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# Robert Woodhouse Crompton 1926–2022

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**ABSTRACT**

Robert (Bob) Crompton was a towering figure in low energy electron and ion physics in Australia and internationally, as witnessed by his seminal publications on swarm physics, atomic and molecular physics and gaseous electronics generally, his widely-read monograph with Sir Leonard Huxley on the subject of charged-particle transport, and the many personal and professional accolades and awards he received for his contributions to science, science policy and the general community. Born and educated in Adelaide, Crompton spent the majority of his long career at the Australian National University in Canberra, with numerous sabbatical periods in overseas laboratories where he fostered many important international research collaborations and lasting friendships.

**Keywords:** Academy, Australia, electron, physicist, science, swarm.

## Introduction

Professor Robert (Bob) Woodhouse Crompton passed away in Canberra on 22 June 2022, shortly after his ninety-sixth birthday and following a long period of incapacity.

Bob was a distinguished experimental atomic physicist who for many years was the face of the discipline in Australia. In addition, he provided a well motivated and focused guidance for the development of charge-particle transport theory and related plasma models. His early career was spent at the University of Adelaide, but most of his groundbreaking research was carried out at the Australian National University (ANU) within the Research School of Physical Sciences (Fig. 1). His pioneering work on electron and ion transport in gases has been recognised internationally and, in many cases, his measurements are still referenced to the present day.

He was also distinguished by his service to the discipline of physics in Australia through his dedicated work over many years with the Academy of Science and the Australian Journals of Scientific Research. He was an influential and tremendously effective member of the academic staff of the ANU and of the Research School, and his opinion was always sought and always valued across the institution.

## The early years

Bob Crompton was born in Adelaide on 9 June 1926, the youngest of two sons, his brother James being born two years previous. His family were small business owners marketing a wide range of products from soap to sheepskins. His mother, a nurse, was English and had come to Australia and Adelaide after World War 1 to care for the family of a doctor with whom she had worked during the war, and it was here that she met and married his father.

His early education at Prince Alfred College (PAC) in Adelaide was briefly disrupted with an extended trip of the family to England in 1936 to visit his maternal grandmother and aunt, whom his mother had not seen since arriving in Australia in 1919. He and brother James (Jim) took advantage of the visit to save up and purchase a variety of English toys which they had heard much about, and they returned with large Meccano sets and several model boats and planes—an early indication of the love of 'building

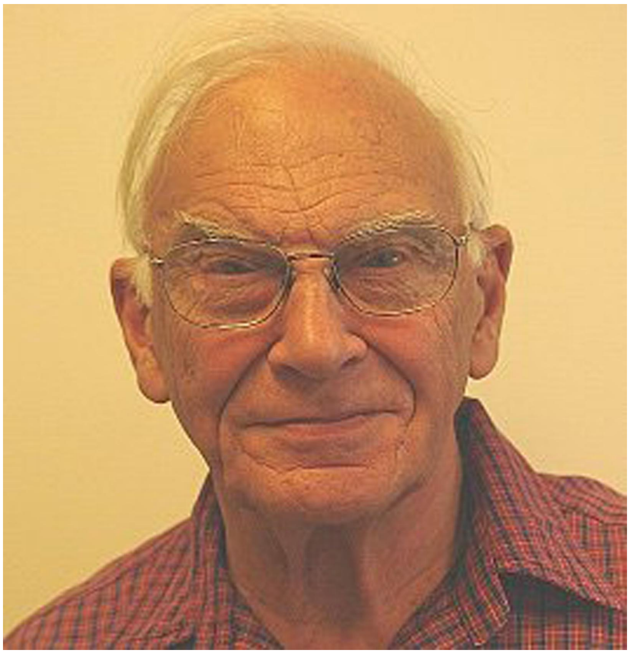

**Fig. 1.** Bob Crompton pictured at around the time of his retirement from the ANU in 1991 (author's collection).

things' that would be a hallmark of Bob's scientific career. On their return from England he resumed his upper years of primary schooling at PAC in what he has described as a rather strict environment, led by a 'martinet' headmaster. This regime changed quickly on the arrival of a new headmaster, Norman Mitchell, who had a much more progressive approach to educating young boys and he was to become a firm friend of the Crompton family and a person whom Bob described as one of his first educational mentors. He also introduced woodwork as a subject to the school, something that Bob took up with great enthusiasm and developed skills that he used throughout his life.

