



D. W. W. HENDERSON, C.B., D.Sc., F.R.S.

*(Facing p. 145)*

## Obituary Notice

D. W. W. HENDERSON, 1903-1968

*President of the Society for General Microbiology 1963-64*

David Willis Wilson Henderson, the only child of John Henderson, a chartered accountant, was born in Glasgow on 23 July 1903. He attended Hamilton Academy but was a rather rebellious student, working well at science and subjects which interested him but giving scant attention to Latin, which he disliked. At his own insistence he was articled to a farmer as a prelude to a career in agriculture, but the experiment was not a success. The streak of impatience with arbitrarily imposed authority which became a notable feature of Henderson's character in later life asserted itself at this juncture with the result that the young David, with somewhat sceptical parental agreement, left the farm to read for a degree at Glasgow University. He chose agricultural bacteriology as his major subject and enrolled under Professor J. F. Malcolm at the West of Scotland Agricultural College, where he graduated in 1926.

Henderson's first post was as lecturer in bacteriology at King's College, University of Durham, where in 1930 he received a M.Sc. degree and married Beatrice Mary Davenport, daughter of Sir Westcott Abell, K.B.E. Henderson entered the Lister Institute of Preventive Medicine, London, in 1931 with a Carnegie Research Fellowship; at the end of its second year he obtained a Beit Memorial Research Fellowship for the years 1932-35. In 1934 he was awarded a Ph.D. degree in the University of London for a thesis entitled 'Studies on the spore-bearing anaerobes with experiments on active and passive immunity'.

Henderson remained at the Lister Institute and at the approach of war in 1939 he was at the Institute's Serum Department at Elstree, dealing mainly with the immunology of *Salmonella* and *Clostridium* species. Soon after the outbreak of war he showed that mice could be killed by clostridial toxins administered in aerosols. His Director, Sir John Ledingham, F.R.S., considered this result of sufficient importance for official action and in the early summer of 1940 Henderson found his time divided between Elstree and the Chemical Defence Experimental Establishment, Porton, Wiltshire, which already had experience in handling toxic aerosols. In October 1940, as a result of instruction from the War Council, he joined a group of microbiologists which was being established at Porton to assess the feasibility of the use of biological agents against man and to devise methods of protection against such attacks. Henderson was a prominent member of this group, though he remained a member of the staff of the Lister Institute until 1946. In 1943 a small party crossed the Atlantic and when it returned Henderson remained behind to assist Americans with their efforts on biological defence. Thereafter, till the end of the war, he shuttled across the Atlantic, making experiments wherever better facilities were to be found. Henderson was the mainstay of the British-American liaison; he became a valuable and fruitful collaborator of a number of American microbiologists and made among them many lasting friendships.

By the end of hostilities, Henderson was convinced that attack on man by biological agents was possible and that the provision of protection against it was rudimentary. However, the magnitude of the threat was not established and *ad hoc* experiments done during a 'war for survival', though justified at that time, were not likely to give a realistic evaluation. A long-term programme was needed to investigate the physical, chemical and biological factors which determined the survival of micro-organisms in aerosols, and the genetic and environmental factors which determined microbial virulence and antigenicity. Who was to lead this effort? The war-time group was dispersing and Henderson was determined to participate only on his own terms, namely in basic studies in microbiology based on the programme sketched above, coupled with the provision of tailor-made laboratories and the highest priority to recruit the requisite staff to man it. After much discussion, ultimately at Chief-of-Staff and Cabinet level, the Minister of Supply was instructed to implement a programme much on the lines that had been suggested, with the priority necessary to get the project moving. In January 1946 Henderson was offered the post of 'Chief Superintendent of the Biological Research Establishment' and characteristically accepted as 'Director, Microbiological Research Department'. A powerful advisory board was enlisted under the chairmanship of Lord Hankey, Minister without Portfolio in the War Cabinet; thus was Henderson's course set for nearly 20 years.

