

Raymond Leslie Martin 1926–2020

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ABSTRACT

Ray Martin (1926–2020) was a talented and successful academic and leader, who won numerous awards and made discoveries that changed fundamental knowledge of the sub-discipline of physical inorganic chemistry. His journey over more than 90 years is one that demonstrates that he was one of nature's gentlemen, who enjoyed sports, arts and people. He was passionate about science and discovery, and through a series of chance events, had a peripatetic life moving from academic positions, to industry, management, a vice chancellorship at Monash University, and then scientific advisor to the Australian Federal Government. Throughout this journey, he always made strong friendships, was an exceptional teacher and outstanding mentor—he was a quiet achiever.

Keywords: Cambridge tennis blue, Chair, Victorian College of the Arts, discovered metal-metal delta-bond, Government Scientific Advisor, Industrial researcher (ICI), Physical Inorganic Chemist, Raymond Leslie Martin, Vice Chancellor Monash University.

The early years (1926–31)

Raymond Leslie Martin (Fig. 1) was born on 3 February 1926 at Fitzroy, an inner suburb of Melbourne, Victoria, Australia. He was the second child of Leslie Harold and Gladys Maude Elaine (née Bull) Martin; later Sir Leslie and Lady Martin. Soon after he was born, his mother took him in P&O ship *Benalla* to the UK, where his father was completing his PhD in physics at Cambridge with Lord Rutherford. It was on this journey, when Ray was only about six months old, that his elder brother, Leon Henry, died—a terrible trauma for his parents. Les and Gladys did not have any more children and Ray was raised effectively as an 'only child'. In 1927, his father applied for a position at the University of Melbourne; he was successful, and the family returned to Melbourne in August of that year.¹

Ray was very much shaped by his early years in Melbourne, and his earliest memories were of 'Astolat', on Riversdale Road in Camberwell, where the family rented a flat. This grand house was owned by Lin Martyn, who was a manager/owner of a foundry, the Steel Company of Australia. Astolat was home to four families, and Ray was doted on by the adults. It was here that the seeds of his life-long passion for sport and the outdoors were sown. There was an asphalt tennis court at Astolat, and aged six, while the adults were enjoying afternoon tea, Ray would appear with his tennis racquet and seek volunteers to give him a hit of tennis. Lin Martyn also had a holiday house at Sorrento (a beachside town) and often took young Ray fishing and sailing in his dingy. Ray's love of the outdoors and all sports, especially tennis, opened many opportunities in his life and he remained a competitive tennis player into his early nineties.

School years (1932–42)

Ray attended Scotch College, Melbourne, for most of his schooling, starting as a six-year-old in a class called 'Bubs'. At school, he was a good student, but was more interested in

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¹The memoir draws on the biographical memoir of Ray's father, Sir Leslie Martin. [Caro and others \(1987\)](#).



Fig. 1. Raymond Leslie Martin, circa 1961.

sports, where he was naturally talented. He played Australian-rules football, cricket and tennis in most years for school teams, and was a member of the army cadets until his penultimate year, which was called Leaving. In 1941, with only one more year to complete his secondary schooling, his burning ambition was to be a school prefect, an honour only granted to students who were in their final year. However, this ambition was thwarted, when his father accepted a secondment to the Council for Scientific and Industrial Research (CSIR) (now the Commonwealth Scientific and Industrial Research Organisation, CSIRO) Radiophysics Laboratory in Sydney, New South Wales.² World War 2 had begun a few years earlier and Australia had a shortage of the valves needed to produce radar systems for Royal Australian Air Force aircraft and naval vessels. The Martin family arrived in Sydney in March 1942. The move was to be life-changing for Ray. His final school year was spent at North Sydney Boys' High School. His reflections on this time were that the only tennis court was 'a concrete slab', and he came to properly understand the privileged life that he had enjoyed up to that time.

²Caro and others (1987).

³Caro and others (1987).

⁴Much information about their undergraduate days is drawn from Greenwood (2012a).

⁵Johnson and others (2020).

In 1942, Sydney Harbour was attacked by two Japanese mini-submarines, and Ray later recalled taking refuge under the kitchen table with his mother, trying to listen to the radio to find out what was happening.

His father was very involved in the war effort and was often away on international trips to the United Kingdom and the United States to be briefed on the latest developments in radar. As a consequence, he spent many months away from his family. Although Leslie Martin was placed in charge of the CSIR Radiophysics Laboratory (known as the valve laboratory) in Sydney, the family decided to return to Melbourne, where he was an associate professor of physics, at the University of Melbourne.³ In 1943, Ray returned to his home city and enrolled at the University of Melbourne.

Early student days (1943–8)

Ray was delighted to return to his friends in Melbourne, and enrolled in a science and engineering degree at the University of Melbourne in 1943. His first year studies included Physics I, Chemistry I, Maths I and Engineering I. His grades were good, and he especially enjoyed technical drawing that was included in engineering. However, he decided to transfer to a science degree for his second year and did not continue with engineering. Having your father as the Professor of Natural Philosophy (renamed Physics) must have been a bit daunting, and Ray decided to do a double major in chemistry.

Ray had an aptitude for chemistry, perhaps reinforced by the theatrical professor of chemistry, E. J. Hartung, who was reputed to give engaging lectures combined with dramatic demonstrations. These were projected onto a large screen that would have made the 'flames and explosions which reverberated throughout the building' a dramatic highlight for the chemistry undergraduates.⁴ Hartung's lecturing and his enthusiasm for chemistry had a positive influence on Ray. Those students who did a double-major in chemistry were a tight-knit group called 'Chem IV' and they became life-long friends, socialising, playing sport, bushwalking and studying together. Several other members of the group became professors, including David John 'Judge' Bevan and Norman Greenwood (1925–2012).⁵

The Bachelor of Science was a three-year degree course, but Ray and others enrolled in the honours stream and were required to complete Chem III and Chem IV together at honours standard in their final year. Participation in the honours stream was a *tour de force*, with practical classes from 9 am until 5 pm, five days a week, and six lectures a week (one on Saturday morning). There was an enormous

amount of organic chemistry practical work that required students to identify 'unknown compounds' using qualitative analysis. In those days there were only a few instrument-based techniques available, so the students needed to identify chemicals using other methods.⁶ Ray thrived in this environment.

