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AUSTRALIA

The five stages of development of science communication

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1. Introduction

Modern science communication in Australia as a discipline emerged in five distinct stages. Some of these steps were influenced by events in other Western countries, especially the UK and the US, while others were influenced by Australia's own particular environment and culture.

By the time European settlers arrived in Australia in 1788, it had been occupied for 80,000 years by the Aboriginal people. They used oral traditions such as dance and stories to pass on knowledge about the natural world. This was the first stage.

White settlement heralded the second stage, characterised by scientific interest in Australia's unique natural history and the need to establish a source of food in an agricultural environment far removed from European conditions. This stage lasted through the two world wars.

US President Roosevelt was advised that the driver of economic growth after World War II (WWII) would be the application of science, and that only a community sympathetic and informed about science could benefit (Bush, 1945). This view was picked up by other countries, including Australia: this was the dawn of the third stage, right after WWII.

The fourth stage, which ushered in the modern era of science communication, arrived with a new emphasis on the public communication of science through increased media coverage of science, the creation of interactive science centres, government programs to support science communication and an increase in science communication employment.

The start of the fifth can be associated with the advent of the first dedicated, professional Australian science communicators, and the provision of university courses and training for an expanding cohort of workers. Academic research increased and science communication developed greater cooperation with industry through the Cooperative Research Centre program, and greater connections with politicians through the Science Meets Parliament initiative.

Many institutions and individuals contributed to these five stages, and this chapter describes their roles and the contributions they made to the emergence of modern science communication in Australia.

2. Historical endeavours

The earliest drivers of recorded science communication in Australia were the needs of European settlers on their arrival from 1788. They considered Australia a harsh country, with poor soil, a difficult climate, strange animals and crops that stubbornly refused to grow in seasonal conditions that were the reverse of the northern hemisphere.

The relationship of European settlers with the Aboriginal communities in various areas was difficult and they were not able to use Aboriginal knowledge to improve their situation.

For thousands of years Aboriginal people survived in the Australian landscape relying on their intricate knowledge of the land and its plants and animals. Tracking and hunting, digging soakages and maintaining surface waters were just some of the ways that people survived. (Central Land Council, 2019)

The settlers relied on their own worldview of Western science. Lindy Orthia (2016) documents the new colony's fascination with science from its earliest days in a study of Sydney's mass media and popular culture. This is hardly surprising, given that every expedition to explore Australia included a person with scientific interests.

Cultural and scientific institutions appeared 40 years after white settlement: the Philosophical Society of 1821 and Sydney's Australia Museum in 1827 were among the first. Other state (regional) museums followed. Traditions of scientific inquiry were extended in the 19th century by mechanics institutes,¹ botanic gardens, learned societies, public libraries and universities:

By the 1870s it was clear that the programme that had unfolded in these [learned] societies was one largely committed to the collection, description and classification of Australian natural history, phenomena and resources, combined with a discussion of practical matters involved in colonial development. This reflected the mood of the times, which had little patience with abstract theorizing. (Inkster and Todd in Home, 1989, p. 113)

Publication of Australian newspapers began in 1803. Science stories were primarily lifted from American and British publications and often covered agricultural topics.² But there was input from domestic journalists, including the Reverend W. B. Clarke and James S. Bray. Bray described himself as a 'naturalist and science journalist' (Burns, 2014b) and was perhaps the first to use this term in Australia. He wrote for the *Sydney Morning Herald* and other antipodean journals on subjects including venomous snakes:

The season, popularly known as the 'snake season' for 1894–95 has passed away. There is little chance of any person being bitten by a reptile, in a state of nature, for the next five months to come. All our venomous reptiles have already retired, or are about to retire, into their winter quarters. (Bray, 1895)

Bray examined NSW Government records 'for recorded instances of deaths and bites from venomous reptiles' and noted where victims were bitten (most frequently on the finger); the most dangerous snake (black snake); and popular treatments (strychnine, scarifying, or tying a ligature and sucking the wound).

The inauguration of the Australasian and New Zealand Association for the Advancement of Science (ANZAAS) in 1888 was a major advance in science communication. Building on a Victorian-era fascination with science and modelled on the British Association for the Advancement of Science (Macleod, 1988, p. 19), ANZAAS was a meeting place for scientists and the public, to make 'science more widely understood, more generously and wisely

1 The objective of the typical Mechanics Institute was 'the diffusion of scientific, literary and other useful knowledge among its members and the community generally and particularly among the young as well as the operative classes'. See R. W. E. Wilmot, quoted in Home (1989).

2 See Burns (2014a, pp. 72–6).

supported, more directly beneficial to the nation, and more accountable to the public interest' (ibid.). ANZAAS conferences attracted large crowds, as the 'only national forum for science' in Australia (Fenner, 2005, p. 2).³

The results of science were taken more directly to the people by agricultural extension officers. Established in the 1860s, extension services helped farmers develop agricultural systems where traditional European approaches had failed to cope with the unfamiliar local soils and conditions (Hunt et al., 2012, p. 11). The demand for these services grew after World War I, when 40,000 demobilised soldiers took up land grants under the Soldier Settlement Scheme. Many had no previous farming experience and much of the land they were offered had only marginal agricultural potential (ibid., p. 12), so a problem–solution exchange from a visiting government extension officer was very helpful.

