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TRIBUTE TO DECEASED FELLOWS OF THE ROYAL SOCIETY[1]

By Sir WILLIAM BRAGG, O.M.

THE PRESIDENT OF THE ROYAL SOCIETY

THE year which has passed since our last anniversary meeting is sadly distinguished by the heavy losses which death has brought upon our society.

First and most conspicuous is the death of our revered patron, His Majesty, King George V. With all his peoples we mourn the close of a life devoted to the cause of peace and progress. As members of our society we feel deeply the loss of a patron who was a true friend to the purposes for which our society exists.

By the death of Richard Tetley Glazebrook, at the age of eighty-two years, we lose one of the most active and efficient scientific workers and organizers of his generation. Glazebrook began his scientific career under Clerk Maxwell and the late Lord Rayleigh at the Cavendish Laboratory. His first investigations were on double refraction. In the early eighties he became interested in the absolute determination of the electrical units, which continued to occupy him up to the very end of his life.

He was for a time senior bursar of Trinity and then principal of Liverpool University, but on the establishment of the National Physical Laboratory in 1899, Glazebrook was appointed the first director, and the present prosperity and national importance of that institution are more due to him than to any other single man. It remains as an abiding monument of his life's work. His retirement in 1919 by no means marked the close of his activities. As chairman of the Aeronautical Research Committee and of the Executive Committee of the laboratory, he was still able to

[1] From the Anniversary Address of the President of the Royal Society of London, given at Burlington House on November 30.

do much to promote the work to which he had devoted his best years. He was elected to the society as early as 1882, and received the Hughes Medal in 1909 and the Royal Medal in 1931. He was created K.C.B. in 1920, and received numerous other honors. The debt which the country owes to him in the development of aeronautics is very great.

Percy Carlyle Gilchrist was associated with his cousin, the late Sidney Gilchrist Thomas, in experiments which ultimately led to the establishment of the basic Bessemer process. Bessemer had discovered in 1855 that a stream of air when blown through molten pig iron contained in a converter removed its carbon and silicon by oxidation, the heat evolved being sufficient to retain the metal in a molten condition. The metal thus produced was brittle, owing to its oxidized condition. Within a year Mushet made the important discovery that if manganese was added to the molten metal in the form of ferro-manganese it removed the absorbed oxygen and enabled sound malleable ingots to be cast. These discoveries led to the establishment of the "acid" Bessemer process in which the lining of the converter is a siliceous refractory material. But phosphoric irons were not amenable to this treatment, since with an acid lining the phosphorus remains in the finished steel and renders it brittle.

In the early seventies Thomas conceived the idea of lining the converter with a basic material and making additions of lime with a view to eliminating the phosphorus in the converter. After preliminary experiments he enlisted the help of his cousin, P. C. Gilchrist, who was then a chemist at Cwm Avon in South Wales. Experiments were continued at these works, and Thomas and Gilchrist took out two patents. They were greatly assisted in their work by Mr. Martin, of the Blaenavon Steel Works, who came to their assistance, and on March 6, 1878, another patent was taken out. After this, progress was rapid, and at the autumn meeting of the Iron and Steel Institute, held that year in Paris, they presented a paper entitled "On the Elimination of Phosphorus in the Bessemer Converter." The paper was not read at this meeting and was adjourned until the following one in 1879, when it was read by Thomas and published in the journal of the Institute. In this way the basic Bessemer process was established and has proved to be one of the main processes for producing cheap steel on a large scale.

Stewart Ranken Douglas was deputy director of the National Institute for Medical Research and director of the Department of Experimental Pathology and Bacteriology. He will always be remembered for his work, in association with Sir Almroth Wright, on opsonins and vaccines. The discovery of opsonins was communicated to the society in 1903, a second communication followed early in 1904, and further work on these subjects during the following decade laid the foundations of vaccine therapy as it is practised to-day. Douglas devised several valuable nutrient culture media for pathogenic bacteria, and one of these proved invaluable during the war, for it enabled large quantities of vaccines to be made for the army at a time when the constituents of culture media as then compounded were becoming difficult to procure. After the war, Douglas organized the new pathological laboratories at the National Institute for Medical Research and devoted himself to the initiation of new lines of research and the encouragement of his juniors. He was largely responsible for planning and directing the scheme of study of virus diseases at the institute which proved so fruitful. Although the publications under his name in this branch of knowledge are few, he inspired and guided much of the work published by his juniors. He was elected to the fellowship of the society in 1922 and to the fellowship of the Royal College of Physicians in 1933.

