

Tribute to CSIRO Scientists

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In this invited presentation we pay tribute to the four CSIRO colleagues, Drs. John Dunlop, Tony Farmer, Gerry Haddad and Don Price, who lost their lives in the horrific crash of a Robinson R44 helicopter in March, 2013. The presentation briefly summarises the scientific careers of all four colleagues. Two of these scientists, Dunlop and Price, had been most enthusiastic supporters of and regular contributors to this Annual Condensed Matter and Materials Conference, since its inception in 1977, and their respective contributions are also included.

1. Introduction

A couple of months ago, I received a call from Dr. Stephen Collocott, CSIRO, Lindfield, who had been invited by the Organising Committee for this Conference, to prepare and present a tribute to his four colleagues, Drs. Tony Farmer, Gerry Haddad, Don Price and John Dunlop, who lost their lives in the horrific crash of a Robinson R44 helicopter, near Panorama House, Bulli Tops, Wollongong, on 21st March, 2013. While Stephen shared the view of the Organising Committee that it would be most appropriate for such a tribute to be presented at the 2014 “Wagga” Conference, he knew at the time that he could not attend, so before accepting the invitation, he telephoned me to ask if I would present such an invited tribute. As I too felt it was a good idea on the part of the Organising Committee, I agreed and while I cannot claim to have known all four of Stephen’s CSIRO colleagues as well as he did, I am grateful to the Organising Committee for the opportunity to make this presentation on Stephen’s behalf.

2. Tony Farmer, 1944 - 2013

Anthony John Douglas Farmer was brought up in Adelaide and following a BSc (Hons) from the University of Adelaide, he completed a PhD in physics at that same university in 1970. “Post-docking” followed, firstly overseas at York University in Toronto, Canada, and then a year at the University of Newcastle, NSW.

Farmer started with the CSIRO in 1973 as a Research Scientist with the Division of Applied Physics, then based in the grounds of Sydney University. His research had already been in spectroscopy at very short wavelengths (in the vacuum ultraviolet range) and his initial project with the CSIRO was the development of a new method to make precise measurements of the spectral characteristics of light sources and detectors. He also collaborated with the US National Bureau of Standards on a successful project that eventually improved the accuracy of silicon photodiodes.



Tony Farmer (1944 – 2013)

From 1981, Farmer was involved in a new research area, thermal plasmas, in keeping with the increased emphasis on industrial physics of what was then the Division of Applied Physics. With Gerry Haddad, he published a series of benchmark papers on temperature measurements of electric arcs. Initially the measurements used spectroscopic techniques, which made use of the light emitted by the arc.

After that, to avoid some of the problems inherent in this approach, Farmer and Haddad were pioneers in the use of laser scattering - a more accurate approach, but one that presented extreme experimental difficulties, as the strength of the scattered signal is minuscule compared to that of the intense arc radiation. It was a tribute to Farmer's skill and persistence that this work was successful.

He led many industrial projects in the arc-physics area in the 1990s, two of which were outstanding successes. One was the development of a process to coat artificial hip joints with hydroxyapatite using plasma spraying, for Portland Square Pty Ltd. The second, in collaboration with the CSIRO's Division of Manufacturing Technology and SRL Plasma, was on the development of the PLASCON waste treatment process to allow destruction of ozone-depleting substances. Twelve PLASCON plants, most of which are still operating, have been constructed around the world. For this work, Farmer was awarded, together with two CSIRO colleagues, the 2008 Alan Walsh Medal for Service to Industry, by the Australian Institute of Physics (AIP). Shortly before his untimely death, he had taken on the position of Editor of the "house journal" of the AIP, *Australian Physics*, but unfortunately only two issues of the journal (Jan-Feb and Mar-Apr, 2013) resulted from this voluntary involvement with the Institute.

Farmer was promoted to Senior Principal Research Scientist (Level 8) in 1998. In 2000, he took on the leadership of the sub-surface radar project. This team made significant advances in the understanding of the interaction of electromagnetic waves and the geophysical environment, and they developed borehole electromagnetic probes for geophysical measurements while drilling, in coal mines. This technology was adapted for environmental applications including measuring moisture, salinity and soil quality. This team also developed SiroPulse, a sub-surface radar system designed for security counter-measures applications, which received wide acceptance within Australia, New Zealand and US government agencies.

In 2005, Farmer became a Theme Leader in CSIRO's Industrial Physics Division, and from 2008 was Deputy Chief of Operations at CSIRO's Materials Science and Engineering Division. He retired in 2010, but continued as an Honorary Fellow, working in the area of high-power ultrasonic processing.