He also found a mentor in secondary school, Raymond Smith, who taught physics at PAC and who encouraged Bob's interest in making things, leading to the construction of a parallel plate polarimeter and numerous electric motors built from scratch to power his Meccano models, amongst other things. Bob's intellect and ingenuity led to him topping the state in the public exam for physics in his Leaving Honours year, an honour which brought much delight to his family and his mentor Raymond Smith. This success also led to him being accepted into a cadetship in the Department of Physics at the University of Adelaide.

## University studies and teaching in Adelaide

Bob Crompton commenced his university studies just after the end of World War 2. His cadetship meant that he was the most junior member of the physics department and effectively an assistant to all of the lecturing staff, which at that stage was only four academics. However the cadetship also relieved him and the family of tuition fees that were considerable, at the expense of adding an extra year to the term of his undergraduate degree that, with an additional year for an Honours degree, amounted to five years of study.

The department was led by Professor Sir Kerr Grant who was particularly keen on physics education and laboratory practice, and part of Bob's cadetship role was to help make and set up the laboratory equipment for the lecture demonstrations. One particular item that he remembered with pride was the construction of an automated cloud chamber to demonstrate the presence and motion of charged and radioactive particles. He also built electron diffraction cameras by using electron guns from old cathode ray tubes together with a phosphorus screen from an oscilloscope, and a Van de Graff high voltage generator which one of us (E. W.) gratefully used later in his Honours project under Bob's supervision—he was an inspiring lecturer and mentor. Bob's immediate boss through his cadetship was Dr Roy Burdon, who was a reader in physics and had research interests in surface physics and surface tension.

Kerr Gant retired in 1948 and was succeeded as head of department by Sir Leonard Huxley, who came from the University of Birmingham, and was to have a profound effect on Bob Crompton's career. Huxley brought change to the department by introducing several new lines of research, including one in particular that was to captivate Bob and set the stage for the rest of his career.

As Huxley arrived in Adelaide, Bob was searching for a research topic for PhD study, and he chose a laboratory-based program that Huxley was interested in—the interaction of electrons with gases. In addition to interacting with Huxley as his PhD supervisor in the laboratory, Bob also saw him outside of the university in these early days after his arrival in Adelaide, as Bob's parents had travelled to England to see his brother, and the Huxley's were staying in the Crompton family house. Bob was charged with looking after the garden and this enabled a closer personal introduction and engagement with Sir Leonard.

Bob's PhD thesis, *A Study of the Collisions Between Slow Electrons and Gas Molecules,* was submitted in 1953 and the degree awarded in 1954. It was amongst a group of the very first PhD degrees awarded in Australia and, in times when funding and access to materials and equipment for research were lean, he honed his skills as a glassblower, vacuum technologist and experimental physicist.

Bob remained at the University of Adelaide as a lecturer, and then senior lecturer, in physics until 1960, with the only break being a period of sabbatical leave spent at University College Swansea. In Swansea he worked with Professor Frank Llewellyn Jones and his team, principally Jack Dutton and Syd Haydon. Haydon later took up a position at the University of New England in Armidale, and they remained collaborators and firm lifelong friends. The Swansea group were known internationally for their work in the field of ionised gases and plasmas and while conditions in Swansea were still challenging following the damage from World War 2, Bob spent a productive year on the measurement of pre-ionization breakdown currents in gases.

