

Lionel Leslie Stubbs: pioneer of Australian plant virology

D.G. Parbery^A and R.S. Greber^B

^AFaculty of Agriculture, Forestry and Horticulture, The University of Melbourne, Parkville, Victoria 3052 Australia

^B25 Lakeside Crescent, Currimundi, Queensland 4551 Australia

'Have faith in ecologically based research for which there will always be a need. 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. LLS 1994'.

Background

Lionel Stubbs retired from the Chair of Plant Pathology at the University of Melbourne in December 1981 after a distinguished career as a plant virologist, vegetable pathologist and plant scientist. This career began in 1939 as an assistant entomologist in the Victorian Department of Agriculture. Thirty years later, having built up a world class plant virus research laboratory at Burnley, and having firmly established himself as a leading authority on plant viruses, he was invited to apply for a Chair in Agriculture at the University of Melbourne. There, he developed a strong, productive teaching and research unit in plant sciences which trained highly successful plant scientists in crop physiology, plant breeding and plant pathology. It would be difficult to exaggerate the significance of his contribution, especially in the establishment and advancement of plant virology in Australia.

Lionel Stubbs was born in Charlton, Victoria on 3 May 1916, but grew up in Portland. When his grandfather, James Jones, took four-year old Lionel fishing in a creek that ran through his orchard there began the love of a sport which has continued to be an important part of his life. More than anyone, James Jones introduced Lionel to the wonders of nature and awoke in him the urge to discover what made it work. He grew up with acute powers of observation, a deep interest in ecology and a good knowledge of the plants, birds and animals of the surrounding district. Lionel completed his secondary education at University High School, Melbourne, during 1932 and 1933.

In early 1934 Lionel was offered a free place in Agriculture at the University of Melbourne. Despite



Lionel Stubbs 1994

some early problems with agricultural chemistry he went on confidently to complete his course with distinction.

The Burnley years

The entomologist At the end of 1938 several positions in the Victorian Department of Agriculture were advertised. Laboratory-based research attracted him and an interest in entomology had been stimulated

by Charles French, then retired from Burnley. During 1939 much time was spent solving problems with aphids and investigating the biology of the codlin moth. This valuable experience was of great benefit as his career unfolded. With the outbreak of World War 2, Commonwealth funds were withdrawn from apple and pear research, and in early 1940 Lionel reluctantly transferred into plant pathology.

Launch into plant virology The war also thrust vegetable production from small, market garden enterprises into large-scale field industries. This meant that farmers and their departmental advisers had to adapt to large-scale production methods, including large-scale production of vegetable seed more or less *de novo*. There was little or no knowledge of the problems that arose, particularly in disease and insect control, or in producing vegetable seed on the scale required to sustain the industries being developed. Most knowledge was gleaned on the job and usually on the run! Lionel's first such problem was in carrots where a high proportion of roots, stored for dehydration and transplantation for seed production, rotted. The initial focus on a fungal root rot led nowhere. Eventually the investigation was redirected to an aphid-borne disease, later named carrot motley dwarf, which he investigated extensively (Stubbs and Grieve 1944; Stubbs 1948*a*; 1952; 1955*a*; 1955*b*; 1956*a*; 1966*b*). This secured a healthy future for the carrot industry in Australia and earned him a M. Agr. Sc. degree from Melbourne University in 1948. It also made him aware of the significance of this largely unknown group of plant pathogens in Australia, triggered his keen interest in discovering what other unresolved plant disease problems were of virus origin, and in defining their importance in the production of Australian crops.

Although the Victorian Department had investigated potato viruses in the late 1930s (Bald and Pugsley 1940), when Lionel began investigating carrot motley dwarf disease he had had no training in virology and there were no experienced virologists in the Department to assist him. He learned as he went, and the experience he gained between 1940 and 1948 enabled him to begin a systematic survey of virus diseases in Victoria and to begin research into diagnosis and epidemiology. He developed a strong base to build what was to become the best equipped and staffed plant virology unit in Australia.

Lionel's emergence as an eminent virologist, coincided with national recognition of the need for a strong, well-organised laboratory devoted to

Australian plant virus diseases. Viruses had been recognised for only 20 years when the epidemic of tomato spotted wilt was first reported around Melbourne in 1915–1916, and threatened the Australian tomato industry. Its resolution required a national approach at a time when parochial attitudes and state boundaries placed great restraints on interstate co-operation. This was resolved in the late 1920s by CSIR appointing virologists Harold Pittman and Jack Bald (Pittman 1927; Samuel *et al.* 1930) to work on tomato spotted wilt at the Waite Agricultural Research Institute (Fish 1970). Bald and Pugsley (1940) made a start on virus problems in Victorian potatoes in the late 1930s, but by the 1940s Bald and Pugsley had left (Fish 1970; Stubbs 1994).