3. Gerry Haddad, 1941 - 2013

Gerald Neil Haddad hailed from Mount Gambier in South Australia but completed his secondary schooling at Adelaide High School after winning a bursary to attend that institution. There followed a BSc (Hons) and a PhD in the Physical Sciences from the University of Adelaide in 1968. He then worked at the University of Adelaide, Culham Laboratory in the UK, the University of Nebraska and the University of Oklahoma and he returned to Australia as a Research Fellow at the Australian National University.

His CSIRO career began in 1982 when he was recruited as a Senior Research Scientist with the Division of Applied Physics at Lindfield. He was an outstanding experimentalist, with a real talent for the engineering and technical development of new systems. Less than a year after starting at the CSIRO, his group leader described him as being "the best experimentalist I have ever worked with." Haddad led a number of projects in the gas-discharge field, ranging from fundamental studies of the interactions of electrons with molecules, through spectroscopic measurements of welding arcs to the design of high-power



Gerry Haddad (1941 – 2013)

arc plasma reactors for mineral processing for Australian companies, including a facility for the dissociation of zircon sands to produce zirconia for ICI.

The success of his work contributed strongly to the rapid development of the CSIRO plasma group's international reputation. The landmark papers of Haddad and Tony Farmer on the temperature measurements of electric arcs, which are cited in leading textbooks on arc welding, showed that the approximate properties of welding arcs can be predicted theoretically assuming "local thermal equilibrium." This made the development of sophisticated computer codes for the prediction of weld properties possible for almost any industrial configuration, and these have been adopted worldwide by companies and universities. Haddad earned rapid promotion as a scientist, reaching Senior Principal Research Scientist (Level 8) in 1989.

In 1988, Haddad decided to pursue a career in research management and took a position as Program Manager in plasmas, thin films and thermometry in the Division of Applied Physics. Nevertheless, for many years he remained strongly involved in the research and development of the plasma group, often taking the opportunity to "get his hands dirty" in the lab. The plasma researchers who followed, remained indebted to him for the experimental facilities he had developed.

Haddad's success as a research manager and leader echoed that of his research career. Following the formation of CSIRO Telecommunications and Industrial Physics, he was appointed as a Portfolio Manager in 1996, Deputy Chief in 1999 and Chief in 2003. He was also Chief of CSIRO Industrial Physics from its formation in 2004 until he retired in 2007. After retiring he took a position at Standards Australia and was there until his second retirement in 2012.

4. Don Price, 1945 - 2013

Donald Carruthers Price was born in Dumfries, Scotland, where his parents had been taking part in the British war effort. After the war, the family returned to Australia and settled in Melbourne. Don's first degree was at the "new" (at least then) Monash University and this was followed by a PhD in which he applied Mössbauer spectroscopy to the measurement of hyperfine field distributions at the ¹¹⁹Sn nuclei in ferromagnetic, transition-metal alloys, under the supervision of the late Professor Bob Street. There followed a series of post-doctoral fellowships at the University of Manitoba, Canada, the University of Liverpool, UK, the Research School of Physical Sciences at the Australian National University and the Royal Military College, Duntroon, where his prime research interest was again focussed on the Mössbauer effect. He then worked on the detection of breast cancer using ultrasound at the Queensland Institute of Technology.



Don Price (1945 – 2013)

It was in the field of ultrasonics that in 1982, he was appointed to the CSIRO, Division of Applied Physics in Lindfield, as a Research Scientist, and where he expanded his research to include both measurement techniques and materials properties. He went on to become Discipline Leader (equivalent to a Research Group Leader) for Acoustics and Ultrasonics, and held leadership positions, including as a member of Divisional Management teams. He was promoted to Senior Principal Research Scientist in 1993.

Price's work on modelling the behaviour of ultrasonic waves in composite materials led to the development of instrumentation for the non-destructive testing of aerospace structures. Modern aeroplanes are no longer just made of metal riveted together, but rather materials such as carbon fibres glued together, and Price worked out how to test the joints ultrasonically

without destroying them. He performed outstanding research in this area in collaboration with Boeing for many years.

He was instrumental in the development of a collaboration with NASA that resulted in the Ageless Aerospace Vehicle (AAV) project, for which he was project leader. The project focused on intelligent active sensing systems for structural health management in aerospace vehicles, though the principles had much broader applicability.

Price also led the tube eccentricity measurement project, which developed an online system to measure the wall thickness and eccentricity of extruded copper tube using high-frequency ultrasound. The system was installed in the production line at Metal Manufactures Ltd., Port Kembla Tube and Fittings Mill, where it is used to sort tubes for subsequent processing, and continues to provide valuable results.

