ROBIN A. WOODING

6 March 1926 – 19 November 2007

Robin Alan Wooding was born at Timaru, New Zealand on 6 March 1926 and passed away on 19 November 2007 at his home in Canberra, aged 81. He was educated at Carew Primary School (a single-teacher school located in a Mid-Canterbury farming district) 1933-1938, the NZ Government Correspondence School 1939, Timaru Boy's High School 1940-1941 and Canterbury and Victoria University Colleges of the University of New Zealand 1947-1948, 1949-1950. At V. U. C. he gained an MSc degree with Second Class Honours, conferred in 1951. In 1951 he joined the Department of Scientific and Industrial Research (DSIR). The DSIR provided leave and a scholarship which enabled him to travel to Emmanuel College, University of Cambridge, where he gained a PhD, awarded in 1960, under the supervision of P.G. Saffman in the Department of Applied Mathematics and Theoretical Physics. In 1963 he left the DSIR to work under J. R. Philip in the Agricultural Physics section of the Division of Plant Industry (later within the Centre for Environmental Mechanics), CSIRO, Canberra, Australia. In 1968 he visited the California Institute of Technology on a Senior Research Fellowship. He was a visiting professor at the Johns Hopkins University (1970-1971) at the invitation of O. M. Phillips, and then at the University of Wisconsin (1971), where he worked with P. A. C. Raats whom he had met at Johns Hopkins. In 1972 he rejoined the DSIR in Wellington and continued there until his retirement, on reaching the compulsory retiring age of 60, in 1986. He was awarded a Senior Foreign Energy Scholarship by the U. S. National Science Foundation to attend Colorado State University (1975-76). He was awarded a DSc by the Victoria University of Wellington in 1970.

At the Correspondence School Robin worked at a high school level, and his second year at Timaru BHS was in a fifth form class that studied latin. Having passed the University of NZ's matriculation examination, Robin left school at 15 to work on the family farm, which he did for over four years. He developed his lifelong interest in ham radio and bought the book "Calculus Made Easy" to try to understand the Bessel functions used in the theory of frequency modulated radio transmission. With the aim of becoming a radio engineer he took an ICS correspondence course. In 1946 he was engaged on the temporary staff of the DSIR as a Junior Sounder on the Canterbury Project a joint UK-NZ combined micrometeorological and radar study of over-the-horizon propagation effects. The observations were centred on the Ashburton Aerodrome.

With his interest in science reinforced, Robin enrolled for a BSc at Canterbury University College in 1947. In 1948 he was invited to work as a summer student at the Biometrics Section of the DSIR in Wellington. The following year, in order to support his studies, he took a part-time job there, assisting with the punched-card computers, and transferred to Victoria University College to complete his BSc. In 1950 he worked full time on his MSc in Mathematics.

In 1951 Robin joined the Geophysics Division of DSIR, at first with the newly-formed Oceanographic Observatory (later Institute), working on ocean wave statistics, and then the Underwater Research Laboratory in Auckland when that was formed, working on physical oceanography. Work on classified research was not his preference, and so in 1955 he transferred to the Applied Mathematics Laboratory in Wellington. He came to the AML when it was expanding from its original brief of Mathematical Statistics into

classical Mathematical Physics, and in particular into work on the NZ geothermal area and in fluid dynamics. His first three published papers were on statistics. In one of them he introduced the multivariate distribution of complex normal variables, which is now widely used by communication theorists. This arose from his interest in the application of random-noise theory to ocean surface waves. A change in topic occurred in 1956, when he became involved with John Banwell on attempts at modelling the convective flow of heated groundwater. Robin published his numerical results, together with experimental results which he obtained in conjunction with Roy Benseman, in the Journal of Fluid Mechanics. This was the first paper from NZ to appear in that journal.