There always seemed to be time for a bit of fun, despite the teaching schedule. The last day of second term included a fancy-dress hockey match between the Chem IV boys and the Chem III and IV girls followed by the Engineers Ball. This was all happening in August 1945. These were turbulent times and when Victory in the Pacific Day (15 August 1945), which proclaimed the end of the Second World War, coincided with the Chem IV Practical exam (a two-day event), the exam was cancelled. Ray and his fellow students celebrated this and the end of the Japanese participation in the war with a 'special coffee': after obtaining a test tube full of absolute ethanol, each student ignited a spoonful and used these 'flaming torches' to toast the Japanese Emperor and the professor of organic chemistry before plunging these spoons into their coffee.⁷

Ray finished his BSc degree with good grades and received the Cuming Scholarship to help him undertake an MSc degree. Interestingly, at his graduation ceremony in April 1946, five sons of professors graduated (Fig. 2). Two of those sons, were Ray and his good friend Norman, shown in the photo with their fathers, Professor L. H. Martin (physics) and Professor J. N. Greenwood (metallurgy).

Another great influence on the Chem III/IV students was Professor J. S. Anderson (1908–90).⁸ JS (as he was known) was just 37 years old in 1945 but had already established himself as a towering figure in solid-state inorganic chemistry and with H. J. Emeléus, another doyen of chemistry, he had published a textbook *Modern Aspects of Inorganic Chemistry* that was to excite a generation in what is now called materials chemistry.⁹

Three of the 1945 Chem III/IV students were accepted to work with J. S. Anderson for their MSc degrees: Ray, Judge Bevan, and Norman Greenwood. JS was born in London and educated at Imperial College (BSc 1928, PhD 1931). He came to Australia as a senior lecturer at the University of Melbourne in 1938.¹⁰ He developed a world-class research program on solid-state inorganic chemistry and specifically non-stoichiometric phases, which was the research area that attracted young Ray. It should be noted that PhD degrees were not typically available in Australian universities, although the first Australian PhD in science was awarded at the University of Melbourne in 1948.¹¹



Fig. 2. Five professors and their sons at the BSc Graduation, University of Melbourne April 1946: Professor L. H. Martin, Ray Martin, Graham Hercus, Associate Professor E. O. Hercus, Norman Greenwood, Professor J. Neill Greenwood, Philip Scutt, Professor C. A. Scutt, Owen Singleton, Associate Professor Owen Singleton, [*The Sun* (Melbourne) 8 April 1946].

The new MSc students were given research projects that required isolation of rare-earth oxides from the beach sands of Byron Bay in northern NSW. Ray's MSc thesis was entitled 'A Study of the Oxides of Praseodymium' and was submitted in February 1948. It included four chapters on theoretical and experimental work contributing to X-ray studies, electrical properties and tensimetric studies of these oxides of praseodymium and concluded that non-stoichiometric oxides exist in an intermediate state where an oxygen atom vacancy existed. Many decades later, when Ray and Judge were both in their eighties, they revived this research area and published several papers after re-analysing the available X-ray powder data for these materials and developing a general model for the structural properties of several other non-stoichiometric oxides.

Ray and Judge Bevan shared a laboratory and office (Room 49) and were given the task of 'blowing' their own vacuum lines in order to handle air-sensitive materials. In his later years, Judge recounted that Ray was given the task using Pyrex glass, which was relatively easy to manipulate; whereas Judge was given soda glass which was a much more difficult material with which to create a vacuum line.

Ray became resident tutor in chemistry at Queen's College during his MSc years.¹² This was located on the campus, which meant that he was only five minutes away from his academic and sporting facilities. These positions

⁶Greenwood (2012a).

⁷Greenwood (2012a).

⁸Hyde and Day (1992).

⁹Emeléus and Anderson (1938).

¹⁰Radford (1978).

¹¹Dobson (2012).

¹²Parnaby (1990).

were ideal for the young MSc students: they became involved in the formal aspects of College Dinners and Balls; provided tutorials in chemistry for the undergraduate students; and took part in social and sporting opportunities including regular trips to the local cinema.¹³ It was post-war and this group of young men who had avoided the harrowing experiences of war were balanced and socially adept, and yet serious about their academic pursuits and even competitive amongst themselves.

In August 1947, about six months before Ray was due to submit his MSc thesis, Anderson returned to the United Kingdom to be Deputy Director of Atomic Energy Research (later known as the Atomic Energy Research Commission) but he remained supervisor to Ray, Judge and Norman. Despite being 'left to their own devices', Anderson's students submitted their theses in February 1948. Norman and Ray topped the year, with Norman being awarded the Dixon Scholarship and the 1851 Exhibition Research Award, and Ray the Dixon Scholarship and the Kernot Scholarship.

According to Norman Greenwood,¹⁴ Ray's MSc was almost not awarded: he had 'several attempts at passing Science German, which left him at risk of not graduating from MSc. It required him to pass a 'special exam' just before he completed his MSc' ... this was ironic as, later, he became quite proficient in German and even spent a period in Stuttgart in 1953 with Professor Josef Goubeau.¹⁵

After his MSc was conferred, Ray decided that he should publish his research. JS was still overseas and letters to the United Kingdom took approximately six weeks, so Ray asked his father to recommend a good journal. His father suggested a magazine called *Nature*. Ray submitted his MSc research entitled 'Oxides of Praseodymium' to *Nature* in September 1949, and it was published on 4 February 1950. Ray was new to publishing and submitted his paper as sole author (a full list of Martin's publications is contained in Supplementary Material to this memoir); a fact that he later reflected (with a smile), 'JS probably never recovered from'.

During his MSc research, Ray had worked as a senior demonstrator in the chemistry department¹⁶ as well as being promoted to senior tutor at Queen's College¹⁷ at the University of Melbourne, but on the completion of his studies he decided to apply for an 1851 Exhibition Research Award to undertake further studies in the United Kingdom. This is a story of 'reverse nepotism', as Ray's father was on the selection committee. Leslie Martin ranked David Caro (who later became Vice-Chancellor of the University of Melbourne) first and Ray second. However,

the committee overruled Leslie Martin and both Ray and David were given an 1851 Exhibition Research Award in 1949. Ray and his father are the only father and son recipients of this scholarship to date.¹⁸ This award enabled Ray to undertake his PhD studies at Cambridge as his father had done in the 1920s. Later, in 1952, Ray was one of the few Australian recipients to also be awarded a Senior 1851 Exhibition Research Award, a grade that was introduced to enable a few carefully selected students of exceptional promise and proven capacity for original work to devote themselves full-time for two or three years to scientific research. Ray was now on the next phase of his chemistry journey, which was to undertake a PhD with Professor Harry Emeléus at Cambridge University.¹⁹

The Cambridge years (1949–54)

His ship to England was RMS *Strathaird*, which departed Melbourne on 26 July 1949. It took a month to make that journey, arriving at Tilbury, near London on 25 August. He kept a detailed diary for a short while that recorded events and impressions of that time. There were many deck sports, dinners, dances and games. Life on ship was tempered by offshore visits to Ceylon (now Sri Lanka) and India, the passage through the Suez Canal and up the coast of Spain, before finally arriving in the United Kingdom.