James Hartley Ashworth was a distinguished zoologist and acquired a wide reputation as a teacher, more particularly in that branch of the subject which is usually referred to as medical zoology.

In the early part of his career he made an important contribution to our knowledge of the Alcyonaria and afterwards turned his attention to the anatomy and systematics of the lug-worms (Arenicolidae). His elaborate investigation of the histology of the nervous system of these worms and the distribution of the giant-cells it possesses yielded results of great interest and importance.

Soon after his appointment to a lectureship in the University of Edinburgh, he was invited to provide a course on medical zoology for post-graduate students. As it was the first course of this kind to be given in this country, it was difficult at first to obtain a sufficient supply of specimens to illustrate his lectures; but with characteristic energy and skill he soon remedied the deficiency. In a few years the course acquired a wide reputation and attracted a large number of young medical men.

In connection with this class, original research was encouraged and stimulated, his own great monograph on the organism *Rhinosporidium,* which causes a polypus in the nose, being a contribution to our knowledge of outstanding importance.

Professor Ashworth will also be long remembered for the energy he displayed in obtaining the necessary funds for the magnificent new Zoological Laboratory in Edinburgh which now bears his name, and also for the wide knowledge and skill that he showed in expressing his wishes to the architects of that great building.

Professor Ivan Petrovitch Pavlov, best known of Russian men of science and greatest of Russian physiologists, died on February 27 last at the age of 86. He had been a foreign member since 1907, was Copley medallist in 1915, and Croonian lecturer in 1928. He was Nobel laureate in 1904.

Pavlov was the son of a village priest and the grandson of a priest, and throughout his life, in spite of fame and position, he kept the simplicity of his origin, and in his teaching some of the attributes of the priest. He preserved his vigor to the end, and in August, 1935, presided over an International Congress of Physiologists which his prestige, and the affection of physiologists for him, had brought to Leningrad. His position in Russia was unique among scientific men and unique in public estimation. The attention paid to science in the Soviet Union is due, to a significant extent, to Pavlov's character and achievements.

Pavlov's earliest researches were on the physiology of the circulation, and in that work he realized, as Starling said of him, the necessity of avoiding if possible disturbing factors such as anesthetics, pain and discomfort, in experimental work on the normal functions of the body. From 1888 to 1900 came his great work on digestion, particularly on the nervous control of digestion. From 1902 onwards Pavlov and his pupils dedicated themselves to the problems of the higher nervous processes in the brain. The whole subject of "conditioned reflexes" was developed by Pavlov during that period. His demonstration that intelligent behavior in animals is built up largely of conditioned reflexes, just as skilled movement is the integration of simpler reflexes, although its consequences may often have been exaggerated by others, will remain one of the fundamental contributions to the physiology of the brain.

Pavlov remained an inspired and inspiring teacher to the end. A few weeks before he died he wrote a "Bequest to the Academic Youth of his Country," which gives vividly the philosophy of his experimental work: "Never attempt to screen an insufficiency of knowledge even by the most audacious surmise and hypothesis. Howsoever this soap-bubble will rejoice your eyes by its play, it inevitably will burst and you will have nothing except shame." "Perfect as is the wing of a bird it never could raise the bird up without resting on air. Facts are the air of a scientist. Without them you never can fly. Without them your theories are vain efforts." "Do not allow haughtiness to take you in possession. Due to that you will be obstinate where it is necessary to agree, you will refuse useful advice and friendly help, you will lose the standard of objectiveness." "Remember that science demands from a man all his life. If you had two lives that would be not enough for you. Be passionate in your work and your searchings."

