

Dorothy E. Shaw: A biography of her career in plant pathology

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Dorothy Shaw is an Australian plant pathologist whose career has included an early period in Australia, two years in Canada, over 21 years in Papua New Guinea (PNG) and a later period also in Australia. This biography describes some of her professional experiences in plant pathology and related fields.

Early Australian studies

Dorothy began her tertiary studies at the University of Sydney in 1943 in the Faculty of Agriculture, and proceeded during her course on Commonwealth scholarships. During her University vacations she worked in the Australian Women's Land Army and after World War II with other employers in various rural industries. She graduated BScAgr in 1947 and became a Demonstrator and later a Teaching Fellow in Plant Pathology, in Genetics and Plant Breeding, and in Agricultural Botany, at the University of Sydney. During this time she worked closely with Professor W L Waterhouse, especially in regard to non-rust specimens, including the identification of some herbarium specimens from PNG, and isolating *Claviceps purpurea* for his ergot research. Those of us who remember Professor Waterhouse will realise that many of his admirable qualities are reflected in Dorothy's character, especially the commitment and determination which became a hallmark of her career. She also worked with Peter Valder during his honours year. During this time she developed interests in mycology, fungal taxonomy and cytology, as well as pathology, interests which have continued to the present day.

Dorothy was admitted to the degree of MScAgr in 1953 for her work on species of *Septoria* and related genera on Gramineae in Australia. Two papers were published from the thesis, but the main part of the work remained unpublished because in 1953 she was awarded a Thomas Lawrance Pawlett Scholarship and left immediately for overseas.



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Canadian experiences

En route to Canada via the UK by ship Dorothy visited the Commonwealth Mycological Institute (CMI, later International Mycological Institute, now CABI Bioscience) then at Kew, and met the mycologists with whom she has had most worthwhile contacts during the last 45 years.

In Canada she worked at the Canada Department of Agriculture Cereal Laboratory at Winnipeg under Dr. T. Johnson, and was also enrolled at the University of Manitoba. While there she gave a series of seminars on the genetics of microorganisms, including *Neurospora*, *Aspergillus* and *Allomyces*. Field work was carried out around Ottawa, and samplings were made across the northern United States of

America and the Canadian prairies. She obtained her PhD in 1955 following studies on *Leptosphaeria avenaria*, especially regarding the formation of microconidia during autumn and winter, the development of the sexual state in spring, and the nuclear condition of the propagules. While in Canada she was awarded a Rockefeller Grant which enabled her to visit laboratories in the United States of America.

Papua New Guinea

The Plant Pathology Section and conditions in PNG In 1955 Dorothy was invited to develop a Plant Pathology Section in the Department of Agriculture, Stock and Fisheries in PNG. She was the first person to hold such a position and as such faced a challenging task, as there were few facilities, equipment or literature, and no ancillary laboratory staff. For example, the Pathology Laboratory consisted of one room and annex, both with open (louvred) sides and therefore impossible to keep free from dust and contamination, one old microscope, one refrigerator, little laboratory equipment and little pathology literature. All equipment had to be ordered from Australia.

There was almost no information available on the occurrence and importance of plant diseases, and some of what was available was incorrect, e.g. the reputed occurrence of sugarcane smut, caused by *Ustilago scitaminea*, which has never been recorded in PNG since the first misidentification by a non-pathologist.

There was also little information available on the danger posed by exotic diseases to plants important in subsistence agriculture and to the plantation crops contributing to export earnings.

Furthermore, there was little understanding of the causal agents of disease by indigenous growers. Blights, spots, malformations and other symptoms were usually attributed to malicious witchcraft, and one of Dorothy's early experiences was her involvement with 'bewitched' yams (infected with *Colletotrichum gloeosporioides*) where the owner was threatening drastic personal repercussions on the reputed perpetrator (a fellow villager) of the 'bewitching'.

Another difficulty was that of language. There are over 700 languages in PNG, most of which have never been recorded, and although there are two lingue franche, viz. Neo-Melanesian ('Pidgin') in New Guinea and Police Motu in Papua, these were

by no means universal even within the two regions. Most expatriates soon acquired useful phrases in one or both, while some (like Dorothy) took courses in each. However, often laboratory assistants could not communicate with each other (because of the multiplicity of languages) except in English. This was becoming more widely taught in schools, but the highest grade available in the early days was equivalent to primary level.

An added corollary to the above was that even PNG speakers in Pidgin or Police Motu could often not read in either, or in English. As pointed out by Shaw (1984) this meant that chemotherapy was rarely practised in subsistence agriculture in PNG, mainly because of the former inability of many growers to read instructions, poison warnings and antidote measures. There was also the possibility of error and misinterpretation in oral instruction, especially if translated through one or more of the local languages or several lingue franche for each recipient.

Transport was often a problem. Roads were very limited in 1955 and were of course unsealed away from the main centres. Even the Highland Highway between Lae and Mt Hagen was often blocked with landslips at the Kassam and Daulo Passes. Vehicles were sometimes scarce, and on one occasion in the Highlands a hearse was the only transport available. Surveys to and between village gardens often had to be made on foot, but there was usually access by road to boarding schools, missions and prisons, all of which relied on their garden produce.

