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Historical Records of Australian Science

Dr W.R. (Bill) Blevin 1929–2022

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ABSTRACT

William Roderick (Bill) Blevin graduated from the University of New England (UNE) with First Class Honours in science in 1950, completed a Diploma of Education in 1951 and a Master of Science degree in 1952. He joined the CSIRO Division of Physics in 1953 as a research scientist and became the leader of the Optical Radiometry and Pyrometry Group. In 1972, he was awarded a DSc from the University of New England and in 1976 became a chief research scientist within CSIRO. In 1988, he was appointed chief of the CSIRO Division of Applied Physics. For much of his distinguished research career his focus was on improving measurement standards for optical radiometry and photometric measurement. Among his many achievements was an independent experimental determination of the Stefan–Boltzmann constant which advanced the accuracy of agreement with theoretical determinations by more than an order of magnitude. His work on the Stefan–Boltzmann constant and his determination in the face of international opposition eventually led to the redefinition of the candela, the SI (International System) unit for light intensity, in terms of the unit for power. His work was widely recognised internationally and brought great credit to CSIRO as well as gaining great respect for metrology in Australia. Bill served as president of the International Consultative Committee for Photometry and Radiometry (CCPR) for some twelve years and served as a member, secretary and vice-president of the International Committee for Weights and Measures (CIPM). He received many awards and honours throughout his illustrious career, including recognition as a Member of the Order of Australia.

Keywords: candela, light, measurement, photometry, physics, radiometry, SI units, Stefan–Boltzmann.

Early days and education

Dr William Roderick (Bill) Blevin (Fig. 1) was born in Inverell, New South Wales, Australia on 31 October 1929. He was the fifth of six children born to William Blevin and Elizabeth McRae. His father, William, was of Irish descent and his mother, Elizabeth, of Scottish descent. William was a pupil teacher (primary school teacher) at the age of fifteen. He undertook military service in the first world war and returned to teaching after service.

Bill's primary school education was at small one-teacher schools in Brodies Plains, near Inverell, and Duri, near Tamworth, schools where his father was placed as a teacher. His secondary education was at Tamworth High School. Tamworth, like many other high schools at that time, offered only a limited range of subjects for the matriculation Leaving Certificate. Science at Tamworth High School was offered as combined physics and chemistry for the first three years, through to the Intermediate Certificate, but was offered only as chemistry for the Leaving Certificate. Consequently, Bill's early formal interest in science was in chemistry.

His tertiary education was at the New England University College (NEUC)[1] where he studied science on a Teacher's College Scholarship and graduated with First Class Honours. It was during his Honours year at NEUC that he developed an interest in physics and under the influence of Professor Jack Somerville undertook research on

[1]New England University College was founded in 1938 as a campus of the University of Sydney. It became the University of New England in 1954.

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Fig. 1. Dr W.R. Blevin AM 1929–2022. Photograph: Courtesy of Australian Academy of Science.

short pulse arc discharges. His first scientific paper, stemming from his Honours work with Somerville, was published when he was aged just twenty.[2]

Bill very much enjoyed his time at NEUC but by the end of 1952, he had decided to pursue opportunities in a larger organisation. He applied for two positions within CSIRO (Commonwealth Scientific and Industrial Research Organisation), one position was in the Division of Physics at the National Standards Laboratory (NSL)[3] on the campus of the University of Sydney and the other was in the Division of Wool Physics located in Ryde. The Division of Physics was well established while Wool Physics was a new division. Bill was offered both positions and, in the event, chose to go with the more established Division of Physics in the NSL where he was appointed research scientist with responsibility for optical radiometry. At that time all new research scientists at NSL were encouraged to take on honorary positions whenever possible to broaden their scientific outlook. As a new research scientist Bill was invited to take on the position of honorary secretary in the New South Wales branch of the British Institute of Physics and the Physical Society, in addition to his other responsibilities. In this role, he had the opportunity to work with the distinguished scientist Dr Joe Pawsey, who was chairman of the branch at that time. Together with Pawsey, Bill played a significant role in the later establishment of the Australian Institute of Physics.