From 1900 to 1926 the population of Australia increased from 3.7 million to 6 million. Agriculture was a mainstay of the economy and the national government wanted to make greater use of science to develop the country. In 1926 it created the Council for Scientific and Industrial Research (CSIR), a body that originally targeted problems and productivity in the agricultural sector—sheep blow-fly, pizzle disease and seed testing. CSIR worked with the state governments to offer extension services, initially to farmers but over the years as it expanded into other research areas, it employed people for the specific purpose of communicating research results to the public and industry.

On 1 January 1901 the six independent colonies of the Australian continent united to form a single country. By 1939, the population had doubled to 7 million. Nine universities in 1900 had become 17 by 1939. Attendance at ANZAAS conferences rose from 693 in 1900 to 1,200 in 1939. Science journalism became more visible, with a sharp increase in science reports in newspapers. There was a national push to communicate research results to farmers. And then WWII arrived.

3. Leading into the modern era: post–World War II

The war changed everything: new industries, different jobs and new employment opportunities emerged, and people moved to the cities to take advantage. Employment in rural industries dropped from 24 per cent of the

3 The colonial period of science communication is discussed in the paper 'The Emergence of Modern Science Communication in Australia' (Gascoigne and Metcalfe, 2017).

workforce in 1901 to 14 per cent in 1954, and then to under 3 per cent in 2011 (Pollard, 2000; Abjorensen, 2015). Agricultural jobs based on manual drudgery morphed into city work requiring different skills and, increasingly, an educated workforce.

Science caught the imagination of the world through transistor radios, the moon landings, hovercraft and the polio vaccine. In Australia, plagued by rabbits,⁴ three scientists won fame when they injected themselves with the myxoma virus in order to demonstrate the safety to humans of this rabbit disease.

The government recognised the benefits of scientific research in the shape of the potential for new industries, new employment and solutions to environmental problems. Research was shifting into unfamiliar territory. Before the war most research related to agriculture, important to Australia's economy and familiar to its citizens: diseases and pests affecting animals and plants, food, forest products and fuel (Rivett, 1972, p. 88). But in the years after 1945, less familiar topics emerged: lasers, quasars and pulsars, genetic manipulation and computing science. Science was increasingly outside the everyday experience of Australians, and the comprehension gap between scientists and the general population grew.

The growing interest in science by the federal government led to a tussle for control with the science community and a debate about restrictions applying to the communication of science. Scientists had a philosophical attachment to the free exchange of ideas, but the Australian Government felt restrictions should apply to research with military or commercial implications. Complicating this was a distrust of scientists in conservative political circles, and the shameful debate in the Australian Parliament beginning on 30 September 1948 (complete with McCarthyist overtones⁵) about who should control the scientific agenda (Rouse, 2002, p. 166).

The love affair with science went through phases in Australia as it did internationally: fascination at the machines of war; awe mixed with revulsion at the atomic bomb; and wonder and optimism at Sputnik in the 1950s. But concerns about the side effects of science also emerged: the anti-nuclear demonstrations of the 1950s; the publication of Rachel Carson's *Silent Spring* in 1962; and napalm and Agent Orange in the Vietnam War. These concerns amplified workers' suspicions about science: how would new technologies affect traditional jobs?

4 Rabbits are a pest in Australia, estimated to cost the economy AU\$200 million each year.

5 For details, see Rivett (1972).

Stephen Hill charts the course of this love affair in *The Future for Sale*. Science was a source of ‘international prestige and emancipation’ in the 1960s but that soured in the 1970s when people saw the potential downside, sparking ‘a shift in public consciousness towards disenchantment with science’s intrinsic promise’ (Hill, 1993, p. 63).

The post-war years saw the opening of university courses in the history and philosophy of science. These began at the University of Sydney in 1945 and the University of Melbourne in 1946; it is claimed they were among the first departments in the world to tackle such subjects. Their discussions pre-empted questions of subsequent concern to science communication (History and Philosophy of Science, 2019).

The foundations were now set, and the role of science communication and the science communicator unfolded over the next 50 years as a profession, an area of training and a field of study.

4. The modern era

There is no set date for the beginning of the modern era of science communication. It began some time in a 20-year envelope from the mid-1960s. Media activity was marked by the establishment of the Radio Science Unit at the Australian Broadcasting Corporation (ABC) in 1964. Questacon, the first interactive science centre, was forming in the mind of Dr Michael Gore (its inaugural director) by 1980 and opened in 1988. The Commonwealth Scientific and Industrial Research Organisation (CSIRO)⁶ accelerated the engagement of staff to manage communication activities in the 1980s.

Universities made tentative steps into science communication courses from the late 1980s, and the first national government program to support science communication followed the release of the Bodmer Report in the UK in 1985. Bodmer was an international watershed that reverberated around the world. It recommended actions for scientists, educators, the media, industry, government and museums, aiming to increase overall awareness of science and the way it pervades modern life:

Science and technology play a major role in most aspects of our daily lives both at home and at work. Our industry and thus our national prosperity depend on them. Almost all public policy issues

⁶ CSIR was renamed CSIRO in 1949.

have scientific or technological implications. Everybody, therefore, needs some understanding of science, its accomplishments and its limitations. (Royal Society, 1985, p. 6)

The influence Bodmer had on science communication policy in Australia can be inferred. As Simon Lock points out, UK institutions have a long history in science communication and 'initiatives in this area, particularly institutional programmes in the public understanding of science, have frequently become exemplars for other countries when developing their own' (Lock, 2011, p. 18). Australia as a former colony and member of the Commonwealth borrowed freely from Britain in setting up many of its institutions, including ANZAAS and the Science Media Centre.