Although plant pathology did not survive the reorganisation of CSIRO, in 1949 the Australian Agricultural Council asked CSIR to organise a plant pathology conference in Melbourne to consider disease problems in Australia. Its success led to regular five yearly conferences until the Australasian Plant Pathology Society took over in 1974 (Purs 1994). At this first AAC conference, a national need to establish a centre for the diagnosis of plant viruses and the determination of their host ranges was recognised, and expansion of the initiatives developed at Burnley was recommended (Stubbs 1994). Lionel's ten years experience in the vegetable industries, his research on problems in carrot production, and the national endorsement of his initiatives culminated in the development of a world class plant virus research laboratory. Many national and international visitors were attracted to work at Burnley and a number of interstate virologists (one of us, RSG, among them) benefited from time spent there. Advice was commonly sought from the Burnley Group from many quarters, some rather unexpected. One of their more macabre tasks arose from the finding that tobacco mosaic virus survived processing and was common in cigarette tobacco. An association between lung cancer and smoking, and a hypothesis that it resulted from infection of lung tissue with TMV resulted in many samples of diseased lungs being sent to Burnley to be ground up and tested on indicator plants. It may be no coincidence that about this time Lionel gave up smoking!

Lionel's achievement at Burnley cannot be overstated. It is clear he had the backing of the Chief Biologist, the late Stan Fish, but it resulted very much from his own efforts. It can be equated with the establishment of Centres of Research Excellence today, except it grew from the efforts of one person

and was driven by enthusiasm more than large sums of money. The high reputation of the Burnley group was maintained until well into the 1980s when reduced Government support for agriculture, inadequate financial reward for research achievement, and never-ending reviews of administrative structures within the Victorian Department of Agriculture drove out key staff through disenchantment, movement into administration and early retirement.

By the mid 1960s Lionel was Principal Plant Pathologist with considerable administrative responsibility. He still found time, however, to foster the interests of promising young plant pathologists drawn into the investigation of problems of interest to him and worked hard to ensure that they were able to gain academic recognition for their work. R.D. Price and P.R. Smith gained M.Agr.Sc. degrees in the mid 1960s, and a little later, G.T. O'Loughlin enrolled for a PhD at Melbourne University where he undertook an ultrastructural study of the relationships between the lettuce necrotic yellows virus and its plant and insect hosts. On return to Burnley, Dr O'Loughlin ran the electron microscope suite for which Lionel had obtained funding and which gave a great boost to the identification and study of plant viruses. About this time, R.H. Taylor spent several months in Davis, California and on his return added more strength to the virology unit.

The virologist Lionel's personal contribution to virology was in diagnosis, epidemiology and control. He was especially interested in controlling virus diseases through the production of virus-free propagating material. This was greatly influenced by his initial training in entomology and his subsequent interest in and knowledge of insect behaviour. His success as a researcher was greatly enhanced by his acute powers of observation and an almost intuitive ability to connect relevant observations. For example, by 1959 he knew that the cause of lettuce necrotic yellows was transferable to *Nicotiana glutinosa*. He had noted high incidences of lettuce necrotic yellows along irrigation canal banks thickly colonised by sowthistle. He found that sowthistle was a symptomless host of the virus and that its reactions on *N. glutinosa* sometimes suggested that the virus was a variant of lettuce mosaic virus or tomato spotted wilt virus. The virus, however, could not be transferred back to lettuce and Lionel keenly sought a vector. Then near his Ivanhoe home he noticed a patch of sowthistle, which he knew contained the virus, smothered in aphids. Colonies contained *Macrosiphum*

euphorbiae and *Hyperomyzus lactucae*. When transferred to healthy lettuce, the latter proved to be the vector of a new virus, lettuce necrotic yellows virus. In 1966, Lionel was invited to advise a group of lettuce growers in Mildura on avoiding the serious losses caused by lettuce necrotic yellows. In a badly affected crop he explained the absolute importance of eradicating sowthistle from in and around plantings. The owner of the crop challenged this advice, pointing out that all sowthistle had been removed from the field but the problem was still severe! Lionel agreed the paddock was weed-free but pointed out that the problem was most severe next to an orange grove. In about six bounds he cleared the fence between lettuce and oranges, and amongst the foliage of the nearest orange tree revealed a large sowthistle smothered in aphids! It was an object lesson to all of us in both disease control and effective extension.

Most of his work was focused on fruit and vegetables and this is where he made his greatest contribution. The main viruses he worked on were:-

Carrot motley dwarf disease (1944–1956) This is mostly dealt with above. However, bio-control was effected with a hyperparasitic wasp (Stubbs 1966c).

Broad bean wilt virus (Stubbs 1948a; 1960; Taylor and Stubbs 1972) The cause of the disease was diagnosed and the virus described.

Citrus viruses in Victoria (Stubbs 1952a) This was an on-going interest shared with Dr Lilian Frazer of the NSW Department of Agriculture.

Citrus-tristeza virus complex (Stubbs 1961; 1963c; 1964) This work led to a long-term field trial at the Irymple Research Station, near Mildura in which grapefruit grafted onto sour orange rootstock were cross-protected with a mild strain of tristeza. At least two progress reports were given at conferences including one in Greece in 1975. At that stage there had been no deaths of protected trees from tristeza whereas most unprotected trees had died.

Lettuce mosaic virus (Stubbs 1954; Stubbs and O'Loughlin 1962) This highly destructive disease of lettuce in Victoria was reduced to near insignificance by promoting a disease-escape program for producing virus-free lettuce seed.

The production of virus-free propagative material Lionel recognised the essentiality in horticulture of using pathogen-free nursery stock. He used heat therapy (Stubbs 1955c; 1963a; 1966) and other means (Stubbs 1963b; 1966), often with great success, to provide such nursery stock.

