

Emeritus Professor Reinhard Ferdinand Mathias Van Steveninck (1928–2017) and Dr Margaret Elva Van Steveninck (1931–2017) – plant physiologists and electron microscope X-ray microprobe specialists

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Abstract. This obituary highlights the careers and contributions of two eminent plant physiologists. Emeritus Professor Reinhard Van Steveninck (1928–2017) was educated at Wageningen and London University. He joined the Department of Scientific and Industrial Research (DSIR), New Zealand, and achieved early recognition for his publications on abscission and mechanisms of salt uptake of plants. He was appointed Professor of Agriculture (Plant/Soil Science) at La Trobe University in 1976. He expanded his research into salinity tolerance of lupins and the ultrastructural localisation of ions using X-ray microprobe analysis. He was a good teacher and nurtured and trained many researchers in this area. He was a recognised expert in using a combination of ultrastructural techniques to study the movement of ions within plant cells and across tissues. His publications include book chapters on plant physiology, as well as a major review on the ‘washing’ or ‘ageing’ phenomenon in plant tissues. He was an active member and President of the Australian Society of Plant Physiologists. Margaret Van Steveninck (1931–2017) worked as a Research Assistant at Adelaide University and subsequently as a Demonstrator and Senior Demonstrator in Botany at Queensland and La Trobe University. Her plant physiology research with her husband resulted in numerous joint publications including a chapter on microanalysis in ‘Electron microscopy of plant cells’.

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This obituary is a tribute to the late Emeritus Professor Reinhard Van Steveninck (RFM) (1928–2017) and Dr Margaret Van Steveninck (1931–2017) (Fig. 1). Their careers and distinguished contributions as teachers and researchers in plant physiology are highlighted. They were renowned for major contributions of salt and ion transport within plant cells using ultrastructural X-ray techniques.

Emeritus Professor Reinhard (Ted) Ferdinand Mathias Van Steveninck was born of Dutch parents in the former Dutch East Indies Colonies, now Indonesia, on 28 July 1928. In 1945 he enrolled at the State Agricultural University in Wageningen, Holland, for the *Candidaats* and graduated in 1949, before continuing his studies for the *Ingenieurs (Ir.)* Degree which he obtained in March 1951.

In August 1951 he joined the Crop Research Division at the Department of Scientific and Industrial Research (DSIR), Lincoln, New Zealand where he was employed as a plant breeder in charge of breeding linseed, flax and lupins under Director, Dr Otto Frankel, FRS (later Chief of the Division of Plant Industry, CSIRO, Canberra). During this period, he developed an interest in reproductive physiology and plant growth substances controlling abscission in lupins. Ted’s early research achievements resulted in sole author

publications in the prestigious journal ‘Nature’ (Van Steveninck 1958, 1959, 1961, 1965), which today, requires large team efforts for research to be accepted for publication, such is the high regard of this journal. As a result, he was



Fig. 1. Dr Margaret and Emeritus Professor Ted Van Steveninck.

awarded a National Research Fellowship in Plant Physiology at King's College, University of London in 1958, where he enrolled for a Doctor of Philosophy (PhD) under the supervision of Professor TA Bennett-Clark, FRS, conducting research on the salt uptake mechanism in storage tissues. From September 1959 to July 1960 he was seconded as a Senior Scientific Officer to the Agricultural Research Council at Wye College, and worked on the characterisation and identification of the abscission accelerating hormone in yellow lupins before returning to King's College and completing his PhD (Lond.), which was awarded in 1961. He then returned to the Crop Research Division of DSIR in New Zealand, and was promoted to Senior Scientific Officer, publishing further research on salt accumulation mechanisms in storage tissues.

In August 1964 he was appointed to a 3-year Senior Research Fellowship with Professor Rutherford Ness Robertson, FRS in the Botany Department at the University of Adelaide, continuing his work on salt transport mechanisms and on the biochemical and ultrastructural aspects of changes in mitochondrial activity. In June 1967 he was appointed Senior Lecturer in the Botany Department of the University of Queensland and was promoted to Reader in 1969. In June 1972 he was awarded a 1-year British Council Travel Grant, which he spent in the Botany School and Cavendish Laboratory at the University of Cambridge.