We argue that all these influences—greater expenditure on science, the quickening pace of change, international influences and new government awareness of the power of technology—created new demands on communication. There were demands for accountability, for awareness and for education so the population could take advantage of new opportunities. Together, they triggered a demand for the science explainer, a person who could translate the complexities of science into language comprehensible by a layperson.

In part, this was to counter concern about public understanding and attitudes to science (Eckersley and Woodruff, 1984). After reviewing six surveys of popular attitudes to science and technology in Australia, Richard Eckersley concluded that:

Australians applaud technological process and fear it ... we generally regard science and technology as a good thing, but feel threatened by their growing and seemingly uncontrolled power ... this anxiety may be heightened by the fact that few of us feel we are very well informed about science and technology. (Eckersley, 1987, p. 1)

The rationale for science communication activities in Australia followed a pattern familiar to other Western countries (Gascoigne, 2001):

- We want a modern, knowledge-based economy.
- Only this sort of economy will deliver the satisfying, high-paying, sustainable jobs that will ensure our national prosperity.
- We believe it would assist us to achieve this sort of economy if we had a population that understands and appreciates science.
- We need a population that understands health and safety issues, like AIDS.
- We also want to ensure the next generation of scientists and technologists, and to stimulate students to do science at school and university, particularly in the 'hard' sciences like mathematics, physics and chemistry.

5. Science in the media: Julius Sumner Miller, Peter Pockley and the ABC Science Unit

Television was introduced to Australia in 1956. The most memorable early science program was *Why is it so?*, where ‘the blazing-eyed American Professor Julius Sumner Miller performed like a magician simple experiments demonstrating laws of nature: Groucho Marx PhD, someone called him’ (Inglis, 1983, p. 215). The program ran for 20 years and is remembered with affection by many older Australians, not least because Miller never held back on explaining the science. (A measure of his impact was that Miller was commissioned to make TV commercials for Cadbury chocolate, where he emphasised the health benefits of ‘a glass and a half of full-cream dairy milk’.)

In 1964, the ABC Science Unit was formed at the urging of the Australian Academy of Science, which ‘wanted the ABC to take science more seriously’ (ibid., p. 215). Peter Pockley was appointed Talks Assistant (Special Duties) with responsibility for both radio and television broadcasts on science. He began a new science program *Insight* in 1965, and his arrival coincided with moves at ABC Radio to sharpen the style of presenters: less stuffy, more sparkle and more attuned to the growing market of people travelling in cars.

Pockley was responsible for science in both media, but it was television he really cared about; he itched to work up programs of the kind he had seen done on the BBC. For a start he was given Science Question Time, a fortnightly program ... of a panel answering questions sent in by viewers. (Inglis, 1983, p. 215)

Robyn Williams joined Pockley and the ABC Science Unit in 1972 and broadcast his first *Science Show* in 1975. It is the longest-running radio science program in Australia and Williams has been officially designated a National Living Treasure.⁷ Apart from interviewing countless scientists and serving as President of Australian Science Communicators, part of the Williams legend is that early in his career he made guest appearances in *The Goodies*, *Monty Python’s Flying Circus* and *Doctor Who* (ABC News, 2018).

7 In 1997, the National Trust of Australia (NSW) invited the public to nominate Australians they most valued.

Figure 6.1: Peter Pockley.

Source: Made available by Cultural Collections, Auchmuty Library, University of Newcastle.

Figure 6.2: Robyn Williams.

Source: Made available by ABC RN.

Pockley was his boss; in an obituary Williams described Pockley as a pioneer and an innovator with a marvellous on-air presence:

He turned out to be a magnificent mentor, offering the most thorough going training any budding broadcaster could wish for. And it was clear from the start that the Unit was everywhere, and pioneering on all fronts. Our Apollo mission coverage (I was hired to prepare for Apollo 16) was across all radio networks and also on TV. And when it came to craft skills we were the first in the ABC to try talk-back⁸ (using an Army field telephone, which would have been more suitable for Rommel in North Africa) and we were secretly doing our own editing. (Williams, 2013)

Pockley set up radio programs at the ABC such as *Insight* and *The World Tomorrow*, but the ABC hesitated about letting him loose on television. He was widely regarded as a prickly character, and this led to monumental battles with management. He was the first senior officer to be charged with breaking staff rules about public comments (spectacularly at a packed ANZAAS Conference, when he responded frankly to a question about ABC plans for science on television).

⁸ When listeners phone in to ask questions of the presenters, live to air.

The formation of the ABC Science Unit was a major development in the reporting of science. Pockley claimed it ‘catalysed newspapers into appointing their first science writers’ (Pockley, 2004). It was certainly a significant step and may have sparked interest in science by the print media—certainly all major newspapers had journalists dedicated to covering science and technology by 1990 (Metcalf and Gascoigne, 1995). Burns, however, records a history of science journalists stretching back well before the Science Unit was formed (Burns, 2014b).

Pockley persuaded the Australian Academy of Science to become more involved in public communication. The Academy had been formed in 1954 and the first object in its charter is ‘to promote, declare and disseminate scientific knowledge’ (Fenner, 2005, p. 314). But faced with a multitude of tasks, limited resources and high expectations, the Academy concentrated on scientific publications and educational materials, with public activities such as lectures, exhibitions (e.g. *Illusion and Reality* in 1983) and forums regarded as supplementary.

The academy did accept one of Pockley’s suggestions in establishing the Australian Science and Technology Information Service (ASTIS) in 1985, a database of expert scientists willing to talk to the media. Pockley chaired media briefings at the University of Technology Sydney (UTS), assembling panels of experts to address topics of media interest, briefing them on media expectations and leading a discussion before an audience of journalists.