Certified virus-free strawberry runner scheme (Stubbs 1956b; 1966) This extremely successful scheme improved flavour dramatically and lifted the production of strawberries in Victoria from less than 1 ton per acre in 1963 to 8 tons by 1970. During this time, over 6 million runners were sold through the scheme (Smith 1971). Lionel had found that, with the exception of strawberry yellow edge virus (SYEV), viruses could be eliminated from strawberry with heat therapy. He was able to avoid SYEV through selection. Early on, he recognised that the environment of Toolangi, similar to that of the Otway Range, was too cool and moist to support the aphid vector of the strawberry viruses. He therefore recommended that once virus-free stock was available it should be bulked up at Toolangi. For similar reasons, Toolangi was used, and has continued to be used, for the pathogen-tested seed potato scheme.

Barley yellow dwarf virus (Price and Stubbs 1963; Stubbs and Walbran 1963) The failure of BYDV infected cereals to produce grain was similar to, and initially confused with, dead-heads caused by frost damage and take-all disease. Price and Stubbs (1963) identified BYDV as a serious disease in Victoria, especially in wheat, but also in oats and barley, where it can cause up to 80% yield loss in seasons following an early autumn break. The work was pursued at the University of Melbourne where Lionel encouraged a PhD candidate to survey its presence in grasses. It was found to be common in rye-grasses and many other pooid species. This initial study was followed up by Dr. G.M. Halloran and a number of postgraduate students.

Lettuce necrotic yellows virus (Stubbs and Grogan 1963a; 1963b; Stubbs *et al.* 1963) This was an important find in several ways. It was the first rhabdovirus discovered in plants, it was the first plant virus shown capable of replicating in plant and insect hosts (O'Loughlin and Chambers 1967) and it caused a highly destructive lettuce disease which was relatively easily controlled once its biology and that of its vector were understood.

Peach rosette and decline disease (Stubbs and Smith 1971; Smith and Stubbs 1976; Smith *et al.* 1977i; 1977b) Peach trees in the Goulburn Valley of Victoria affected by this very destructive disease usually contained three distinct viruses, prunus necrotic ringspot virus, prune dwarf virus and greasy sunken mottle virus (syn. apple chlorotic leaf spot virus). Prune dwarf virus was shown to be pollen disseminated and was considered the main

cause of peach rosette and decline disease (Smith and Neales 1977). Stubbs (personal communication) also found prunus necrotic ringspot virus common in New Zealand in apparently healthy roses.

One of his most important research initiatives was a pioneer investigation of the protection of plants from destructive strains of viruses by deliberately inoculating them with mild (masked) strains. This arose from two observations, the first that there were mild strains of a number of viruses which caused no detectable changes in host appearance or production. The second was that the presence of one strain of a particular virus usually excluded other strains of that virus from infected hosts. This was widely known by the mid 1950s when Stubbs in Australia and Chamberlain in New Zealand initiated field experiments to see if losses from severe strains of viruses could be avoided through mild strain protection. Chamberlain worked with apple mosaic virus in apples, Stubbs with citrus tristeza virus in grapefruit which was grafted to sour orange rootstock to avoid collar rot (caused by *Phytophthora citrophthora*). Tristeza infection caused loss of trees through death of the graft union. By the mid 1960s Stubbs (1964) had demonstrated that the mild strain had no harmful effect on inoculated trees but protected them from severe strains. Twenty years later, when most control trees were dead, most inoculated trees were still healthy. This work has had its greatest impact in New Zealand where inoculation of tomatoes with a mild strain of TMV avoids the serious losses previously caused by severe strains.

When Doug Parbery first visited Burnley in 1962, he was impressed by the many experiments attempting to produce virus-free planting material. Various specimens of virus-infected fruit trees were being subjected to regimes of sustained and alternating high temperature. Some years before, in an attempt to discover the reason for poor growth of strawberry plants and the poor quality of strawberries in Victoria, the Burnley group had found that strawberries were universally infected with various combinations of several viruses. Through developing tests for the presence of each virus and the application of heat therapy they selected virus-free parent material as foundation stock for the certified strawberry runner scheme launched in 1963.

Jack Bald laid the foundation for the establishment of a pathogen-free seed potato scheme. Bald and Pugsley (1940) had shown that while potato crops in Victoria were generally badly affected by combinations of several viruses which reduced

yield, crops in regions such as the Otway Range were relatively free of virus. This enabled virus-free potato seed crops to be raised and a certified seed potato scheme to be developed. It was also based at the Toolangi Research Station. Although Lionel did not work directly on this project, he strongly encouraged it and was able to pass on valuable information obtained from Jim Hirst at Rothamsted in 1965 to colleagues at Burnley working on the elimination of tuber-borne viruses.

Many of the most successful procedures developed in Victoria to control virus diseases have resulted either directly from the work done by Lionel Stubbs, or through his influence, encouragement and enthusiasm. Both at Burnley and later at the University, his enthusiasm for and support of projects almost always guaranteed financial support. He had a keen eye for the possible and was excited by new and innovative ideas. For example, the 1961 AAC conference adopted his recommendation that a repository for virus-free fruit tree foundation stock be established in north-eastern Victoria, where most common virus vectors were absent in a region isolated from commercial areas. He worked hard to get it established as a national project, but unfortunately support at the national level was not secured.

