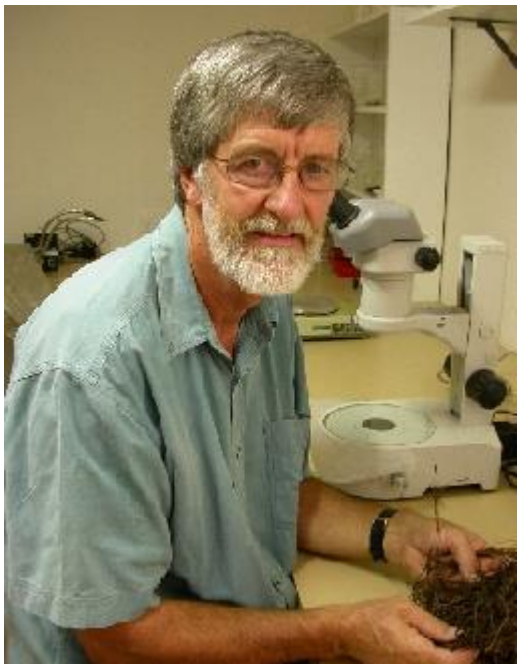
APPS Fellow and Honorary Member
Dr Graham Stirling



Graham Stirling was born in 1947 and grew up on his family's wheat and sheep farm on Kangaroo Island. He commenced his agricultural science studies at the University of Adelaide in 1965, intending to specialise in pastures and grazing animals but finished up majoring in Horticulture and Plant Pathology. Dr. John Fisher then introduced him to the fascinating world of nematodes and supervised his Honours and Master's projects on the ecology of stubby root nematodes (*Paratrichodorus*).

Graham moved to Loxton in 1970 as a Nematologist with the South Australian Department of Agriculture and decided to concentrate on root-knot nematode (*Meloidogyne* spp.) because his surveys showed that it was causing major losses throughout the South Australian wine industry. Graham was convinced that nematode-resistant rootstocks would solve the problem and argued that the ban on the importation of grape rootstocks into South Australia (due to the risk of *Phylloxera*) was not justified. The ban was eventually lifted and this enabled Graham to screen a wide range of rootstocks for resistance to the main species of root-knot nematode in South Australia. Since propagation problems were limiting the supply of grafted vines to industry, Graham then turned his hand to grafting research. By 1975, the grafting problems had been solved and bench-grafted grapevines were available to growers. Graham therefore moved on to other challenges.

The award of a CSIRO Post-Graduate Studentship in 1975 provided Graham with an opportunity to move to the University of California, Riverside, where he intended to study mechanisms of resistance to root-knot nematode in grapevines. However, he was soon introduced to the biological control work being done in Dr. Ron Mankau's laboratory and decided to specialise in that area. At a time when most biological control workers were studying nematode-trapping fungi, he found a new parasite of root-knot nematode eggs (*Dactylella oviparasitica*) and showed that it was keeping the nematode under control in some Californian peach orchards. He was awarded his Ph.D for that work in 1978. Interestingly, the fungus was not seen again until 2003, when it was found to be a major factor suppressing populations of cyst nematode (*Heterodera schachtii*) in California.

Graham returned to Loxton in 1978 and began to work on a fascinating bacterium (*Pasteuria penetrans*) that was an obligate parasite of root-knot nematode. He developed an *in vivo* culture technique that soon became the standard method of mass producing the bacterium for research purposes, and in a landmark paper published in Phytopathology in 1984, showed that inundative application of *Pastueria* provided excellent control of root-knot nematode. Later he then went on to study the host specificity of *P. penetrans* and was one of the first scientists to make a serious attempt to culture the bacterium *in vitro*.

In 1983 at the age of 35, Graham moved to a Nematology position in Brisbane with the Queensland Department of Primary Industries. His first task was to tackle a new disease that was devastating the Burdekin rice industry. He found the causal agent was a new species of needle nematode (*Paralongidorus australis*) that occurred naturally in wet environments in north Queensland. Rice paddies were an ideal habitat for the nematode and over a period of 5-10 years, populations increased to levels that completely destroyed the rice root system. By 1988 he had developed a range of control measures for the nematode, but unfortunately they were never used because the rice industry collapsed for economic reasons and rice-growing land was planted to sugarcane.

