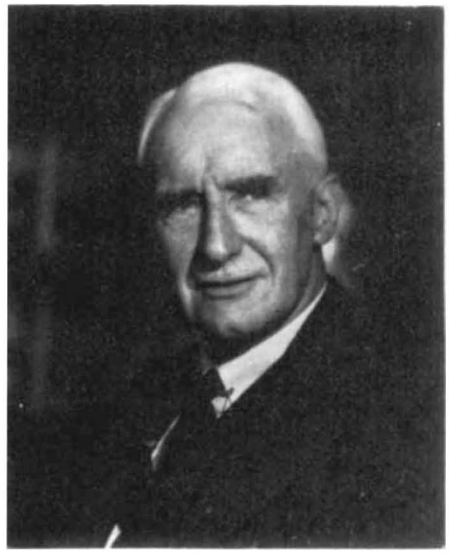
obituary

A. V. Hill



A. V. HILL died at his home in Cambridge on 3 June, in his 91st year. A.V., as he was known to his colleagues all over the world, was one of the great scientific leaders of his generation. He will be remembered not only for his pioneering work on the energy exchanges in active nerve and muscle, but for bringing physico-chemical ideas and precision measurements to bear on biological problems, and above all for his personal example and influence in inspiring and encouraging many of his younger colleagues, and in helping those who had been driven from their laboratories by political or racial persecution.

He was born at Bristol on 26 September 1886, went to Blundell's School at Tiverton, and in later years maintained a close connection with the West Country. He used to spend many summer months in Devonshire, staying with his family at 'Three Corners', his little house in Ivybridge, and working from time to time at the nearby Marine Biological Laboratory at Plymouth. In 1913, A.V. married Margaret Keynes, sister of John Maynard and Geoffrey Keynes, starting a partnership which lasted for nearly 60 years, and a pleasant family home whose hospitality is remembered by colleagues and friends from many countries.

At Blundell's School, he was profoundly influenced by J. Thornton, an outstanding mathematics teacher who also taught his pupils the need for clarity in thought and precision in the use of words. In 1905, A.V. went to Trinity College, Cambridge as a Scholar, taking mathematics and finishing as 3rd Wrangler in 1907. Under the tutelage of W. M. Fletcher (later the first Secretary of the Medical Research Council), he decided to turn to physiology and in 1909 took a first in part II of the Natural Sciences Tripos. The year after, he was made a Fellow of Trinity College.

In the Physiological Laboratory at Cambridge, A.V. found himself in the company of outstanding people, among them Joseph Barcroft, Keith Lucas, J. N. Langley, Walter Fletcher and F. Gowland Hopkins. He started by publishing theoretical papers on nerve excitation and on the kinetics of the oxygen-haemoglobin reaction. The latter is still referred to on occasions, when authors use the so-called 'Hill-coefficient' as a characteristic index in aggregate or cooperative molecular interactions. But before long, A.V. embarked on his own experimental research which he pursued, with interruptions caused by two world wars, for the next 55 years.

He followed Langley's advice to investigate 'the efficiency of the cut-out frog's muscle as a thermodynamic machine.' This became an unending story, in which he was helped by his assistants A. C. Downing and J. L. Parkinson, developing instruments of increasing sensitivity, greater time resolution and better stability, a story of continuously searching for errors in technique and interpretation, of replacing obsolete results and ideas with better experiments and fresh hypotheses; it was a process of temporary setbacks and continuously improved experimentation that gave A.V. the greatest pleasure and provided him with the kind of entertainment he enjoyed throughout his life. His early measurements of heat production in active muscle, analysing and dividing it into an initial anaerobic, and a subsequent, oxygen-requiring recovery phase, correlating them with what was known about lactic acid production and oxidative restoration processes, is now part of classical history, but at the time it was a most exciting technical and experimental advance and represented one of the outstanding contributions to our knowledge. Moreover, A.V. was quick in extending the work and applying it to the study of muscular exercise and the associated oxygen requirements in man.