Professor of plant pathology

Prior to Lionel's appointment to the University of Melbourne, plant sciences were taught by staff in different departments. The agronomy of crops and pastures by Drs Yvonne Aitkin, J.H. Wilson and D.F. Smith in the School of Agriculture, applied genetics, plant physiology and plant pathology by Drs Margaret Blackwood, T.F. Neales and D.G. Parbery, respectively, in the Botany School, and biochemistry and microbiology by Professor F. Hird and Dr Nancy Millis, respectively, in the Departments of Biochemistry and Microbiology. Lionel saw advantages in the greater integration of teaching and research in all the plant sciences and a stronger focus of research on field problems than had been the practice in some areas. He preferred to have staff working together as a team. He sought the introduction of teaching and research in plant breeding, the transfer of plant pathology from the Botany School to Agriculture and the appointment of a crop physiologist to provide a better balanced team within Agriculture. Through an agreement with Professor

J.S. Turner, then Head of Botany, the position of lecturer in plant pathology (and DGP with it) was transferred to Agriculture in 1970. Dr. G.M. Halloran, an experienced wheat breeder from the Wheat Research Institute (WRI) at Wagga Wagga, was appointed lecturer in genetics and plant breeding in 1971 and a few years later, on his retirement from the Directorship of the WRI at Wagga, Dr A.T. Pugsley was appointed Senior Research Associate. In 1979, Dr. M.J. Dalling was appointed lecturer in crop physiology. These appointments alone would not have led to the formation of the dynamic, productive unit which resulted without appropriate research facilities. Again, just as he did at Burnley, Lionel set about providing them. From 1969 until he retired, he relentlessly sought finance to boost facilities at both Parkville and Mount Derrimut, and from 1977, at *Strathfieldsaye* in east Gippsland. At Mount Derrimut he obtained funds to supplement the generous Brumley Bequest and developed the Brumley Centre into a first rate field research laboratory where extensive research on problems in pastures and field crops was conducted. He used it very effectively as a showcase for Plant Sciences where he presented the work of his group to members of the various granting bodies supporting his work. He upgraded all facilities at Parkville and found funds to build and equip the Clive Disher Laboratory at *Strathfieldsaye*.

Lionel's appointment to the University occurred at a time of growing concern over declining productivity of pastures based on subterranean clover in Victoria. This focus on pasture diseases coincided with increasing awareness of the seriousness of many pasture diseases in Australia. Thus from the start, Lionel enthusiastically sought support for work in this field. He was helped by a State-wide flare up of clover scorch (caused by *Kabatiella caulivora*), which caused severe destruction of subclover throughout Victoria in two successive seasons. Dr Mark Hutton, then Chief of the CSIRO Division of Tropical Pastures, and others interested in the welfare of the pastoral industries, supported initiatives to find solutions to disease problems. Lionel found funds to appoint a Research Fellow, Dr. L. W. Burgess and other researchers such as Dr. H.J. Ogle, and attracted researchers including W.A. Bowker, J.P. Edgerton, A.W. Kellock, W.C. Morgan and Wan Zainan Nik.

He encouraged the re-organisation of undergraduate teaching. Although he did not particularly enjoy lecturing, it was important to him that what he was involved in was the best! One day in the mid

1970s he was told by someone in industry, that they preferred La Trobe graduates over Melbourne because Melbourne graduates were not 'computer literate'. He was appalled and returned to the School to insist that a course in computer use and applications be included in the Agricultural Science and Forestry Science courses. Within a short time this was done and later the Faculty went on to lead the University in its teaching of computer use and the applications of computer technology.

During his tenure at Melbourne, Lionel influenced the faculty in many ways. His greatest satisfaction, however, was rooted in his success in building up the Plant Sciences section to a highly regarded and productive unit. During his twelve years in the University many of the Faculty's top graduates were attracted into research in the plant sciences. This resulted in the award of three D. Agr. Sc degrees, 20 PhDs and 40 M. Agr. Sc. degrees. In addition, the annual publication rate of the section trebled with almost 200 papers being produced in the period.

Lionel was always a strong advocate of the institution he represented. This was true at Burnley and no less so at Melbourne. He fought to gain resources to build units he could be proud of, and took great pride in doing his best by them. Among the many initiatives he advocated, most of which were adopted, were two which were not, and which the Faculty was later to regret. The first was the incorporation of the University's Centre for Environmental Studies into the Faculty. He led a group which believed that an enlarged Faculty of Agriculture, Forestry and the Environment, would have had great strength and long term benefit. For various reasons, however, Faculty did not elect to follow that path until almost 20 years later when it was too late. The second initiative was to encourage the establishment of a research and teaching unit in molecular biology and genetic engineering within the school. Dr Dalling had developed a strong interest and considerable expertise in the field and was strongly placed to take the lead in the University. Unfortunately, at the time the University took the view that the future direction and structure of the Faculty should foster stronger emphasis on agricultural systems and field oriented research. The irony of this decision was that a decade or so later, the University castigated the Faculty for not embracing the molecular biological sciences.