During his time in QDPI, Graham made a major effort to change the nematode management practices used in Queensland's horticultural industries. He saw nematicides as a tool of last resort and tried hard to convince growers that the principles of integrated pest management could be applied to nematodes. He encouraged the use of forage sorghum as a rotation crop in the vegetable industry, demonstrated the value of organic amendments in the ginger industry and showed that nematode populations on many pineapple farms were not high enough to warrant nematicide treatment.

Although Graham's primary responsibility in QDPI was to find immediate solutions to the nematode problems being faced by growers, he retained an interest in biological control because he was convinced that our understanding would eventually improve to the point where biological control agents would be provide useful nematode control. In 1991, his book entitled 'Biological Control of Plant Parasitic Nematodes' was published in the UK and became accepted internationally as the standard reference text in that area. During the next five years he developed several commercially-acceptable formulations of nematode-trapping and egg parasitic fungi and demonstrated their potential in the field.

Graham eventually found that it became more and more difficult to work within the constraints of a government agency, and so in 1997 he joined his wife Marcelle (also a plant pathologist) in their own company (Biological Crop Protection Pty. Ltd.). This allowed him to focus on what he thought was a plant pathologist's primary role: undertaking research, providing diagnostic services and helping growers improve their disease management. The first major issue that he addressed was the withdrawal of two widely-used soil fumigants: ethylene dibromide in the pineapple industry and methyl bromide in the vegetable industry. Rather than simply replacing one chemical with another, Graham used the opportunity to introduce more sustainable management practices for soil-borne diseases into both industries. He therefore concentrated on deriving economic thresholds for root-knot nematode, establishing monitoring procedures for key pathogens and providing predictive services for consultants and growers. Diagnostic tests for *Meloidogyne* and *Fusarium oxysporum* f. sp. *lycopersici* were developed in collaboration with colleagues in CSIRO and SARDI and were the first validated DNA tests for soil-borne pathogens to be available in horticulture.

From 1995 to 2006, Graham also made a major contribution to the Sugar Yield Decline Joint Venture, a multi-disciplinary research project that was established by Sugar Research and Development Corporation to determine the causes of yield decline in the Queensland sugar industry and develop

solutions to the problem. Graham considered this one of his most satisfying assignments because the scientists involved worked together as a team and the outcome of their work was a new farming system that changed the way sugarcane was grown. This farming system (which involved crop rotation, controlled traffic, reduced tillage and residue retention) was more profitable and sustainable than the previous sugar farming system and overcame most of the physical, chemical and biological constraints that were causing yield decline. His main contribution was to demonstrate that plant-parasitic nematodes were one of factors causing yield decline, that nematode control was one of the reasons that soybeans and other legumes were useful rotation crops, that inputs of organic matter were important in enhancing the suppressiveness of soil to nematode pests, and that free-living nematodes were useful indicators of the biological status of sugarcane soils.

The work on yield decline of sugarcane gave Graham a better understanding of the soil biological environment and how it was influenced by the farming system. He continued working with sugarcane but also commenced similar projects on cereals and vegetables. This work showed that rotation crops, tillage practices and organic inputs influenced the suppressive potential of soil and therefore played a major role in sustaining the biological control agents that normally keep plant-parasitic nematodes under control. This work is continuing and in the next few years he hopes to see the day when all crops (but particularly vegetable crops) are grown using farming systems that sustain the beneficial soil biota and therefore enhance the natural biological control mechanisms that should operate in all soils.

During a career that has so far spanned 37 years, Graham Stirling's energy, enthusiasm and organisational skills have enabled him to make a contribution to a wide range of agricultural and horticultural industries. A commitment to achieving practical outcomes has also ensured that the results of Graham's research were adopted by growers. Graham felt that scientists had a responsibility to communicate their results to others and this is evidenced by the more than 100 research papers and many more extension publications that he produced during his career. However, Graham's contribution to his profession should not just be measured by his research and extension contributions. For example, he was APPS Regional Councillor in Queensland for several years, he has served as a Senior Editor of Australasian Plant Pathology, he was a driving force behind the establishment of the Australasian Association of Nematologists, he was a member of the committee that organised the first Australasian Soil-Borne Diseases Symposium and he also supervised ten students during their post-graduate studies at the University of Queensland and James Cook University.

Marcelle Stirling, Trevor Wicks, Ken Pegg.

Biography from UC Davis

Biography from Nemaplex