A highlight of his time at Swansea was that Huxley visited England and they arranged to meet in Oxford. There Huxley introduced Bob to Sir John Townsend who was internationally renowned in the field of charged particle scattering and ionised gas studies. Indeed Townsend, and German physicist Carl Ramsauer, had independently discovered in the 1920s that some atoms appeared to be anomalously 'transparent' to the passage of low energy electrons, a phenomenon that has become known as the Ramsauer-Townsend effect and which was hailed as one of the first observable verifications of the then new field of quantum mechanics. It also proved to be an area that Bob made major contributions to in later years.

Both Huxley and Llewellyn Jones were former PhD students of Townsend, and Townsend in turn was a student of Sir J. J. Thompson who 'discovered' the electron and was awarded the Nobel Prize in physics in 1906 for his work on the conductivity of gases. Bob was extremely proud and mindful of this heritage as a 'scientific grandson' of J. S. Townsend and a 'scientific great-grandson' of J. J. Thompson.

## A move to Canberra and the ANU

In 1960 Huxley left the University of Adelaide to take on a short role with the CSIRO executive before accepting the position of vice chancellor of the Australian National University. Shortly after his arrival at ANU he contacted Bob and invited him to bring his small research group to Canberra and establish an electron and ion research activity in the Research School of Physical Sciences, that had been established in 1950 within the Institute of Advanced Studies (IAS) at the ANU and was still led by founding Director Sir Mark Oliphant.

Bob arrived with his small team to Canberra in 1961 to find his allocated laboratory space in the Research School was the burnt-out eastern end of the Cockcroft building that had suffered a recent fire (Fig. 2). While a shock, it also proved a major opportunity for Bob and his team to re-build the laboratory to suit their own purposes. Bob had learnt through his PhD and subsequent research at Adelaide that low energy electron collision experiments required clean uniform surfaces and clean ultra-high vacuum conditions and he, and his life-long friend and chief technician, John Gascoigne, set about establishing amongst the ruins the Electron and Ion Diffusion Unit (EIDU) which would become the world-leading laboratory in these studies.

While developing this high-vacuum technology was relatively expensive, it was 'peanuts', as Bob described, compared to most of the other large-scale physics experiments underway at the time in the Research School, so they considered themselves to be very well supported. This development also coincided with the return to Australia and to ANU of Malcolm Elford. He had studied under and worked with Bob in Adelaide, and then spent several years overseas working with high-vacuum experiments, and this expertise which he bought back to ANU proved invaluable in the development of the laboratory.

**Fig. 2.** The sight that greeted Bob Crompton and his team when they arrived at the ANU in 1961.

## Electron swarm physics at ANU

At the heart of Bob's research was the pursuit to discover and quantify the extent to which low energy electrons interact with atoms and molecules. In our modern world these interactions lie at the core of many chemical processes, and their understanding has ramifications across an enormous area of everyday applications—a field now referred to as gaseous electronics—that includes areas as diverse as lighting and lasers, welding technology, atmospheric and astrophysical processes, plasma processing of semiconductors and radiation biology, to name just a few. More recently, contemporary applications have been found in plasma medicine, plasmas for agriculture, and other fields requiring treatment of the living tissues.

However, in the early 1960s the field of gaseous electronics was still in its relative infancy, following the early burst of activity in the years of Ramsauer and Townsend. Bob was determined to establish a new and highly accurate approach to measuring so-called collision cross sections, atomic level parameters that are used to characterise the extent of the interaction of an electron with an atom or molecule.

At the ANU, he and his team developed several new electron (and ion) 'swarm' experiments within high vacuum apparatus to measure the way in which electrons drift and diffuse in gases. In contrast to the more conventional experiments of the day where a fine beam of electrons was fired at a dilute beam of atoms or molecules and individual single collision events measured, Bob's experiments followed the collective motion of an ensemble of electrons, or an 'electron swarm', as it moved through a high-pressure gas under the influence of an electric field, suffering collisions with gas atoms or molecules. They used either a hot filament or a radioactive isotope as the point source of the electrons at the cathode end of their experiment and would detect both the time taken for the swarm to arrive at the experimental anode—measuring the 'drift velocity' of the ensemble—and the spatial distribution of the ensemble at the anode—measuring the transverse diffusion coefficient. Bob coined the phrase 'swarm' to describe these transport experiments, and this has since become well-established in the experimental physics lexicon.