The new Department continued to occupy part of the animal house of the Physiology Section of the Chemical Defence Experimental Establishment supplemented by pre-fabricated huts built during the war. Additional laboratories of standardized unit construction were added to house the staff that Henderson was busy recruiting. This was not an easy business, partly due to the opprobrium associated with the work and an active lobby against it and partly because of Henderson's belief that top-quality research work could arise only from dedication. His demands and standards for recruits were very high. He tended to recruit individuals, rather than to man a programme, and to rely on his powers of persuasion and infectious enthusiasm to weld the sometimes ill-assorted bunch into co-operative effort.

Meanwhile, plans for the new laboratories went ahead. Henderson based his concept on the laboratory of the National Institute for Medical Research at Mill Hill, planned before the war but still under construction. He wished to cover the same wide spread of scientific disciplines from the physical sciences to the biological sciences and to make special provision for the growth and handling of pathogenic micro-organisms on a considerable scale. He often set specifications so stringent as to be unrealistic. These he would only relax when convinced that they were unattainable. Building started in June 1948 and Henderson drove it forward every inch of the way, unleashing thunderbolts on officials of the Ministry of Works or on their contractors every few weeks. In consequence the building was completed in 3 years against the estimate of 2 years 9 months which Henderson had forced on a sceptical Ministry of Works. He took possession of a laboratory, unique of its kind in the United Kingdom, which served for many years as a model for microbiological buildings in many parts of the world.

Now followed the harvest; by 1959 Henderson and his staff had established an international reputation in microbiology. Henderson's cardinal role was recognized by the award of a C.B. in 1957 and scientifically by his election to the Royal Society in 1959.

In October 1959 the Ministry of Supply was dissolved and Henderson fought to have his department transferred to civilian control, but in vain; it passed to the War Office. This change in direction and the increasing complexities of administration depressed Henderson, but he continued to foster active research throughout the Establishment. The strain, however, was beginning to tell. Hypertension, established in the early 1950s, was becoming troublesome and Henderson, who had always been a heavy smoker, was increasingly subject to attacks of respiratory infection. By the time he reached the age of 60 these attacks were beginning to make the winters miserable for him unless he could escape into sunshine for a couple of months after Christmas. Within a year he, who had never been able to understand why people retire early, was seeking a successor. No one was more pleased than he when Dr C. E. G. Smith succeeded him in August 1964. By the end of 1964 he had completed the hand-over, and avoiding involvements in matters of policy or management with an almost pedantic correctness, he went back to the laboratory. He was delighted to be back at the bench, but several minor thromboses from which he recovered almost completely left his walking slightly impaired. Another attack in July 1967 brought his active work to an end. He was in and out of hospital several times during the following year but his condition slowly deteriorated and he died quietly in his sleep on 16 August 1968.

Henderson's contributions to the advance of microbiology were threefold: personal research, creative work, and guidance of the Microbiological Research Department, and interest in the affairs of the Society for General Microbiology. By far the greatest contribution was the second; the influence of Henderson's department on contemporary microbiology has been considerable.

Henderson's published research work was not large; directing his department left little time for personal research. His work was characterized by ingenuity and thoroughness. Before the war at the Lister Institute he came under the influence of Dr Muriel Robertson, and studied the immunology of the obligate anaerobes, particularly *Clostridium chauvoei*, *C. oedematiens* and *C. welchii*, and he co-operated with Professor W. T. J. Morgan in investigating the antigens of *Salmonella typhi*. Because of this early work, Henderson always called himself an immunologist, but as a result of his experience at Porton during and after the war he was more an experimental pathologist with special expertise in the techniques for studying respiratory infection and the subsequent spread of infection in the host. During the war he evolved an apparatus, known familiarly as 'the piccolo', for exposing animals to aerosols of pathogenic bacteria such as *Bacillus anthracis* and *Pasteurella pestis*, at known concentrations. The details of this apparatus were published in 1952 (*Journal of Hygiene* (1952), 50, 52); since then modifications of the 'piccolo' have been used throughout the world for controlled respiratory infections. With this apparatus and a more sophisticated sequel, 'the organ', Henderson and his colleagues studied the effect of particle size on respiratory infection with *B. anthracis*, *P. pestis* and *Brucella suis*; the importance of small particles in establishing infection deep in the lung was recognized. Next Henderson turned his attention to mixed infections by the respiratory route. He showed the profound effect that one infection could have on the course of another; for example, guinea pigs could be protected from anthrax and plague by first having brucellosis. Henderson summarized his work on mixed infections in the 14th Symposium of the Society for General Microbiology (1964). Towards the end of his life Henderson became interested