Beyond science, Price contributed greatly to the Division. As a member of the management teams of CSIRO Telecommunication and Industrial Physics, he was instrumental in setting research directions and increasing the awareness of the Division's science achievements in the broader community. He played a major role in internal Divisional review processes, and in managing the Division's contribution to external reviews of its science. He was responsible for coordinating and leading the work of various research teams, and managed and developed valuable external collaborations. He was also a great mentor to students, regularly hosting students from both Australia and overseas. He was very active in the Australian physics community, being a regular attendee at AIP events. In addition, for a number of the issues of *Australian Physics*, prior to Don's untimely death, he had been preparing a column for the journal, reporting on topical issues of physics research and development, internationally, that had "caught his eye" in the literature.

Don was conscientious and generous, frequently making sacrifices for the benefit of his colleagues. He was quietly spoken, with a wry sense of humour. He was never comfortable with self-promotion, preferring the quality of his work to speak for itself. Following his retirement in 2009, Price continued with the Division at Lindfield as an Honorary Fellow.

My personal friendship with Don Price began in his early years as a PhD student at Monash University where he was also an active sportsman, and particularly excelled at baseball. In his later years he took to long-distance running and could boast a best time for the marathon of 2 hrs 36 mins. He has been an active contributor to this conference throughout its history and from the records, I have counted a total of 21 "Wagga" papers which he authored or co-authored and 17 attendances at "Wagga" conferences.

5. John Dunlop, 1946 - 2013

John Burton Dunlop's life began in Wigan, England and following an English Grammar School education, he graduated with a Bachelor of Science with Honours and a PhD in Physics in 1972, from Imperial College, London. His research was concerned with the magnetic properties of hard magnetic materials. John had research fellowships at the University of Sheffield in England and at the University of Genoa, Italy, prior to joining the CSIRO in 1976 as a Research Scientist with the National Measurement Laboratory, then in the grounds of Sydney University. Subsequent changes within CSIRO meant that he worked in CSIRO Applied Physics, CSIRO Telecommunications and Industrial Physics and, later, CSIRO Materials Science and Engineering. He was promoted to Principal Research Scientist (Level 7) in 1987 and retired in 2008.



John Dunlop (1946 – 2013)

In his early years at the CSIRO, Dunlop's research focused on the magnetic properties of transition metal alloys and glassy metals. With the latter he developed techniques for their fabrication, which involved rapid solidification from the molten phase. However, the greater part of Dunlop's career was devoted to the study of the rare-earth permanent magnets and their application in devices, in particular, electrical machines. He was part of the team that developed a pilot plant for the production of the rare-earth magnet neodymium-iron-boron. This was as an extremely successful project, and resulted in the formation of a spin-out company, Australian Magnet Technology.

John was always keen to see his science translated into real-world applications, and this was achieved many times with projects conducted through the Sydney Electrical Machines, Controls and Applied Magnetics (or SEMCAM) consortium and with industrial partners that included, for example, General Motors Holden and Electrolux. These more commercial activities were balanced by a fundamental interest in the magnetism of rare-earth metals, and related alloys, and Dunlop and his fellow team members were credited with the discovery of the so-called "Fifth Family of Permanent Magnets", the 3:29 alloys. He also contributed to the development of novel methods for producing titanium-based alloys.

However, he was not comfortable seeking rewards for himself, he preferred instead to perform useful work for his colleagues and collaborators and for Australian companies. He was highly respected for his deep scientific knowledge, his cheerful willingness to assist and provide practical advice to other researchers, and his friendly and generous nature.

Dunlop was also very active in the Australian solid-state physics community. His efforts, with close colleagues, saw the establishment, in 1977, of the Australian Institute of



(L→R): Stephen Collocott, John Dunlop, Charles Johnson and Don Price, at "Wagga 2012."

Physics Solid State Physics Meeting which, on account of its residential location in Wagga Wagga, NSW, became known simply as "Wagga." A later name change to ANZIP Solid State Physics Meeting evolved from the participation in and hosting of this annual conference by New Zealand groups and later still, further name changes to "Condensed Matter Physics" and "Condensed Matter and Materials" reflected changes in fashion of the day. But it remains the "Wagga Meeting" and the records show that of the 37 "Wagga" conferences up to and including "Wagga 2013", John Dunlop had attended 29 of them and had authored or co-authored 33 "Wagga" papers.

6. Conclusion

In conclusion, may I say that at a personal level I must pay tribute to both John Dunlop and Don Price for their active involvement in what has become an aspect of "Wagga" conferences, the Trivia Night. John, in particular, was a master at setting Trivia Quiz questions and recently both John and Don served as Trivia judges on the night itself. They will be sadly missed from this year's quiz night.

May I invite you all to stand and observe a minute's silence, to enable those of you who knew any of Tony Farmer, Gerry Haddad, Don Price or



(L→R): John Dunlop, Don Price and Trevor Finlayson running the Trivia Night at "Wagga 2013."

John Dunlop, to reflect on your own personal experiences in interacting with them professionally and/or socially.

Acknowledgments

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