

## WILLIAM BROWN: PIONEER LEADER IN PLANT PATHOLOGY

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William Brown was born on 17 February 1888 in the small Scottish village of Middlebie, some seven miles north of Annan in the county of Dumfriesshire. He retained his southwestern Scottish accent until he died on 18 January 1975; the strong physical constitution that enabled him to accomplish so much also endowed him with long life. He was not obviously destined by birth for the fame that he eventually achieved. He was the second child in the family. His father, Gavin, owned a small farm and supplemented his income by acting as an agricultural engineer, especially for the repair of farm mills and suchlike. His mother, Margaret Broatch, came from a background similar to that of her husband, although a somewhat more prosperous one. So Brown's parents were unable to give him a sheltered start in his career, but what they did endow him with was infinitely more valuable: good health and a mind that he was eventually to develop to its utmost limit. He had the traditional Scottish virtue of thrift, in its wider sense of economy of effort and material, and a habit of sustained hard work, for both of which his parents had set him an example. His eldest daughter, Lucy, remarked to me that her father's movements were unusually well coordinated, so that he easily acquired the rhythm that saves energy in farm work. He was accustomed to hard work in his own large garden and continued this until well into his eighties, regularly trying out new species and cultivars. His zest for growing plants, augmented by a wide knowledge of the British flora, dominated his spare time and took over the golf, tennis, and billiards that he had played before he had a garden. Similarly, he was deft and quick in laboratory work; his senior technician, Taylor, once said to me: "Many's the time I've seen the Prof take off his coat and wash up a hundred Petri dishes in twenty minutes."



William Brown

## EDUCATION AND THE MOVE TO LONDON

Brown did well enough at local schools to be awarded a bursary for the University of Edinburgh, where he was admitted in 1904, at the age of sixteen. His main subjects were mathematics and physics, with some chemistry and a little geology and botany. He graduated MA in 1908, with first-class honors in

mathematics, and then spent two more years working for the BSc degree, taking petrology, zoology, and botany, including plant physiology. Brown had a brilliant academic record over these six years, being awarded fourteen medals. His precocious intellectual development was characteristic of a mathematician or physicist, and it was by this path that he came to the study of plant and fungal physiology and their combination, physiological plant pathology. In 1910 Brown was appointed by Isaac Bayley-Balfour to a two-year lectureship in plant physiology in the Edinburgh botany department.

In the spring of 1912, Brown went with a two-year scholarship from Edinburgh to the botany department of the Imperial College of Science and Technology in the University of London, where he was a graduate student under V. H. Blackman. One way or another, Brown stayed on in the botany department until in 1923 he was given an established post on the teaching staff. In 1928, he was made Professor of Plant Pathology at the University of London, the first such appointment in Britain. Brown remained at the Imperial College for the rest of his career, was made head of the botany department in 1938, and retired in 1953.

In 1921, Brown married Lucy Doris Allen, who came from a London family and was a graduate in botany of Bedford College. Four children were born of the marriage, but the eldest, Lucy, was the only one to follow her father as a teacher at the University of London.

## PERSONAL RESEARCH

William Brown's experimental work on the mechanism of fungal infection in plants and on the physiology of fungal growth in culture was published during the years between 1915 and 1928 in a series of eighteen papers; all but three were his sole authorship. Most of the work on infection was carried out with *Botrytis cinerea* Fr. on lettuce and broad bean (*Vicia faba* L.). Brown was concerned first with the role of fungal pectinases in the disintegration of host tissue. Second, he showed that nutrients diffusing through the cuticle of flower petals and young leaves increased the infectivity of fungal sporelings. He also anticipated the recent interest in diffusates from pollen grains as an adjuvant to fungal infection of leaves. In the final paper in this series, Brown & Harvey (1) demonstrated that cuticle penetration by *B. cinerea* is effected by growth pressure of the extending but eventually rigid penetration hypha; fungal deformation of the cuticle is opposed both by the tensile strength of the cuticle and by the turgor of the underlying epidermal cells.