in the pathogenesis of virus infections, despite a healthy scepticism of some methods of their assessment epitomized in his oft repeated remark 'virologists can't count'. His last paper (*British Journal of Experimental Pathology* (1967), 68, 228) showed the route with which a respiratory infection with Semliki Forest virus reaches the brains of hamsters with astonishing rapidity.

In guiding the research of the Microbiological Research Department, Henderson had three main themes. First, in studies of infectious disease emphasis should be on initiation and pathogenesis of infection and not, as in most medical research, on therapy. Secondly, all disciplines—biochemistry, pathology, genetics and immunology—should be concentrated on relatively few micro-organisms. *Bacillus anthracis*, *Pasteurella pestis*, *Brucella* spp. and pox viruses received concentrated treatment. Thirdly, there should be better methods for producing large quantities of microbes than by batch culture in large tanks. These themes, coupled with Henderson's flair for allowing the maximum freedom for individual scientists to pursue their ideas, led to first-rate work, much of it of international repute. The department was especially noted for work on microbial infection by the respiratory route, factors involved in microbial survival, virulence and antigenicity, methods for handling dangerous micro-organisms safely, and continuous culture techniques. One has only to consult the journals, the proceedings and symposia of the Society over the years of Henderson's stewardship at Porton to realize the tremendous influence he had on microbiology through the work of his department.

Henderson was an original member of the Society for General Microbiology. He was a member of the Committee which guided the affairs of the Society in its formative years, 1947–51. When elected to President in 1963 Henderson was already in failing health. Nevertheless, he was rarely absent from a Council meeting or a General meeting of the Society during his term of office. Much work was done under his chairmanship, and the Officers of the Society and Council members remember the charm and good humour with which he conducted their affairs. His flair for persuading individualists to work together was abundantly apparent.

At the personal level few could remain indifferent to Henderson. He had a keen analytical brain but his judgements were often intuitive and only subsequently sanctioned by reason. He was always forthright, sometimes rude, occasionally downright offensive. He was often a thorn in the flesh of his superiors but his technical assessments were well considered in 'high places'. And he had much personal charm and humour. One suspected that his broad Glasgow accent which got more pronounced when he became excited was sometimes 'tuned up' to enhance the effect. He evoked friendship, respect, admiration and, in some cases, devotion from his staff for whom he fought valiantly across the board. Only rarely did his partisanship outrun his discretion. Several research workers, now with international reputations, have good cause to thank him for the hours he spent in clarifying their papers for publication. As the status of the Establishment as a centre of excellence grew, a number of overseas visitors asked for the use of its specialized facilities and Henderson would go to much trouble to ensure not only that the attachment was agreed but that everything was prepared for the visitor to start work immediately he arrived.

His first wife died in 1952 and in 1953 he married Emily Helen, daughter of the late D. Theodore Kelly of New York, who was herself trained as a bacteriologist. They made their home in Great Durnford on the banks of the Avon between Amesbury

and Salisbury. Their XVth century cottage had a large garden in which Henderson expended much time and labour and from which he derived much satisfaction. And on the rare occasions when he had leisure and the weather was right he would fish in the small stream which formed the western boundary of his property. His second wife survives him.

L. H. K.

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