

## **DANIEL McALPINE** *A Pioneer Plant Pathologist of Australia*

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In the quiet countryside of Cohuna, Victoria, Australia, is a simple headstone with the inscription - "Sacred to the memory of Daniel McAlpine - died 12th October, 1932, aged 83 years". "Never idle" would have been appropriate to have included in the epitaph as this was characteristic of the man during his lifetime of search for biological truth. In fact, it was the motto of the Caesarean Leopold - Caroline Academy of Natural Phenomena, founded in Halle, Germany, in 1677 to which he had the honour of being elected as a member in 1894. Not only did the Caesarean Academy have "Never idle" as its motto, but it expected energetic work from its brotherhood of learned men.

Daniel McAlpine certainly lives up to its motto and gave his adopted country 26 years of very active work in plant pathology from its beginnings in Australia in 1890 by exploring, investigating and developing a body of precise knowledge of the plant disease situation here and by extending this knowledge of plant pathology to primary producers and others in very well produced and illustrated, authoritative publications and by field demonstrations of plant disease control.

He was born at Saltcoats, Ayrshire, Scotland, on 21st January, 1849, was the third son of Daniel and Flora McAlpine and received his early education at the Ardeer School where his father, a gaelic scholar of some note, was a Master. Later he became a teacher at the same school, after which he gained some industrial experience where he was highly regarded for his character, ability and application. He matriculated at the London University in 1873 and, like Marshall Ward, studied in the Science and Arts Department at the Royal School of Mines, South Kensington, where he undertook in 1873, 1874 and 1875 courses including biology under Professor Thomas Huxley, botany under Sir William Thistleton Dyer, geology under Professors Sir Archibald Geike, J. Geike and paleontology under Professor R. Etheridge. The latter expressed the opinion that no student worked with greater ardour or with more success than Daniel McAlpine.

Huxley's thoroughness and attention to detail left a lasting impression on Daniel McAlpine and was very frequently quoted by him to his students. He was appointed Professor of Natural History at the new Veterinary College, Edinburgh and Lecturer in Biology and Botany at the Watt Heriot College, Edinburgh, in 1877 and also lectured at the Pharmaceutical Department at the School of Medicine in Nicolson Square, Edinburgh.

In recognition of his scientific work in Scotland he was offered the honorary degree of Doctorate of Laws at the Tercentenary of the Edinburgh University in 1882. Because he and his wife had decided to leave Scotland and bring their family to Australia, this honour was refused as they both thought that a doctorate degree would be unnecessary in a democratic country like Australia. They both later regretted this decision.

Daniel McAlpine, armed with excellent letters of introduction, arrived in Melbourne in 1884 where he hurriedly boarded a horse-drawn bus to Ormond College within the University of Melbourne. He received an appointment as Lecturer in Biology at Ormond College in 1885. In 1886 he was appointed as a visiting lecturer in botany in the Pharmacy College, Melbourne, and held that part-time appointment until he resigned from it in 1911 over which period of 25 years he never missed a lecture and was never a minute late. Commenting on his appointment as Vegetable Pathologist McAlpine (8) said - "I was appointed on 12th May, 1890, to attend to

any disease that might form the subject of inquiry". There is little doubt that his appointment as Vegetable Pathologist was a result of the 1889 rust epiphytotic. The losses in wheat from rust in that year were estimated to be £2,000,000 to £3,000,000 for the whole of Australia. Prior to his appointment to the Department of Agriculture, Victoria, he was a member of the Committee appointed by the Australasian Association for the Advancement of Science at its meeting in Melbourne in 1890 to investigate the question of rust in wheat. The Victorian section of the A.A.S. Committee - Daniel McAlpine, Professor W. Brown and A.N. Pearson drew up a preliminary program of experimental work to be done. This, with a few modifications and additions, was adopted by the Inter-colonial Rust in Wheat Conference as a basis for action. It was agreed that the work would be carried out and financed by the Department of Agriculture. Although not present at the first Rust in Wheat Conference held in Melbourne on the 10th and 11th of March, 1890, (his appointment to the Department of Agriculture, Victoria having taken place after that date in that year) he had, as seen, a hand and influence in the formulation of the experimentation adopted by the Conference and attended subsequent Rust in Wheat Conferences held in Sydney in 1891, Adelaide in 1892, Brisbane in 1894 and was chairman of the final conference held in Melbourne in 1896. He said that in the various reports of the Rust in Wheat Conferences special attention was paid to the effect of different cultural methods on the control of wheat rust such as drainage, irrigation, conditions of seed beds, ploughing, harrowing, rotation, burning stubble, manure treatment, seed treatment and selection and cross-breeding. McAlpine (9) stated "that for the burning rust question the only measures I can suggest are to produce wheat suited to our Australian conditions by crossing as Mr. Farrer, wheat experimentalist in New South Wales, is now so successfully doing".