In the same year that he took up his appointment at the NSL, he married Doreen Graham, a young lady whom he had been courting for a number of years. Doreen was training as a science and mathematics teacher at that time and went on to become an outstanding teacher in those fields. Bill and Doreen had three children: Sue, Douglas and Julie.

Leader of the Radiometry Group

At the NSL, Bill reported initially to Dr Ronald Giovanelli, a senior scientist who later became chief of the Division of Physics. Bill was given responsibility for the Photometry and Radiometry Group and much of his early work was concentrated on coming up to speed with the activities of the group including the provision of a calibration service for standard tungsten filament lamps. It was during this period that Bill became involved in many practical applications of lighting, such as the improvement of street lighting technology, signage, development of more effective colour signals for traffic control and more effective illumination of airline traffic runways.[4] In the process, he became the key point of contact within the division for all things lighting. He was consulted for advice and assistance on many scientific and medical developments involving lighting such as the measurement of the haemoglobin content in blood.[5]

Bill's links with industry and his commitment to practical applications developed further with his appointment as an Assessor for the National Association of Testing Authorities (NATA).[6] He later became the chairman of the NATA

[2]Full details of all publications are contained in the Bibliography that appears in the Supplementary material.
[3]NSL was created in 1938 within the CSIR, later the CSIRO, to be responsible for the establishment and maintenance of national standards of measurement and associated research in support of testing and uniform measurement in Australian secondary industry. It was located in the grounds of the University of Sydney, see Wright (1988).
[4]Giovanelli and others (1962). Wright and Blevin (1965).
[5]Blevin and Wootton (1964). Wootton and Blevin (1964).
[6]NATA, the National Association of Testing Authorities, was established in 1947 and provides accreditation of testing and calibration facilities within Australia (Stanton and Davies 1998). It was the first such accreditation body in the world and in Australia is based on a volunteer panel of experts who assess a facility for technical capability and for competence of staff and operators. Accreditation is provided against claimed capabilities and Bill's expertise as an assessor in photometry and radiometry was highly regarded. NATA, NSC and NSL, which later became the National Measurement Institute, are key elements in the Australian national measurement system (Todd 2004).

Advisory Committee for Photometry and Radiometry and in 1982 was co-opted to the Executive Committee (Board) of NATA on which he served as a director for fourteen years.

Standards research

As the leader of the Photometry and Radiometry Group, Bill saw the need to improve the accuracy of the calibration service that NSL provided and to ensure that the accuracy offered was comparable to that provided by other National Laboratories around the world. He was also concerned that photometry, and the measurement of light in general, were not objectively based on physical units, but still maintained links to candles and visual comparisons with lamps. While the luminous efficacy of the human eye for measurement purposes had been adopted in 1931, the V_λ curve, the candela was still source-based, the luminous intensity of a black body source operating at the melting point of platinum. Bill saw radiometry, without the added complication of vision, as a potential means of relating light measurement to physical units through the measurement of radiated power. Accordingly, he focussed his research initially on radiometry and on improving radiation detectors rather than the more conventional approach of developing standard sources such as standard lamps. The field of radiometry at that time was not new but the accuracy of radiometric measurement was poor and Bill had to develop new measurement techniques to improve the accuracy of radiometric measurement. This led him into the field of black body[7] radiation and research into the radiation absorptivity of 'black surfaces' required to improve the accuracy of radiation measurement.[8]

One of the reasons that radiometry had not attracted greater attention at this time was the poor agreement between theory and experiment. In 1900, when Max Planck published his celebrated law governing the energy radiation from 'black bodies' it became possible to calculate a value for the Stefan–Boltzmann constant, concerning radiated power from a black body radiator. However, after some sixty years the best experimental agreement with the calculated value of radiated power was no better than 1.5%. Bill believed that in order to gain recognition for radiometry as a potential basis for the measurement of light in terms of physical units there would have to be significantly better agreement between experiment and theory in regard to the Stefan–Boltzmann constant. To address this, Bill took up the very difficult challenge of independently determining the Stefan–Boltzmann constant. Working in vacuum with a gold cavity Black Body radiator and a detector that balanced radiant heating against electrical heating, Bill, together with his colleague Bill Brown, achieved an experimental value in agreement with the theoretical value with an accuracy of 0.1%![9] In the process of achieving this, Bill identified sources of error and short-comings in the work of a number of other prominent experimenters. This was a major achievement, a real break-through in radiometry that brought great credit to Bill, the National Standards Laboratory and CSIRO!

