Reynold (Reyn) Gilbert Keats

15 February 1918 – 1 April 2014

Reyn Keats will be remembered as a champion for mathematics in establishing a clear presence for mathematics at the University of Newcastle and in contributing to the welfare of the Australian Mathematical Society. His early career and time at Defence laid the foundation for his understanding of the role and importance of mathematics from both theoretical and real-world perspectives. He saw the need to have a strong independent presence for mathematics at all levels of the education process as well as a strong mathematics profession interacting with the wider community.

The Early Years

Reyn was born in Port Pirie on 15 February 1918. He attended Port Pirie High School and was the dux of the school in 1933. But it was the time of the Great Depression and difficult for school leavers to gain employment. Reyn spent the first three months of 1934 at Adelaide High School with the hope of doing sufficiently well to be accepted as a student by the University of Adelaide. However, this plan ended when he was convinced by a fellow student to apply for employment as a bank clerk at the Savings Bank of South Australia. His application was successful and Reyn returned to Port Pirie as a junior clerk in that Bank. Reyn spent his limited free time at the Port Pirie Tennis Club. He improved his tennis and became Treasurer of the Club.

The War Years and Defence

Following the outbreak of World War II, Reyn joined the Army at the beginning of 1940, enlisting in the 2/48th Infantry Battalion as a private. In November 1940, he departed as a corporal with the Battalion being shipped to the Middle East. He served in the Siege of Tobruk (April – November 1941) and then moved with the Battalion to Syria. After 2–3 months there, the Battalion was assembled to move towards Egypt. The troops were confident that they were being returned

to Australia, now under threat from the Japanese, who had advanced into New Guinea. However, they were disappointed.

Reyn, now a sergeant in the Signals Platoon, was informed by the senior officers that the Battalion would take part in the Battle of El Alamein. Reyn was sure that he would soon be involved in this battle against the Germans. However, that was not to be the case. About two weeks before the El Alamein battle commenced in July 1942, the commanding officer, Lt Col Windeyer, asked Reyn to accompany him into No-Mans-Land to assess the situation. Reyn did so and was relieved to find that the enemy was present but not vigilant. On the day following, Reyn was summoned to the Battalion's Headquarters where he was informed that he was being sent immediately to the Officers' School in Syria.

After completing Officers' School, Reyn was made Lieutenant and joined the Battalion again in Palestine in time to return with it by ship to Australia, reaching Melbourne at the end of February 1943. From there, he went to Maroochydore to teach 'Signals' for several months. In September, he was able to spend a short time in Adelaide before joining the Battalion again when it moved to New Guinea. They landed near Lae in October 1943 and forced a Japanese retreat. When the Battalion returned to Australia in February 1944, Reyn attended an extended training period in Ravenshoe on the Atherton Tablelands.

The Battalion went back to New Guinea in April 1945, but Reyn was not with them. On a morning in December 1944, he was halted by the Adjutant with the words: 'How would you like to be discharged?' to which Reyn responded 'Don't be tiresome, I'm busy.' However, he was to be discharged as a result of an application he had lodged several weeks earlier. He had found out that those who had been on active service for five years could apply to attend a university and the Federal Government would pay course fees and other expenses, plus three pounds five shillings per week. Reyn's application was successful and he attended his first lecture at the University of Adelaide in March 1945.

Reyn studied at Adelaide for three years and graduated with a B.Sc. in mathematics and physics in 1947. For graduate Reyn Keats, 1948 was an eventful year. He married Joy Brealey, a pre-school teacher. (They had met at a Red Cross dance at Glenelg Town Hall soon after Reyn joined the army in 1940 and had announced their engagement when Reyn returned to Australia in 1943.) After a brief honeymoon in Tasmania, Reyn and Joy travelled to England where Reyn worked as a research scientist at the Royal Aircraft Establishment at Farnborough till late 1950.

At a meeting of the Mathematical Association in Birmingham in April 1949, Reyn presented a paper with B.T. Gilroy, entitled 'Teaching of Mathematics in Australia', which was published in *The Mathematical Gazette* of October 1949. The authors noted, with some optimism, that:

> Some increase in [the number of students attempting an Honours Degree] has occurred in recent years, and with the present expansion of secondary industries and research facilities in all States, the opportunities for the mathematician should increase considerably.

Before he received his B.Sc. degree, the Australian Government Department of Defence had offered Reyn the opportunity to join the newly formed Long Range Weapons Establishment at Salisbury — renamed the Weapons Research Establishment (WRE) in 1955 — as a research scientist. A major purpose of this Establishment was to design and oversee the building of the guided missile range at Woomera. (Reyn had actually spent three weeks at Salisbury in 1948 before his transfer to England.)