While these experiments are simple in principle, the analysis of the transport parameters that are produced in order to extract the scattering cross sections is a complex undertaking. The raw data must be analysed computationally by using the Boltzmann equation which relates the collective motion of the group or 'swarm' of electrons to the motion of the individual electrons in the group. In this way the cross section for the collision process or processes involved can be extracted.

These experimental and analysis techniques, largely unknown within the atomic physics community, were developed and refined over a period of five to ten years, which was possible at that time within the IAS at ANU where longer-term experimental investigations were initiated and encouraged. They enabled the ANU team to measure these scattering cross sections at energies spanning from a fraction of an electron volt (eV) to around 10–15 eV, depending on the nature of the collision target.

To illustrate the care that went into refining the accuracy of the experiments, Bob's team was the only group in the world that employed a traceable primary pressure standard to enable the accurate measurement of the gas density, and Kelvin probe technology to test surface potentials of the electrodes. For the diffusion coefficient measurements, the technique that was developed to measure extremely small electron currents at two segments of the anode (in the so-called Townsend-Huxley experiment), while controlling surface potentials at the millivolt level, was a brilliant development.[1]

Throughout the 1970s the time seemed right for Bob to develop a new integrated approach to swarm physics, and he set about combining the experimental skills of the group (including those of colleagues Malcolm Elford and John Gascoigne) with input from theoreticians, enticing Kailash Kumar and Robert Robson to work on the theoretical foundations of the transport theory and provide highly accurate calculations. Bob was also instrumental in motivating his colleagues towards the development of improved computer codes for solving the Boltzmann equation under the two-term approximation,[2] and for Monte Carlo simulations, which could provide accurate results but were limited by the accuracy of the input data and the computer processing time required.[3] He saw, and pursued, an opportunity in exact Monte Carlo and multiterm solutions[4] to provide the basis for comparisons with single collision data (both experimental and theoretical) without the uncertainties due to limitations in the numerical transport theory.

At the same time, single collision experiments and theory had reached new heights in accuracy, with the theory able to tackle complex quantum mechanical scattering problems. The stage was set for the primary goal of Bob's scientific agenda, to compare and achieve consistency across all three of these different approaches.

## Taking ANU swarm physics to the world

The first cross section results that emerged from the ANU swarm experiments in the late 1960s, for electron collisions with one of the simplest atoms, helium, were at odds with recent single-collision measurements. Bob Crompton's laboratory measurements of transport parameters boasted experimental uncertainties of much less than 1%, and they believed that their derived cross sections were accurate to ±2%, whereas for helium they differed from the single-collision experiments by more than 10%.[5]

Bob found himself travelling the world and delivering lectures to whoever would listen about their new techniques at the ANU and the discrepancies that they had revealed in some fundamental atomic physics measurements. Given the importance of such atomic collision data to this new and emerging area of applied physics known as gaseous electronics, he was absolutely driven to resolve these discrepancies. But resolution did not come quickly or easily, and it was not until later in the 1970s when the first highly accurate quantum scattering calculation for helium appeared in the literature,[6] and was in perfect agreement with the ANU data, that Bob's approach was vindicated.

However, Bob was not completely satisfied as he wanted to understand the reasons for the discrepancy with the single-collision experiments. This led him to recruit one of us (SLjB) to set up a single-collision laboratory, alongside

[1]Crompton and others (1965).
[2]Gibson (1970).
[3]Reid (1979).
[4]Lin and others (1979).
[5]Crompton and others (1967).
[6]Nesbet (1979).

the swarm work within the EIDU, in order to gain a better, mutual understanding of the experimental techniques and challenges. The first single collision experiments that were performed in this new laboratory were (of course) on the helium atom and they served to resolve this earlier discrepancy and showed excellent agreement with Bob's swarm cross sections.[7]