Ray's arrival in Cambridge in September 1949 was made easier by having two of his Aussie friends (Norman Greenwood and Barry Dawson) from chemistry (University of Melbourne) already in residence at Sidney Sussex College. They, as well as one of his tennis friends, Mimi Newing, were all enrolled for PhDs under the supervision of Professor Emeléus, although Mimi was not at Sidney Sussex. Ray shared college rooms with his friend Norman, and it was a great help to have someone who could explain the college traditions, rules and idiosyncrasies and ease his way into life in the United Kingdom.

Turning up in the chemistry department in Cambridge shortly after his arrival, Ray discovered that his PhD supervisor was on vacation. Bob Hazeldine, who had recently been appointed to a junior staff position, rather brashly told Ray that he would be his supervisor, rather than Harry Emeléus. Ray wasn't too keen on this option, so he and Norman decided to take a few weeks off themselves while they waited for Emeléus to return and they started planning a walking trip in the Lake District, Cumbria. This

¹³Greenwood (2012a).

¹⁴Greenwood (2012a).

¹⁵Joseph Goubeau was an Inorganic Chemist with whom Ray undertook a short (six month) post-doctoral research period in Stuttgart, Germany, see https://en.wikipedia.org/wiki/Josef_Goubeau.

¹⁶Radford (1978).

¹⁷Parnaby (1990).

¹⁸Phillips (2001).

¹⁹Greenwood (1996).

proved to be an extremely successful decision scientifically, as Ray and Norman walked, talked and planned a research direction that was to be fruitful in both their PhD studies.²⁰

Professor Harry Emeléus was the doyen of Britain's inorganic chemistry: a quietly spoken man described by his students as 'one of nature's gentlemen'. Greenwood noted in his book that Emeléus was enthusiastic about the two of them embarking on a new research direction, but advised that they should divide the work so that each of them would have a clearly independent piece of work to include in their dissertations.

Ray and Norman returned from their holiday in the Lake District full of new ideas from their fortnight of discussions. The plan was to undertake a systematic experimental study of the physiochemical and electrochemical properties of molecular addition compounds of boron trifluoride (BF_3). Norman had already started work on boron trifluoride-diethylether ($\text{BF}_3 \cdot \text{Et}_2\text{O}$) and then extended this to hydrates ($\text{BF}_3 \cdot \text{H}_2\text{O}$) and alcohols ($\text{BF}_3 \cdot \text{ROH}$, $\text{R} = \text{Me}$, Et , $i\text{-Pr}$). Ray undertook the adducts of boron trifluoride with esters of acetic acid ($\text{BF}_3 \cdot \text{CH}_3\text{CO}_2\text{R}$, $\text{R} = \text{Me}$, Et , $n\text{-Pr}$, $n\text{-Bu}$). The starting materials included the reactive gas BF_3 , which was prepared by heating a mixture of boric oxide (B_2O_3) and potassium fluoroborate (KBF_4) with concentrated sulfuric acid (H_2SO_4). This was not trivial, as these were highly corrosive and reactive compounds that required care and skill to prepare. Furthermore, they determined the electrical conductivity, viscosity and density over a range of temperatures. They had to design specialised apparatus to analyse the volume and composition of the evolved gases. Together they published twelve research papers between 1950 and 1954. This research advanced the field of these adducts substantially and proved a valuable contribution to understanding the coordination chemistry of BF_3 (Fig. 3, top). Of that time, Norman Greenwood noted in his memoirs, that 'It might be thought ... that research work and lectures were but minor interludes in a life devoted to travel and other social activities. Of course ... this is an illusion because laboratory notebooks and draft publications ... [suggest] that a great deal of intense effort ... and considerable progress was achieved. ... Ray and I gained something of a reputation for our ability to amass an astonishing amount of very significant results despite the short overall time we actually spent in the laboratory'.²¹

The research environment at that time was clearly stimulating for Ray, with seminars by Nobel Laureates and pioneers in various scientific disciplines being regular events at Cambridge. Examples included X-ray crystallography by Sir Lawrence Bragg (Nobel Prize in Physics, 1915), Paul Dirac on quantum mechanics (Nobel Prize in Physics, 1933), and Sir John Cockcroft (Nobel Prize in Physics, 1951), who was a friend of Ray's father. The group of young Cambridge

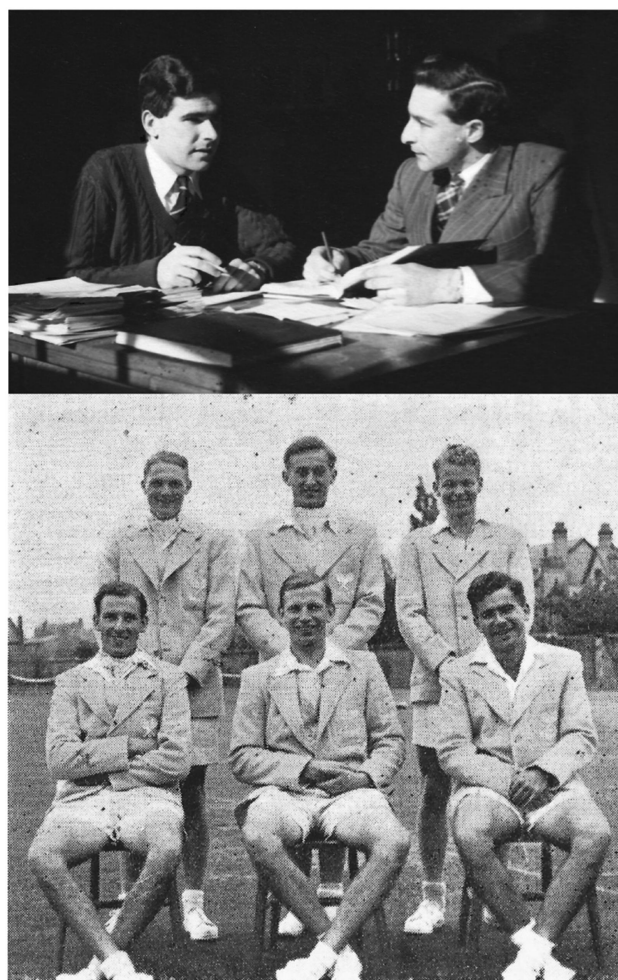


Fig. 3. Ray Martin and Norman Greenwood during PhD days in Cambridge and the Cambridge tennis team. Standing: F. R. Kipping, J. E. Barrett, I. A. McDonald. Seated: J. G. H. Hirsch, B. R. Penfold (captain) and Ray Martin, circa 1952.

chemists also regularly travelled to London to attend the Chemical Society (later the Royal Society of Chemistry's (RSC)) symposia and lectures.²² It seemed to be a truly rich intellectual environment.