Soon after his return to Australia in 1951, a first daughter Bronya was born and then a second daughter Kristin in 1953. Reyn spent two years at the Aeronautical Research Laboratory in Melbourne then returned to WRE at Salisbury, where he worked from 1953 to 1961, with occasional work-related visits to the UK. Reyn took part in both the preparation and launching of missiles at Woomera. One was an experimental test vehicle (ETV) for an anti-tank guided missile, which was first fired on 6 December 1954. The goal was to hit a five-metre-square target at a distance of about one kilometre. Reyn was the first to successfully hit the target. He was very impressed to find he had guided the missile into the target barely a metre from its very centre.

While at WRE in the 1950s, Reyn learnt to use an analogue computer, a huge device occupying most of the space in a large building. The experience that he gleaned was a key factor in ensuing years in the use of such computers for mathematical modelling of guided missiles that were being tested at the Woomera range. Then in 1960, when an IBM 7090 was purchased, Reyn, as a member of the Systems Assessment Division (SAD), successfully argued that all colleagues who could program in FORTRAN — not just those in the Mathematical Services Group — should be able to write their own code and have their computer programs run by the data-processing office staff.

A 1998 article on the history of SAD attests to Reyn's keen mathematical mind that was in evidence at WRE:

> Keats' background in mathematics and assessment was also important. He was, what one would call, a true mathematician, one of those people who are not really convinced of the truth of anything unless they can completely understand it in mathematical terms. [2, Part II]

Peter Morton's book *Fire across the Desert* [1] contains information on the entire program at Woomera and specific references to Reyn Keats and his work there.

Adelaide University and Ph.D.

Reyn had always wanted to be an academic, so he was thrilled when, in 1961, he was offered a job at the University of Adelaide as a senior lecturer in mathematics. As well as lecturing, he worked on his Ph.D. under Ren Potts and was awarded this degree in 1965 for his thesis entitled 'The application of correlation techniques to checking and adjusting mathematical models'. The acknowledgment included:

> The topic discussed in this thesis was conceived by the author as a desirable complement to the work, on the evaluation of guided weapons

> using mathematical models, in which he had been actively engaged at the Weapons Research Establishment, Salisbury, South Australia. The experimental work was carried out using computing equipment at W.R.E.

Reyn's brother John, who had moved to the University of Newcastle in 1965, informed Reyn in 1967 that a position for a mathematics professor was soon to be advertised. Reyn applied and unexpectedly was successful. He and Joy moved to Newcastle in January 1968, where they lived for the next 40 years.

Additional insight about Reyn can be obtained from Graeme Cohen's book *Counting Australia In* [3], in particular regarding Reyn's early research career and Ph.D. thesis (p. 134).

The University of Newcastle

Reyn took up his appointment in January 1968 as Professor of Mathematics and Head of the Department, which consisted of 10 teaching staff, 5 of whom had been appointed in the 1950s. The Mathematics Department had moved with the main departments of the University to the Shortland site in 1966 and has been offering its fourth-year honours course since then. The honours class of 1968, Reyn's first year at Newcastle, consisted of four students, Brailey Sims, Glenn Cocking, John Lloyd and Alan Fenwick, all of them going on to outstanding careers in mathematics, with Alan Fenwick completing a Ph.D. under Reyn's supervision.

Reyn's organisational astuteness and talent became immediately apparent. By 1969, he had reorganised the University's mathematics curriculum. Instead of teaching Pure Mathematics, Applied Mathematics and Statistics as separate subject units, Reyn introduced teaching by topics with a topic consisting of just over 20 hours of lectures, so that all students had the opportunity to see mathematics from a variety of perspectives. The Department had always had a major commitment to service teaching for engineers so specialised teaching could be accommodated within this more flexible topic structure. Students studying for honours took additional advanced topics. The topics curriculum continues to be the basis for the present day system.

Reyn's research interest was in the area of signal detection — in particular, the detection of underwater signals using arrays of hydrophones. He received regular annual grants from the Australian Department of Supply and its successors. Obviously, information about the research he had been engaged in for Defence is not publicly available. For example, the work done at Woomera on guided missiles was classified material. Nevertheless, from an examination of his published papers, it is clear that his enthusiasm for signal processing was passed on to his research students and collaborators.

His graduate students at Adelaide included Mee Chooi Cheng (Ph.D., 1968), Helen Hutchens (M.Sc., 1969), and several others jointly supervised with Ren Potts, while at Newcastle they included Barrie Stokes (M.Math., 1974), Alan Fenwick (Ph.D., 1975), Vincent Yu (M.Math., 1977), and Winifred Frost (M.Math., 1984).