The helium data are now well accepted as a 'benchmark' in the field and these measurements were followed by measurements on all the rare gas atoms and a number of simple diatomic and polyatomic molecules. The experiments with molecules posed a different set of challenges as, while for low energy atom scattering the only process available is elastic scattering, for molecules both rotational and vibrational motion can be excited with electron energies well below 1 eV. This not only poses experimental problems but also adds additional complexity to the Boltzmann analysis. Nonetheless Bob and colleagues were able to establish further benchmark cross sections for the low energy rotational and vibrational excitation of the $H_2$ molecule.

These experiments on $H_2$ were particularly challenging as the molecule comes in two forms, *ortho*- and *para*-hydrogen, depending on the alignment of the nuclear spins of the two protons in the H atoms that form the $H_2$ molecule. As the best way to establish a 'benchmark' for $H_2$ was to work with a single form, and do so at a very low temperature, Bob decided to attempt to separate the two forms and do experiments on *para*-hydrogen, the form where the spins of the two protons are antiparallel and which is normally only present at 25% in a normal $H_2$ sample. The benefit of working with *para*-hydrogen would be that only one rotational process would be active at the liquid nitrogen temperature used for the experiment. Separation was not easy to achieve as it involved a very low temperature catalysis process, but Bob and colleagues managed to do this and then use the purified sample of *para*-hydrogen to measure the electron scattering cross sections for both rotational and vibrational excitation of the $H_2$ molecule.

The rotational cross sections agreed perfectly with the best contemporary quantum scattering theory,[8] a result that both delighted Bob and vindicated the years of hard work that had gone into their production. However, the situation for the vibrational cross sections was not as rosy, as the agreement with theory, and some other experiments using single-collision techniques that came later, was not at the same level. In the scheme of things this disagreement was not enormous, but it was well outside the error bounds that Bob and colleagues placed on the measurements, and many other measurements that they subsequently did to cross-check their technique. This 'controversy', as Bob often referred to it, and its resolution, remained in Bob's sights for many years and his prediction that he may never see it resolved proved correct, as to this day the reasons for the discrepancy are still not well understood.

Another area of low energy electron physics that fascinated Bob was the propensity for low energy electrons to 'attach' to atoms and molecules—but mainly molecules in his case—to form negative ions. Gas discharges, the phenomena that lay at the heart of many of the applications in the field of gaseous electronics, consist of a soup of atoms/molecules and charged species—electron and ions. The electrical conductivity of such environments is a crucial factor in their behaviour and is critically dependent on the transport of all charged species, but particularly the 'light' electrons. If an attaching gas—one that has a strong affinity to attach an electron to form a negative ion—is present in the soup, it has the effect of drastically reducing the conductivity of the gas as the mass of the negative ion that is formed by attaching an electron is much greater than that of the electron, and drastically changes the behaviour of the discharge.

Bob understood the importance of accurate data for the attachment cross sections of such gases (molecules containing fluorine and chlorine atoms are good examples of species with high electron affinities that readily attach an electron) and he and his team, including one of us (ZLjP), perfected a technique for measuring such cross sections in the critical near-zero-energy regime. Several of these measurements, along with those discussed earlier for helium,[9] also still stand the test of time as absolute 'benchmarks'.[10]

Bob was also a great collaborator. He understood very early on the limitations of doing front-line experimental science in Australia in the 1960 and 1970s—the 'tyranny of distance' as it is often called—and the importance of international connections in staying abreast of the latest developments. He took full advantage of the (then) generous study leave entitlements that the ANU offered staff in the Institute of Advanced Studies and was a regular visitor to overseas laboratories in the USA, UK, Europe and Japan, during which he forged what were to be many life-long friendships and collaborations. It is notable that one of his longest and most enduring collaborations was with Professor Michael Morrison from the University of Oklahoma, the theorist whose calculations showed disagreement with Bob's $H_2$ measurements.[11] Despite the scientific differences, they were great friends and collaborators for many years and enjoyed numerous long visits to each other in an attempt to resolve this scientific discrepancy.

