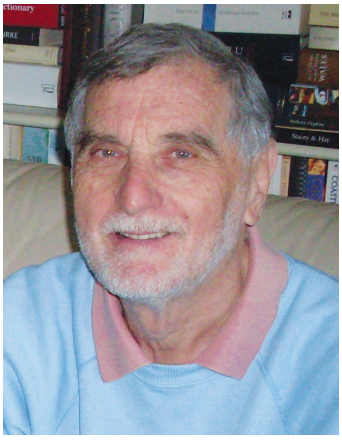
The Royal Society of Queensland
Award of Life Membership to Dilwyn J. Griffiths, 15 June 2021



Born in 1932 and brought up in a rural farming community in West Wales, UK, Dilwyn Griffiths received his early education at Brynconin Primary School and later at the nearby County Secondary School in Narberth, Pembrokeshire. His ambition was to train as a schoolteacher, and in his later school years (the two-year sixth form of the Welsh Joint Education System), he developed an interest in science. Candidates for the Higher School Certificate were required, in those days, to submit for examination a piece of practical independent work of their own choosing and design. He decided to carry out and report on some simple experiments to measure the growth of selected plants under different conditions – his first attempt at trying to obtain reportable quantitative data to describe basic physiological processes.

Later, at University College Swansea in the University of Wales, he was taught by Professor Florence Mockeridge (Head of the Department of Botany). After graduating with an Honours I in botany, with zoology and pure mathematics as subsidiary subjects, Dilwyn sought to combine his interest in plant growth studies with his aptitude for quantitative data by experimenting with pure cultures of unicellular microalgae, where growth rates could be more precisely evaluated and expressed than was practicable for higher organisms. In pursuing these studies, he noted that different microalgal species used different nutritional processes to fuel their growth requirements, ranging from obligate autotrophy (i.e. photosynthesis), facultative heterotrophy (i.e. photosynthesis supplemented by alternative methods of acquiring carbon and energy) to obligate heterotrophy (entirely dependent upon non-photosynthetic processes).

There was growing worldwide interest at the time in using microalgal cultures for biomass production and in the design of culturing systems to maximise production. This focused attention on the facultative heterotrophs, which can maintain high growth rates even under conditions of limited photosynthetic production. This became the subject of Dilwyn's doctorate, supervised by Professor H. E. Street, a leading specialist in plant tissue-culture and organ-culture techniques.

Dilwyn's subsequent research career developed along two major pathways. The first continued a more academic investigation of aspects of microalgal growth and metabolism; the other, a more applied approach, largely dating from his relocation to Australia in 1967, investigated microalgal

ecosystems and associated environmental effects, much of the work in the form of client-funded contract research projects.

Microalgal Cell Growth, Cell Division and Chloroplast Development Studies

These studies commenced with a review of the process of oxidative assimilation of organic substrates by microalgae. Then followed a series of papers describing the metabolism of these organic substrates by different microalgal species and the factors influencing cell growth and cell division, including the application of ultrastructural studies at the sub-cellular level. These studies led to the identification of a strain of *Chlorella* having a special light requirement for cell division without which the cells, under heterotrophic conditions, grew to 'giant' dimensions. Application of techniques of cell synchrony identified the cell division requirement as being linked with photosynthetic chloroplast-centred events. Studies of the recovery of cell division in 'giant' cells confirmed an apparent link between cell division and protein-related events located in the chloroplast. The observed special role, in this strain, for L-arginine was interpreted as being consistent with evidence from other experimental systems (other microalgae, plant and animal cells and yeast) of the involvement in the cell-cycle of certain regulatory proteins (cyclin-dependent kinases – CDKs).