Access between areas was by plane, including the Catalina Flying Boat, and Avro Ansons whose 'paper' fuselage sometimes peeled off in patches. Some of the airstrips were (and still are) on slopes, so that planes could land only up the strip, no matter the wind direction. Small ships and launches were used around the coast, and local canoes on some rivers and as access to coastal areas without wharves.

In later years there were more and improved airstrips and more modern craft. Helicopters were used later in special circumstances. These included the transport of staff to relatively inaccessible spots remote from the area with coffee rust in 1965. These spots were thought to be uninfested, but needed to be checked by ground teams. A helicopter was also used to search the heavily forested slopes of Mt Giluwe, the highest mountain in Papua, for a clearing said to have been made during the war, and which could have been used as a base for sampling for *Phytophthora cinnamomi* or whatever, in the

Nothofagus forest. As no clearing was found – it had probably been overgrown in the intervening years – a landing had to be made in a small village clearing.

The Plant Pathology and ancillary services The Plant Pathology Section was developed to provide a Government service incorporating examination of specimens from all growers. Specimens were usually forwarded direct by expatriate growers, and by expatriate Agricultural Extension Officers (who normally spent three out of every four weeks patrolling) on behalf of indigenous growers. Specimens sometimes took many days to reach the laboratory.

Dorothy made innumerable collecting trips in PNG and began amassing information towards her long term goal of publishing a host index of plant diseases in that country. Her first list was published in 1963. All plants were of interest, but especially the subsistence crops (taros, sweet potato, bananas, coconut, sago, yams and cassava); plantation crops (coffee, cocoa, coconut, tea, rubber and later oil palm); plantation shade and ground covers; pasture species; introduced vegetables; and weeds and indigenous plants, with many of these last being utilised in village culture.

Dorothy was a gazetted Plant Quarantine Officer with close association with the Quarantine Service of the Department and she (and later other staff) was responsible for the examination of all plants being grown in quarantine at the Laloki Station outside Port Moresby. She also lectured on the need for quarantine to Members of the House of Assembly (the forerunner of Parliament before Independence) during which they saw, for the first time, objects smaller than those discernible to the naked eye. Quarantine aspects were also introduced into lectures on PNG Natural History given by Dorothy to incoming expatriate officers in various government departments on their arrival in PNG.

As well as pathological problems, studies were carried out on nodulation of legumes in the field, and she initiated the supply of *Rhizobium* cultures to growers as a Government service. Various microbiological and abiotic conditions were also investigated. These included algae on some high altitude wet airstrips; haemolytic sago; fungi on waste food around villages; malfunction of the cooling system of one of the main electricity generating plants; entomogenous microorganisms; leaf tumours in tea seedlings; and lightning strikes, especially in coconuts. Forensic investigations were also carried out.

The above studies were often in collaboration with other pathology staff and colleagues in agronomy, chemistry, entomology, medicine, civil aviation and other government departments.

Many overseas specialists collaborated in carrying out identifications of PNG material on request, especially those at the CMI, including Drs. C. Booth, F.C. Deighton, M.B. Ellis, D.L. Hawksworth, A. Sivanesan, D.J. Stamps and B.C. Sutton) and at the Royal Botanic Gardens (especially Drs. D.A. Reid and D.N. Pegler), also at Kew. Assistance was also received in virology and nematology identifications from Rothamsted (United Kingdom) and Indooroopilly (Queensland). These and others who carried out identifications were acknowledged in Shaw (1984, pp 4-5). Visitors with pathology, mycology or microbiology interests included Drs. E.J.H. Corner, A.J. Dabek, J.M. Hirst, A. Johnston, Y. Kobayasi and colleagues, L.S. Olive, D.D. Perkins, A.F. Posnette, R.T. Plumb, R.H. Stover, P.D. Turner and G.A. Zentmyer.

Dorothy and other Department members achieved world wide recognition for their work with coffee rust, caused by *Hemileia vastatrix*. This pathogen was discovered in 1965 in the hills inland from Port Moresby in small coffee plantations. Eradication was attempted and was deemed successful, as no infections were found in (published) surveys carried out throughout the entire country during the next ten years. The campaign, which cost an assessed \$Aus70 000 at the time, gave many years of respite to the main coffee growing areas and provided the PNG economy with hundreds of millions of dollars in export funds before the fungus subsequently occurred in a different region (and spread quickly) in 1986.

As a result of the campaign, FAO invited Dorothy to participate in a study group meeting in Costa Rica to consider the later outbreak of coffee rust in Brazil. In 1977 she visited Nicaragua as an FAO/UNDP Consultant on the outbreak of coffee rust in that country, and El Salvador to advise on protection measures.

After some years, Dorothy was able to build up facilities at both the Port Moresby (Konedobu) and Keravat laboratories, and to increase the professional staff in the Pathology Section, as well as ancillary members. It was very pleasing to her to see more pathologists appointed in the Department of Forests and at the University. These were, of necessity, expatriates until such time as PNG graduates became available and were in turn absorbed into the work of the Departments and the University.