There are many legacies of Bob's electron swarm research, particularly those embodied in his research

[7]Buckman and Lohmann (1986).
[8]Crompton and others (1969).
[9]Crompton and others (1967).
[10]Petrović and Crompton (1985).
[11]Morrison and others (1987).

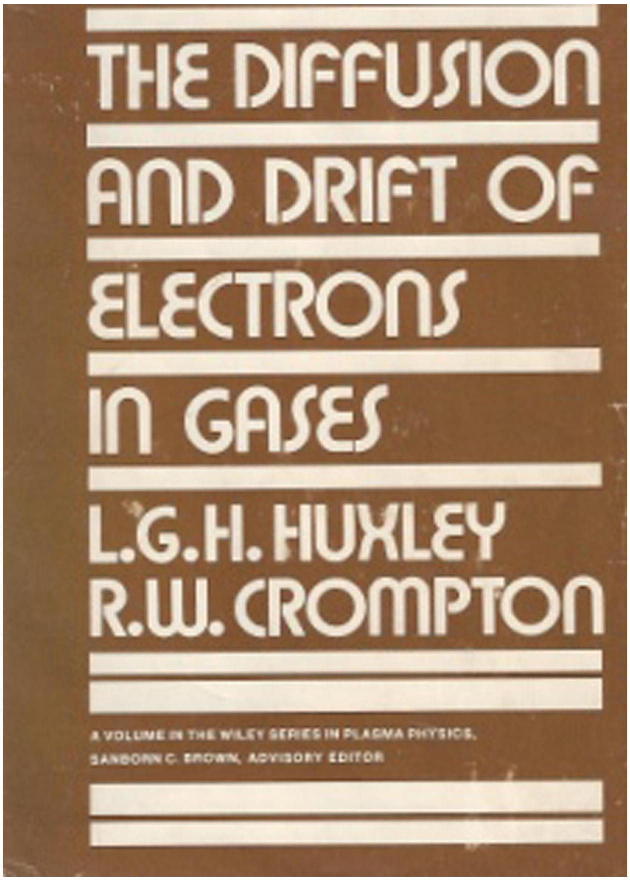


**Fig. 3.** One of Bob Crompton's greatest legacies, his monograph with Huxley on electron swarm physics.

publications (a full list of Crompton's publications is contained in the accompanying Supplementary material), and the eleven PhD students and many postdocs that he has trained. One of the most enduring legacies is the textbook that was published in 1974—*The Diffusion and Drift of Electrons in Gases* by L. G. H. Huxley and R. W. Crompton (Fig. 3).[12] This monograph quickly became the 'bible' for those engaged in the field and is still referenced to this day. At the time of its production in the early 1970s, Huxley had retired a few years earlier from his role as Vice Chancellor of the ANU, but was still living in Canberra, and Bob would venture regularly to his house to sit with him to prepare and write the book. Stickler that he was for accuracy and detail, Bob was horrified to find a number of small typographical errors that had crept in to the book after proof reading, a consequence he felt of it being one of the very first books to be computer typeset in Australia. He later confided that he never publicly revealed where these errors were, leaving them to the reader to discover!

As a leader and scientific administrator, Bob was amongst the very best. He led the EIDU which was established in the Research School on the invitation of Vice-Chancellor Huxley, and later was the founding Head of the Atomic and Molecular Physics Laboratories (AMPL), an amalgam of the EIDU and several other research groups, which became one of nine active Departments in the Research School. He was deeply interested in what his staff and students were doing, both in the laboratory and beyond, and his management style was just an extension of his relaxed, highly personable way of interacting with people. He always had time for his students, encouraging them to seek excellence in their research, and was prepared to work through many drafts of papers and theses with them to attain just that.