McAlpine co-operated very closely with Farrer by testing at various centres in Victoria the rust resistance of his wheats. They had a high regard for each other as indicated in the Farrer letters. According to Large (7) "the greatest single undertaking in the history of applied plant pathology was the attack on rust of cereals. The mighty investigation soon to be world wide began in Australia with a series of Rust in Wheat Conferences following the epidemic of 1889".

At several of the Rust in Wheat Conferences investigations were invariably recommended to be made (9) "regarding all plants that are affected by rust in the different colonies because it was felt that such a wide outlook was necessary for understanding properly the history of a single species". Because of the destructive nature of rust McAlpine decided to tackle this problem which aimed at recording all rusts so far known in Australia in order to prepare the way for a consideration of the best methods of preventing their spread in numerous commercial crops subject to their ravages. After some years of intensive work he published in 1906 a monograph on the rusts of Australia, their structure, nature and classification. All species known at that time were included.

In 1892 when Cooke published his Handbook of Australian Fungi 72 rusts were recorded, When McAlpine published his monograph the number had reached 161, of which 75 new species were described by him. In reviewing this monograph in the Journal of Mycology in 1907 Professor J.C. Arthur (1), a leading rust authority in the United States of America, stated - "Preceding the systematic part, the first 20 pages are devoted to a discussion of the general subject of rusts in its various aspects and from the most modern point of view it is by much the best account now available in the English language. The thoroughness with which the author has accomplished his task has ensured a valuable work of reference for local and other botanists."

No one was more conscious than McAlpine (9) of how much yet remained to be done before the rusts of Australia were thoroughly understood but felt that his work "might lighten the labours of those who followed and that by the combined efforts of various future workers the true nature and life history may be so revealed that the ravages due to rust may be reduced to a minimum".

How right he was in this forecast of the future developments as at that time he was quite unaware, because of lack of fundamental knowledge, of the extreme variability in the stem rust of wheat pathogen, which was to upset the breeding programs in many countries and the further developments which ultimately led to success with new releases of wheats that combined several genes for rust resistance.

As McAlpine considered that smuts were second in importance from the amount of loss caused by them, chiefly in cereals and grasses, the smut fungi and smut diseases, together with their prevention, claimed his next attention. In April 1910 he produced a monograph on Smuts of Australia, their structure, life history, treatment and classification.

The object of this work as described by McAlpine (10) was to classify and describe all known species of Australian smuts for their identity and give an account of their life history as far as present knowledge goes in order that a rational mode of treatment may be adopted for preventing their ravages in our cultivated crops".

In this monograph McAlpine covered and recorded 68 species of smuts for Australia and described 26 new species and brought together existing overseas information of importance on their nature and control as well as reporting local experimental information of practical value particularly on the control of Stinking Smut of wheat. McAlpine made an important contribution to our agriculture early this century when he introduced wet bluestone and formalin dips in place of hot water treatment for the control of Stinking Smut of wheat and he states (8) "that this disease no longer troubles the careful farmer since he knows that by properly steeping his seed, his crop is clean and quite recently the treatment of maize seed has been found effective in preventing smut".

Root Rots of wheat were first mentioned as occurring in South Australia in 1868. McAlpine in 1902 recognized *Ophiobolus graminis* as a cause of take-all and dead heads of wheat. This discovery opened up the field which resulted in much work on this problem in Australia and overseas during the following 70 years.

McAlpine studied diseases of a wide range of crop plants and, apart from his critical monographs of Rusts of Australia and Smuts of Australia, produced volumes of Diseases of Citrus in 1889, Diseases of Stone Fruits in 1902, Diseases of Potatoes in 1911, as well as diseases of vines, vegetables and apples and pears. Apart from the above there were about 137 publications on plant diseases by McAlpine. He (8) further stated "that over the past 20 years from 1890 diseases of various descriptions have been sent to me from all parts of Australia and experiments have been carried out with various modes of treatment". He further states that the results will be given in another book which will appeal to the man on the land under the title of Australian Plant Diseases. This did not happen because about that time he was asked by the combined States and the Commonwealth to investigate the nature and control of Bitter Pit. This investigation, which was commenced in 1911, was reluctantly undertaken. McAlpine published five reports between 1912 and 1916 and in a review of the work in Phytopathology in 1921 McAlpine (9) states "that careful and continuous investigation has shown that insects, fungi and bacteria must be excluded as a cause of Bitter Pit and that in seeking the cause we are therefore thrown back on the structure and working of the tree and more particularly on the fruit where the disease manifests itself. In addition light pruning was shown to reduce the amount of disease considerably and in irrigated areas a light watering throughout the season instead of a heavy watering towards the end of the period had beneficial effects and that it was recognized at an early period of the research that there were three main lines of investigation worthy of being followed as a means of minimizing the pit - (a) experiments with different stocks, (b) crossing liable and non-labile varieties, (c) breeding of a bitter pit proof variety."