Hill's preoccupation with precise and exceedingly sensitive myothermic measurements had some important 'spin-off.' It enabled him to detect the heat production during the conduction of nerve impulses, a feat which many distinguished scientists, among them the great Helmholtz, had attempted, but failed to bring off. In addition, A.V. showed that his thermopiles could be applied to practical problems, in measuring osmotic pressure of very small volumes of body fluids, and in determining arterial elasticity and pulse wave velocity. Although he once publicly admitted that he did his work 'not because it is useful, but because it's amusing', he was nevertheless accustomed to looking at living machinery with the eyes of a practical engineer. This, together with his personal interest in athletics, prompted him to study muscular movement not only in isolated frog muscles, but in man, and to work out the relations between physical dimensions of different animals and the limits to the speed and power of their muscular performance.

Hill's early work in the Cambridge laboratory came to a halt in 1914; he joined the Cambridgeshire Regiment, served as Captain and Brevet Major and later became Director of the Anti-Aircraft Experimental Section, another useful outlet for his engineering interests. He recommenced his muscle experiments in Cambridge at the end of the war, but in 1920 went to the Physiology Chair in Manchester. Three years later, he moved to University College London, first as Jodrell Professor of Physiology, then as Foulerton Professor of the Royal Society. He stayed at UCL, working in the laboratory for many years after his official retirement, until 1967 when he returned to Cambridge, leaving behind a Biophysics Department which he had founded in 1951.

A. V. Hill gave public service of many different kinds. During the uneasy years before 1939, he joined the Tizard Committee which initiated radar defence, and he also accepted the task of compiling a Central Register of Scientific and Technical Personnel in anticipation of wartime needs. He did this during a period when he was fully engaged in his laboratory, working

single-handed on new experiments which resulted in the publication of one of his most important papers, on the energy liberation and the heat produced during shortening of active muscle. At the same time, he served as Biological Secretary of the Royal Society and on numerous scientific committees, and took a leading part in helping refugee scientists.

During the 1939/45 war he was Member of Parliament for Cambridge University, and he served as Scientific Adviser to the Government of India in 1943-44. To name only some of his other extramural activities, he served the Physiological Society, on its Committee, and as an Officer and Editor of its Journal, for 25 years, was Foreign Secretary of the Royal Society, Secretary General of the International Council of Scientific Unions, President of the British Association in 1952 when he gave his memorable address on 'The Ethical Dilemma of Science', and Chairman of the Society for the Protection of Science and Learning. A.V. gave a powerful stimulus to the study of marine biology in this country. He was President of the Marine Biological Association, and he constantly encouraged his younger colleagues to work at Plymouth and take advantage, not only of its delightful surroundings, but of the unique opportunities for experiments provided by the marine fauna. This initiative, together with his fascinating Liversidge Lecture on 'Chemical Wave Transmission in Nerve' helped to attract a number of distinguished biologists to the Plymouth Laboratory which later on led to very striking developments in the neurophysiological field.

A.V. was honoured by academic institutions all over the world; he was made a Companion of Honour in 1946 and received high honours from the Governments of France and the United States. At the age of 31 he was elected to the Royal Society who later awarded him the Royal and Copley Medals, and he received the 1922 Nobel Prize for Physiology together with Otto Meyerhof.