Despite the scholarly research work on his PhD, Ray continued with his passion for sports and especially tennis (Fig. 3, bottom), which he played for Cambridge University and for Cambridgeshire. In addition to rival universities, such as Oxford University, there were competitions across the United Kingdom and even internationally (for example with the Netherlands). There is no doubt that this provided a valuable balance in his life, as well as expanding his friendship group.

In 1950, there were numerous social balls, The Sidney Sussex May Ball being a highlight. Also, a ski trip to

²⁰Greenwood (2012a).

²¹Greenwood (2012b).

²²Greenwood (2012b).

Reimegrend, Norway, so that Norman Greenwood could visit a young lady, Kirsten Rydland, with whom he was smitten and who would later become his wife. The trip left a lasting impression on Ray. They travelled by steamship along the fjords and by train to the northern-most regions, where the northern lights were spectacular. During the summer of 1950, the Australians (Ray, Norman, Dal and Don Swaine, and Owen Singleton) purchased a 1934 Alvis Sports 'Speed 20' (convertible) car that they named *Kanga II*, and went on a European car adventure through France, Northern Italy then Rome, Pompei including Vesuvius, Venice, Switzerland, Austria, Germany and Belgium. This took two months and was a trip of a lifetime for the Aussies. The photos show bearded men who looked like bushrangers returned to Cambridge in late August.

Ray completed his PhD in 1952 and was awarded the Senior 1851 Exhibition Research Award, which allowed him to continue as a research fellow at Cambridge.²³ He also was appointed a Senior University Scholar and Residential Fellow of Sidney Sussex College, Cambridge. This lofty position required him to attend High Table at Sidney Sussex College and be responsible for pouring port for the Fellows, which, he later reflected with amusement, was one of the more enjoyable tasks. However, he moved out of Sidney Sussex College into rental accommodation, called 'digs' during this time. He continued to excel at tennis (no doubt due to his application). He represented the university competitively and was awarded a Blue.

Later that year, Ray went to a party in London and it was there that he met Rena Laman, a Sydney girl who was on a post-university trip and was working in a pathology laboratory associated with one of the hospitals in London. Rena was the love of his life from that moment onwards and they were soon engaged. Professor Emeléus had advised Ray to do an overseas post-doctoral period with his close colleague Professor Josef Goubeau at the Technische Hochschule, Stuttgart, Germany, and Ray convinced Rena to go with him, although social protocol required that they reside in separate locations. Scientifically, the research involved distillation of deuterated perchloric acid that was required to obtain the Raman spectrum in anhydrous conditions. Of that time Ray said: 'At one stage during those postgraduate Cambridge years, however, I decided it would be good to work in another laboratory and, after some consultation, Professor Emeléus said, "Look, I have a very good friend in Stuttgart in south-west Germany. Why don't you go down and see if he'll take you on?" I went to Stuttgart, and I worked with Professor Josef Goubeau. He was a charming man, as was Harry Emeléus—old-world gentlemen both. I lived in Stuttgart for six months and did some research there. I wasn't very popular, because Professor Goubeau

had asked me to explore a compound called anhydrous perchloric acid, which nobody had ever made. This field was notorious for violent explosions and people didn't want to share a laboratory with me, as they used to feel that an explosion was imminent, but fortunately none happened. So, I had that break away from Cambridge'.

Although Ray and Rena only stayed in Germany for six months, it proved a great experience for them both and when they returned to the United Kingdom, they married on 20 February 1954 in a thirteenth-century church 'St Edward King and Martyr' in Cambridge. Sadly, their parents were unable to attend, so Harry Emeléus gave the bride away and Norman Greenwood was Ray's best man. Ray had forgotten to organise the honeymoon, but John Cockroft (later Sir John), who was a family friend, lent the couple a beach cottage, so they were able to enjoy some time together (Fig. 4).

Sydney (1954–61)

With the need to support his new wife, Ray looked for university positions in Australia. He received two offers, the first from the University of Adelaide, where Sir Geoffrey Badger was the professor of chemistry, and the other from the University of Technology Sydney, which later became University of New South Wales (UNSW), where Professor (later Sir) Ronald Nyholm was head of chemistry. Ray had attended and been inspired by a lecture that Nyholm had given at University College London in 1950 titled, 'The Renaissance of Inorganic Chemistry'. This lecture had excited Ray with ideas about novel transition metal coordination chemistry and some early work on the magnetic properties of these complexes. This research area was to become significant for Ray and he would subsequently leave his mark here as a physical inorganic chemist. Also, Rena's family were living in Sydney, so Ray chose this position to establish himself in an academic career and he was appointed a senior lecturer in 1954.

Ray and Rena quickly settled into life in Sydney, renting a small cottage from Rena's parents at the northern beach region of Newport. Ray carpooled with some other locals to do the daily commute through Frenchs Forest and across the Sydney Harbour Bridge to the campus at Kensington. Nyholm and Ray built a variable temperature Gouy apparatus to undertake magnetic studies on antiferromagnetic perovskite compounds, and they published two papers together. In 1955, however, Nyholm was appointed to University College London and left soon afterwards. Ray was asked to undertake supervision of the then PhD student Brian Figgis (later a professor of chemistry at the University

²³He was one of the few Australian recipients of a Senior 1851 Exhibition Research Award, a grade that had been introduced to enable a few carefully selected students of exceptional promise and proven capacity for original work to devote themselves full time for two or three years to scientific research.