The trial briefings were successful, and the idea attracted significant private sponsorship, but the government chose to discontinue funding and the briefings ended (Fenner, 2005, p. 275). Ten years later, they reappeared, this time run by the Australian Science Media Centre (AusSMC), to inform media coverage of science issues. It is no coincidence that the inaugural (and current) director of SMC is Susannah Elliott, a former colleague of Peter Pockley at UTS.

6. The first science centre opened in 1988

Australia’s first interactive science centre was the vision of one man, Dr Michael Gore, a physicist at The Australian National University (ANU). Like others, he was inspired by Frank Oppenheimer’s *Exploratorium* in San Francisco. Gore’s centre began modestly in 1980: it ‘opened on a shoestring budget, and every science organisation in Canberra helped build the displays. Based in an old inner-city infants’ school, it grew and began to attract private sponsorship’ (Gascoigne and Metcalf, 1994, p. 412).

Gore piloted his home-grown science centre into Questacon, the National Science and Technology Centre. His cause was aided by a bicentennial gift from the Japanese Government, which paid half the cost of the new building. Questacon aimed to change science museums from ‘dusty, static, even dead emporia of esoteric mysteries ... [they] started to come alive, to involve and question their millions of visitors; they started to explain, entertain and educate’ (ibid., p. 410).

Professor Chris Bryant takes up the story:

At once, it attracted large crowds that needed to be managed, so Mike [Gore] hit on the idea of training student explainers to give science shows in the side rooms, thus easing the press of people on the main floor. This pragmatic response to an organizational problem had a far-reaching effect, as these young men and women eventually formed the foundation of the Questacon Science Circus ... the most extensive outreach project of any science centre in the world, with the whole of Australia as its territory. (Bryant et al., 2015, p. 129)

Questacon and the new Centre for Public Awareness of Science (CPAS) at ANU formed a partnership to train the ‘student explainers’ in both the theory and practice of science communication. The training evolved from a Graduate Certificate into a Graduate Diploma and a master’s degree program.

Australia also had other science centres and travelling science educational activities, and they have a patchy history. Bryant lists nine centres that opened in Australia between 1980 and 1992, from Wollongong to Hobart. The passion of ‘local champions’ was integral to their success, but this proved a fragile base: several subsequently closed, went through funding crises or moved to other venues. (Bryant et al., 2015).

7. Government programs to support science communication

From the 1960s, both sides of government had concerns about science, driven by low investment in research and development by industry, and collapses in the prices of agriculture and mining products. In 1981, the Liberal (conservative) Minister for Science and Technology David Thomson urged scientists to speak out and to carry the public with them. Similar calls were made by both his predecessors and his successors, with ALP minister

Barry O. Jones famously calling scientists ‘wimps’ in 1984 for remaining silent while he was fighting for the science budget in cabinet⁹ (New Scientist, 1989, p. 20).

It was dawning on government that scientists willing to be more vocal about their research and its benefits (as part of a broad push into science communication) might help achieve national objectives: informing the public, changing behaviours and stimulating interest in science. The Labor Party announced a policy on science communication in 1982:

[to] initiate a continuous public information campaign in an attempt to demystify scientific processes, to raise levels of community understanding about science and technology so that the Australian people and their political representatives can be directly involved in choosing between options and determining priorities. (Bhatal, 1985, p. 1)

But government support for science communication was minimal. There were no policies and no institutions to achieve government objectives, and any moves were experimental. In 1984 the Labor Government took a tentative step, establishing the Commission for the Future:

Its emphasis will be on explaining future scenarios pointing out the range of options opened by new technology and then saying to the people, you must choose for yourselves. (Jones, quoted in Bhatal, 1985, p. 1)

Five years later, after the under-performing commission had closed, the government made a major announcement on science. Urged by his polymath science minister Barry O. Jones, Prime Minister Bob Hawke delivered the ‘Clever Country’ speech, a landmark address leading into the 1990 election. It set out new expectations of science: ‘No longer content to be just the lucky country, Australia must become the clever country’ (Hawke, 1990). Influential was an OECD report critical of Australia’s National Science and Technology Policy: such an ‘external international perspective can be a strong motivator for action’.¹⁰ Hawke unveiled spending measures, a new rhetoric about science, and a program to support science communication: the Science and Technology Awareness Program (STAP).

9 Jones is an extraordinary figure, a member of all four Academies in Australia, prolific author and visionary for science. He later denied he had called scientists ‘wimps’ but admitted to accusing them of ‘wimpish behaviour’ (Personal correspondence, c. 2002).

10 Personal communication, Professor Sue Stocklmayer, 2017.

STAP was Australia's first national science communication program. Created in 1989, it had seven staff and a budget in 1991–92 of AU\$0.7 million, rising to AU\$1.7 million in 1992–93 (10 cents per head of the population of Australia). These were modest resources given its ambitious aims:

The Government's Science and Technology Awareness Program aims to increase public awareness of the central role that science and technology play in national life, including economic and social development. The contribution of science and technology to industry, and the contribution of our manufacturing and services industries to national development, are not widely recognised by Australians. This lack of recognition appears to be one reason for the reluctance of Australians to adopt new technologies and innovative practices in the workplace. (Commonwealth of Australia, 1991, p. 4)

The program's five target groups were young people and their teachers; women; industry and business leaders; scientists; and journalists. STAP funded about 40 special projects annually, including briefing forums for the media, an annual register of science communicators,¹¹ and co-hosting the first national conference for science communicators in August 1990.