In February 1976 he was appointed Professor of Agriculture (Plant/Soil Sciences) in the School of Agriculture at La Trobe University, and Dean in June 1976 for a period of 2 years. This position was jointly rotated by the three Professors of Agriculture in the School, and he subsequently held this position again in 1983. He was also a member of the Academic Board.

In 1979 he spent 6 months as a Visiting Professor at the Botanische Institut der Tierärztlichen Hochschule in Hanover, conducting research with Professor André Läuchli on salinity tolerance in lupins and the ultrastructural localisation of ions by means of X-ray microprobe analysis (Van Steveninck *et al.* 1982a, 1982b). This became a major area of productive research conducted with his wife Margaret, his research assistant, as well as postgraduate students and postdoctoral fellows and technical staff (Van Steveninck *et al.* 1974, 1988, 1990; Treeby *et al.* 1987; Huang and Van Steveninck 1988; Treeby and Van Steveninck 1988; Muralitharan *et al.* 1992; Van Steveninck and Fernando (1995) and continued until he retired from La Trobe University. In 1980 Ted was awarded a Doctor of Science (DSc) from the University of Queensland, in recognition of his research publications.

Ted was an enthusiastic lecturer whose lectures were greatly enjoyed by the students; his plant physiology practical classes were obviously well thought out and worked well. At La Trobe he presented courses in plant nutrition and stress physiology in the third year of the 4-year Bachelor of Agricultural Science (BAGSc) degree program, and also supervised fourth year research projects. One Sri Lankan student conducted his undergraduate fourth year research project as well as his PhD under Ted's supervision and reported that Ted was both a passionate and engaging supervisor who gradually assumed the role of a father figure and provided him with unstinting support during his subsequent academic career. Ted nurtured and trained several researchers who went on to make notable

contributions to the wider agricultural sector and to our collective knowledge of how plants grow and thrive in hostile saline soils and how to manage input resources better.

Ted's lifelong research interests were in the areas of developmental physiology, salt transport and plant nutrition – especially the role of growth regulators such as abscisic acid in controlling transport of salt and nutrients in the plant. He made significant contributions to our understanding of the role of phytohormones using techniques that seem almost primitive by today's standards but were ground-breaking at the time. His work on the compartmentalisation of sodium and chloride helped us understand how some plants are able to restrict the movement of those ions from the roots to the shoots and thereby avoid or minimise the deleterious effect of high tissue concentration. This knowledge has helped inform plant improvement programs. He developed a further interest in utilising ultrastructural techniques to study the movement of ions across and within freeze-fractured leaf, shoot and root cells using a combination of electron microscopy (EM), and scanning electron microscopy (SEM) together with X-ray microprobe analysis becoming one of the recognised experts in this field. The School of Agriculture did not possess EM facilities when he arrived, and because there was no central EM facility, Ted depended heavily on booking time on EM instruments in the Botany, Zoology and Physics Departments. This greatly hindered his work and so he successfully sought funds from both the Australian Research Council and the University which eventuated in the School obtaining a Scanning Electron Microscope with cryo-EDAX facilities in 1981. This allowed him to employ Denise Fernando as a research assistant from the mid-1980s to the mid-1990s and Ted, Margaret and Denise would often be found together at the end of the day in the EM suite examining images and X-ray data. Joe Edwards, a Professional Officer, grew and tested various plants that showed a range of cellular elemental analytical concentrations and thus demonstrated the quantitative abilities of the newly acquired EM (Edwards and Van Steveninck 1987; 1988). Ted also helped Denise pursue a career in plant science through her inclusion as a co-author in some of his publications (Van Steveninck *et al.* 1987, 1988, 1990, 1994; Van Steveninck and Fernando 1995).

The School's EM and cryo-EDAX instrument was used by several postgraduate students and post-doctoral fellows to map phosphorus, sodium and chloride as well as other mineral elements such as potassium, calcium, magnesium and sulphur, at cellular and subcellular scales across tissues and organs in response to salinity stress (Treeby *et al.* 1987; Treeby and Van Steveninck 1988; Huang and Van Steveninck 1988; Muralitharan *et al.* 1992). Ted encouraged his postgraduate students to consider seeking post-doctoral positions overseas to round off their training.