It has been stated by Waterhouse (6) "that his (McAlpine's) results were not very satisfactory". In commenting on McAlpine's review article in Phytopathology (9) Hanger (6) states "McAlpine obviously was aware that much work was necessary if we were to understand more clearly the

mechanics leading to bitter pit. The realization that the plant's water relations, pruning methods and varietal differences all played a part in the bitter pit story certainly put research workers in the right direction. The work of McAlpine makes no mention of nutrition". Research shows that it was not until 1936 before the first evidence of calcium deficiency was implicated by De Long (4), 1956 before Garman and Mathis (5) obtained evidence to link calcium content and susceptibility to Baldwin spot and 1961 before Yamazaki and Mori (14) showed that bitter pit occurred in Jonathon apples with a restricted calcium supply. Even now, some 60 years from McAlpine's bitter pit work this problem is only partly controlled by spraying with soluble calcium salts.

McAlpine would have been extremely lucky to have found by chance calcium deficiency as the cause of bitter pit.

The bitter pit investigation by McAlpine was discontinued beyond 1916 for lack of further funds. That day he came home a very disappointed man and his daughter told me that he was emotionally upset and said "they don't want me any more".

Carne (12) refers to Daniel McAlpine as the father of plant pathology in Australia and to all intents and purposes unofficially the plant pathologist of Australia. Waterhouse (13) supports his statement - "Daniel McAlpine has been well named father of plant pathology in Australia, we should never forget the great debt we owe."

At a meeting of the Pan Pacific Congress held at the University of Melbourne in August 1923, at which I was present, the following resolution was proposed by Dr. P.H. Easterfield, Director of the Cawthorn Institute, N.Z., was seconded by Dr. E.J. Butler of London and unanimously carried - "This meeting places on record its feelings of regret that D. McAlpine was unable to be present at this meeting of the Pan Pacific Congress. It expresses its deep appreciation of the value of his contribution in plant pathology and trusts that he may long be spared to take an interest in the extension of the science which owes so much to his pioneer investigations." This was conveyed to D. McAlpine in a letter signed A.E.V. Richardson (12) as Secretary of the Agricultural Section.

The plant pathologists of Australia in 1934 presented Dr. E.J. Butler, the Director, and the staff of the Imperial Mycological Bureau, in appreciation of the work of the Bureau, a portrait of D. McAlpine signed by most of us at the time. Dr. E.J. Butler (2) in reply stated - "it is very fitting that there should be some representation of this pioneer worker in an Imperial Institution devoted to this field in which he laboured and I do not think we could have had a more excellent one than this".

D. McAlpine was, in my opinion, a scientist who certainly used a telescope as well as a microscope. Sir John MacFarland, Chancellor of the University of Melbourne, wrote to D. McAlpine in 1924 - "that his work in Ormond College helped to forward the movement to establish a Biology Faculty in the University of Melbourne".

Before 1910 McAlpine (8) wrote - "I look forward to the time when a central laboratory will be established by the Commonwealth for the study of plant diseases where the most complete equipment will be provided, where the best men available will be engaged in the physiology and pathology of plant life."

He also stressed the need for the study of plant pathology in the Agricultural Faculties of the Australian Universities for the purpose of providing plant pathologists of the future.

This all came to pass.

It is impossible for me to assess all the influences of Daniel McAlpine, who has been described as a man possessing charm of manner, Scottish wit and dignity.

He did the difficult pioneering job which was required to be done at the time and 'gave it all he had', thus pushing down deeply the roots of plant pathology in his adopted country and preparing the way for Australian plant pathologists of the future.

## ACKNOWLEDGEMENT

The writer thanks the daughter of Daniel McAlpine, Mrs. Erica Wedge, who graciously supplied information about her father and earlier enabled me to peruse his personal papers which are now housed in the La Trobe Library, Melbourne, and the correspondence with Farrer in the Mitchell Library, Sydney.

Also, my thanks to her for presenting to the Victorian Plant Research Institute, Burnley, some years ago, the original letter of appointment of her father to the Department, as well as his Membership Certificate of the Caesarean Academy.

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