At Cambridge he quickly made his mark. His thesis topic with Phillip Saffman was the growth of fingers at an unstable diffusing interface in a porous medium or Hele-Shaw cell. The senior scientists at the DAMTP decided that he was only suited to being an experimentalist, but as he had no allotted laboratory space he did his experiments on a table in a corridor. This turned out to be an advantage as G. I. Taylor regularly walked past his setup and became interested in the project. In order to better plan his experiments Robin worked out the theory of what was happening, including adapting the solution of Taylor for dispersion during flow in a tube to flow between parallel plates. After the unstable fingering work was published Robin gained an immediate international reputation. Saffman later described Robin as his first and also best ever graduate student.

On his return to Wellington Robin became heavily involved with other DSIR scientists on the modelling of the Wairakei thermal field. It was here that he made a major contribution by establishing the plume nature of the field. He also worked with Frank Henderson on overland and underground flow of water to a stream in a catchment.

At Canberra he conformally mapped, designed and arranged the construction of the large wind tunnel in the basement of the Pye Laboratory which made possible much of the groundbreaking experimental work by the micrometeorology group over the next four decades. His most important CSIRO contributions were in water movement, and with Tom Chapman he published papers on groundwater flow in sloping aquifers. Despite strong opposition from John Philip, who wanted him to spend all his time on turbulence problems, he worked on and solved the problem of the unsaturated flow of water from a disc on the soil surface, and his 1968 paper has been cited 265 times. This theory became the basis for the disc permeameter method developed by Ian White and colleagues for measuring soil hydraulic properties. Robin and the geomorphologist Jack Mabbutt investigated the shapes and alignment of dunes in the Simpson desert, which resulted in two papers.

Robin returned in 1972 to the Applied Mathematics Division, DSIR, where he worked on geothermal energy with Alex McNabb, Elizabeth Bradford, Frances Sutton and Malcolm Grant, and also maintained publications on unsaturated flows. He developed one of the first finite element models of a gasfield, as part of an evaluation of the Kapuni field. He later extended this work, along with Warwick Kissling and Graham Weir, to the Maui gasfield, where Robin identified that dynamic effects in the neck between two gas bodies can maintain their connection in the presence of waterdrive. Robin championed the concept of reconstructing the Pink and White Terraces, by using waste water from the Wairakei geothermal power station, and he produced a novel mathematical model for the spacings between such pools.

In 1988, shortly after his retirement from the DSIR, Robin returned to Canberra, where he was given an Honorary Fellowship (renewed annually) by CSIRO Land and Water. There he and colleagues published a series of papers on convection in groundwater below an evaporating salt lake. In 2007 his listed objectives were to investigate inhomogeneity in porous media and the hydrology of the Murray-Darling Basin. He continued to publish papers until the very last days. Indeed, his last published paper was published in February 2007. In it, Robin showed how an improved formulation of the governing equations of flow and transport in porous media could lead to better agreement between numerically simulated and experimentally observed convective fingering that develops from an evaporating salt lake. Robin continued to think about new scientific problems and solutions to the very end. His mind was still incredibly sharp and curious.

Robin was a member of the American Geophysical Union, the Royal Society of New Zealand, the NZ Mathematical Society and the NZ Hydrological Society. He was also a member of the NZ Forest and Bird Society, and walking, skiing, diving, and playing chess were among his recreational activities.

On 11 May 1957 Robin married Judith Benita Simpson Jowett, who predeceased him. Robin had met Beni at work in the Applied Mathematics Laboratory in Wellington. He is survived by his sons Alan and Kevin, his daughter Josephine, and his stepsons Brian and Ronald Simpson.

Robin did not seek honours. He preferred to spend his time helping other scientists with their problems rather than on flashier activities that might have led to wider recognition. Typically Robin would listen to the description of a problem that a person had struggled with for months, quickly come up with a neat solution to the problem, and then apologize for doing so.

Robin is remembered by his colleagues as a gentleman and a gentle man. He will be greatly missed.

Don Nield; with the assistance of Brent Clothier, Alick Kibblewhite, John Knight, Robert McKibbin, Alex McNabb, Bert Olsson, Peter Raats, Craig Simmons, Graham Weir, Kit Withers

Selected papers of R. A. Wooding

The starred items have been cited over 100 times.

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