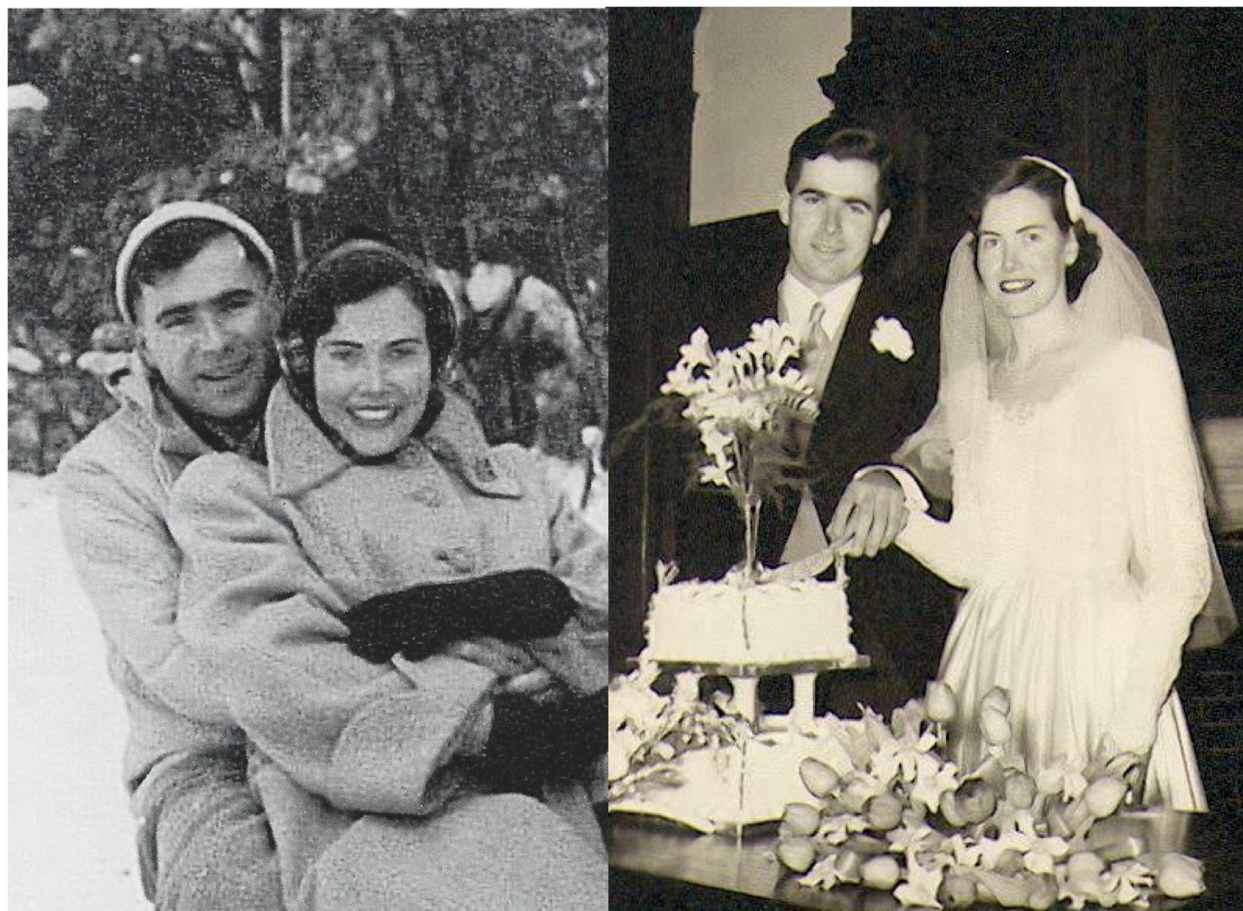


Fig. 4. Ray and Rena in Germany (circa 1953) and their wedding in Cambridge [20 February 1954].

of Western Australia), who was investigating anomalous paramagnetism of hydrated copper acetates.

Ray realised that the magnetic anomalies were due to overlapping metal-based d-orbitals on the two copper centres, and he named this interaction a δ -bond (delta-bond).²⁴ This was a significant discovery as, at that time, only bonds between s-orbitals and p-orbitals (σ -bonds and π -bonds, i.e. sigma- and pi-bond, respectively) were known to exist. Later, in 1964 F. Albert Cotton in the United States found and published what he called the quadruple bond. This was later claimed to be the naming and first example of a δ -bond in a historical overview, published in 2014.²⁵ However, Brian and Ray's work was published much earlier, in *Journal of the Chemical Society* in 1956, a few years before Cotton's description was published.

In the following years, Ray contributed an enormous body of research on the structure and magnetism of transition metal complexes. He was active in the New South Wales branch of the Royal Australian Chemical Institute (RACI) and during those years he became a father to Christopher Leon and

Lisandra Lorraine. However, after a few years Ray was missing his home city of Melbourne, so when Len Weickhardt, research director of the newly established Central Research Laboratories of Imperial Chemical Industries of Australia and New Zealand (ICIANZ), in Ascot Vale, Melbourne, offered Ray a position, he was keen to try his hand in industry.

Melbourne (1959–72)

He was appointed Associate Research Manager and Section Leader of the Inorganic and Physical Chemistry Group of ICIANZ in (1959) and the family moved to Melbourne. Ray always appreciated his time in industry; the philosophy of patent rather than publish was quite different to what he had previously experienced. However, he did combine his industry research with part-time teaching (solid-state inorganic chemistry) at the University of Melbourne. At the end of 1961, the head of the chemistry school at the university, Alan Buchanan, approached Ray with an offer to

²⁴Figgis and Martin (1956). Martin and Waterman (1957).

²⁵Falvello and others (2014).

become the foundation professor and head of the newly created Department of Inorganic Chemistry, which he accepted and started in 1962; he was thirty-five years of age. Ray wrote: 'The great Australian inorganic chemist, Professor R. S. Nyholm, FRS (born in Broken Hill and Head of Department of Inorganic Chemistry at University College, London) travelled widely promoting his conviction that "the renaissance of Inorganic Chemistry" had arrived! It was against this exciting background that I found Alan Buchanan's offer irresistible!'