Brown is also well known for his studies on the variation of growth in culture among species and strains of *Fusarium*, which revealed serious flaws in the contemporary classification of this genus and led eventually to new taxonomic dispositions. Most of Brown's classical work in mycology and plant pathology

has been so well incorporated into the foundations of our subject that it is easy to forget how much he contributed. In my biographical memoir of him for the Royal Society, I have included a detailed appreciation of his research papers (4). But there is one paper (2) that has so influenced subsequent thinking and is so topical that I must mention it here. This is a study of gas storage and cold storage for the control of fungal rots of apple fruits. A combination of the two was found to give much better control than either method alone. In these experiments on the fungistatic effects of carbon dioxide and low temperature respectively, Brown included a wide series of comparisons between fungal spores sown in water and others sown in nutrient solution (to simulate leakage of nutrients from damaged fruit). Control of spore germination and mycelial growth is always better when the spores are sown in water alone. Brown epitomized his findings in the generalization that the effect of fungistatic factors is greatest when the fungal energy of growth is least. This is one of the most fundamental and far-reaching generalizations that Brown ever made. Recently, this concept has provided the simplest explanation for repeated observations that general soil fungistasis, which keeps fungal spores dormant in soil, can be overridden both by a glucose solution and by the nutrients present in root exudates.

## UNIVERSITY TEACHER

I was one of William Brown's graduate students in 1934 and 1935 after four years as assistant plant pathologist at the Waite Agricultural Research Institute of the University of Adelaide. During my time in South Australia, I had discovered Brown's series of papers, which I read with steadily increasing admiration and profit. Realizing that I still had much to learn about the art of experimentation, I read the papers again, to see how it was done. So before I actually met Brown, I had already learned more from him than from anyone else. At our first meeting in Brown's room at the college, I was still young enough to be surprised by his small physical stature, because I had expected a presence imposing enough to match my conception of him. But this fleeting impression was soon dispelled by the warmth and force of his personality, and his final words were just right for me: "I don't go snooping round the incubators, Garrett, but if you want me you'll know where to find me." Brown was as good as his word and every month or two I had a long talk with him. Several times this took up most of the day and I had lunch with him in the staff canteen. Conventional in dress and behavior, he was just the reverse when faced by an unconventional proposal, and he readily accepted my suggestion that I should write up my work for a paper in the *Annals of Applied Biology* and then use a copy for my PhD thesis. But my flexibility did not then match his, and I was startled by his suggestion that I include three tables of data in the

discussion section of this paper, although I soon saw the force of his argument.

Brown was equally flexible and considerate in his treatment of more personal problems. In December 1934 I got married on a dwindling capital reserve and no immediate prospects, which worried my family. So I waited with some anxiety to tell Brown. He received this news calmly; looking at me with a twinkle in his eye, he said, "Well, Garrett, you must bring your wife to dinner with us; I will ask my wife for a convenient evening," which they soon arranged. Three months later, I was awarded a two-year research fellowship, which Brown and V. H. Blackman helped me to get. Few graduate students escape anxieties of one kind or another at a time so critical for their future; those who do may not have much of a future in research. Nevertheless, my contemporaries, coming from Canada, Ceylon (now Sri Lanka), and New Zealand as well as from English universities, formed a happy and cheerful group. Working together in the same large laboratory, we learned much from one another, as well as from our professor.

While at the college I took the opportunity of attending Brown's lectures to undergraduates. His lecturing style was plain and unadorned by any tricks of rhetoric, which would have been quite foreign to his nature, but was enlivened by flashes of a rather dry humor. His breadth of culture must be rare nowadays, because he had a good education in the classics as well as in science and for much of his life continued to read Greek and Latin texts in their original languages. Wit and wide erudition are combined in his most entertaining lecture on spontaneous generation to the Royal College of Science club at the Imperial College (3); this lecture would astonish those who have read only Brown's papers in the *Annals of Botany*. I will now conclude my personal reminiscences of William Brown with a story about his encounter with a fellow traveler when he was going by train to the college field station at Slough, dressed in what he called his gardening clothes. He was reading the *Origin of Species* and gradually became aware that a Church of England parson, seated opposite him, was puzzled by the book he was holding. At length this parson could contain his curiosity no longer; he leaned forward, tapped Brown on the knee, and said, "Tell me, my man, do you think that you understand what you are reading?" He said later that he was so taken aback that he was at a loss for a witty reply and could only mumble, "Yes, I think I do."

Economy of words was characteristic of William Brown. I hope that this tribute to him does justice to his example.

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