With the appointment of Dr. M.J. Dalling the group gained a strong stimulus through his interest

in crop nitrogen metabolism and increasingly in the application of genetic engineering techniques to crop production. This large dynamic group within the Plant Sciences Section was of great value in many respects. Dr Dalling, strongly supported by Lionel, also developed a sound reputation in environment management through research into and management of reconstitution of land subjected to open-cut mining. When Mike Dalling left the University to become founding Managing Director of Calgene Pacific, a company based on the biotechnology of genetic engineering, his association with Lionel continued. Mike shares the sentiments felt by many in regard to support readily given by Lionel.

Lionel made an immense and telling contribution to Mike's career at Melbourne and unwittingly did much to shape his attitude to science, in particular agricultural science.

When Mike returned from the USA and Switzerland in May 1982, he was infected with the bug of genetic engineering and its exciting applications to agriculture. There was then, and still is, a degree of religious zealotry about this 'infection' and Lionel was able to temper, but never dampen, and direct that zeal.

Apart from Lionel's strong, unwavering support of the Calgene Pacific concept, he took on the task of assembling and chairing the Calgene Pacific Institutional Biosafety Committee (IBC). This was challenging as community attitudes to the technology were not clear and there were no government regulations (and still are none) pertaining to the use and application of biotechnology. What is more, there was a general deficiency of individuals with any previous experience of this general topic. Lionel's reaction was simply to put together a team with the highest individual abilities and with a diverse range of professional qualifications and experience.

From its establishment in 1987, Lionel's team served the company well. An easily understood and observed system of work practices allowed the company to quickly establish large scale PH1 glass-house trialing facilities, and in 1992 to gain approval from GMAC for field trials with carnation and potato. All this from an individual well into retirement!

Those who earned Lionel's support gained a pillar of strength. Having joined the University, he still fostered the careers of erstwhile colleagues from Burnley by supporting their applications for post-graduate work at the University. Thus A.W. Kellock investigated subclover decline, J.W. Meagher made a comprehensive study of the interrelationship of

the cereal cyst nematode with *Rhizoctonia solani* and the developing wheat plant, and P.R. Smith investigated the biology of viruses associated with peach rosette disease. At the same time he always managed to have stimulating Research Fellows in the Plant Sciences group of postgraduates and staff. Dr Uri Kushnir from Israel (plant breeder), Dr. Albert Pugsley, Professor Dick Hageman (agronomist/plant physiologist) from the USA, Dr. (now Professor) Lester Burgess (plant pathologist) from Sydney University, Dr Hans Lambers (crop physiologist) from Wageningen and Professor Peter (L.B.) Thrower (plant pathologist) from Hong Kong, were among them. During Lionel's tenure, funding support for research in the School of Agriculture was the highest, per capita, within the University and within the School, Plant Sciences turned out the greatest number of higher degrees and the greatest volume of published work.

It was fitting that his last major research involvement was with a virus disease, peach rosette and decline. P.R. Smith and he had become interested in the disease while Lionel was still at Burnley where they had determined that it was caused by one or more of three viruses present in infected trees (Stubbs and Smith 1971). In the mid 1970s Peter Smith obtained leave to undertake a PhD program involving a study of the biology of this destructive disease. Dr. T.F. Neales and Lionel supervised the project which was run to a very satisfactory conclusion (Smith and Neales 1977; Smith and Stubbs 1976; Smith *et al.* 1977a; 1977b).

International connections and recognition

Recognition of his scientific worth and leadership qualities were first bestowed by the AAC meeting in Melbourne in 1949. With the general dearth of capacity to deal with plant viral problems in Australia and the substantial progress being made at Burnley, Resolution 11 from the meeting recommended to AAC 'that the AAC strongly endorse further development of Burnley as a centre for the diagnosis and further study of plant virus diseases'. It must be remembered, that at the time there were no electron microscopes, ELISA tests or sophisticated molecular biological techniques which make the diagnosis of plant virus disease so much simpler and assured today than in the 1940s and '50s.

He began work at a time of great insulation and isolation of the various States of Australia. His first

official business out of the state was to attend a conference on potato and vegetable problems in Canberra in 1951 while his first officially sanctioned visit to New South Wales was in June/July of 1955 for the second ACC Plant Disease Conference at Hawkesbury Agricultural College where he was invited to lead discussion on viruses of grape vines, stone fruits, pome fruits, small fruits and vegetables in the quarantine section as well as contribute papers on 'Trials to Remove Viruses from Fruit and Vegetables with Heat Therapy' and 'The Problem of Virus Introduction in Nursery Stock' (Stubbs 1955c; 1955d).

Also in 1955 he was awarded a Commonwealth Fund of New York Fellowship (supported by the Harkness family and later called Harkness Fellowships) which enabled him to spend 12 months studying virological research programs and techniques in the United States from September 1955 to August 1956. For this period he was a Research Associate in the Department of Plant Pathology, University of California, Berkeley and through an arrangement with the Department of Entomology at that University engaged in a study of virus-insect vector relationships. From August 1956 he spent some time in the United Kingdom and the Netherlands. He was struck by the fact that wherever he went, information was made freely available, he was able to discuss openly matters of mutual interest, and learn about new problems. Through his Harkness Fellowship he made many lifelong associations which resulted in a valuable international network and enriched the work at Burnley through two-way follow-up visits and exchanges. At the relatively early age of 40 he was the elder statesman in plant virology in Australia and as the years passed, was recognised as one of Australia's most respected plant pathologists.