The Budget Statement for the next year (1992–93) built on this base. It renamed the Science Council 'The Prime Minister's Science and Engineering Council' and gave it a new task: 'to enhance awareness in community of the importance of science, technology and engineering for Australia's economic and social development' (Commonwealth of Australia, 1992, p. 2.91).

So in quick succession through the 1980s, Questacon was launched; STAP was established; and the 'Clever Country' speech meant more support for programs aiming to lift awareness of science and technology (*ibid.*, p. 1.20–1.22).

The achievements of STAP were modest, reflecting its experimental nature and limited funding. Over the next 15 years, successive governments tinkered with the program, not satisfied it was making much of a difference. The Australian community was not engaged, student numbers in science were falling, and investment in research by industry was among the lowest in the OECD. STAP was modified, renamed and eventually replaced by *Inspiring Australia*, a new strategy launched in February 2010 by science minister Carr (and still running):

11 The Register of Australian Science and Technology Communicators was first published in 1990. By the time of the Third Register in 1994, there were 407 individuals listed (70 academia; 72 education; 31 electronic media; 31 print media; 36 government; 5 industry; 47 museums and science centres; 52 research institutions; 44 in service industries and 19 other).

Figure 6.3: Dr Mark Norman dissecting a Giant Squid at Melbourne Museum in front of the media and streamed live on the internet, 2008.

Source: © Museums Victoria. Photographer: Jon Augier.

Again the Government had lofty aims:

we must communicate and engage the wider community in science. Australia aspires to an innovative society with a technologically skilled workforce, a scientifically literate community and well informed decision makers. The *'Inspiring Australia'* strategy aims to build a strong, open relationship between science and society, underpinned by effective communication of science and its uses. (Commonwealth of Australia, 2010, p. xiii)

Science minister Carr was blunter: 'If we are serious about giving people a real voice in how we run this high-tech world of ours, we have to be serious about science communication' (Carr, 2010).

Inspiring Australia introduced new approaches: a long-overdue recognition that the humanities and social sciences play a part in science discussions, and an attempt to co-ordinate national and regional activities. It established working groups to examine specific issues: the working group on 'Science and the Media', for instance, produced a 60-page report with 26 recommendations. It aimed to bring a new energy to the sector, targeting priority groups (youth, industry, women).

After 10 years, the impact of *Inspiring Australia* is hard to gauge. Evaluating science communication is notoriously difficult, but its small initial budget and a lack of enthusiasm combined with declining funding from the current government suggest tokenism rather than a serious attempt to tackle an ambitious agenda.

8. The birth of Australian Science Communicators 1994

In the early 1990s, people working as science communicators were isolated. Every science research organisation, every museum and each of the 37 divisions of CSIRO had at least one communicator, but there were few mechanisms to enable them to exchange ideas. An association had been formed in about 1987 (with Pockley playing a lead role) but it died after 18 months under the weight of logistical challenges. A national conference of science communicators (with a schoolteacher focus) was convened in 1990 by Questacon and the government, and STAP's registers of science and technology communicators were preliminary steps to events of 1994.

The impetus to form an association came to a head in 1993, when the authors of this chapter (Gascoigne and Metcalfe) were asked to present a paper at the Public Communication of Science and Technology (PCST) Conference in Montreal. Their paper was a summary: which organisations were communicating science in Australia, what were they doing, and how much were they spending?

The authors collected information by asking organisations for a copy of their annual report and interviewing communication staff, and it quickly became clear that people in these roles felt isolated. There was little opportunity for them to share experiences. Tertiary courses in science communication were at an embryonic stage. Publishing articles on science communication was a fanciful idea and attending international meetings to discuss professional issues was almost unknown. The internet as a means of communication was in its infancy.

Clearly there was a need for an association. A meeting at the National Press Club in Canberra in 1994 was the first step. Twenty-three people attended: from the science media, research organisations, science-based institutions and government departments. Alison Leigh, then executive producer of the ABC's national television science show, chaired the meeting; and the only contentious discussion was whether membership should be limited to working journalists or open to anyone prepared to pay the subscription. The latter view prevailed.

The next step was a general invitation to communicators to register as Foundation Members: 375 people paid AU\$25, and these funds together with donations from the Academy of Science, the Institution of Engineers, CSIRO and the Department of Science provided Australian Science Communicators with working capital. The inaugural general meeting at the ANZAAS Conference in Geelong on 22 September 1994 voted to adopt the draft constitution and elected science journalists Julian Cribb (*The Australian* newspaper) and Ian Anderson (Australasian editor of *New Scientist*) as president and vice-president.

The major achievement of Australian Science Communicators (ASC) has been to create a network where none existed before. Members have discovered colleagues and common interests, and worked together to organise events such as National Science Week.¹² ASC hosted the PCST conference in 1996 and the World Conference of Science Journalists in 2007, and runs annual national conferences and a newsletter. None of this would have been possible without an association. The ASC website, discussion list and new media provide a mechanism for advertising conferences and publications. The result has been a large increase in Australian participation in journals and meetings internationally (aided by the advent of the internet and the rise across the world in science communication activities).

9. University courses in science communication

An ASC survey in Australia in 1996 recorded 16 universities offering or planning to offer courses in science communication. These were a mixture: short courses for scientists in writing and handling the media; a bachelor's degree in science and the media; electives for science and journalism students in writing science; and postgraduate and short courses in technical writing (ASC, 1996).

