

## **A discussion of past events and influences in the development of Australian plant pathology**

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Plant pathology, long recognised as a discipline in its own right, is an amalgam of plant orientated sections of mycology, bacteriology, virology, nematology, genetics, physiology, nutrition and ecology and other disciplines could be added – and yet we have been regarded as specialists!

In its early days in the USA, because of its dependence on chemical control of pathogens, adherents were given the derogatory label of 'squirtgun botanists'. In April 1940, when I was appointed an Assistant Plant Pathologist, there still remained some justification for that term, although it was even more applicable to entomology. In those days we were identified closely with the State in which we worked and qualified. We were constrained by State boundaries and rarely met plant pathologists, or, in fact, representatives from any of the agricultural disciplines, from other States. Visitors from overseas were rarer still, as were opportunities for Australians to travel, work or study abroad. It seems unbelievable today, but it was almost as difficult to travel officially interstate. I had my first trip to attend a CSIRO organised conference on 'Potato and Vegetable Problems' in September 1950. There were four delegates from Melbourne, each from a different discipline. The Conference involved two days in Canberra and concluded with two in Sydney. Two of the Victorian delegates went to Canberra (one being myself) and two to Sydney, and we travelled by train in those days! It was not until the 1955 Australian Plant Pathology Conference that I had my first officially sponsored trip to New South Wales. I had then been a plant pathologist for more than 15 years and was three months removed from a one-year Commonwealth Fund of New York (Harkness Fellowship) in the United States.

In retrospect one wonders whether the events I shall identify and discuss as important influences on the development of contemporary plant pathology in Australia would have occurred so quickly without the overriding influence of World War 2. The war brought about dramatic changes in agricultural production. New skills had to be learned quickly and research initiatives of a short term nature undertaken, particularly with new crops such as flax. Old crops such as vegetables, which had been neglected because they were primarily market garden crops, were expanded almost Australia-wide for both food and seed production, the latter with little local knowledge and experience. Plant pathologists were in demand, horticulturists and agronomists were transferred to new areas and new crops and collaboration at all levels was essential. Associated with these developments was a special unit of the US Army liaising with staff at all levels, and expediting the supply of scarce resources, e.g. seed and seed protectant fungicides from the USA. During the pre- and immediate post-war period I doubt that any of us realised that State parochialism was not the norm. The nationally recognised rivalry between Melbourne and Sydney was part of our tradition and still exists, although we have at least learnt to communicate.

It is beyond the scope of this article to review the history of plant pathology in Australia. This has already been done by Carne (1928) and Fish (1970) together with detailed references to State and Commonwealth developments of the discipline. A factual account of the status quo in plant pathology in Australia (Stubbs 1970) was prepared at the request of the Commonwealth Mycological Institute when the author was Official Correspondent (Australia) for the Institute. It was compiled largely from

information solicited from senior plant pathologists in each State, together with a brief history of the development of plant pathology in Australia. Reference will be made later to statements for which the author was personally responsible, but these must be preceded by some quoted from Carne and Fish. Statements and predictions by Carne (1928), made in a Presidential Address to the Royal Society of Western Australia during which he adopted the Eras and Periods classification of the development of Phytopathology as defined by Whetzel (1918), are of particular interest and relevance. In his introductory statement he said 'We appear to have passed through two stages and to be on the threshold of a third. In the first stage belonging to the Pre-Modern Era, the phytopathological workers of Australia were men from abroad, without specific training in Pathology, but who by their keen interest and natural ability helped to develop the study and lay the foundations of modern pathology'. In identifying McAlpine as 'the father of Phytopathology in Australia', his eulogistic statement detailing his achievements both nationally and internationally provided ample justification for such recognition. Carne also identified the commencement of the Modern Era with the replacement of the early workers by those who had received a training in Australia 'in scientific agriculture including Pathology'. The passing of Melbourne's pre-eminence in phytopathological work – gained during McAlpine's time – to Sydney he attributed to the 'stimulating and inspiring influence of W.L. Waterhouse'. There would be few if any who would disagree with that recognition which is also strongly supported by Fish (1970). There would be many, however, who would disagree with Fish about the Melbourne course in Plant Pathology (at least in my generation) who found its mycological orientation boring and lacking relevance to agriculture. As the same criticism applied even more to Agricultural Bacteriology, it is not surprising that Melbourne graduates were then reluctant to become plant pathologists. In fact, there were two of us in that category at Burnley, and two had resigned just prior to my appointment.