The new department was fortunate that three existing members of the University, Tom O'Donnell, Don Stranks and Allan Casey, elected to transfer to the new department. Ray was also able to scour the world for experts in complementary areas (well documented by Valda McRae in her history of the chemistry school²⁶) and he appointed Ray Colton, Richard Robson, Warren Fee and Bernard Hoskins. He also seconded George Winter to the new department from CSIRO. State-of-the-art equipment was purchased, and new undergraduate courses were developed. The number of BSc (Hons) and PhD students grew. From 1962 to 1972, the annual publication output grew from fourteen to thirty-four, a reflection of the enthusiasm and engagement of the staff and students. This was an exciting and productive decade. Ray wrote: 'for those of us involved in the 1960s, the practice of 'modern' inorganic chemistry was an exciting and rewarding experience.'

Scientifically, Ray continued to pioneer studies on the magnetic properties of metal complexes, and by mid-late 1960s together with some talented students (including, Hanika Waterman, Tony Gregson, Allan White, Graeme A. Heath, Tony Masters, Norma Rhode) had characterised a class of novel spin equilibrium complexes (using ligands such as acetylacetonates, dithiocarbamates and dithiolenes). This work attracted the interest of several overseas groups, and Ray travelled extensively to Russia, Europe, the United Kingdom, Japan and the United States of America giving invited lectures. This work also led to a twelve-month sabbatical period at the Bell Telephone Research Laboratories in New Jersey. Despite the name, this was a leading research organisation and Ray relished this opportunity to work with Al (Alan) Ginsberg, exploring aspects of magnetic-exchange chemistry. They later wrote five papers together on this subject.

During his time at the University of Melbourne, Ray and some of the other young professors were active in trying to 'modernise' various aspects of the traditional approaches to university administration. At one stage, Ray was both Dean of Science and of Arts, simultaneously, which may have reflected his diplomatic management style and was a hallmark of his career.

This time and environment must have been intellectually stimulating as, together with his colleague Dr Ray Colton, he contributed three publications to the field of astro-archaeology—analysing stone circles and making predictions

about the astronomical role of Stonehenge (and other stone circles) in ancient Britain.

The family had expanded to four children with Antony Raymond and Michael Paul both being born in Melbourne, so it was an enormous task to pack for the family (using tea chests) and board *SS Arcadia*, which would take them from Sydney to the United States of America for the twelve-month sabbatical with Bell Telephone Research Laboratories in 1967–8. It was a very successful experience and Ray benefited from both the academic affiliation and the time in the United States with the family. He returned to Melbourne and submitted the publications he had assembled for his first ScD degree to the University of Cambridge, which was duly awarded in 1968.

The return to Melbourne in 1968 was to a now well-established and dynamic department, and Ray enjoyed an increase in the number of research students and regularly hosted overseas visitors.²⁷

Late in 1971, somewhat unexpectedly, Ray was approached by David Craig to consider accepting the Foundation Chair of Inorganic Chemistry (and Deanship) in the Research School of Chemistry at the Australian National University (ANU), located in Canberra. At that time, ANU had a unique structure in which the research schools in the Institute of Advanced Studies were funded directly with a block grant from the federal government and offered research-only positions (no teaching). This meant that the research facilities were top notch and overseas post-doctoral fellows were funded to support the academic researchers. Not only did Ray find this an attractive option, but his parents had semi-retired to Canberra, after his father's appointment a few years earlier to the positions of Dean and Professor of Physics at the Royal Military College, Duntroon, that was part of the University of NSW.

Although Ray accepted this position, he decided to take a six-month sabbatical first at Columbia University, New York in the first half of 1972. A leading inorganic chemist, Stephen Lippard, had asked Ray to 'look after his research group' at Columbia University while he was on sabbatical elsewhere. Ray and Rena took the younger two boys with them, Leon was left in Melbourne, boarding with a family, so as not to disrupt his penultimate secondary school year, while Lisa moved in with her grandparents to start the school year in Canberra.

Also in 1971, Ray was elected a Fellow of the Australian Academy of Science (FAA), something he was particularly proud of, as his father (Professor Sir Leslie Martin, FRS) was a founding member (1954).

The ANU Research School of Chemistry (1972–6)

The move to Canberra and to ANU was extremely successful, although Ray later lamented the lack of contact (teaching)

²⁶McRae (2007) pp. 22–28.

²⁷Davison and Murphy (2012).