With Pavlov died one of the greatest of our foreign members, one of the greatest teachers and investigators in physiology, and a very good and simple man.

Professor Conwy Lloyd Morgan, who died at the age of eighty-four years, entered the School of Mines with a view to becoming an engineer: here he came into contact with T. H. Huxley, under whose stimulating influence he acquired a deep interest in biology. After occupying a post in South Africa, he was appointed lecturer on geology and zoology at University College, Bristol, succeeding Sir William Ramsay as principal of the college in 1887. He had long had a deep interest in psychology and philosophy, and his sound scientific training well fitted him to take a broad synoptic view of the problems of life and mind. His researches on comparative psychology, especially on birds and dogs, were directed particularly to the segregation of innate and acquired factors in early behavior and are of permanent value in the development of a truly scientific psychology, founded upon a sound biological basis. In his later years he built up a philosophy of emergent evolution.

George Thurland Prior, distinguished as a mineral chemist and a well-known authority on meteorites, was elected a fellow of the society in 1912. He was born at Oxford in 1862 and, after a school and university education there, he entered the Mineral Department of the British Museum in January, 1887. There he did his life's work. In 1909 he succeeded Sir Lazarus Fletcher as keeper of minerals, and on reaching the Civil Service age-limit he retired in December, 1927, after over forty years of service.

In addition to his work as curator of large and growing collections and to the labor involved in determinations and reports on specimens submitted to the museum, he made many investigations on minerals, rocks and meteorites. Many new minerals were based on his careful analytical work, often done on very small amounts of material. He excelled in the difficult analyses of minerals containing niobium, tantalum, titanium, zirconium and the rare earths; and problems relating to these were often referred to him by workers in other countries. One of these minerals, a titanoniobate of yttrium and cerium earths from Swaziland, which he had analyzed, was named priorite after him by W. C. Brøgger, a foreign member of the society. His petrographical work included descriptions of the rocks collected by the Antarctic expeditions of Ross (1839–43), Borchegrevink (1898–1900) and Scott (1901–04), and of alkali-rocks from Abyssinia and East Africa. In his work on meteorites he described many new falls and devised simpler methods for the partial analyses of others previously known. From his results he was able to show that "the richer in nickel is the nickel-iron, the richer in ferrous iron are the magnesium silicates." This may well be called Prior's law. On it he based a new genetic classification of meteorites. His "Catalogue of Meteorites" is the standard work of reference. Dr. Prior was for eighteen years the general secretary of the Mineralogical Society and its president in 1927–30.

To the physiologist the name of John Scott Haldane will always be associated with that masterly investigation of the respiration which was his outstanding contribution to pure physiology, for this has played a remarkable part in moulding the change of outlook in physiological thought which has been apparent since the beginning of the present century. Deeply interested in a philosophy of life which guided, and was in turn guided by, his own experimental researches, he has made clear by his work the exquisite and quantitative coordination of the different functions of the body on which the integrity of the living organism depends, and the delicate adaptive changes which are characteristic of life. By the introduction of new experimental methods and the design of special apparatus, he has shown how it is possible to use delicate methods of chemical and physical analysis to gain an insight into the physiology of the intact and normal human being. Far-seeing and original in his ideas and courageous in maintaining his views, his work ranged over a far wider field than academic physiology, for he drew no distinction between pure and applied science but found inspiration for his work in both alike. Much of his time and thought was devoted to investigations whose object was the reduction of the risks which the miner has to run in the course of his daily occupation, and the elimination of the diseases and discomforts associated with mining or with other occupations when men have to face foul air or extremes of temperature. By the application of strict scientific methods he has rendered negligible the dangers which were formerly associated with deep diving and work in compressed air. Great as were his contributions to physiology his investigations in the field of general industrial hygiene were no less important and fruitful.