During her time in PNG, over 10 000 specimens were handled by the Pathology Section. Some of these were retained in the Herbarium and are now housed in a new Reference Collections Building at Kila Kila near Port Moresby (APPS News, April 1997), and some duplicates were lodged at the CMI.

Dorothy's particular interests have been plant pathology and mycology with a spill-over into some botanical aspects of the hosts. One fungal genus (*Shawiella*) has been named after her, and four new fungal species. She has herself named four new fungal genera (three with co-authors) and 14 new fungal species, (some with co-authors). Her published papers on PNG material, some with other staff members and some with overseas colleagues, are included in the list of publications.

In 1970 she was appointed an M.B.E. for public service and in 1975 was a recipient of an Independence Medal awarded by the PNG Government.

Dorothy considered herself fortunate to work in PNG for a reason other than pathology, viz. the opportunity it gave her to meet and talk with many interesting people in PNG, and with scientists from around the world. These latter included Professor T. Dobzhansky (geneticist); Dr. P.W. Richards (botanist); Dr. L.J. Brass (botanist on the Archbold Expeditions); Dr. J.L. Gressitt, Dr. Elmo Hardy, Dr. T.C. Maa and Professor C.D. Michener (entomologists); Sir Alexander Todd and Dr. Woodward (chemists); Professor Kennedy (geophysicist); Professor Pike (linguist) and Dr. Hobart van Deusen (zoologist). These, and many others, visited PNG on field work or for familiarisation and other purposes.

During her period in PNG, Dorothy studied philosophy for three years as an external student of the University of Queensland. Recreational interests included snorkelling, sailing, canoeing (in outriggers) and range shooting (.303 rifle). She was also a member of the Scout Association and Headquarters Commissioner (Cubs) in PNG, being awarded the Silver Acorn in 1969 for outstanding service to Scouting.

Overseas and vocational study Investigations of plant disease outside PNG included a survey (with A. Johnston of the CMI) of West New Guinea (now Irian Jaya) and a coconut problem in Solomon Islands. As a PNG representative, Dorothy visited India, and had study tours to the Philippines, Malaysia, Ghana, Costa Rica and Trinidad. Vacation study was undertaken at the CMI (United Kingdom), at the Canada Department of Agriculture at

Ottawa, and at Brisbane in the Department of Primary Industries. I readily recall Dorothy seeking permission for the use of the laboratories for her vocational studies in the Plant Pathology Branch, first on aquatic fungi and later on false yeasts.

Recent work in Australia

Dorothy returned to Australia in 1976 as a Visiting Scientist in the Plant Pathology Branch of the Department of Primary Industries at Indooroopilly, Queensland, where she continued her contact with PNG pathology as a Consulting Pathologist. At Indooroopilly she compiled *Microorganisms in Papua New Guinea* which was published in 1984. This list includes microorganisms on plants and many substrates, including insects, plant and forest products, plant litter, soil and man's artifacts. This is quite a remarkable achievement when considered alongside similar documentation within many countries, including Australia. Few countries can boast such a knowledge base for the benefit of future generations and yet its compilation (as distinct from the records) was (apart from the section on 'Lichens' with Dr. D.L. Hawksworth) the work of one scientist.

As mentioned previously, Dorothy visited Nicaragua and El Salvador in 1977 at the request of FAO/UNDP after the outbreak of coffee rust in the former country. She also revisited PNG twice after the outbreak of coffee rust there in 1986, as well as visiting Canberra twice in the same year to consider the implications of the outbreak with colleagues at the Australian National University. She was also an invited speaker at the International Foundation for Science's Meeting on Edible Aroids in Suva, Fiji, in 1981.

Dorothy continues her work on pathology, particularly on diseases of certain aroids and on mycology. She has also published various papers on bees and fungi, including a world review of the incidental collection of fungal spores by bees and the collection of spores in lieu of pollen. This subject is of particular interest to her as the spores collected include those of rusts and powdery mildews as well as *Neurospora*. Her papers also include some on botanical and related aspects of aroids and bees in an extension of the above interests. The work is still being carried out at Indooroopilly, where she is a Visiting Scientist with the Plant Protection Unit and an Honorary Research Associate with the Queensland Herbarium.

Memberships and Offices

Dorothy was Secretary of the Australian Institute of Agricultural Science (NSW Branch) for some years, and a foundation member and PNG representative of the Australasian Plant Pathology Society, who awarded her Honorary Membership in the Society. She is a member of the Australian Institute of Agricultural Science (now A.I.A.S.T) and President of the PNG Branch, being awarded a Fellowship in that Society; a Life Member of both the British Mycological Society and the Linnean Society of NSW; and a member of the Royal Society of Queensland and of the International Aroid Society.

In PNG she was Chairperson of the Scientific Advisory Committee to the National Parks Board; Trustee, PNG National Parks Board; Trustee, PNG Museum; Councillor, PNG University; Councillor, Australian Conservation Foundation; Associate Editor, Biological Conservation; and Secretary, Editor and later President of the PNG Scientific Society.

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