Carne's review also deals with the development of plant pathology in the Council for Scientific and Industrial Research (CSIR) following the appointment in 1927 of

Dr B T Dickson, a Canadian phytopathologist as Chief, Division of Economic Botany, as did also Fish's review. The latter provides details of initial staff appointments, research involvements and initiatives subsequent to 1928. Carne, himself one of the initial appointees, not surprisingly supported the development enthusiastically. He refers to 'central laboratories for fundamental research, the appointment of staff free from routine and advisory duties, co-operation with State workers and the allocation and co-ordination of research throughout the Commonwealth', and later to 'a feeling of optimism and enthusiasm amongst pathologists due, in this State at least, to a recognition that the period of isolation so marked in the past is passing for all time'. However, as stated in my review (Stubbs 1970), the initial impetus was not maintained and later the Organisation largely abdicated from this field in favour of the State Departments of Agriculture. Recognition of the importance of plant diseases to the agricultural economy of Australia might have been greater if CSIRO had developed a Division of Plant Pathology, as it did so effectively for its sister discipline, Entomology.

Later, in a Presidential Address to the Australian Plant Pathology Society I said (Stubbs 1975):

'Few would deny that in Australia we had an impressive beginning. Daniel McAlpine, Nathan Cobb and Henry Tryon firmly established the discipline in Victoria, New South Wales and Queensland in the 1890s and early 1900s and all States except South Australia developed plant pathology laboratories in their respective Departments of Agriculture. South Australia was unique in sponsoring the development of a university department at the Waite Agricultural Research Institute.

During the past 30 years there has been continuous improvement in both staffing and facilities, including some late developing forest pathology laboratories, and the output of research publications has generally been better than that of other agricultural disciplines in state departments.

Unfortunately, the reverse has occurred in the CSIRO where, after an equally impressive beginning, plant pathology has been relegated to a minor role. There are few, however, who know the complex series of events – personal

problems, accident, tragedy and political decisions – that led to the change in emphasis in the Organisation's Division of Plant Industry. I never fail to be amazed, however, that it proved possible in a country where disease limits, and in some cases inhibits, the production of practically every plant species we cultivate'.

After re-reading the above statements 19 years later I see no reason to retract any of them. There is need, however, to refer in more detail to the plant pathology staff losses in the CSIRO that contributed to compensatory research developments in State Departments of Agriculture and Australian Universities.

From here on my comments with which some may well disagree, will have a high degree of subjective interpretation or be based on a close knowledge of, or friendship with, pathologists whose departure precipitated change.

The first crisis arose as a result of CSIRO's joint project with the Waite Agricultural Research Institute involving the spotted wilt disease of tomato. This disease, first observed near Melbourne during the 1915–16 season, spread rapidly from a small affected nucleus to all the tomato growing areas of Australia, causing greater devastation to that crop than any other disease before or since. Although the etiology of the disease was unknown, a vector transmitted virus was suspected. The joint project was to be based at the Waite Institute and conducted by G. Samuel and H.A. Pittman, the latter appointed Assistant Plant Pathologist to the CSIR for this purpose. Pittman had a brilliant undergraduate record at Sydney University (silver medallist), but an egocentric personality which later resulted in loss of objectivity. According to him (told to the writer after his appointment to the plant Research Laboratory, Burnely *ca.* 1942), he disagreed from the outset with Samuel over the former's insistence on investigating 'red spider' mite (*Tetranychus telarius*) as a vector of the disease. Pittman apparently conducted the investigation of thrips independently and when he had positive transmission evidence, published a short note separately in the CSIR journal (Pittman 1927) which according to rumour temporarily disrupted relations between the collaborating organisations. Pittman was replaced by J.G. Bald in 1928 and Samuel, Bald and Pittman (1930)

then collaborated as joint authors of the first detailed publication concerned primarily with thrips transmission studies. Pittman was then Plant Pathologist, Department of Agriculture, Western Australia.