Percy Fry Kendall was born in London in 1856. He began his geological studies at evening classes, and in the early eighties took the full course at the Royal College of Science, South Kensington. He then went to Manchester as a Berkeley fellow of Victoria University. His life's main work was the building up of the School of Geology at Leeds. Starting under difficult conditions as a part-time lecturer at the Yorkshire College in 1891, his teaching attracted students to his classes and brought prestige to the college, so that when Leeds University received its charter in 1906, he became the first occupant of the chair of geology.

Among geologists, Kendall will be remembered as the great protagonist of glaciation of Britain by land ice. He was the central figure in the organization of local workers who, through a British Association committee, made systematic records of the dispersion of glacial boulders. An outstanding contribution to natural knowledge is the demonstration of ice margin-retreat stages round the British hills, which was started with his publication in 1902 on "The Glacial Lakes of Cleveland" in the *Quarterly Journal of the Geological Society.*

From about 1900, Kendall's attention was directed to the supply of underground water for Yorkshire towns and villages, and so to the problems of the coal-fields. For the Royal Commission on Coalfields in 1905 he produced a masterly report, documenting the local application of the doctrine of posthumous folding and estimating the unproved area of the Yorkshire, Nottinghamshire and Derbyshire coalfield at 3,885 square miles.

Professor Kendall was awarded the Lyall Medal of the Geological Society in 1909. He retired from the chair at Leeds in 1922 and was granted the title of emeritus professor. He was elected into this society in 1924, and received the honorary degree of D.Sc. at the coming of age of Leeds University in 1926. He died at Frinton-on-Sea in March, 1936.

By the death of Sir Archibald Garrod, the society loses a fellow who, while primarily an investigator, became famous as a practising physician and pathologist. He was trained in medicine at St. Bartholomew's Hospital. Early in his career he was attracted by the subject of urinary pigments and published papers on haematoporphyrin, urochrome uroerythrin and urobilin. His work on alkaptonuria was of primary importance: he saw in it not a disease but an individual variation; these and other studies led to the publication of his book on "Inborn Errors of Metabolism" in 1909. His professional career absorbed much of his time, and left him little leisure for personal research, though his sympathies and interest were a direct stimulus to much valuable work while he was regius professor of medicine at Oxford from 1920 to 1927. He was elected a fellow in 1910 and was a vice-president from 1926 to 1928.

Sir Joseph Ernest Petavel was born in London in 1873, spent his early years at Lausanne, where he studied engineering and returned to England in 1893 to continue the study of his subject for three years at University College, London. For the next three years he worked in the Davy Faraday Laboratory of the Royal Institution on the properties of matter at low temperatures, on the emission of light and heat from carbon and platinum with the object of obtaining a standard of light; there also he devised the well-known "Petavel gauge" for measuring the rate of rise of pressure in explosive reactions.

Proceeding to Manchester University in 1901, he lectured on mechanics and meteorology and applied his conspicuous gift for design to the evolution of a new technique for work at high pressures and temperatures. This had an important influence on the study of ballistics and of combustion and on the industrial development of chemical reactions under the above conditions. He became professor of engineering there in 1909.

Through his interest in the problems of the upper air, he came into touch with aeronautics and in the early days of the war supplied a definite stimulus to the study of aerodynamics, resulting in improvement in the stability of aeroplanes. His fertility in design was also employed in other work for the Admiralty and the War Office.

In 1919 Petavel succeeded Sir Richard Glazebrook as director of the National Physical Laboratory and gave his undivided attention to the extension of its activities and especially to the increase of its usefulness to industry.

Petavel will be remembered not only for his achievements in pure science and in administration but also for his personal qualities, his courtesy, hospitality and love of his house and gardens, for the upkeep of which he expressed a wish that a contribution should be made from his bequest to this society.