This initial focus of university science communication courses was on training scientists rather than catering to the newly-emerging profession of 'science communicators', and many of the teachers of science communication had scientific rather than communication qualifications and experience. (Metcalf and Gascoigne, 2012, p. 23)

¹² The first national event was held in 1997.

Figure 6.4: Chris Bryant, Mike Gore and Sue Stocklmayer at ANU campus, 2019.

Source: Photo by Toss Gascoigne.

The first universities offering master's courses in science communication were the University of Central Queensland (UCQ) in 1993 and ANU in 1996. Emeritus Professor Lesley Warner designed the UCQ course in 1992:

The idea to offer the courses came from my contacts with Chris Bryant and others at Questacon in the early 1990s and I went to the ... workshop on media skills that you¹³ offered in Rockhampton in August 1992 (I value my attendance certificate most highly). I was looking for niche-market courses that could be offered in the external mode, and at the time we thought there was an opportunity going begging. The interest in sci-comm was developing and there were no post grad courses in Australia. I also found an interesting initiative that was being offered across Universities in Belfast and Dublin so I met with them as well. Basically though the final format was put together by an interdisciplinary group across the university ... There was no model to follow.¹⁴

13 Authors Gascoigne and Metcalfe.

14 Personal communication, email from Emeritus Professor Lesley Warner, 20 February 2014.

An influential factor in the ANU course was the partnership with Questacon's Science Circus. Shortly after the foundation of the Circus in 1985, Questacon Director Mike Gore asked ANU Dean of Science Chris Bryant if the newly formed Centre for the Public Awareness of Science (CPAS) could provide theoretical training and a formal qualification to back up the Circus' more practical approach. The graduate certificate program began in 1988 and was converted into a graduate diploma in 1990.¹⁵ Demand from outside the Circus grew, and Sue Stocklmayer was appointed as lecturer in science communication. Master's and PhD programs followed in due course.

These courses were pioneering. A preliminary survey records only China (1989), the UK (1990) and India (1993) running master's or research degrees in science communication any earlier (Gascoigne, 2014). The work of Mike Gore, Chris Bryant and Sue Stocklmayer blazed a trail in the Antipodes.¹⁶

CPAS and other courses responded to the need to train people to match new job opportunities in science communication. In 1990, CSIRO employed communicators in each of its 37 divisions: to write articles, issue media releases, organise exhibitions, assist researchers with presentations and papers, organise demonstration days for farmers and manage relationships with funding bodies and industry. Staff at museums and the new science centres had similar roles, with greater focus on educational activities. Managing organisational websites later became an important part of a communicator's work.

The normal prerequisite to enter a science communication course in Australia was a degree in science. This contrasts with European and American courses likely to be offered in journalism, arts or social sciences contexts.¹⁷ CPAS was established in 1996, and its courses were advertised as allowing 'a new generation of highly qualified scientists to become skilled communicators who can engage people with the science, technology, or medical information that is most relevant to them'.¹⁸

Requirements have changed over time. University of Queensland's courses were designed 'for science graduates, or those with strong science backgrounds, who wish to communicate effectively with scientists and

15 Personal communication, email from Emeritus Professor Chris Bryant, 2017.

16 Gore, Bryant and Stocklmayer worked together to initiate and develop the courses: Gore as founder and first Director of Questacon; Bryant as Dean of Science at ANU; and Stocklmayer as the first Director of the Centre for the Public Awareness of Science, ANU.

17 See, for instance, *Directory of Science Communication Courses and Programs* by Sharon Friedman and Sharon Dunwoody et al., published in years from 1978 and listing and describing science communication courses in the US.

18 As published on CPAS's website in March 2015, site now discontinued.

professionals in business, industry, government, and the media'. This wording was subsequently modified: 'for graduates from disciplines engaging with science'.¹⁹ The University of Western Australia required a strong mathematics background.

Since 1996, when 16 universities offered courses, there has been a consolidation. The 16 are now half a dozen and CPAS has emerged as the powerhouse. But this is a volatile area and new courses are liable to rise and fall as personnel, funding and vice-chancellors change.

10. Research in science communication

As science communication courses grew and became concentrated in a handful of Australian universities, interest in research at postgraduate level increased. It started at CPAS in 1996, and the number of PhD students has grown steadily to about 30 today. Two other universities have had a significant presence in science communication: the University of Queensland and the University of Western Australia. In 2011 they had 10 PhD students and 20 master's students between them, but numbers declined after staff changes.

Publication of articles on science communication was virtually non-existent in Australia before 1990. The reasons were simple: science communication was emerging as a field of study; *Knowledge: Creation, Diffusion, Utilization* (now published as *Journal of Science Communication*) was the only specialised journal in the field (although related journals might carry articles); and there was no culture of publication. A search of 22 journals relevant to science communication discovered only two articles by Australian authors published before 1990 (Metcalf and Gascoigne, 2012).

But the trend is upwards. Metcalfe's 2012 study identified a total of 73 articles, 23 published in the period 1990–99, and a further 48 since 2000. In the last five years, authors attached to CPAS have published four books, 18 book chapters and 49 refereed papers.²⁰ A study of the three international journals devoted to science communication found that Australians were fourth in producing peer-reviewed papers, behind the US, UK and Canada (Guenther and Joubert, 2017).

19 As published on University of Queensland Science Communication Field of Study website in 2015, site now discontinued.

20 A list of publications by all CPAS staff and students is published at: cpas.anu.edu.au/research/publications/archive (accessed 6 November 2018).