For the remainder of his association with the CSIR, Bald continued to work on virus diseases, concluding the comprehensive investigation of 'spotted wilt' of tomatoes with Samuel (seven papers), and contributing advice and criticism to Norris (1946), whose work encompassed strain complex and symptom variability of the virus. Later he worked on potato viruses and virus diseases (24 papers) and tobacco mosaic virus (12 papers) (Fish 1970). Experiments and observations on the main virus diseases of potatoes in Victoria (Bald and Pugsley 1941) identified areas where virus spread was minimal and led directly to the establishment of the first Victoria seed potato certification scheme and the Toolangi Potato Research Station (now National Potato Improvement Centre). The latter was to become the centre for initial field testing, multiplication and distribution of the Victoria Strawberry Runner Certification Scheme (based on virus-tested stock) and the Victorian Pathogen Tested Seed Potato Scheme which began operating commercially in 1963 and 1974, respectively. Both schemes have been outstandingly successful and fulfilled a need almost Australia-wide.

Bald resigned from the CSIR (*ca.* 1948) because of irreconcilable disaffection with management, accepted an appointment at the University of California, Los Angeles and permanent residency in the United States. His loss to Australia at that time was prodigious. He was intellectually outstanding, and had the training, experience and collaborative ability to be the leader of the developing discipline of plant virology in Australia. We became firm friends from 1955 onwards and although I know he was happy in the USA, he remained firmly Australian. He returned on sabbatical leave in 1970/71 and worked with G.C. Wade at the University of Tasmania. He would have loved to remain here if suitable arrangements could have been made.

Two further staff losses, both under tragic circumstances, resulted from the deaths of W.L. Geach and W.V. Ludbrook. Carne also left the CSIR to join the Department of Commerce

and Agriculture. By 1949, the loss of experienced staff was so great that the Commonwealth Scientific and Industrial Research Organisation (CSIRO replacing CSIR) would never regenerate to play a leading role in Australian plant pathology. This became evident following changed management and structural changes in research emphasis, most noteworthy of which was the work of K.O. Müller's group, initiated in 1953 to study the biochemistry and physiology of disease resistance. The role of previously unrecognised antifungal compounds host-specific in plants (phytoalexins) has been reviewed by Cruickshank (1963; 1966).

However, in spite of its loss of direct influence in general plant pathology, the CSIRO was to play a leading role in communication between plant pathologists and this led to some of the most significant advances in the history of the discipline in Australia. This began in March 1949 when at a meeting of the Australian Agricultural Council the following resolution was adopted: 'That a conference be held in Melbourne in May 1949 under the aegis of CSIR to consider and report on mycological and plant pathological problems'. It was also stated that the CSIR finance the travelling expenses of those attending, that each State Department send one or two mycologists or plant pathologists, and that each University involved in plant pathological or mycological investigations be invited to send a representative. The aim of the conference was 'to consider the problems in reducing food losses in crop and storage caused by plant disease'. Translated broadly, that could mean that the need for improvement in facilities, staffing and equipment might also be considered.

In opening the Conference, Dr. I. Clunies Ross, Chairman of CSIRO stated that it was 'the most representative gathering of plant pathologists ever assembled in Australia'.

The following excerpt from the Conference Proceedings summarises the manner in which the Conference was conducted:

'The procedure adopted was for one delegate to act as discussion leader, outlining the disease situation as it existed in his State with any other general information he had been able to gather. A representative of each State then supplied any additional information thought necessary about the position.

Following general discussion the Section Leader then briefly summarised the salient points that had been made. At the end of the Conference, action deemed necessary was incorporated in the form of resolutions'.

The Conference was held during the period 23–26 May 1949 and was attended by 30 delegates, 16 from the CSIRO.

Of the 18 resolutions framed by the Conference for submission to the Australian Agricultural Council two were of immediate significance. Resolution 11, after recognising that 'the importance of virus diseases and their complex inter-relationships make it desirable to establish a centre for diagnosis and host range studies' stated 'That the present work on differentiation and diagnosis of plant viruses at the Plant Research Laboratory, Burnley, Victoria, be expanded'.

Resolution 18: After recognising the 'great benefits from mutual discussion of plant pathological problems and their influence on the Australian economy' stated that 'Because of the great value of technical discussions on plant disease problems it can be recommended that a similar conference be held in 1952'.