Professor Karl Pearson, Galton professor of eugenics at University College, London, from 1911 till his resignation in 1933 at the advanced age of 76, died suddenly on April 27. Elected to the Goldsmid professorship of applied mathematics at University College in 1884, he began the statistical work with which his name is chiefly associated about the year 1891, his first statistical memoir being printed in the "Philosophical Transactions" of 1894. From then onwards there followed an ever-increasing mass of work at first largely in our "Transactions" and "Proceedings," later mainly in the journal *Biometrika,* which he founded in 1901, work which may well be said to mark a new epoch in the history of statistical method. Pearson was not only himself an indefatigable worker, but an outstanding teacher with a great capacity for rousing enthusiasm in others, and his pupils are scattered all over the world. But he was not only a statistician; he wrote on other branches of applied mathematics and in earlier years edited and completed Todhunter's "History of the Theory of Elasticity." This, the well-known "Grammar of Science," the "Life of Francis Galton" and several of the essays in "The Chances of Death and other Studies in Evolution" fall within the field of science. An early little book on the Veronica legend and portraits of Christ, and the essays of "The Ethic of Freethought" show the scholar, historian and philosopher. Elected a fellow in 1896, Pearson was awarded the Darwin Medal in 1898, but never took any active part in the general work of the society.

Alfred Cardew Dixon, who died on May 4 last at the age of 70, was senior wrangler in 1886, fellow of Trinity and afterwards professor of mathematics successively in Queen's College, Galway, and the Queen's University of Belfast. Like most Cambridge mathematicians of what is now the older generation, his interests extended over a very wide domain in the science, and at different times he published original papers on geometry, analysis, dynamics and the theory of elasticity. Among his best-known achievements may be mentioned his theory of the singular solutions of systems of differential equations of any order; his papers on the integration of partial differential equations; his great memoir of 1901 on matrices of infinite order—a subject in which he was a pioneer, and a subject now of great importance in the last decade on account of its applications in quantum mechanics—and the researches of his later years on the theory of integral equations and the problems of the elastic plate. As a teacher and administrator he was most highly regarded in the University of Belfast, which conferred on him the honorary doctorate of science. After retirement from his chair in 1930, he settled near London and took an active part in the affairs of the London Mathematical Society, of which he was president in 1932–33.

Sir George Hadcock, a fellow of the Royal Society since 1918, was a man of great charm of manner, and was much liked by all with whom he came in contact.

His extensive experimental work in connection with the development of artillery in all its phases was largely responsible for the present position of the science of gunnery and ballistics; and his "Ballistic Tables," published in 1897, were for many years the official tables of the War Office to be used in conjunction with the "Text-book of Gunnery."

Hadcock conducted experiments to determine the effect on the resistance of thick-walled cylinders to internal pressure, which were some of the first to be carried out in this country; and upon them our present knowledge of overstrain in metals is largely based.

He was the author of several books and many papers on artillery and ballistics, and wrote articles on these subjects for the "Encyclopædia Britannica." He also contributed a paper, which was published in the "Proceedings of the Royal Society," on the "Longitudinal Strength of Cylinders, etc."

Professor William Ernest Dalby, emeritus professor of engineering in the University of London, died on June 25, 1936, at the age of seventy-two years. At the early age of fourteen he commenced his practical training at the Stratford Works of the Great Eastern Railway. Then having been awarded a Whitworth scholarship he went to the Crewe Works of the London and North-Western Railway. In 1891 he accepted an invitation from Professor Ewing to act as his assistant and from that time onwards his career ran along academic lines.

After six years with Ewing, Dalby was appointed to a professorship of engineering at the Finsbury Technical College, where he remained from 1896 until 1904, when he was promoted to the chair of civil and mechanical engineering at the City and Guilds College at South Kensington. This professorship of London University he retained until his retirement from academic work in 1931. Although Dalby in nowise neglected or belittled his duties as a teacher, his interests were mainly concentrated on research, particularly research of a practical variety. His researches were very varied and, with the exception of the electrical, dealt with almost every branch of engineering knowledge. When at Finsbury the research which monopolized his attention was concerned with "Balancing of Engines." On this subject he became recognized as the highest authority. It was his first love in research and it is the one with which his name will continue to be associated by future generations of engineers. Elected a fellow in 1913, he served on the council during the year 1924. Hard-working, conscientious and conspicuously generous minded in his estimate of others, he leaves behind him the pleasing memory of a man who without motive invariably gave the best that was in him to the cause of engineering science and the betterment of engineering education.