He is remembered and held in affection by all his pupils, not only as a great scientist who imparted to them the joy and spirit of adventure in doing experiments, but as a man who gave an example of uncompromisingly straight dealing, in the laboratory as well as outside. The pursuit of truth was to him not simply a scientific exercise, confined to one's work in the laboratory and presentation of results; it also governed his attitude in all his actions and in his relations to other persons. He was unrelentingly critical and never ceased to probe for flaws in his own deductions or experimental approach. 'To be uncritical', he said, 'particularly of oneself and one's ideas and motives, is the first long step towards dishonesty.' Yet, he never permitted his intellectual austerity to damp his enthusiasm, and I do not believe he ever allowed the slightest doubt to arise in his mind about the importance of the work he was engaged in. This buoyancy transmitted itself to those who were associated with him and helped to carry them over periods of failure and possible frustration. A.V. liked to get a good laugh out of situations which others might have regarded as perhaps slightly embarrassing; he detected and managed to focus on the humorous side of people's failings including his own. He retained, until nearly the end, a delightful, boyish sense of humour which greatly appealed to most of his friends, though at times it may have puzzled the more serious-minded ones among them.

I shall always remember a particular occasion in 1934. I was then a medical student in Leipzig, about to take my finals and anxiously making plans to escape from a hostile environment. I came across a correspondence in *Nature* between A. V. Hill and Johannes Stark, a famous physicist who had become the scientific 'Gauleiter' in Nazi Germany. After the 1914–18 war, A.V. had insisted (against some initial resistance) that colleagues from Germany should be invited straight away to attended International Congresses and be made to feel welcome in the scientific community. But in 1933 he was also the first to speak out vigorously against the Hitler regime and the dismissal and persecution of Jewish scientists. He was promptly taken to task by Professor Stark who stated in two letters to *Nature* that there was no factual basis for A.V.'s critical remarks, that the Nazi Government was obliged in self-protection to restrict the influence of certain persons and was simply engaged in lawful activities like any other respectable Government. The correspondence ended with a short note from A.V. in which he said that monetary contributions had been received in response to his appeal for assistance to colleagues who had been driven out of Germany. He added that he was not quite certain whether the donations were the result of his own eloquence, or rather of the explanations given by Professor Stark to whom, he felt some thanks were due. The *Nature* correspondence gave me my first impression, from a distance, of A.V.'s personality, and I found it so attractive that I made every effort to go and work with him as soon as I could.

There will be hundreds of scientists from different continents who recall with gratitude the welcome and hospitality they received, not only in the laboratory in Gower Street, but from A.V. and Margaret at their home in Highgate and at 'Three Corners' in Devonshire. Last year, on his 90th birthday, well over a hundred of his friends sent him a large volume containing greetings and reminiscences, and A.V. very much enjoyed browsing through them during the remaining months of his life. There can be few scientists and teachers who have won as much affection as A.V., and I believe that his personal influence among his scientific descendants in all parts of the world is a contribution to international scientific relations, not on a large scale, but of a kind perhaps more valuable than anything that official organisations could provide.

B. Katz

Roman Kozlowski

PROFESSOR ROMAN KOZLOWSKI, who died on 2 May, 1977, at the age of 88, was perhaps the most internationally honoured doyen of invertebrate palaeozoology. He was responsible for establishing a school of palaeontological study at Warsaw of exceptional breadth and excellence. His major contributions were on the Brachiopoda and Graptolithina, but he made some contributions on most other invertebrate fossil groups.

He was born on 2 February, 1889, at Wloclawek, north-west of Warsaw, Poland, and in 1907 he attended the University of Freiburg, and continued his geological and biological studies at the Sorbonne where he graduated in 1910. Between 1913 and 1921 Kozlowski was Professor of Geology and Mineralogy and later Director of the School of Mines at Oruro, Bolivia. It was during this period that his early work on the Carboniferous Brachiopoda and Devonian faunas of Bolivia was mostly done. The latter field he developed for a doctoral thesis under Professor Marcellin Boule (whom he affectionately spoke of as 'mon Maitre') which he received in 1923: the monograph, published in the *Annales de Paléontologie*, set a new standard for palaeontological illustration by collotype.

In 1924 he returned to Poland to teach at the University of Warsaw, becoming a full Professor of Geology and Palaeontology in 1934 and Chairman of the Palaeontology Department. Then really began the progressive growth to excellence of his department. His first major subsequent work followed visits in 1925 and 1926 to the Dneiper River