In 1966 he was Chairman of the Organising Committee for the ACC/CSIRO Australian Plant Pathology Conference held in Toowoomba, Queensland. The Committee invited Dr. J.M. Hirst, a highly respected plant pathologist from Rothamsted Experiment Station, UK to attend as guest of the conference.

In 1967 Lionel was appointed Australian correspondent for the Commonwealth Mycological Institute, as IMI was then called. That same year, he visited New Zealand as the guest of DSIR and the NZ Fruit Growers Federation to advise on virus diseases of stone fruit. In 1968 he led the Australian delegation to the Eighth Commonwealth Plant

Pathology Conference in England where he was elected Chairman of the conference. This preceded the First International Plant Pathology Congress, held at Imperial College, London from 14 to 26 July. It was attended by 1100 delegates including 20 Australians. He was invited to give a paper 'Lettuce necrotic yellows virus' in a session entitled 'Wild hosts in the ecology of crop viruses'.

It was during this period that he was invited to apply for one of the two Chairs in Agriculture being offered at Melbourne University. On 1 March 1969 he took up his appointment to a Faculty in the process of re-organisation, recognising with an element of regret, that it probably meant the end of his personal involvement in research, since there was much re-organisation required. He embraced the task with his usual enthusiasm and began building up a strong research facility and team in plant sciences. The University had agreed to appoint Deans to the new Faculty on a three year rotation. Professor D.E. Tribe was the first Dean, with Lionel the second from 1973-75. As a Professor, head of a Section and as Dean, he was involved in many University committees. In 1976, on the death of Dr. Clive Disher, the University inherited an 1800 ha property, *Strathfieldsaye*, in East Gippsland. Lionel enjoyed his involvement with the administration of the estate and worked hard to develop a useful university presence in the area.

In 1974-75 he was President of the Australasian Plant Pathology Society. In 1975-76 he visited the University of California spending time in the Departments of Plant Pathology at Riverside, Davis and Berkeley. In July he visited London where he again led the Australian delegation to the Ninth Commonwealth Plant Pathology Conference, and where he was the CSIRO appointee to the Australian delegation to the Commonwealth Agricultural Bureaux Review conference. After visiting research establishments in Britain, The Netherlands and Spain, he joined members of the International organisation of Citrus Virologists, touring citrus research stations and concluding with a conference in Athens. On his way home, he visited Malaysia on behalf of the Australia-Asia University Co-operation Scheme, to review the Plant Protection Department, Universiti Pertanian, Malaysia. The final six months of his leave was spent at the DSIR Mount Albert Research Centre in Auckland, New Zealand where he conducted research into rose wilt and decline disease, consistently isolating prunus necrotic ring spot virus from symptomless plants. He also visited vegetable, fruit

and flower production areas throughout New Zealand. On returning to Australia in April 1976, he spent a month consulting with CSIRO Division of Forest Research over a die-back disorder of eucalypts in Tasmania.

From 1976 to 1978 he was a member of the Committee of Reference for the Reserve Bank of Australia, of which he was Chairman in 1978. The committee made recommendations on the disbursement of research funds to projects in agriculture, forestry and fisheries. From 1976 to 1981 he was also a member of the Victorian Wheat Industry Research Committee.

For many years, Lionel has been a member of the Royal Society of Victoria of which he was President in 1979-80. During his career he has been made a member of Sigma Si (1956); was awarded the Australian Medal of Agricultural Science (1966); elected a fellow of the Australian Institute of Agricultural Science (1978); and was made Professor-Emeritus of the University of Melbourne (1982). During his first two years in retirement he was involved in organising the highly successful International Plant Pathology Congress held in Melbourne in 1983.

Lionel Stubbs

Lionel is a man who enjoys entertaining friends and colleagues. As with all other pursuits, he does so with enthusiasm, imagination and generosity. He is a very keen observer of nature, he is full of ideas, he loves hearing new ideas, he enjoys being provocative and he has always competed hard to be the best in whatever he does. This has resulted in a lifetime of success and achievement in all he has tackled.

Lionel has always been an enthusiastic fisherman and until recently, has made an annual pilgrimage, which began almost 50 years ago, to Bemm River which runs into Sydenham Inlet, for a fishing holiday. He is also a very keen and successful gardener.

In his 80th year, it is fitting that we remember the enormous contribution Lionel has made to plant pathology in Australia.

Publications

Stubbs L.L. and Grieve, B.J. (1944) - A new virus disease of carrot. *Journal of the Department of Agriculture, Victoria*. 42: 411-415.