Richard Dixon Oldham, who died on July 15, 1936, at the age of seventy-eight years, spent twenty-five years of his active life of research as a member of the Geological Survey of India; and, after his retirement from official work in 1904, he continued to carry on, with marked distinction, his studies of seismology and physical geography. His work in India was mainly devoted to the regional geology, and especially the stratigraphy of Baluchistan, the Himalayas, Northern Peninsular India and the Andaman Islands. This wide range of field experience qualified him eminently for revising the official "Manual of the Geology of India," which was published in 1893.

In a paper, published in 1906, analyzing the seismographic records of fourteen world-shaking earthquakes, Oldham established the existence of two distinct sets of deep-seated waves, traveling at different speeds; and, from the way in which the waves of distortion were damped out in depth, he deduced the existence of a central core in the earth, four tenths of the radius in thickness, which contrasted in physical properties with the external shells. In this way Oldham pointed to the pretty analogy between seismic waves as a source of information regarding intratelluric conditions and those of light which, on analysis by the spectroscope, give information regarding the composition of the sun's atmosphere.

Oldham was elected a fellow in 1911 and served on the council of the society in 1920–21. He was also elected president of the Geological Society of London in 1920, and in 1931 an honorary fellow of the Imperial College of Science, in which he received his early training.

Sir Henry Wellcome, head of the great firm of Burroughs, Wellcome and Company, died in London on July 25, at the age of eighty-two years. Famous throughout the world for his commercial achievements, he attained still greater renown for his lifelong interest in medical science, to the promotion of which, in one or other of its branches, he devoted most of his energies and practically all his wealth.

After an early training in pharmacy and chemistry in America, where he was born, he came to this country and founded with Burroughs, in 1880, the firm which later passed into his sole control.

In 1894 in the early days of serum therapy, he grasped the possibilities of protective and curative sera and founded the Physiological Research Laboratories with the twofold object of bringing serological and biological remedies within the reach of medical men and their patients and of carrying out researches into the fundamental problems of immunology and allied subjects. Two years later he founded the Chemical Research Laboratories, and then in 1913 the Bureau of Scientific Research to carry out researches in tropical medicine and coordinate the work of the various research laboratories and museums he had founded. The museums included the Museum of Medical Science, depicting modern medicine in graphic form, and the Historical Medical Museum, illustrating, by a most extensive and priceless collection of instruments, objects and books, the history of medicine from the earliest times to the present day.

He built the Wellcome Research Institution in the Euston Road and established the Tropical Research Laboratories in Khartoum.

He made arrangements in his will for the continuance of his great business and of his various research laboratories and museums, all of which are now grouped under the name of the Wellcome Foundation. Over and above this, residuary profits are also to be devoted for the most part to the furtherance of scientific research.

Dr. Bernard Smith died on August 19, having held for only ten months the directorship of the Geological Survey of Great Britain and of the Museum of Practical Geology, London. He had served on the council of the Royal Society for nearly a year and was chairman of a committee on ordnance survey maps. For thirty years he had been a member of the Geological Survey. He had been since 1931 assistant to the director, and in charge of field work in England.

Smith was essentially a field geologist with a special bias to the study of the relations of physiography to geology. This was well shown by his published textbook of "Physical Geography," which is in its third edition. His principal contribution to British geological science was his interpretation of the Whitehaven coalfield. This difficult ground was entrusted to him, and a staff of geologists working under his direction, in 1920, and the maps and memoirs are now nearly all published. The work maintained a very high standard and solved many problems previously little understood. Almost equally important was his investigation of the iron-ore deposits of West Cumberland and Lancashire, the principal sources of British hematite.

Smith's early death cuts short a career of great promise. His ability was shown in all his investigations and his judgment was cautious, sound and penetrating. With equal ease he handled a great variety of subjects and as a colleague and director he was universally esteemed. Gentle and unobtrusive in manner, he won the confidence of his colleagues and of the public, and, unspoiled by popularity and success, he exerted a stimulating influence on wide circles of British geologists.