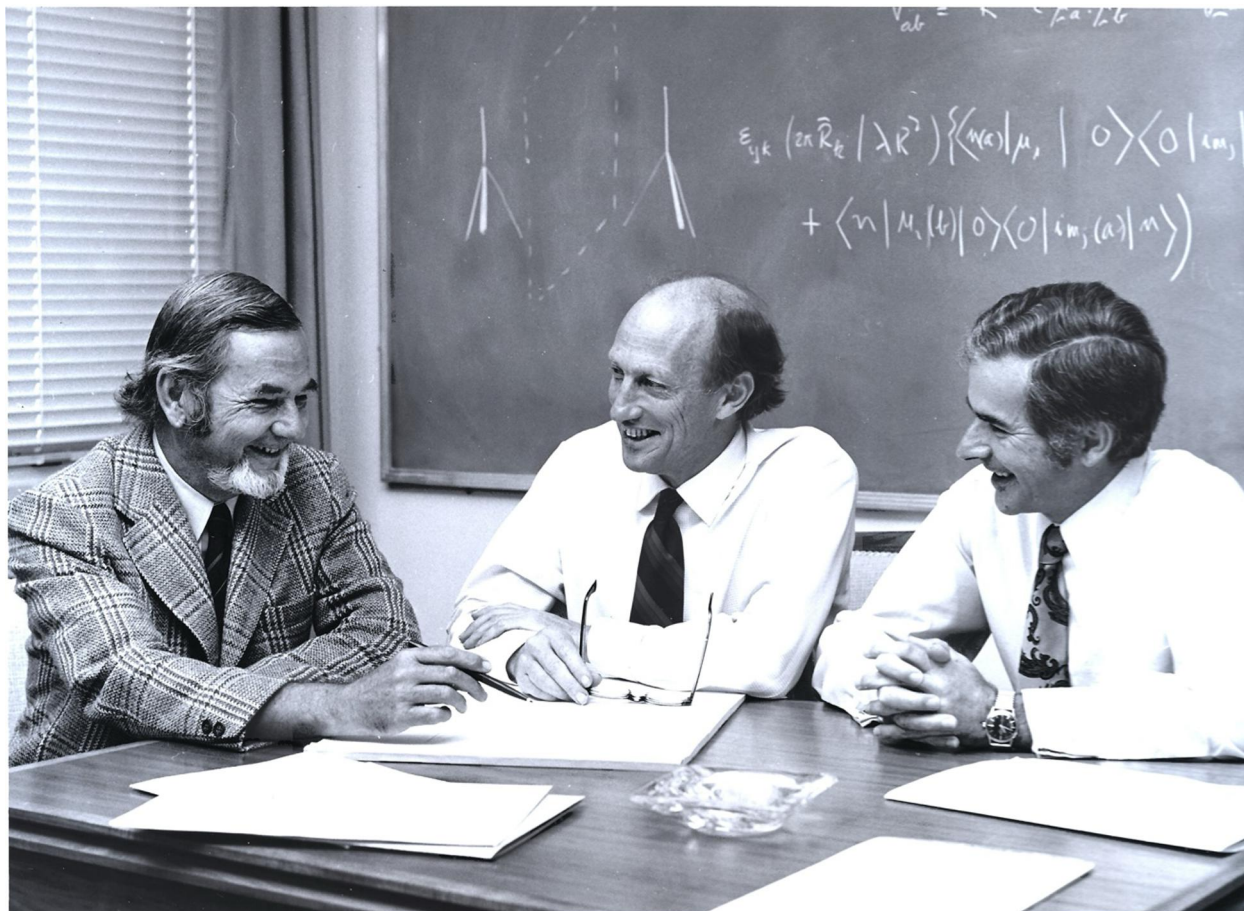


Fig. 5. The three foundation professors of the Research School of Chemistry, ANU. Professors Arthur Birch, David Craig and Ray Martin (left to right), circa 1972.

with undergraduates. His two fellow foundation professors at the Research School of Chemistry were David Craig and Arthur Birch (Fig. 5). Both were extremely successful academics and were welcoming. This was a time and place with many international visitors including the Nobel Laureates Linus Pauling and Henry Taube, as well as a plethora of international leaders in chemistry such as Ronald Mason, Harry Gray and Robin Clarke, just to name a few. There were many social activities that provided outlets for intellectual endeavours, and cricket matches, barbecues and of course Ray and his colleague Alan Sargeson won the ANU doubles tennis competition (against some young *fellas*), for which they were awarded a giant spoon that was displayed in the tearoom at RSC for many years.

Again, this was academically a productive period for Ray and he submitted his research for a second Doctor of Science in 1977, receiving this DSc from the ANU in the same year. The Martins enjoyed their life in Canberra, living on a street that backed onto Mt Ainslie nature reserve. Ray played

regular tennis and golf; Rena started painting and exhibited in the local art shows; and the children were growing up and involved in various activities.

However, once again, opportunity knocked. Ray was surprised when Brian Hone left a note for him at RSC, asking if Ray was free for a cup of tea the following day. Hone (former headmaster of Melbourne Grammar School, who had met Ray playing tennis when he was at University of Melbourne) was a member of the Council of Monash University. After that meeting, Hone noted that Ray was 'a charming, approachable man, a fine scientist of high integrity, not forceful or politically engaged, but capable of being 'resolute and tough' when the occasion required it'.²⁸ He therefore recommended the selection committee invite Ray to consider the position of vice-chancellor at Monash University. This was a challenge of a different kind, but after meeting with the committee and due consideration, Ray accepted the position and the family were once again on the move, returning to Melbourne.

²⁸McRae (2007).

Monash University, as Vice Chancellor (1977–86)

Monash University was a product of the *Martin Report*, commissioned by prime minister Robert Menzies in 1959, who was quoted in 1957 as saying: ‘A university education is not, and certainly should not be, the prerequisite of the privileged few ... We must become a more and more educated democracy if we are to raise our spiritual, intellectual and material standards.’ Ray’s father, Leslie Martin, chaired the Australian Universities Commission (1959–66) that wrote the *Martin Report*, recommending the creation of a three-tier tertiary education sector.²⁹ This resulted in an expansion of the existing complement of sandstone universities. Monash University is now the largest university in Australia, with the motto: ‘I am still learning’.

Ray arrived at Monash in 1977, after the retirement of the founding vice-chancellor, Louis Matheson, who had established a university from a plot of land that had been an apple orchard and was affectionately named ‘The Farm’. However, the golden years of university funding, which provided academic positions, new buildings, and equipment for research programs was over, and commonwealth funding for higher education was static during the decade of Ray’s vice-chancellorship. Ray believed in ‘scholarly excellence’ and that academic standards were closely linked to the autonomy of universities. However, universities relied on government handouts, so the ever-pragmatic Ray, led the quest for external funding and commercialisation opportunities, greater community engagement, and administrative reforms, while ensuring that Monash maintained academic excellence: ‘the last of the old style’ universities.³⁰

During the decade of Ray’s vice-chancellorship (1977–86), there were many notable initiatives. One of these was forming new academic structures—centres and institutes—at a time when knowledge was crossing the disciplinary boundaries. These centres globalised academic conversations and provided an organic framework that was responsive to progressive ideas. Although there were four of these in place on Ray’s arrival at Monash, at the end of his tenure there were fifteen. These included centres of research into Aboriginal affairs, migrant studies, policy studies, general and comparative literature, child studies, early human development, molecular biology and medicine, environmental studies, continuing education, laser studies, commercial law and applied legal studies, and Japanese studies. These centres supported enormous social developments such as the first successful pregnancy involving in-vitro fertilisation (IVF) in Australia by Professor Carl Wood, and only the second in the world. This in turn

began conversations of bioethics and the Monash brand of debate influenced policy and debate internationally. Furthermore, this fostered one of Ray’s greatest legacies, which was the creation of Monash’s own high-tech consulting company, Montech, to ‘enhance the University’s image as a centre of pure and applied scientific research’. Monash IVF was an early spin-off company, as was Circadian Pharmaceuticals, which involved the use of melatonin for jet-lag, developed by Professor Roger Short.³¹ These steps ensured that Monash University was becoming more self-sufficient and less reliant on government funding.

Ray also had a passion for the arts and he established extensive community, cultural and recreational links to the local communities around Monash University (Clayton campus). Of these, one particularly creative project stands out within the visual arts: the *Banksia* project. Celia Rosser was a self-taught botanical artist who was working part-time in the biology department. Ray enabled funding to sponsor her to complete a series of paintings of all known species of *Banksia*. This project was ultimately completed after twenty-five years and was published in a three-volume series. Copies of these volumes were selected as gifts for Queen Elizabeth II, Australian Prime Ministers, and other dignitaries (Fig. 6). Professor Bruce Holloway (FAA) said that ‘Rosser’s work will live on when a lot of the other research achievements of Monash have been forgotten’.³²

Ray’s time at the helm of Monash is far too extensive to be realistically represented here; however, there were many interactions with the student body, and to his credit he faced these with his usual effective management style. He always relaxed on Saturday afternoons with his tennis group and claimed that this was a key ingredient to maintaining a balance in his working life.