Marine and Freshwater Microalgal Ecosystems

Studies of marine microalgal ecosystems used isolated and cultured phytoplankton species to provide estimations of their contribution to the productivity of marine waters, and of their susceptibility or tolerance to copper, commonly used as an algicide in 'nuisance' microalgal ecosystems. *In situ* incubations in coral reef waters pointed to a relatively low contribution from the phytoplankton to the productivity of coral reef waters. Observations that the microalgae of tropical marine waters frequently occurred in symbiotic association with a range of invertebrate hosts prompted further investigation of these particular microalgal ecosystems. These studies then focused on symbiotic associations between a range of invertebrate hosts and a unique 'microalga' *Prochloron* having ultrastructural affinities with prokaryotes (i.e. bacteria-like organisms) and pigment characteristics resembling those of green microalgae and higher plant chloroplasts – both features of particular relevance to considerations of the evolution of chloroplasts, as summarised in a later review of the *Prochloron* group of organisms (the Prochlorophytes).

Much of northern Australia, especially away from the coastal fringe, is arid with high rates of evaporation and large seasonal and annual variabilities of rainfall and runoff. There are very few natural lakes, and more recent settlement of the region has been supported by the construction of water storages to provide year-round supplies of water for domestic, agricultural and industrial use. Such developments inevitably create novel aquatic ecosystems, with microalgae as an important, but not always a dominant component, requiring careful management based upon extensive scientific monitoring and study. Studies commissioned by Mount Isa Mines, for example, over the years yielded a comprehensive body of information describing the hydrobiology of a number of the artificial lakes of the region and contributing substantially to improving the efficiency (and reducing the cost) of a range of water-treatment processes.

Similar studies were carried out at Lake Dalrymple in the Burdekin Irrigation Area and at Solomon Dam on Palm Island off the east coast of Queensland; the latter in response to what was to go on to receive worldwide attention as one of the more serious cases ever recorded of human poisoning by cyanobacterial (blue-green microalgal) toxins. The study recommended various remedial water treatment processes and tested the effectiveness of various water-column management procedures. More extensive investigations of the toxic causal agent (the cyanobacterium *Cylindrospermopsis raciborski*) followed. Dilwyn's most recent publications have taken the form of more general reviews of specific subjects reflecting his continuing interest in the biological sciences, but with particular emphasis on topics relevant to northern Australia.

Career Summary

Dilwyn's contribution to teaching and research in the biological sciences has come from his career-long work as an academic – as assistant

lecturer, later lecturer, in the University of Wales, Bangor, 1958–1967; as Senior Lecturer at La Trobe University, Melbourne, 1967–1974; and as Professor and Head of the Department of Botany within the School of Biological Sciences, James Cook University, Townsville. He considers himself to have been fortunate to have started his academic career at a time when the subject was in transition from what had previously been largely descriptive to one that gradually became more experimental, with increasing application of available technological advances and improved instrumentation. His work as a teacher (and his understanding of the subject) has benefited from his allied research interests, while his involvement in both pure and applied research projects has provided opportunities for training young researchers in the wider environmental aspects of the subject. The latter have been able to acquire skills in a range of monitoring techniques, data processing and interpretation, reporting and interacting with professional officers in the water industry. Many of these scholars have gone on to successful careers in industry and other professional areas.

Dilwyn Griffiths has had a long commitment to The Royal Society of Queensland as a member and, with his wife Mrs Elen Griffiths, as a dedicated attender of Society meetings. He is recognised for his major contribution to biological sciences in Queensland's tropical ecosystems over many decades. After an extensive and distinguished career, he has been Emeritus Professor for the past twenty-four years and during that period has published four significant works: *Microalgal Cell Cycles* (2010), *Microalgae and Man* (2013), *Freshwater Resources of the Tropical North of Australia: A Hydrobiological Perspective* (2016) and *Tropical Ecosystems in Australia: Responses to a Changing World* (2020). He has been an inspirational academic leader, researcher and teacher at James Cook University, where his dry, whimsical wit was greatly appreciated. He is recognised for both his scholarship and his contribution to The Royal Society of Queensland.

The President and Council of The Royal Society of Queensland congratulate Professor Griffiths on his outstanding career and honour him with its highest award of Life Membership.

Publications

Books

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