Henry Louis Le Chatelier devoted almost the whole of a long and active life to physical chemistry in its applications to concrete problems, giving special attention in the later years to those of metallurgy. His early work on the dissociation of calcium carbonate led him to the enunciation of the "Le Chatelier principle," which indicates the influence of a change of external conditions on the state of a system in equilibrium. This principle has played a great part in the development of physical chemistry. His application of the theory of solutions to metallic alloys opened up a new field, which has proved very fertile. He was an excellent experimenter and introduced several new instruments, the most important of which was the thermo-electric pyrometer, universally used in the study of alloys. By his foundation of the "Revue de Métallurgie" in 1904 he provided a medium for the publication of French researches in metallurgy, which has ever since retained its position as a leading technical journal. The esteem in which he was held by scientific men of many countries was shown by the celebration in Paris of his academic jubilee in 1922. A graduate of the École des Mines and for many years one of its professors, he approached chemistry from the side of a mining engineer, and this fact determined his practical bias. Both by his teaching and through his important text-books he exerted a great influence on the development of chemistry and chemical industry in France. He was elected a foreign member of the Royal Society in 1913.

William Johnson Sollas, who was elected a fellow in 1889, died at the age of eighty-seven years, retaining undiminished his remarkable energy and many-sided interest in science. His researches not only illuminated his own special province of geology with mineralogy, but also included important contributions to zoology and anthropology, even, in his work on the "Age of the Earth," venturing into the domain of physics. He was educated at the City of London School and the Royal School of Mines, and wrote, not many months ago, his memories of student days under the inspired teacher T. H. Huxley, and of the group of friends who, led by the late Dr. William Garnett, migrated to Cambridge. After many years of teaching his subject in Dublin, he became in 1897, and remained until his death, professor of geology at Oxford, where the arrangement and great development of the university collections and the deepening interest in geological study will be long remembered as the fruits of his occupancy of the chair.

Sollas was formerly fellow of St. John's College, Cambridge (elected 1882), and became fellow of University College, Oxford, a few years after his election to the professorship. His election last year to the honorary fellowship of the Imperial College of Science gave him much pleasure. He was president of the Geological Society of London 1908–09, and was awarded a Royal Medal in 1914.

Professor George Forbes was a man of great versatility and was particularly interested in physics, astronomy and electrical technology. He was born in 1848. After graduating at Cambridge he was appointed, at twenty-three years of age, professor of natural philosophy in Anderson's College, Glasgow, which post he held until 1880. One of his chief pieces of physical work was a determination of the velocity of light by a modified Fizeau method carried out in conjunction with Dr. T. Young and described in "Philosophical Transactions" in 1882. The result obtained was a velocity of 301,382 kilometers per second. In 1874 he took charge of an expedition to Hawaii to observe a transit of Venus.

When incandescent electric lighting began commercially at about 1882, Forbes came to London to occupy a post in an electric manufacturing company and made improvements in arc lamps and electric meters. His chief contribution was the introduction of brushes for dynamo machines and motors made of hard graphite carbon; an improvement of general utility. When the great project of employing part of the water power of Niagara for generation of electric current was started, Forbes was appointed to superintend the work of the electric installation and plant erection at the site and acted as consulting engineer to the Cataract Company carrying out the work.

Forbes traveled extensively and was a correspondent of the *Times* during the Russo-Turkish war. He invented a naval gun sight and a military range-finder and was granted a Civil List pension in 1931 for his services.

He was elected a fellow in 1887 and was a Chevalier of the Legion of Honor of France and an honorary member of the Franklin Institute of America. He died at Worthing in October, 1936.