Following his work on the Stefan–Boltzmann constant Bill became recognised as an international leader in the field of photometry and radiometry and was invited to join the International Consultative Committee for Photometry (CCP). Under Bill's influence, this later became the Consultative Committee for Photometry and Radiometry (CCPR)[10] (Fig. 2).

The candela

Having gained international recognition for the integrity of radiometry from his work on the Stefan–Boltzmann constant Bill then returned to photometry and his belief that photometry should be set on a sounder basis in terms of physical units. At the 1971 meeting of the CCPR, Bill proposed for the first time that the SI base unit for 'luminous intensity', the candela, be changed and related directly to radiated power, the watt. This was a rather radical proposal at the time. The photometry community was very conservative, and consequently, Bill encountered great reluctance for any change in the definition of the base unit. With great perseverance over many years and in spite of strong opposition, Bill was able eventually to gain the support of a number of key players and finally achieve a redefinition of the candela in terms of radiated power, the watt.[11] This was testimony to Bill's vision and his international negotiating skills! Based on Bill's work the candela, one of the seven base units in the SI (International System of units) is now defined in terms of fundamental physical constants.[12]

Leader in International Metrology

The Metre Convention (Treaty)

The basis of international metrology and the international system of units is the Metre Treaty, or the Convention of the

[7] Blevin and Brown (1966).
[8] Blevin (1970).
[9] Blevin and Brown (1971).
[10] The CCPR is one of ten specialist Consultative Committees established to advise the International Committee for Weights and Measures (CIPM) on all matters related to the relevant area of international metrology.
[11] Blevin and Steiner (1975).
[12] The candela (cd), is the SI unit of luminous intensity in a given direction. It is defined by taking the fixed numerical value of the luminous efficacy of monochromatic radiation of frequency 540×10^{12} Hz, K_{cd}, to be 683 when expressed in the unit lm W^{-1}, which is equal to cd sr W^{-1}, or cd sr kg^{-1} m^{-2} s^3, where the kilogram, metre and second are defined in terms of h, c and $\Delta\nu_{Cs}$. (https://url.au.m.mimecastprotect.com/s/BqTRCoV1kpflMQrBYt1oE3V?domain=bipm.org). See also Quinn (2012).

Fig. 2. Dr W.R. Blevin, president of the Consultative Committee for Photometry and Radiometry, 1982. (WRB: front row, 6th from left). Photograph: Courtesy of BIPM.

Metre as it is officially known. The Convention (Treaty) was signed in Paris on 20 May in 1875 by seventeen foundation member countries (States). The Treaty established the International Bureau of Weights and Measures (BIPM) in Paris, together with a governance structure to oversee the activities of the BIPM. The governing body of the BIPM is the International Committee for Weights and Measures (CIPM), which itself is under the control of the General Conference on Weights and Measures (CGPM). The CGPM is comprised of delegates from the Governments of all member States and it is responsible for electing the members of the CIPM, for approving the BIPM programs of work and for setting the financial dotation to support the activities of the BIPM. There are currently sixty-four Member States and thirty-six Associate States of the Treaty, Australia became a member State in 1947. The CIPM is comprised of eighteen eminent scientists each of a different nationality and membership normally includes all Presidents of Consultative committees (Fig. 3).

Bill was elected a member of the CCP in 1962 and elected president of the CCPR In 1980, a position in which he served for some twelve years, from 1982 to 1994. In 1982, he was elected a member of the CIPM and served as a CIPM vice-president from 1992 to 1996 and then as CIPM secretary and vice-president from 1997 until 2000 (Fig. 4).