Ted's research was primarily funded through grants obtained from the Australian Research Grants Committee (ARGC) and the Australian Research Council (ARC) and his results were always published in peer reviewed national and international journals. ResearchGate data has shown that his publications have been cited over 1500 times. He also contributed chapters on plant physiology in books (Van Steveninck 1974, 1976a, 1976b) as well as a major review on the 'washing or 'ageing' phenomenon

in plant tissues (Van Steveninck 1975) and together with his wife a chapter on microanalysis in 'Electron microscopy of plant cells' (Van Steveninck and Van Steveninck 1991).

As well as being a leading scholar in his own area of interest, Ted provided excellent cross-discipline leadership in the development of the School of Agriculture. Ted was a good administrator and was highly regarded by his secretaries one of whom rated him both a true scholar and a gentleman. He encouraged the academic staff in the plant/soil area in their scientific endeavours, applications for external funding for research and laboratory and field facilities including glasshouses and soil laboratories to support their teaching and research. He also strongly supported their applications for academic promotion given the difficulties generally experienced by staff at La Trobe involved in agricultural field research, which often meant that 3-years of field trials resulted in only one major scientific paper, compared with those scientists who solely conducted laboratory-based research. He also supported their applications in attending and presenting papers at national and international industry and scientific conferences and congresses, as well as supporting the applications of local and overseas students for Commonwealth and La Trobe Scholarships for postgraduate studies.

Ted was an active member of the Australian Society of Plant Physiology, and held the positions of State Representative (1964–66), Honorary Secretary (1970–73), and President (1991–92). Ted died of pneumonia on 15 July 2017; his passing represents a significant loss to the Australian plant physiology community.

Margaret Elva Van Steveninck, nee Jackman, was born in Adelaide, South Australia, on 8 March 1931. After completing secondary school, she worked at the Waite Agricultural Research Institute of the University of Adelaide while studying part time for a Bachelor of Science (BSc) degree at the University of Adelaide. She met Ted when she was appointed as his Research Assistant in the Botany Department at the University of Adelaide. They were married in Adelaide in 1967. She also assisted as a Demonstrator in the Botany Department. Following Ted's appointment at the University of Queensland she completed her Master of Science (MSc) degree (Van Steveninck 1970) before enrolling for her PhD at the University of Queensland while working as a Demonstrator in the Botany Department. Following Ted's appointment to a Chair in Agriculture at La Trobe University in 1976, Margaret was appointed Senior Demonstrator in the Botany Department, under Professor Alan Wardrop FAA, running their second year laboratory practical classes. She was invariably happy, optimistic, kind and charming. She also actively conducted her collaborative research with Ted, which resulted in many joint publications.

Ted and Margaret had no children of their own, although Ted had two daughters from his first marriage. They travelled extensively, particularly to Professor Horst Marschner's group at the University of Hohenheim in Germany, and always took sabbatical leave overseas. Both Ted and Margaret were wonderful hosts and participants in the convivial early days of La Trobe University hosting staff and student gatherings around their swimming pool at their home in Old Eltham Road. Ted loved sports and arts and often engaged in long chats on cricket in

the School of Agriculture tea room with some of his students. They both loved to garden and Ted always had a productive vegetable and blueberry garden.

Ted retired from La Trobe University in 1993 and was appointed Emeritus Professor, and retained an office in the School for many years. After retirement they built a home at Noosa Heads where they spent 6–8 months each winter. The couple were active members of the Noosa Parks Association, and helped with many revegetation projects and warmly welcomed visits by former staff members. In summer they retreated to their Melbourne apartment in the city where they enjoyed attending the opera, classical music recitals and performances and tennis. They were also keen bushwalkers.

Ted and Margaret downsized into a retirement village in Camberwell, Melbourne where Margaret's health deteriorated and in later years, she became dependent on him for her care. They relocated to Adelaide in 2015. Margaret died a few months after Ted, on 20 October 2017.

Ted is survived by his daughters Annette and Garcia, son-in-law Keith and four grandsons.

Conflicts of interest

The author declares no conflicts of interest.

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