With the death of William Arthur Parks on October 5, the society loses a great Canadian and a great scientist. He was born at Hamilton and graduated at the University of Toronto, in which he was afterwards professor of paleontology. He joined the geological staff of the university in 1893, and touched on nearly every aspect of geology during his career. His exploration of Northern Ontario broke new ground, and his report on the building and ornamental stones of Canada is well known. But his favorite subject was undoubtedly paleontology, and to the world outside Canada he will be remembered chiefly for his classical work on dinosaurs. He became director of the Royal Ontario Museum of Paleontology in 1913; in 1926 he became president of the Royal Society of Canada. He was elected to our fellowship in 1934.

Thomas Martin Lowry, professor of physical chemistry in the University of Cambridge, died on November 2, 1936, at the age of sixty-two years. In his early days he was a pupil of, and an assistant to, Professor H. E. Armstrong and laid the foundation of his lifelong studies on optical rotatory power by discovering the mutarotation of nitrocamphor and the stereoisomerism of a number of halogen derivatives of camphor. He traced the mutarotation of nitro-*d*-camphor to the passage of equilibrium of two constitutionally different forms of the substance, and showed that the rate of change of the one form to the other could be influenced by the addition of traces of catalytic agents. By much careful work he established that the presence of an amphoteric agent is a factor in bringing about the isomeric change. Thus, whilst the mutarotation of tetramethyl-*d*-glucose can be arrested in the hydroxylic solvent, cresol, and the basic solvent, pyridine, it proceeds very rapidy in a mixture of these two solvents. On the basis of this and much other work, Lowry founded his now well-known theory of prototropy, according to which the migration of a hydrogen ion, in compounds such as nitrocamphor and the sugars, depends on the addition and removal of a proton at opposite poles of the molecule. It is largely due to Lowry's work that the conception of dynamic isomerism advanced by van Laar became generally accepted.

Concurrently with his chemical work on mutarotation, Lowry took up the study of optical rotatory dispersion which had been much neglected since the death of Biot in 1862; he demonstrated the validity of Drude's equation for simple substances and showed that it also covered the anomalous rotatory dispersion of *d*-tartaric acid and the tartrates. This work formed the subject of the Bakerian lecture given by Lowry and Austin in 1921. His later very precise determinations of the rotatory power of quartz in the visible and violet provided valuable data by which the validity of the Drude equation was further extended.

Lowry later extended his studies of the rotatory power of transparent media to that of absorbent media, namely of the Cotton effect, and was able to develop equations which are adequate to express the dispersion throughout the absorption band. Whilst occupied with the study of optical rotatory power, Lowry carried on parallel lines of research; his earlier verifications of Drude's equations were combined with corresponding measurements of magneto-rotatory dispersion and, in his search for possible relationships between diverse optical phenomena, he carried out a series of investigations on the refractive dispersion of organic compounds.

(To be concluded)

SCIENTIFIC EVENTS

BRITISH GOVERNMENT GRANT TO THE ROYAL SOCIETY

At the dinner given on the occasion of the 274th anniversary meeting of the Royal Society, London, Neville Chamberlain, chancellor of the exchequer, announced the intention to make a treasury contribution towards the establishment of an institute of chemotherapy. In the course of his address he said:

In order to show that the Government was not indifferent to the duty of one generation to carry on investigations, the result of which perhaps might benefit only the generations which would succeed it, he would like to say that only within the last week or so he had consented to give a grant of £30,000 a year towards the establishment of an institute of chemo-therapy. Perhaps when he said that that allocation was in response to a request from the Medical Research Council, backed up by the Department of Scientific and Industrial Research and supported by his colleague the Lord President of the Council, they would think that that was no spontaneous act but merely the more or less graceful yielding of a movable object to the pressure of an irresistible force. He assured them that he could bring good evidence to show that the object in question was not always movable and that to move it there must be internal as well as external force at work.

It was difficult to foresee all the possibilities of the new institute. Unfortunately all the money that he had to find could not be devoted to objects which were so agreeable to himself. It was an unhappy but necessary feature of the present situation that a large part of the Government's activities had to be devoted to the defence of the country. That activity was reflected in the sums which were allocated to research for defence.

This year they would be spending £3,800,000 upon this