Metcalf's review (2012) of Australian science communication scholarly papers notes other trends in publishing over the last 15 years:

- a more interdisciplinary approach
- a greater diversity of topics
- a move in the disciplinary background of researchers, away from natural sciences and towards the humanities/social sciences
- more research into models of science communication, and engagement.

11. Communication with industry: Cooperative Research Centres, 1990

Communication with industry (apart from agriculture) has been a problematic area in Australia. Part of this is the nature of the commercial sector. Industrial investment in research is lower than in comparable countries, partly because many companies in Australia are branch offices. To increase the industrial take-up of research, the government moved to encourage collaborative research: consortiums of research organisations, industrial companies, government departments and the end users. In 1990 it established the Cooperative Research Centre (CRC) program.

The CRC program brought industry and researchers into networked groups bound by a common interest. Groups worked in areas including renewable energy, viticulture, freshwater ecology and asthma. The program involved public good issues as well, notably in the environmental area where the 'industry partners' were government agencies or organisations aiming to improve matters such as air or water quality. A notable example was the CRC for Freshwater Ecology run by the redoubtable Peter Cullen. Cullen pioneered the use of 'knowledge brokers' to link research with end-users and drew up a 'Top Hundred' list of all the people he had to communicate with. He said that as long as these people knew what was happening at his CRC, it was achieving its aim.

Consolidation of research was an advantage, but communication was a challenge, as Riedlinger et al. notes:

There are many advantages to functional diversity, including increased innovation, renewal, and creativity. The main disadvantage of functionally diverse organizations is that diversity makes communication and cooperation difficult. (Riedlinger et al., 2004, p. 56)

By 1994 more than 50 CRCs had been established, each with up to 100 partners. The challenge of communicating across a cooperative venture of this diversity was initially underestimated, with the communication role often carried out by the administrator of the CRC, outsourced to a communicator working with one of the partners, or devolved to the researchers. A review of the CRC program in 2003 (Howard Partners, 2003) concluded that a successful CRC requires a major commitment to regular communication among all participants (researchers, the board, industry bodies, government and the community), but observed this area was often under-resourced:

For many CRCs external communication does not appear to be a high priority. Yet communication is an important path to adoption. ... CRCs spend, on average, only 1.9 per cent of their total expenditure on communication. Given the purpose of the CRC Programme in promoting adoption, this low level of commitment to communication is of concern. (Howard Partners, 2003, p. 91)

As the program has matured, so has the role of communication. The focus on industry and making partnerships work across institutional cultures has re-orientated the communicator's normal focus on communicating with the public. The belated recognition of the importance of communication is demonstrated by a guide published by the CRC Association in 2010, emphasising the central importance of internal and external communication and listing 20 different approaches (CRC Association, 2010).

12. Communicating with politicians: Science meets parliament, 1999

Australians are proud of their scientists: in 1966 when the country moved to decimal currency, half the new bank notes featured portraits of scientists. But in political terms, science is a low priority, shuffled around from department to department and low on the ministerial totem pole. Supporting science is not seen a vote-winning policy.

Parliamentarians are a difficult target group for science communication. Only a handful of the 227 national parliamentarians have university-level qualifications in science. Their lack of knowledge is apparent when parliament discusses science-based issues like water, energy and genetic engineering. There is a vocal distrust of science by some parliamentarians, part of an inclination by conservative forces to dismiss scientists as 'chardonnay socialists and latte-sipping liberals'. One result has been a long-running and rancorous debate on energy and climate policy.

In 1999, a national advocacy body for science (the Federation of Australian Scientific and Technological Societies (FASTS)) tackled this issue head-on with a new event, 'Science meets Parliament' (SmP).²¹ Loosely modelled on the US 'Congressional Visits Day', it brought 160 scientists to the national parliament to meet MPs and talk about science and its benefits. Half of the national parliamentarians agreed to meetings with a pair of scientists.

SmP was an instant success and galvanised enthusiasm across the science community. Its stated purpose was to inform MPs about science, but it also served to educate scientists on the policymaking process. It was a trail-blazer in Australia: no other organisation or sector had attempted to influence parliamentary opinion by 'invading' Parliament House *en masse*. SmP is firmly established as an annual event and is much copied by organisations from other sectors and regions. It has spawned a European event with a similar name: Science meets Parliaments.²²

SmP had a controversial start. At the initial event FASTS employed Robbie Swan, a well-known lobbyist, to tutor participating scientists in advocacy. One senator was not impressed:

Senator Harradine: So I was rather surprised to learn of the methods that the Federation of Australian Scientific and Technological Societies used yesterday to assist scientists in their communications with parliamentarians. Some lobbyists go about their work in a very professional way. They might say they apply similar systematic and rigorous methods as do scientists. By and large, they are a reputable group. We all know who they are, and there is no need to mention them by name. But whom did the organisation decide to pick to tutor the scientists in how to approach lobbyists? None other than the spokesman for the porn industry.

Interjection: Oh, no!

Senator Harradine: Yes, the spokesman of the porn industry, Robbie Swan, or should I say Caroline Sweetly, whichever alias he goes by. (Hansard, 2001, p. 26332)

21 For a description of the event, see Gascoigne (2005).

22 See europa.eu/newsroom/events/science-meets-parliaments_en.

Figure 6.5: *Canberra Times*, Monday 11 October 1999.

Source: Published by permission of the artist, Pat Campbell.

