable contributions to the study of British land and freshwater Mollusca and especially in the critical genus of the *Pisidia*, his specimens of which are now in the national collection. It is at once a tribute to his characteristic thoroughness and physical endurance that, in the course of the study of this group, he examined almost all the very large number of tarns in North Wales.

Oldham was a field naturalist of the best type, outstanding alike in the accuracy of his observations and the breadth of his knowledge, and by no means the least valuable of his services was his influence upon those with whom he came in contact. For ten years Oldham was one of the honorary secretaries of the Hertfordshire Natural History Society and its president in 1920. His annual reports on the birds