- Stubbs, L.L. (1946) – A simple hand duster for the application of abrasive and insecticidal dusts in plant virus transmission stock. *Journal of the Australian Institute of Agricultural Science* 12: 53-54.
- Stubbs, L.L. (1948a) – A new virus disease of carrots: its transmission, host range and control. *Australian Journal of Science Research, Series B*. 1: 303-332.
- Stubbs, L.L. (1948b) – A destructive vascular wilt virus disease of broad bean (*Vicia faba* L.) in Victoria. *Journal of the Department of Agriculture, Victoria* 46: 323-332.
- Stubbs, L.L. (1952a) – Further host range and transmission studies with a virus disease of carrot endemic to Australia. *Australian Journal of Biological Science* 5: 399-408.
- Stubbs, L.L. (1952b) – Virus diseases of citrus in Victoria. 1. A virus disease of mandarin on rough lemon (*Citrus limon* (L.) Burmann) rootstock. *Journal of the Department of Agriculture, Victoria* 50: 124-128.
- Stubbs, L.L. (1954) – Lettuce mosaic virus disease. *Journal of the Department of Agriculture, Victoria* 52: 259-264.
- Stubbs, L.L. (1955a) – Retention of carrot motley dwarf virus in *Cavariella aegopodii* following a moulting. *Journal of the Australian Institute of Agricultural Science* 21: 267-268.
- Stubbs, L.L. (1955b) – Strains of *Myzus persicae* active and inactive with respect to virus transmission. *Australian Journal of Biological Sciences* 8: 68-74.
- Stubbs, L.L. (1955c) – Trials to remove viruses from fruit and vegetables with heat therapy. *Report of the Plant Disease Conference (AAC/CSIRO)*, Hawkesbury Agricultural College, NSW, June/July 1955, pp. 136-140, 149-154, 167-171.
- Stubbs, L.L. (1955d) – The problem of virus introduction in nursery stock. *Report of the Plant Disease Conference (AAC/CSIRO)*, Hawkesbury Agricultural College, NSW, June/July 1955, pp. 136-140, 149-154, 167-171.
- Stubbs, L.L. (1956a) – Motley dwarf virus disease of carrot in California. *Plant Disease Reporter* 40: 763-764.
- Stubbs, L.L. (1956b) – Diseases of strawberries. *Journal of Agriculture, Victoria* 54: 232-236.
- Stubbs, L.L. (1957) – A comparison of three low persistence viruses of strawberry. *Australian Journal of Agricultural Research* 8: 652-658.
- Stubbs, L.L. and McLean, D.L. (1958) – A note on aphid transmission of feathery mottle virus of sweet potato. *Plant Disease Reporter* 42: 216.
- Stubbs, L.L. (1959) – Plant virology in Australia. *Journal of the Australian Institute of Agricultural Science* 25: 11-17.
- Stubbs, L.L. (1960) – Aphid transmission of broad bean wilt virus disease and comparative transmission efficiency of three vector species. *Australian Journal of Agricultural Research* 11: 734-741.
- Stubbs, L.L. (1961) – Control of virus diseases by 'mild' strain protection. *Proceedings of the Plant Pathology Conference (AAC/CSIRO)*, Waite Agricultural Research Institute, Adelaide, South Australia, October 1961, Volume 1, pp. 8.1-8.13.
- Stubbs, L.L. and O'Loughlin, G.T. (1962) – Climatic elimination of mosaic spread in lettuce seed crops in the Swan Hill region of the Murray Valley. *Australian Journal of Experimental Agriculture and Animal Husbandry* 2: 16-19.
- Price, R.D. and Stubbs, L.L. (1963) – An investigation of the barley yellow dwarf virus as a primary or associated cause of premature ripening or "dead-heads" in wheat. *Australian Journal of Agricultural Research* 14: 154-168.
- Stubbs, L.L. (1963a) – A phytotron cabinet for heat-therapy studies with virus-infected plants. *Commonwealth Phytopathological News* 9: 49-52.
- Stubbs, L.L. (1963b) – Production of virus-free propagating material. *Journal of the Department of Agriculture, Victoria* 61: 421-428.
- Stubbs, L.L. (1963c) – Tristeza-tolerant strains of sour orange. *Food and Agriculture Organisation Plant Protection Bulletin* 11: 8-10.
- Stubbs, L.L. and Grogan, R.G. (1963a) – Lettuce necrotic yellows virus. *Nature* 197 (4873): 1229.
- Stubbs, L.L. and Grogan, R.G. (1963b) – Necrotic yellows: a newly recognised virus disease of lettuce. *Australian Journal of Agricultural Research* 14: 439-459.
- Stubbs, L.L., Guy, J.A.D. and Stubbs, K.J. (1963) – Control of lettuce necrotic yellows virus disease by the destruction of common sowthistle (*Sonchus oleraceus*). *Australian Journal of Experimental Agriculture and Animal Husbandry* 3: 215-218.
- Stubbs, L.L. and Walbran, W.I. (1963) – Accumulation of nitrate in oats infected with barley yellow dwarf virus. *Australian Journal of Agricultural Research* 14: 737-741.
- Stubbs, L.L. (1964) – Transmission and protective inoculation studies with viruses of the citrus tristeza complex. *Australian Journal of Agricultural Research* 15: 752-770.
- Stubbs, L.L. and Meagher (1965) – A virosis-like proliferation (Witches' broom) of lucerne (*Medicago sativa* L.) caused by eriophyid mite (*Aceria medicaginis* Keifer). *Australian Journal of Agricultural Research* 16: 125-129.