An integral part of SmP is an address to the National Press Club (NPC). FASTS had earlier pioneered the use of the NPC to make the public case for science, hoping to profit from the fact that major speeches are televised live. But in the 55-year history of the NPC, no scientist had ever delivered a televised address before FASTS organised an address by Professor Ian Lowe in 1997. FASTS used the NPC to influence the policy debate and connect with a wider spectrum of interests in Australia, including industry. The Academy of Science has followed suit, organising its own speakers from 2001.

13. Conclusion

The story of science communication in Australia began with the Aboriginal oral traditions of passing on knowledge about the natural world. Today there is a rich diversity of science communicators in Australia, including those working for research organisations like CSIRO, in state government departments, for industry and in private consultancy businesses. In the last decade, we have seen science communication put more emphasis on the need to ‘engage’ the public. One of these publics is the Aboriginal community, as the scientific establishment tries to incorporate indigenous knowledge gained over 80,000 years into its Western science model.

All the institutions and events documented above have been important influences on the emergence of modern science communication in Australia. This account omits (for reasons of space) other organisations: the Academy

of Technological Sciences and Engineering; the Royal Institute of Australia; the communication efforts of agriculturally based research and development organisations; the Powerhouse and Australian Museums; the environmental movement from the 1960s; and national awards including the Eurekas and the Australia Prize.

Science communication has had its successes and failures in the modern era. Successes include the growth of courses and research at universities, Questacon, the birth of Australian Science Communicators and the engagement of communicators in international conversations. The 'Clever Country' speech and a national report on science communication (*Inspiring Australia*) were significant policy steps. Science communication has reached out to difficult audiences in the worlds of politics and business. It continues to grapple with hard questions of audiences and publics, and research is coming up with more sophisticated communication tools. There is a lively and well-connected national community actively engaged in practice and research.

But it is also fighting a continuing battle to be effective. What is the best way of engaging with the public, finding a balance between deficit, dialogue and participatory activities? How should communicators act to moderate a discussion between researchers, interested parties and political interests? In the domain of climate change, science communication has been both a success and a failure: polling shows a strong revival of public support (59 per cent) for Australia to take action,²³ but the obstructive stance of the current national government is a source of frustration.

Measured against the government's stated objectives ('We must communicate and engage the wider community in science. Australia aspires to an innovative society with a technologically skilled workforce, a scientifically literate community and well-informed decision makers' (Commonwealth of Australia, 2010, p. xiii)), there has been limited progress. Enrolments in STEM subjects at universities hit a 20-year low in 2017 (Wood, 2017) and decision-makers continue to resist action on climate change and managing Australia's major river system. CSIRO has cut funding for communication activities.

The challenge for Australian science communicators and those who support and employ them is to find the resources to support long-term science communication programs that can help scientists, policy makers and different publics better address the environmental, social and economic issues facing the country.

23 The Lowy poll: 59 per cent of respondents agreed with the statement: 'climate change is a serious and pressing problem. We should begin taking steps now even if this involves significant costs'. See lowyinstitutepoll.lowyinstitute.org/climate-change-and-energy/.

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Timeline

Event	Name	Date	Comment
First interactive science centre established.	National Science and Technology Centre (Questacon)	1988	Questacon began in an inner-city school in 1980, and was renamed Questacon in 1988
First national (or large regional) science festival?	Regional science festival in Canberra (the national capital)	1993	In 1997, the festival was expanded into National Science Week
Association of science writers or journalists or communicators established.	Australian Science Communicators	1994	Inaugural AGM held at ANZAAS meeting in Geelong
First university courses to train science communicators.	Graduate certificate in science communication, ANU	1988	1990: Converted to a graduate diploma There were earlier short courses and diplomas
First master's students in science communication graduate.	University of Southern Queensland	1993	1996: Master's offered by CPAS, ANU
First PhD students in science communication graduate.	CPAS offered a PhD in science communication	1996	First PhD graduate in science communication from CPAS
First national conference in science communication.	In Canberra. Primarily for teachers	August 1990	1996: Melbourne, part of the PCST Conference
National government program to support science communication established.	Science and Technology Awareness Program (STAP)	1989	2010: STAP was replaced by a new program after release of the <i>Inspiring Australia</i> report

Event	Name	Date	Comment
First significant initiative or report on science communication.	<i>Inspiring Australia: A national strategy for engagement with the sciences</i>	February 2010	
National Science Week founded.	National Science Week established	1997	Runs annually in August, with 1,000 events
A journal completely or substantially devoted to science communication established.	<i>Australasian Journal of Science</i> first published	1938	'To publish news on scientific topics of general interest' (name change to <i>Search</i> , now defunct)
First significant radio programs on science.	Radio Science Unit formed at the ABC	1964	Peter Pockley was first reporter and producer
First significant TV programs on science.	<i>Why is it so?</i> Iconic TV program hosted by Julius Sumner Miller	1963	
First awards for scientists or journalists or others for science communication.	Michael Daley Awards for excellence in science journalism	1984	1997: The Daley Awards were rolled into the Eureka Awards, run by the Australia Museum
Date hosted a PCST conference.	Melbourne hosted the fourth PCST Conference	1996	
Other significant events.	Australasian Association for the Advancement of Science founded	1886	1888: renamed the Australia and New Zealand Association for the Advancement of Science
	New decimal currency, had portraits of seven scientists on bank notes	1966	
	First Science meets Parliament (SMP)	1999	Scientists meet national politicians to explain the value of their work
	Australian Science Media Centre (AusSMC) formed	2005	An independent service to help media report science accurately
	5th World Conference of Science Journalists	2007	Conference in Melbourne

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