Because of his earlier research work with industry, Reyn understood that students should know about the wide field of applied mathematics. Consequently, his early staff appointments to the Department included lecturers such as Rodney Vaughan, with research interests in Traffic Engineering, and Annette Dobson, with research interests in Medical Statistics. His objective was to ensure that the Department's doctoral students considered careers in industry to be as important as in academia. In 1971, Tony Guttmann was appointed. He comments that 'It was a wonderful time with typically three or four new appointments each year for a number of years. .... We were a young, active and enthusiastic group.'

Reyn saw the importance of contact with high schools, especially in attracting talented students from the Hunter Valley to study at the University of Newcastle. He organised staff to hold Summer Schools each January. These generally attracted over 100 senior students from the Hunter Valley, with many of them billeted in Newcastle. The first School was held in 1969, and Schools were held each year till 1987. The Department's Mathematics students were encouraged to be tutors in order to enhance their comradeship. Maurie Brearley, an Adelaide University colleague of Reyn, was an inspiring visiting lecturer at a Summer School later in the series. Working with the Newcastle Mathematics Association, Reyn organised the production of a high school mathematics journal, which ran to three issues a year. The first issue was in 1976 and the series continued till 1987.

Not surprisingly, Reyn was a skilful university politician. His outstanding achievement was to persuade the University Senate to create a Faculty of Mathematics in 1971. Graduates from the Faculty were awarded B.Math. (bachelors) and M.Math. (masters) degrees. Reyn became the foundation dean and held that role until 1976 and again from 1980 to 1982. There were 20 members of staff when the Faculty was formed. Faculty student numbers grew from 115 in 1971 to 280 in 1976. Reyn had been inspired by the outstanding example of the Faculty of Mathematics at the University of Waterloo in Canada. He organised a program of staff exchanges with Waterloo, which continued for some years. Reyn himself was an exchange professor in 1979 when he was awarded an honorary Doctor of Mathematics, D.Math., by the University of Waterloo. The concept of a faculty structure for mathematics was subsequently implemented at the Universities of Adelaide and Wollongong. Despite the break-up of the Faculty of Mathematics at Newcastle that has since occurred, the B.Math. degree continues to be offered.

One of the achievements that Reyn was particularly proud of was the number of outstanding women mathematics graduates from the Faculty of Mathematics, including Joan Cooper, who became Deputy Vice Chancellor at the University of NSW, Katherine Heinrich, who became President of the Canadian Mathematical Society, and Eileen Doyle, who became Chair of the Hunter Valley Research Foundation and a member of the CSIRO Board.

Reyn served as Deputy Chairman of University Senate 1977–1978 and participated in its various committees. He was for a time chairman of the Outside Studies Committee. He was Chairman of the Senate Committee investigating the feasibility of introducing year-round teaching incorporating cooperative programs such as the ones implemented at several North American universities. He was also active in

the University Staff Association and represented Newcastle at FAUSA federation meetings.

Retirement and Contributions to the Australian Mathematical Society

Reyn retired in July 1983. He then channelled some of his activity in support of the work of the Australian Mathematical Society. Newcastle University had hosted the Annual General Meeting of the Society in 1974 and 1982. In 1985, Reyn was appointed Advisor on Public Relations, a position to which he was reappointed in 1986 and 1988. He travelled through North America and Britain visiting overseas mathematical organisations. His report urged the formation of an Australian Mathematical Society Council, which was formed in 1989. He also called for a mathematics presence in the Australian Science and Technology Centre.

Reyn was a strong supporter of professional accreditation 'as a means of establishing the Society as a professional organisation recognised as such by business, industry and academe'. Accreditation was finally set up in 1994, with Fellows (FAustMS), Accredited Members (MAustMS), and Graduate Members (GAustMS).

Following retirement, Reyn and Joy continued to live in Newcastle for another 24 years, travelling often to visit their children and grandchildren in New Orleans and Canberra. In November 2007, they moved to Canberra to be nearer their daughters and their families, both of whom were now living there.

Reyn Keats died in Canberra on 1 April 2014. He is survived by his wife Joy, his two daughters Bronya and Kristin, four grandchildren Timothy, Patrick, Rebecca and Katrina, and one great-grandson Eli.

From bank clerk to 'Rat of Tobruk' to weapons research scientist to Professor of Mathematics, Reyn Keats had a remarkable life. As a 'founding father' of mathematics at the University of Newcastle, he has had a long and lasting influence on the Australian mathematical community.

Acknowledgement

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References

[1] Morton, P. (1989). *Fire across the Desert: Woomera and the Anglo-Australian Joint Project 1946–1980*. AGPS, Canberra.

[2] Polomka, B.J. and Biggs, A. Guided weapons: the development of mathematical models and computer simulations in Australia. Parts I, II, and III. http://members.iinet.net.au/~alexandergbiggs/histpt1.html.

[3] Cohen, G. (2006). *Counting Australia In*. Halstead Press (in association with the Australian Mathematical Society).

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