In 1998, Bill's international standing was such that the CIPM invited him to review and report on the national and international needs of metrology. This resulted in the landmark publication of the Blevin Report 'National and International Needs Relating to Metrology: International Collaborations and the Role of BIPM'.[13] The report was submitted by the CIPM to the 21st General Conference on Weights and Measures in 1998. In presenting the report, the CIPM president stated that 'the Report is the most far-reaching review of international activities in metrology that has ever been carried out and is of immense importance for the future of the Metre Convention'.[14]

On the home-front

In 1979, Bill was appointed acting chief of the Division of the National Measurement Laboratory following the retirement of Fred Lehany, the long-standing chief of Division, and pending the appointment of a new chief.[15] Much to the disappointment of many staff involved in the Standards function of the division in May 1980, Bill was not appointed as chief but as assistant chief and chief standards scientist to Dr John Lowke, an external appointee. John was appointed following a CSIRO review which changed the name of the division to the Division of Applied Physics and presented John with the challenge of changing the focus of the division to be more industry oriented with an emphasis on external funding. The NSL had always been industry focussed but had

[13]Blevin (1998).
[14]Report of the CIPM to the 21st CGPM.
[15]Blevin, W. R., *Recorded interview with Prof. Neville Fletcher*, AAS Interviews with Australian Scientists series, AAS, 30 March 2010. https://www.science.org.au/learning/general-audience/history/interviews-australian-scientists/dr-william-blevin-applied#move

Fig. 3. Dr W.R. Blevin representing the Australian Government at the 16th CGPM 1979, Paris. (WRB: front row, centre). Photograph: Courtesy of BIPM.

Fig. 4. Dr W.R. Blevin, vice-president and secretary of the CIPM, 21st CGPM, Paris 1999. Photograph: Courtesy of BIPM.

not been focussed on maximising external funding, it being argued that industry and the calibration customer base pay their taxes and national standards of measurement should be a government funded function in the national interest. There had always been a charge for NML's services but NSL had not sought to recoup the full cost of its standards R and D. To increase external funding the division was therefore forced to reduce its standards activities and increase its revenue generating activities. This was a difficult time for John Lowke as chief of division and particularly for Bill who, on the one hand as assistant chief, had to support the chief and the change in direction for the division but on the other, as chief standards scientist, had to protect the standards activities and the hard-won international reputation that NSL had established over many years. Bill sought to capitalise on this international reputation by entering into Mutual Recognition Agreements with the National Standards Laboratories in a number of Australia's major trading countries. This proved to be of great benefit to Australian industry in winning off-set contracts in defence projects and also for gaining recognition and acceptance of Australia's measurement system in the testing of aircraft for international airlines, in particular for aircraft to meet the rather stringent requirements of the Federal Aviation Authority (FAA) in the United States.

Under Bill's leadership, much of the expertise in measurement standards adapted to the new Divisional priorities. However, Bill foresaw that in the long-term the core function of the division, the measurement standards function, was not sustainable without recognition of its importance and maintenance of funding. In 1981, Bill was appointed chairman of the National Standards Commission, a Statutory Authority independent of the CSIRO. In this role he saw the opportunity to advance his concerns about the standards function in the Division and in 1982 organised a conference entitled 'Australia's Measurement System… does it need rethinking'. The conference was well attended by representatives from the government, CSIRO and the industry and gave Bill the opportunity to share his concerns about the decline in support for the standards function to a packed lecture theatre. He did this at great risk to his personal career, being somewhat critical of CSIRO policy. In the event he received great support for the standards function and recognition from the government and industry, which was all greatly appreciated by Bill, the staff involved in the standards function and by the industrial users of the standards services.

These were challenging and difficult times, particularly for John Lowke, but with the support of Bill John managed to change the focus of the Division to address the standards function and create an Applied Physics Industrial Program. Following John Lowke's term as chief and a further review, Bill was appointed chief of the CSIRO Division of Applied Physics in 1988. He served in this role until his retirement in 1994. After his formal retirement he was appointed an honorary fellow and continued to serve on the International stage as CIPM secretary and CIPM vice-president until the year 2000.