Bob also possessed a wicked sense of humour, which several of us experienced first-hand, and was always ready to play a practical joke. He was always 'on the go' and inspired his team to be the same, and he was often witnessed running down the corridor between office and laboratory to check out the latest exciting result in between many other University activities. His effective management style was broadly recognised across the School and University, and he was at various stages a member of most of the important school and university committees, and a wise counsel for many of the school directors that he served under.

## Service to Australian and international science

Throughout his career Bob Crompton was deeply engaged in promoting science and scientists through his work with many professional bodies. In the early days he was active within the Australian and New Zealand Association for the Advancement of Science (ANZAAS) which ran, amongst other things, annual conferences across a range of 'sections' including physics and mathematics.

Bob attended his first international conferences in 1963: The International Conference on the Physics of Electronic and Atomic Collisions (ICPEAC) and The International Conference on the Physics of Ionized Gases (ICPIG), held in London and Belgrade respectively. This started a long relationship with both of these international meetings, and he spent time contributing to the Scientific Organising Committees of both during the 1970s and 1980s and was a valuable resource for the Australian community for each of these meetings.

On the national scene Bob held a number of important and influential positions throughout his long career. He was a member, and then Chair, of the National Committee for Physics from 1969 to 1979, President of the Australian Institute of Physics from 1993 to 1994, and the inaugural Chair of the Board of the Australian Science Olympiads.

Perhaps Bob's most notable and noticeable contributions to the Australian scientific community were through his

[12] Huxley and Crompton (1974).

work at the Australian Academy of Science (AAS) and the Australian Journals of Scientific Research (AJSR), the latter being jointly administered by the Academy of Science and the CSIRO. Bob was elected a Fellow of the Academy (FAA) in 1979 and was a very active Fellow, serving as secretary for physical sciences from 1984 to 1988. He also joined the Board of AJSR during the 1980s, originally as a member, and then Chair, of the Australian Journal of Physics Board. As with much that he did, Bob was so effective in this role that he was quickly poached to assume the role of Chair of the Board for all of the AJSR journals, which at the time consisted of eleven different discipline series. This was a big job and one to which he devoted an enormous amount of time and effort.

Outside of science Bob was also engaged in many community activities. Perhaps most notable amongst these was his membership, and then chairmanship, of the Board of the National Brain Injury Foundation. It was a task he warmed to, but also one that he found extremely difficult as it involved fundraising, lobbying government, and providing support for people with major debilitating injuries, often against a background of highly stressed and stretched family support.

## Other eclectic interests

Many who were regulars on the ANU campus through the 1970s and 1990s will no doubt recall the regular vision of a small black Wolseley car being driven (at times too fast) around the campus. Bob bought the Wolseley in 1959 in Adelaide and meticulously maintained it right up until the time it was donated to the Australian Museum some fifty years later. The car served the family well, transporting them all from Adelaide when they moved to Canberra in 1961, and returning them back to Adelaide for the many summer holiday visits they did in the early Canberra years. Bob's maintenance activities over the years included rebuilding the engine, gearbox and differential, and he claimed that there was likely not a nut or bolt on the vehicle that he had not undone.

Bob had spent all his career designing and building exquisitely detailed experimental apparatus and his retirement from ANU in 1991 did not see the application of these skills come to an end. In addition to the final 'finishing touches' on the black Wolseley, Bob returned to a project that he (almost) started more than thirty years earlier—the construction of a harpsichord. During a scientific visit to New York in 1965 he discovered, and purchased, a harpsichord kit from a small company, Zuckermanns. The kit assembly lay unfulfilled for many years until in 2002 when Bob finally managed to retrieve the many boxes stored around their house and, surprisingly, all the pieces were intact, and the harpsichord was built and provided him with much enjoyment in the process. Bob never fully mastered the art of playing it, though he often joked that he was aiming to give a concert in the ANU's Llewellyn Hall some day.

## Family life

Bob and his wife Helen met at the University of Adelaide while Bob was a PhD student and Helen was the physics department photographer. They were very close friends before Helen went for a break to England, and they continued to correspond via many letters. Bob finally proposed to her in the middle of the night on a long-distance phone call and, despite the 'appalling quality' of the phone reception in those days, Helen said 'yes' and she returned to Adelaide, and they were married in 1951.