A quotation about Monash from a later vice-chancellor, Professor Peter Darvall, in 1994: ‘It has an image of being progressive, aggressive, a little rough at the edges, vigorous, friendly, daring, successful and exasperating. It is all of these things, and muscular and an international brand.’³³ Ray would be delighted with this assessment of his endeavours during his leadership period at Monash.

During the decade at Monash University, Ray was chair of the Australian Vice-Chancellors Committee and in 1986, he led the Victorian vice-chancellors to China for a three-week ‘fact-finding trip’ to scope and engage with some Chinese universities. His involvement extended well beyond his time as vice-chancellor, including serving on administrative boards, several as chair, such as the Victorian College of the Arts (where he and Professor David Caro were referred to as ‘tribal elders’) and the Heide Museum of Modern Art

²⁹Martin (1964).

³⁰Davison and Murphy (2012).

³¹Davison and Murphy (2012).

³²Davison and Murphy (2012).

³³Davison and Murphy (2012).



Fig. 6. Presentation of a gift of three volumes of Banksia paintings to Queen Elizabeth II (far left), by prime minister, the Hon. Paul Keating, Vice Chancellor Ray Martin, and Celia Rosser (the artist) at Monash University, circa 1992.

(in Bulleen, Melbourne). Philanthropic groups that Ray championed included the Selby Foundation and the Churchill Trust; the latter in the roles of Director of the Victorian Regional Committee from 1984 to 1992, Deputy National Chair from 1988 to 1994, National Chair from 1995 to 1999, Fellowship Director in 2000, and National President from 2001 to 2005. In 2009, Ray was appointed a Life Member of the Churchill Trust.

Another organisation that he maintained a close association with, since the early days when Monash University commercialised melatonin, was Circadian Technologies. Ray was on the board of Circadian during a period of growth where their strategic investment resulted in several local spin-off biotechnology companies, including Optiscan, Antisense Therapeutics and Axon Instruments.

When Ray was appointed vice-chancellor of Monash, he was simultaneously appointed Professor of Chemistry at Monash. Thus, during this period, he was able to continue to nurture his passion for inorganic chemistry, publishing research papers and hosting overseas research visitors in the School of Chemistry, to where he would wander from the administration building at the end of the day to discuss chemistry. It was unsurprising that on his retirement from the 'top job' in January 1987 and at age sixty, he shifted into a small office in the School of Chemistry, obtained research funding from the Australian Research Grants Scheme (ARGS now ARC), and pursued research. Ray enjoyed his time back in chemistry and especially his interactions with his discipline colleagues, including some whom he had known for decades; Ron Brown (Foundation Chair of Chemistry), Bruce West, as well as those he had helped to appoint, Roy Jackson and many others. It was not long, however, before another opportunity presented itself and once again Ray was unable

to refuse. After only a year 'back on the bench', Ray accepted a (part-time) position as Chair of the Australian Science and Technology Council (ASTEC).

ASTEC (1987–92)

The Australian Science and Technology Council (ASTEC) had been established in 1978 by Prime Minister Malcolm Fraser as a think tank on science. Professor Ralph Slayter (FAA) retired as Chairman in 1987 and Ray was invited by Prime Minister Bob Hawke to replace him. ASTEC was an independent group, outside the bureaucracy, and the chairman of ASTEC was, in a sense, the prime minister's science adviser. Ray accepted. It was a unique opportunity to influence government thinking about science and having direct access to the prime minister was essential for the effectiveness of this body. Despite the frequent travel to and from Canberra, Ray relished this period, which resulted in numerous reports on research and technology being presented to Prime Minister Bob Hawke.

The final years

Ray retired from Monash chemistry in 1991, aged 65. Ray and Rena remained socially very active in retirement. Ray's association with ASTEC, Churchill Trust and many other bodies continued well into the early 2000s. His old University of Melbourne buddy Judge Bevan and he published several research papers together on their first love, solid-state inorganic chemistry, the last of which was published in 2014.

He continued playing tennis with a group that was established when he was in Melbourne in the early 1960s, and once the commute to central Melbourne became difficult, he joined a local tennis group on the Mornington Peninsula called the Fosters Fireballs, where he played until he was 93. He loved life, he lived life, and he had no regrets. His philosophy was best described by the Persian twelfth century poet, Omar Khayyam, in the Rubáiyát 'eat, drink and be merry, for tomorrow you die'. Ray died near his home on the Mornington Peninsula on 25 February 2020. The time of Ray's death coincided with the initial events of Covid-19 lockdown (quarantine precautions) at Monash University, and so unfortunately a memorial event for Ray Martin was never organised.

Family details

Ray met his wife to be, Rena Lillian Laman, in the UK, although she was from Sydney (BSc, University of Sydney). They married at St Edward's King and Martyr, Cambridge on 20 February 1954. They retired to Mount Eliza (near

Melbourne) in 1992, with their happy marriage lasting sixty-two years until Rena's death on 20 April 2016. They had three sons and a daughter, all of whom obtained degrees in science. Chronologically, Leon (BSc Monash, 1978; PhD Monash, 1985, in immunology); Lisa (BSc (Hons), Monash, 1981; PhD ANU, 1986, in Chemistry), Antony (BSc, Monash, 1984, in computer science), and Michael (BSc, Monash, 1988; BSc (Hons), La Trobe, 1990; PhD, La Trobe, 2000, in geology)

Postscript

There are so many people, students, colleagues who are not mentioned explicitly in this short memoir, with whom Ray enjoyed friendships and research interactions. This memoir includes my recollections of my father and how he presented his life to me, as well documented materials that were available. Ray enjoyed interacting with people—always with his trademark smile.

Supplementary material

Supplementary material is available [online](#).

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Data availability. Data sharing is not applicable as no new data were generated or analysed during this study.

Conflicts of interest. The author of this memoir, Lisa Martin, has endeavoured to provide a comprehensive and accurate overview of the life of Ray Martin, across his varied experiences and positions. However, as Ray's daughter, her relationship to the subject could be influenced by her familial relationship, despite attempts to provide as much referenced information as possible. Furthermore, Ray and Lisa also worked together for several years and published several research articles together.

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