Tribute to Nancy Millis

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Professor Emeritus Nancy Millis AC.MBE.FAA.FTSE, died on the 29th of September at the age of 90. Nancy's long life had been filled with exemplary service over a broad range of activities affecting her discipline Microbiology, Higher Education and the wider community.

She graduated Bachelor of Agricultural Science from Melbourne University in 1945. Because of her father's illness she had been obliged to leave school early and had completed Matriculation at night school over a period of two years. In those days the Faculty of Science would not accept applicants who had taken more than one year to complete their Matriculation, hence Nancy's enrolment in Agricultural Science. As it turned out this extraordinarily rigid attitude of the Faculty turned out to be a godsend for generations of Agricultural Science students who were taught by Nancy in subsequent years. Nancy thoroughly enjoyed her Agricultural Science course including her time at Dookie. She once said that she always felt at home in her Gum Boots. After her undergraduate course she enrolled for a Degree of Master of Ag. Science with Vic Skerman studying a strain of Pseudomonas able to reduce nitrate. This was the beginning of extensive research carried out by Nancy on the microorganisms involved in the nitrogen cycle. After completing her Master's she accepted a position with the Department of Foreign Affairs to work in New Guinea studying the Agricultural practices of the local women. Unfortunately for Nancy she had not been there very long before she succumbed to a massive intestinal infection, which almost killed her. After some emergency surgery and three months in Port Morseby she was transported via Brisbane to Melbourne where over many months with careful nursing and antibiotics she slowly regained her health. Not wishing to return to the tropics and coming upon an advertisement in the paper for a PhD scholarship offered by Boots for study at Bristol University in the UK, Nancy sent off an application and with a small dowry that she had received from her aunt she took herself off in the hope of a successful outcome. She was granted the scholarship and a PhD position and completed a PhD on the micro-organisms causing spoilage of Cider Fermentations in three years. After returning to Melbourne, she tried unsuccessfully for jobs at Carlton and United Breweries and at Kraft but she was probably not male enough for one and considered over qualified for the other. Fortunately, Syd Rubbo who was Head of the then Bacteriology Department at the University of Melbourne was quick to appreciate her qualities and her skills. He appointed her as Senior Demonstrator in 1952, she was promoted to Lecturer one year later, to a Reader in 1968 and to a Personal Chair in 1982. In 1954 Syd organised an early sabbatical, which enabled her, supported by a Fulbright fellowship and a scholarship offered by the American Society of University Women in Madison Wisconsin to join the laboratory of Marvin J Johnson where she studied the latest developments in the fermentation involved in the production of Penicillin. Back in Melbourne after her study leave she started her own research using strains of *Aspergillus niger* to produce Citric Acid. At the same time she was involved in lecturing to both the science students and the Ag. Science students.

Her next Sabbatical was taken in 1963 when she attended C.B. Van Niel's famous course in General Microbiology given at Hopkins Marine Station followed by a nine month period at The Institute of Applied Microbiology at Tokyo University working with Professor Suichi Aiba on methods of continuous culture of micro-organisms.

During this visit, Nancy, Professor Aiba and a visiting scientist Professor Arthur Humphrey together delivered a course in what was termed Biochemical Engineering. As Nancy later remarked this was the first integrated course in Biotechnology to be given in Japan. On her return to Melbourne Nancy collated these lectures into a textbook "Biochemical Engineering". This was one of the first textbooks in the brave new world of Biotechnology and is still being recommended in some courses in Chemical Engineering today some fifty years after its first publication.

One of the most extraordinary aspects of Nancy's academic career was her breadth of knowledge about all aspects of Microbiology and its application. Her research interests ranged from bacteriophage and bacteriocins of rumen bacteria, to micro-organisms involved in the nitrogen cycle in marine sludges, to bacteria able to break down phenols and various hydrocarbons. She also investigated the possibility of using hydrocarbons as a food for growing yeasts and she was constantly being asked to solve problems caused by the growth of micro-organisms in unexpected places and on unexpected substrates. One of these involved deterioration of a major Highway between Melbourne and Sydney and another the blockage of drainage pipes in the new Art Centre in Melbourne. This breadth of understanding coupled with a healthy scepticism for any

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unsubstantiated claims made her a very popular and very successful teacher. She was able to engage with students whether in field work, in the lab or in the lecture theatre. She is fondly remembered by generations of Ag. Science and other students at Melbourne University. In addition to the Ags, Nancy introduced and taught one of the first courses to be offered in Australia on Industrial Microbiology. She was also involved for many years giving lectures on this topic to the Chemical Engineering students.