Although Resolution 11 did not supply the initiative for virus research at Burnley which was already developing along the lines recommended, it certainly supplied the impetus by its recognition of the need nationally. During the next decade this development was almost fully implemented and flow-on effects were to develop Australia-wide. By far the greatest influence, however, resulted from Agricultural Council's recognition of the continuing need for CSIRO organised technical conferences. These were to be extended to other disciplinary and specialist areas but none derived such benefit from them as did plant pathology, which was undoubtedly the flag-bearer. Their real significance was that they provided the incentive to continue the co-operation and ready exchange of research information which developed between the States during World War 2.

The conferences were unique in that from their inception the numbers of delegates was limited, although with the exception of the 1949 conference, the State hosting the conference tended to supply the greatest number. From the 1955 conference onwards an Organising Committee was appointed to plan each conference in

association with the Agricultural Liaison Unit based at CSIRO Head Office in Melbourne. The entire organisational workload, however, was undertaken by CSIRO, including the compilation and publication of a volume of working papers for each conference, consisting of summaries of 'invited and contributed material of which 'none may be abstracted or used as a reference without specific permission of authors concerned'. In spite of these apparent restrictions the conferences were not inhibited in any way, as indicated by the ready flow of largely unpublished research material. The final CSIRO organised conference (Hobart 1971) attracted 140 delegates, 10 from overseas.

At the 1955 conference held at Hawkesbury Agricultural College, New South Wales, New Zealand by invitation was represented (E.E. Chamberlain) for the first time, and continued to supply delegates at each successive conference.

In 1961, a new procedure was adopted in that a distinguished overseas scientist (A.F. Posnette, East Malling Research Station) was invited as official guest of the Adelaide, South Australia conference with all expenses paid by CSIRO. The invitee was chosen because of personal research contribution of particular relevance to Australian needs. Apart from attending the conference and contributing a paper, the invited guest was also required to visit appropriate research institutions in Australia (and Papua New Guinea in the case of Dr. Posnette) and submit a detailed report with recommendations resulting from his discussions and observations.

An identical procedure was followed for the 1966 (Toowoomba, Queensland) and 1971 (Hobart, Tasmania) conferences where the conference guests were, respectively, Dr. J.M. Hirst, Rothamsted Experimental Station and Dr. M. Hollings, Glasshouse Crops Research Station.

With each successive conference the quality of material submitted as a basis for discussion increased, reflecting improvement in both depth and coverage of plant pathology research in Australia. The conference also provided a forum for discussion of advances as well as the identification of deficiencies and, because they were national in orientation, provided the means through conference resolutions of gaining the ears of politicians. They were criticised by some as being too many years apart, but others considered a five-year interval was about right.

With that interval they did not lapse into a dreary monotone of paper reading. There were always worthwhile objectives to follow, and research developments of note generally followed initiatives which had their genesis in previous conferences. Unfortunately, space will not permit their analysis in detail. The one example cited from the 1949 foundation conference should not be regarded as personal prejudice by the writer. Success in its implementation perhaps provided incentives for other similar initiatives and Australian plant pathology research grew in status and application nationally, and internationally by recognition.

In conclusion it must be admitted that growth in most areas of Australian agricultural research and extension occurred in parallel with the growth of agricultural industries. During much of the past 45 years agriculture provided the bulk of the nation's export earnings and undoubtedly provided a favourable climate for research development. However, such seldom occurs without initiative and it remains the author's belief that the Australian technical conference series provided such initiative when it was needed and most likely to succeed. Unfortunately, the pendulum has swung again and it may be some time before it regains the right amplitude and direction. Having entered the system when it appeared to lack the capacity to swing I have sympathy for those suffering from the effects of the present series of national and international crises, but not too much, because it has happened before (e.g. the Great Depression) to those without the scientific resources currently available.

When choosing a theme for this article I had intended to conclude with some 'crystal ball gazing' into the future of plant pathology. However, this I now regard as presumptuous, so I conclude with some simple advice based on my lifetime experiences:

**Have faith in ecologically based research for which there will always be a need in spite of genetic manipulation inroads, and remember that the former has solved many more problems than biochemically orientated research. Above all, don't become so obsessed by your 'tools of trade' that the detection of a divided genome assumes more importance than the solution of a problem.**

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