Other interests

Bill had many interests outside of science. He was a dedicated family man and took a keen interest in the development of his children and grandchildren. He was also a dedicated parishioner at his local church in Epping. In earlier years, he was a keen tennis player and maintained a regular exercise regime whenever he was at the laboratory. Together with two other chief scientists, known collectively and affectionately as the 'Three Musketeers', they would walk two or three times around the kilometre perimeter road of the NML campus solving the problems of the world as they went. He followed Test Cricket with interest, and was an enthusiastic gardener with a special interest in hydroponics and citrus. In later years, after retirement, he maintained a rain gauge for his retirement village and was a key point of contact for all things scientific within the village.

Bill did not suffer fools easily but he was great company and blessed with a special sense of humour that often came to the fore, particularly during a good dinner and over a couple of glasses of wine!

Honours and awards

During his career Bill was recognised by many honours, awards and appointments, principal among which were:

1972. Awarded Doctor of Science, University of New England.

1983. Elected Fellow, Academy of Technological Science and Engineering.

1985. Elected Fellow, Australian Academy of Science.

1989. Awarded Member of The Order of Australia, (AM). For Service to Science, particularly in the field of Applied Physics.

1991–94 Elected Member of the Australian Academy of Science Council.

1992–93 Elected Vice-President of the Australian Academy of Science.

1995. University of New England Distinguished Alumni Award, UNE.

1996. Lloyd Rees lecturer, Australian Academy of Science.

1996. Awarded Matthew Flinders Lecture and Medal, Australian Academy of Science.

2000. Elected Hon. Member of CIPM.

2001. Awarded Centenary Medal, for service to Australian Society and Science in Applied Physics.

Supplementary material

Supplementary material is available online.

References

Blevin, W. R. (1970) Diffraction losses in radiometry and photometry, *Metrologia*, **6**, 39–44. doi:10.1088/0026-1394/6/2/001

Blevin, W. R. (1998) *Blevin Report, National and International Needs Relating to Metrology: International Collaborations and the Role of BIPM*. Report of the Comité International des Poids et Mesures (CIPM) to the 21st Conférence Générale des Poids et Mesures (CGPM), Intergovernmental Organization of the Convention of the Metre, Saint-Cloud, France.

Blevin, W. R., and Brown, W. J. (1966) Black coatings for absolute radiometers, *Metrologia*, **2**, 139–143. doi:10.1088/0026-1394/2/4/002

Blevin, W. R., and Brown, W. J. (1971) A precise measurement of the Stefan-Boltzmann constant, *Metrologia*, **7**, 15. doi:10.1088/0026-1394/7/1/003

Blevin, W. R., and Steiner, B. (1975) Redefinition of the Candela and the Lumen, *Metrologia*, **11**, 97–104. doi:10.1088/0026-1394/11/3/001

Blevin, W. R., and Wootton, I. D. P. (1964) Iron content of cyanmethæmoglobin, *Bibliotheca Haematologica*, **18**, 73.

Giovanelli, R. G., Blevin, W. R., and Wright, K. A. (1962) Floodlighting of pedestrian crossings, *Lighting Research and Technology*, **27**, 139–142. doi:10.1177/147715356202700303

Quinn, T. (2012) *From Artefacts to Atoms*, Oxford University Press, Oxford.

Stanton, K., and Davies, P. (1998) *Laboratory Accreditation in Australia – From Concept to Reality*, National Association of Testing Authorities, NATA, Canberra. https://www.nata.com.au/images/pdf_files/Laboratory-accreditation-in-Australia.pdf

Todd, J. (2004) *For Good Measure: the Making of Australia's Measurement System*, Allen and Unwin, Sydney.

Wootton, I. D. P., and Blevin, W. R. (1964) The extinction coefficient of cyanmethæmoglobin, *The Lancet*, **284**, 434–436. doi:10.1016/S0140-6736(64)90328-9

Wright, J. F. H. (1988) *Measurement in Australia, 1938 – 1988: A History of Australia's National Standards Laboratory*, CSIRO, Division of Applied Physics, Sydney.

Wright, K. A., and Blevin, W. R. (1965) The night time luminance of white roadlines, *Australian Road Research*, **2**, 3–11.

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