Her deep understanding of Industrial and Agricultural Microbiology combined with a no nonsense approach to solving important problems meant that she was ideally placed to help steer the new developments in molecular genetics into a safe and acceptable framework for application in both Industry and Agriculture. In 1978 Nancy was a member of the Fenner committee reviewing Recombinant DNA in Australia for the Academy of Science. As a result of that report the government set up a new committee The Recombinant DNA Monitoring Committee (RDMC) with Nancy as the Chair. During its eight year tenure this committee, under Nancy's guidance produced and oversaw the implementation of important guidelines for work in Laboratories, in Industry and for the Planned Release of Genetically Modified Organisms. Due to an Acronym change this committee became the Genetic Manipulation Advisory Committee (GMAC) and Nancy continued as Chair until, this committee was replaced by the Office of the Gene Technology Regulator (OGTR). The relatively untroubled and careful introduction of this Technology in Australia owes much to the dedication and skills of Nancy Millis in her interactions with government, scientists and the general public.

Nancy also had an abiding interest in water quality and water management. She was Chair of the Board for the CRC for Water Quality and Treatment, a member of the Board of the CRC for Fresh Water Ecology, Chair of the Research Advisory Committee Murray –Darling Freshwater Research Centre and member of the Board of MMBW. At the same time her own research interests extended to the microbial ecology of wetlands and estuaries and involved pollution studies in Western Port and Port Phillip Bays.

From its very foundation Nancy was an enthusiastic and prominent supporter of the Australian Society for Microbiology. She was National Secretary from 1964–67, President 1978–80, Rubbo Orator 1982 and made an Honorary life Member of the Society in 1987. She was very much involved in the Annual Scientific Meetings where her wit and wisdom were greatly appreciated.

Nancy's very effective contributions as a committee member meant that during her lifetime she served with distinction on many other committees too numerous to list here. She was generous with her time and always conscientious in her preparation. Her consistent contributions have been recognised with a number of accolades. In 1977 she was made a Member of the British Empire (MBE), and in 1990 was made a Companion of the Order of Australia (AC). She was elected to the Academy of Technological Sciences and Engineering (FTSE) in 1977 and to the Academy of Sciences (FAA) in 2004 by special election recognising her conspicuous service to the cause of science with her outstanding career in Microbiology. In 2002 she was one of five scientists immortalised on stamps by the Australia Post as living legends. In 1982 she was appointed to a Personal Chair at the University of Melbourne, being amongst the first women to receive this appointment. In 1987, after her retirement, she was appointed Professor Emeritus. She received an Honorary DSc and an Honorary LLD from the University of Melbourne and an Honorary DSc from La Trobe University. Between 1992 and 2006 she was Chancellor at La Trobe University. She has a number of lectures and scholarships named after her, the Nancy Millis lecture established by La Trobe University, the Millis Oration by AusBiotech, the Nancy Millis Agriculture student scholarship at the University of Melbourne, the Millis-Colwell award of the ASM. There is the Nancy Millis building, Murray Darling Freshwater Research Centre, Albury/Wodonga La Trobe University, the Nancy Millis laboratory University of Melbourne.

Above all, there are the collected memories of all those who had the pleasure and the privilege of working with Nancy over her lifetime and these will ensure that her life and her many, many contributions to the profession and to society will not be forgotten.

For more information about the life of Nancy Millis see S. Morrison. Interview with Professor Nancy Millis, Interview with Australian Scientists, Australian Academy of Science, 12 February 2001. http://w.w.w.science.org.au/scientists/interviews/m/nm.html

S. Morrison The Pick of the Crop. Proceedings of the Royal Society of Victoria 15.9.2010 Transactions I–XII.

S. Morrison, "Nancy Millis Microbiology Boots and All" in Farley Kelly (ed). On the Edge of Discovery; Australian Women in Science, Text Publishing Company, Melbourne, 1993, pp.155–177.