- Smith, P.R., Stubbs, L.L. and Sutherland, J.L. (1965) – Internal browning of tomato fruit induced by a late infection of Tobacco Mosaic Virus. *Australian Journal of Experimental Agriculture and Animal Husbandry* **5**: 75-79.
- Stubbs, L.L. (1966a) – Inactivation of viruses in plants grown in a high-temperature environment. Working Papers of the Australian Plant Pathology Conference (AAC/CSIRO), Toowoomba, Queensland, November 1966, pp. 1-11-16.
- Stubbs, L.L. (1966b) – Biological control of *Cavariella aegopodii* Scopoli by an introduced parasite, *Aphidius salicis* Haliday. Working Papers of the Australian Plant Pathology Conference (AAC/CSIRO), Toowoomba, Queensland, November 1966, pp. 1-48-49.
- Stubbs, L.L. (1966c) – Apparent elimination of citrus exocortis virus by heat therapy and shoot-tip propagation. Working Papers of the Australian Plant Pathology Conference (AAC/CSIRO), Toowoomba, Queensland, November 1966, pp. 1-55-56.
- Stubbs, L.L. (1968) – Lettuce necrotic yellows virus. Abstracts of Papers of the First International Congress of Plant Pathology London, July 1968, p. 195.
- Frazier, N.W. and Stubbs, L.L. (1969) – Pallidosis – a new virus diseases of strawberry. *Plant Disease Reporter* **53**: 524-526.
- Stubbs, L.L. (1971) – Plant Pathology in Australia. *Review of Plant Pathology* **50**: 461-478.
- Stubbs, L.L. (1971) – The assessment of economic loss caused by plant pathogens. Working Papers of the Australian Plant Pathology Conference (AAC/CSIRO), Hobart, Tasmania, November 1971, pp. 1.1-1.4.
- Stubbs, L.L. and Smith P.R. (1971) – The association of *Prunus* necrotic ringspot, prune dwarf and dark green sunken mottle viruses in the rosetting and decline disease of peach. *Australian Journal of Agricultural Research* **22**: 771-785.
- Taylor, R.H. and Stubbs, L.L. (1972) – Broad bean Wilt Virus. In, B.D. Harrison and A.F. Murrant (Eds) CMI/AAB Descriptions of Plant Viruses, Set 5, Sheet 1.
- Burgess, L.W., Ogle, H.J., Edgerton, J.P., Stubbs, L.L. and Nelson, P.E. (1973) – The biology of fungi associated with root rot of subterranean clover in Victoria. *Proceedings of the Royal Society of Victoria* **86**: 119-128.
- Stubbs, L.L. (1975) – The need for greater public awareness of the importance of plant diseases. *Australian Plant Pathology Society Newsletter* **4**: 1-3.
- Smith, P.R. and Stubbs, L.L. (1976) – Transmission of prune dwarf virus by peach pollen, and latent infection of peach trees. *Australian Journal of Agricultural Research* **27**: 839-843.
- Smith, P.R., Stubbs, L.L. and Challen, D.I. (1977a) – Studies on the epidemiology of peach rosette and decline in Victoria. *Australian Journal of Agricultural Research* **28**: 103-113.
- Smith, P.R., Stubbs, L.L. and Challen, D.I. (1977b) – The detection of prune dwarf virus in peach trees affected with rosette and decline with golden Queen peach as an indicator, and the distribution of the virus in affected trees. *Australian Journal of Agricultural Research* **28**: 115-123.
- Kellock, A.W., Stubbs, L.L. and Parbery, D.G. (1978) – Seedborne *Fusarium* species on subterranean clover and other pasture legumes. *Australian Journal of Agricultural Research* **29**: 957-982.
- Kellock, A.W., Stubbs, L.L. and Parbery, D.G. (1980) – Infection of seed of subterranean clover and species by species of *Fusarium*. *Australian Journal of Agricultural Research* **31**: 297-306.
- Stubbs, L.L. (1994) – A discussion of past events and influences in the development of Australian plant virology. *Australasian Plant Pathology* **23**: 138-143.

References

- Bald, J.G. and Pugsley, A.T. (1940) – Main virus diseases of potato in Victoria. *Council for Scientific and Industrial Research Pamphlet* No. 110.
- Fish, S. (1970) – The history of plant pathology in Australia. *Annual Review of Phytopathology* **8**: 13-36.
- O'Loughlin, G.T. and Chambers, T.C. (1967) – The systemic infection of an aphid by a plant virus. *Virology* **33**: 262-271.
- Pittman, H.A. (1927) – Preliminary note concerning the transmission of spotted wilt by an insect vector (*Thrips tabaci* Lind). *Journal of the Council for Agricultural and Industrial Research* **1**: 74-77.
- Purss, G.S. (1994) – History of the Australasian Plant Pathology Society. *Australasian Plant Pathology* **23**: 122-128.
- Samuel, G., Bald, J.G. and Pittman, H.A. (1930) – Investigations on spotted wilt of tomatoes. *Bulletin of the Council of Scientific and Industrial Research* No. 44.
- Smith, P.R. (1971). Working Papers, Australian Plant Pathology Conference (AAC/CSIRO), November 1971, Hobart, pp.
- Smith, P.R. and Neales, T.F. (1977) – The growth of young peach trees following infection by the viruses of peach rosette and decline disease. *Australian Journal of Agricultural Research* **28**: 441-444.