They had three children, Malcolm, Graham and Cathy who have all had successful careers of their own. Malcolm worked mainly in the public service rising through the ranks via a number of departments before becoming the Privacy Commissioner for Australia, a position he held for five years. Graham has had a career in the CSIRO where he spent a number of years as a technical officer in entomology before taking on a managerial role in the CSIRO head office. Cathy completed a psychology degree and has also worked in the public service as well as pursuing a career in teaching. They have also produced seven grandchildren for Bob and Helen, who were devoted parents and grandparents, and have taken great pride in the achievements of their offspring.

Helen sadly passed away quite unexpectedly in March 2018.

## Distinctions and honours

Bob Crompton's many scientific and educational achievements have been acknowledged by significant awards and honours. As mentioned earlier, he was elected as a Fellow of the Australian Academy of Sciences in 1979, and other significant international peer acknowledgements of his achievements came through the award of a Fellowship of the American Physical Society, a Fellowship of the Institute of Physics (UK) and a Fellowship of the Australian Institute of Physics.

Bob was also the recipient of several prestigious international research fellowships, the most notable being a Fulbright Senior Scholar Award and a fellowship from the Japan Society for the Promotion of Science. His Fulbright award in 1968 took him to more than twenty research institutions in the United States and laid the foundations for many future collaborations with American scientists.

Perhaps the crowning recognition of his career was being made a Member of the Order of Australia (AM) in 1999 'For service to science, particularly physics education and research, to the Australian Science Olympiads, and to the

Community through the National Brain Injury Foundation'. In many respects this citation sums up the enormous breadth of Bob's contributions to the broader 'community'.

Following his retirement from the ANU Bob maintained strong contact with the University and School as an Emeritus Professor and was particularly interested in promoting opportunities for the younger faculty and higher degree students in physics. He and Helen made significant donations to both the Research School of Physics and the School of Music at the ANU. Within Physics they established the Robert and Helen Crompton Award that is granted each year to one or more physics PhD students to enable them further their studies through three-to-six months collaborative work in an overseas laboratory. Since its inception the Scholarship has supported more than twenty students to further their research careers, and it is a regular feature on the calendar of activities of the Research School. Within the School of Music they established the Crompton Music Endowment which provided scholarships for undergraduates studying keyboard. They also made a substantial donation to support the School of Music in the purchase and installation of an electronic organ from Allen Organ, Pennsylvania, that when not in use, is on display in the School of Music.

It is especially fitting that his and Helen's memory lives on through the support of these activities in two of the ANU's finest Schools.

## 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 authors have no conflicts to declare. Each has worked closely with Bob Crompton at various stages of their careers: E. W. was supervised by Bob during his Honours year at the University of Adelaide, and was a close colleague of Bob over the years, including a short period where they overlapped at ANU, prior to Bob's retirement in 1991, when E. W. was the Director of the Physics Research School; Z. Lj. P. completed his PhD at the ANU under the supervision of Bob Crompton and they have published many scientific papers together during this period and subsequent collaborations; S. J. B. was appointed to a Research Fellowship in the EIDU in 1983 and worked closely with Bob over many years, benefitting enormously from his kind support and mentoring. Some of the material referenced here was obtained from several interviews that Bob Crompton did. The first was with one of us, Professor Erich Weigold[13] on behalf of the Australian Academy of Science in 2011, and the other an interview with Professor Alistair Blake,[14] the former Dean of Science at the University of Adelaide, also conducted in 2011.

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[13]Interview of Prof Robert Crompton by Professor Erich Weigold in 2011 (Australian Academy of Science 2014).

[14]Interview of Professor Robert Crompton by Professor Alistair Blake (2011). https://set.adelaide.edu.au/physics-chemistry-earth-sciences/ua/media/111/bob-crompton.pdf.